CHAPTER II

REVIEW OF RELATED LITERATURE
REVIEW LITERATURE

The Research Scholar made sincere efforts to locate literature relevant to this study. Some of the Studies cited in this Chapter do not have direct relevance to present study but or of indirect importance in understanding significance and need of present investigation. The relevant studies found from various sources which the Research Scholar has come across are cited below:

Vaccaro, Clarke and J.P Wrenn\(^1\) conducted a study on Physiological Profiles of elite Basket ball players. 15 members of the University of Maryland Women basket ball team were assessed for body composition, somato type, muscular strength, endurance, pulmonary function and aerobic capacity during the 1976-77 basket ball season. Result of the analysis indicated that

(i) measures of height and weight established here were greater than that of the average female and most other athletes.

(ii) Percentage of men fat was less than those values reported for women distance runners.

(iii) Men somato type was similar to those reported for normal group women.

\(^{1}\) P. Vaccaro, Clarke and J.P. Wrenn, "Physiological Profiles of Elite Basket ball players". Journal for Sports medicine and Physical Fitness. 19(March 1979) pp 45-54
Upton and Hagon\textsuperscript{2} conducted a study on 73 female volunteers aged 13-15 years on height, weight, percent of body fat, forced vital capacity, forced expiratory volume for 1 Sec. and maximum voluntary ventilation. During the Treadmill test each subject was continuously monitored via a 12 lead. ECG heart rate was recorded for last 15 Sec. of each minute with a full 12 lead recording at the end each of stage of the test. Blood pressure was monitored at the end of each walking stage using a SPHYGOMANOMETER and PRESSURE CUFF. All subjects were similar in age and height. But the untrained subjects were significantly greater than the trained subjects in total body weight. The secondary women possessed a significantly greater amount of body fat, whereas both groups were equivalent in lean body weight. The women runners had significantly greater maximal aerobic power.

Pate and Miller\textsuperscript{3} matched 8 male and 8 female runners on performance in a 24.2. K.m(15 miles)road race( x time ± S.D = 115.1 ± 2.2. min. for females, 115.8 ±3.2 min. for females). All subjects completed a graded tread mill run during which VO\textsubscript{2} max. and heart rate

\textsuperscript{2} S.J. Upton and R.D.Hagon . “Comparison of the Physiological profiles of the middle aged women distance runners and sedentary women”. Research Quarterly 54. (March 1983) pp 83-84

were monitored at several sub maximal running speeds and at maximal exercise. Blood samples collected at rest and 3 min. after maximal exercise, were analyzed lactic acid and 2,3 diphosphoglyceric acid concentrations, body compositions were assessed. Group comparison revealed that the males were taller, heavier and higher in the Hb than the females.(P<.05). The sexes did not differ significantly in percentage of body fat or in VO2(ml kg\(^{-1}\)min\(^{-1}\))HR, respiratory exchange ratio or ventilatory equivalent of Oxygen during sub maximal running or at maximal exercise( P>.05) 2,3 diphosphoglyceric acid was higher in females when expressed relative to Hb(P<.05). This data indicate that female and male distant runners of equal performance level are very similar to body composition, metabolic and in Cardio respiratory responses to exercise.

Eillen\(^4\) studied the use of haematological measures for the detection of the over work in cross country runners. Subjects for the study were 15 members of the men university cross country team at Springfield College. Blood samples were taken from the subjects 20 times during the season. Each sample was analyzed for Haemoglobin

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\(^4\) Culliname M. Eillen, "The use of haematological measures for the detection of overwork in cross country runners", completed research in health and phy. Education and recreation, 21 (1979) 202
content, red cell count and white cell count. All the subjects times from 6 competitive meets were recorded. Analysis was done and following conclusions were drawn.

Same measures of Haemoglobin, white cell count or red cell count taken prior to a meet does not accurately predict running performance. The changes in the blood compartments from one reading to the next, just before a meet does not predict running performance although the finding were contradictory in this analysis.

Rampothi is of the opinion that endurance from physiological point of view is a question of bodies ability to absorb Oxygen from Oxy haemoglobin. Therefore it is of great importance in athletic performance.

Christine et.al. conducted a study on body composition and aerobic requirement of male and female marathon runners. (7 male and 4 female marathon runners). It was determined that experienced female runners as well as male runners were able to work at high fractions of their aerobic capacity during actual marathon competition. Both the female and male marathon runners had more lean body moss. Further no

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5 Kelevi Rampoti, "The blood picture as a guide to training", Track technique (Sept 1960), pp 36
significant differences in these parameters were observed between the male and female runners studied.

Allen determined the aerobic capacities and physiological fitness of 321 Australian men a sub-maximal bicycle Ergometer test. The results are for use when evaluating the Physiological cost of work in industrial processes. The survey revealed that the fitness was independent of occupation but was dependent upon age. Participation in regular moderate sport leads little effect on fitness, but intensive sporting training was associated with superior fitness. Reduced fitness was associated with over weight, but under weight did not result in superior fitness.

Spitler studied the body composition and maximal aerobic capacity of 10 competitive body builders. Subjects included a former Mr. Universe, A recent Mr. World and a recent Mr. America, with the others ranging from state to national caliber. Measurement of body composition indicated that an average of $9.9 \pm 1.9$ % body fat. Anthropometrical data reveal that body builders are taller and heavier with less total body fat than other national and international caliber

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athletes engaging in weight training. Mean VO$_2$ max. was $4.04 \pm 0.8$ lts /min or $42.7 \pm 7.6$ ml/kg/min. The results of this study indicate that most body builders were physically larger than a normal population-have a cardio vascular fitness level similar to non-athletic men. These parameters would not be suitable for prediction of success of body builders.

Astrand and Headman$^9$ concluded that maximal isometric strength of elbow flexors lifting strength and aerobic work capacity were recorded for men of 50-64 years of age. All measures declined with age. The co-relation of aerobic work capacity with the strength test was low.

Kanstrup and E.K.Blonis$^{10}$ The study of blood volume and haemoglobin concentration as determinants of maximal aerobic power changes in blood volume(BV) and haemoglobin concentration (Hb) were induced in 5 healthy young men after acute hypo-volemic anemia was achieved by blood with drawn. VO$_2$max. values decreased. While the same Hb due to acute Plasma volume expansion (6% dextrin) did not

$^9$ I. Astrand and Headman R. “Muscular Strength and aerobic capacity in men 50-60 years old”, Research Quarterly 35:1(March 1964) pp 86

$^{10}$ Injelix Kanstrup and Bjorn Ekestolme”Blood volume and haemoglobin concentration as determinants of maximal aerobic power “.Medicine and Science in sports and exercise 16 (June 1984) pp 256-262
alter VO₂\text{max}. After re-infusion of blood cells, leading to hypervolemia and increased Hb, VO₂\text{max} increased. Plasma volume expansion in this situation leading to hypervolemia at normal Hb, resulted in a slight reduction in values. Physical performance, measured as time to exhaustion, corresponded to the change in VO₂\text{max}. Except for the hypervolemic anemic situations where it decreased. Changes in peak heart rate were inversely related to BV changes, but were also influenced by Hb. The results point to a significant influence of the total amount of Hb rather than blood haemoglobin concentration for obtaining a high maximal aerobic power. Thus a reduced Hb concomitantly with an elevated blood volume (Plasma Volume) may result in an unchanged VO₂\text{max} but reduced performance time.

In a relationship study Darwick\textsuperscript{11} conducted that active women subjects were heavier, had greater fat free body weight, expended more energy per day had higher maximal oxygen consumption and were stronger in total and trunk extensor strength. Physical education majors were rated higher in those skills than the non-majors.

\textsuperscript{11} Doris Darwick "Maximal working capacity as related to strength. Body composition and physical activity in young females" Completed research in health, physical education and recreation 7(1965)pp.67-68
Mayhew\textsuperscript{12} carried out a study to determine if selected physiological and anthropometric factors that contribute to endurance running performance in adolescent male track athletes contribute similar to endurance running performance in adolescent female track athletes. He concluded that significant differences in body compositions and structures. Haemotological parameters, aerobic capacity and endurance running performance exists between adolescent male and female track athletes. It was further concluded that Cardio-respiratory, body structure and body composition variables contribute significantly to endurance running performance in both male and female athletes, but the degree to which selected variables contributed was not always the same between the sex.

Matsui's\textsuperscript{13} et.al determined the maximum Oxygen intake of normal Japanese adolescents of 12 to 18 years of age during maximum running (8.6 \% uphill treadmill) after 2 mts. Warming up (160 ml/min for boys and 140 ml/min for girls) the subjects ran to exhaustion on the treadmill with speed which was increased by increments of 5 cms/min.

\textsuperscript{12} Jery Lawrence Mayhew" Relative contribution of body composition, selected hematological parameters and aerobic capacity to endurance, Running performance of male and female adolescent track athletes" dissertation abstracts internation 37 (july 1976) pp 179-180

\textsuperscript{13} H.Matsui's et.al "aerobic work capacity of Japanese adolescent", Journal of sports medicine and physical fitness 11(March 1971) pp 33
The Oxygen intake was measured by collection of expired air during 6 min. before all out. Heart rate was examined by recording ECG.

1. The maximum intake of boys increased linearly with age that of girls. However, it was constant from age 12 and 18.

2. The maximum Oxygen intake per body weight of boys increased with age, while that of girls decreased.

3. The correlation coefficient between the body weight and the maximum Oxygen intake were 819 (boys) and 451 (girls), though there was not always statistical significant in correlation in each age.

Bowes\textsuperscript{14} studied the effect of specific exercise on skin fold measurements. The skin fold sites selected were: Posterior surface of upper arm, iliac crest on the mid axillary line and middle side of the thigh, opposite superior ridge of the patella. The experimental subjects were enrolled in a physical education class women which met for three hour periods per week for 10 weeks. 30 min/period were devoted to exercises, which consisted of body mechanics exercises for the first 5

weeks and modern dance techniques, composition and lectures for the second 5 weeks. For the experimental groups significant loss of arm skin fold occurred, mostly during the second 5 weeks.

Mathews et.al determined the Oxygen consumption for 7 subjects who rode a bicycle ergometer at 60 rpm. Under the three different pace conditions. The first condition involved a study pace with a work load of 200 watts/min. The second consisted of a light – heavy pace in which the work load was made heavier every two times. The subjects worked at 100 watts for first 2 min., 200 watts for next 2 min. and 300 watts for last 2 min. The third condition was a heavy – light pace which was an exact opposite of the second condition. The total time taken for each exercise condition was 6 minutes. Net Oxygen consumption was measured for each of the three conditions. The study pace was found to be significantly more efficient.

Michael conducted a study on physiological parameters involved in Oxygen transfers were compared in men and women of similar aerobic capacities as assessed by maximum Oxygen uptake. The parameters of Cardiac output divided by body weight, haemoglobin

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15 Donald K. Mathew “ aerobic and anaerobic work efficiency “ Research Quarterly 34(June 1963) pp356
16 Beavel, Suzanne Michael” A comparison of selected Physiological parameters in men and women of similar aerobic capacity” Dissertation abstracts international 40:2(August 1979): 737-A
concentration and percent body fat were examined to detect differences that might exists due to sex or fitness level. The statistical analysis indicated that cardiac output increased with fitness level increases and was greater in men. Cardiac output divided by body weight increased with increases in fitness level but showed no difference due to sex. Haemoglobin concentration greater in men but did not vary due to fitness level. Percent body fat was greater in women and decreased with increases in fitness level.

Quirk and sinning\textsuperscript{17} conducted on 6 male and 6 female subjects who performed maximal bicycle ergometer work and skipped rope at selected rates. Measures included Oxygen uptake, Oxygen debt, Blood pressure and heart rate. No significant differences were found between treatments for females for any measures. Rope skipping placed high demands on both aerobic (females 92% VO\textsubscript{2}max and males 76.88% VO\textsubscript{2}max) and anaerobic capacities (females 100-106% lactate values after maximum bicycle exercise male 58-78%). Difference in tolerance of males rope skipping were attributed to the lower aerobic power and higher body fat of females.

\textsuperscript{17} John E. Quirk and Wayne Sinning "anaerobic and aerobic responses of male and female to rope skipping" Medicine and Science in Sports and Exercise 14(1984) pp24
Prampero and others\textsuperscript{18} determined that the maximal aerobic and anaerobic power together with fat free body weight were determined by means of indirect method on a group of 116 athletes from different countries competing different events on the Occasion of the Olympic games in Mexico (230 m above the sea level). The highest absolute values in terms of maximal aerobic energy expenditure was observed in the rovers (4400 ml. O\textsubscript{2}/min. or 2 hp). While it referred to 1 kg. body weight the highest value was observed in long distant runners (65 ml. O\textsubscript{2}/min).

The fat content of Olympic athletes independent of their speciality is significantly lower than that of ordinary people. No significant difference has been relative to fat – free body weight, between athletes and members of the ordinary population except for the maximal O\textsubscript{2} uptake of long distance runners which was 25 to 30 percent higher.

Katch\textsuperscript{19} conducted a study to determine the effects of 2 different physical training programme on the body composition of college girls. 10 Tennis players and 5 swimmers were measured three times during


\textsuperscript{19} Franklin Irwin Katch" Physical training and body composition of females " completed research in health, phy. Education and recreation 10( 1968) pp 19
15 weeks of sports training. Body composition measurements included body density of under water weight, subcutaneous skin fold fat and estimated percent of body fat. No significant F-ratio were found with in or between two groups for any of the experimental variables measured. Either the Caloric expenditure during the workout was insufficient to cause changes in inner fat metabolism or directly intake was modified to maintain the body composition.

Dolittle and Bigbee\(^{20}\) made investigation to evaluate the distance covered in 12 min. as indicator of cardio respiratory fitness and to compare it with 600 yard run/walk in this regard. All of the subjects (153 grade 9 boys) successfully completed a test-re test of the 12 min. run/walk. Which yielded a correlation coefficient of 92 indicating that this highly reliable measure. 9 of the subjects also performed maximum Oxygen intake test and 600 yard run/walk test. Maximum Oxygen intake was correlated with the 12 min. run/walk\((r=90)\) and 600 yard run/walk\((r=62)\). It was concluded that the distance covered during the 12 min. run/walk highly reliable and valid indicator of cardio - respiratory

fitness and that it was to be referred to the 600 yard run/walk in this regard.

Riendean et.al \textsuperscript{21} examined the relationship between body fat and selected motor tests. Significant negative correlations of from 0.29 to 0.68 were found between percent body fat and selected motor fitness test. The test items most affected by fat were those which involved running and jumping. Weight did not significantly affect the performance of any of the test items except the 220 yards dash.

In their study relating to somato type and body composition to physical performance 7-12 years old boys. Slaughter and associates \textsuperscript{22} concluded that somato type was not highly related to physical performance scores. However Ponderal index correlated better with performance scores. Somato type components had lower correlation with running and jumping variables than body composition or body size variables.

\textsuperscript{21} R.P. Riendean et.al "relation ship of body fat to motor fitness. Test scores" Research Quarterly 29(may1958)pp 200

\textsuperscript{22} M.H. Slaughter , T.G. Lohman and J.E.Misner " relationship at somato type and body composition to phy.,Education performance in 7 – 12 year old boys" Research Quarterly 48 (Mar 1977) pp 159
Coynee\textsuperscript{23} conducted a study on maximal Oxygen intake was determined by tread mill running, body composition by the formula of Keys and Brozek. Fat free body weight which correlated with maximal Oxygen intake (significant at .05) was the best maximal metabolic reference standard of these measures. A more satisfactory estimate of the maximal Oxygen intake resulted from the inclusion of the fat free body weight, total body fat and total body weight instead of the fat free weight alone. Rigid interpretation of results using the formula of Keys and Brozek for percent body fat was apparently limited in a study involving only trained subjects.

Hensley and Whitfield\textsuperscript{24} investigated the relationship between selected physical performance test and body fatness in pre adolescent boys and girls (N=363). The study concluded with the help of regression equation that for the sum of 2 skin folds by performance on each tests i.e., Vertical jump, standing broad jump, 40 yards dash and 400 yards run was only marginally related to performance. These finding indicated that although inversely related to the ability to more

\textsuperscript{23} Lee Coynee” The relationship of maximal Oxygen intake to body composition and total body weight in active males.” Completed research in health, phy. Education and recreation, 6 (1963) pp 38

\textsuperscript{24} Larry D. Hensley and Whitfield B. East” Body fatness and motor performance during free adolescents “Research Quarterly 53 (March 1982) pp 133
the total body weight, body fatness was of maximal importance in explaining performance differences between the young boys.

Leedy et al. 25 conducted a study to determine the relationship between the body composition and physical performance and related items and to determine whether or not certain physical performance and related items which might be useful in estimating body composition in terms of total lean body mass and percent lean body mass as measured by Potassium-40 determinations in adult men. Data on 19 Physical performance items were obtained from 40 subjects between 21 and 57 years of age. The results are of value to researchers in general and researchers in phy. Education in particular for estimating gross body composition using certain physical performance items.

Johnson, Berg and Latin 26 Compared the effect of 2 trainee frequencies of aerobic dance on Oxygen uptake, body composition and personality. 23 sedentary female students (aged 18-31) enrolled in 2 aerobic dance classes subject trained at 70% of maximum heart rate for 30 min. in a week and progressed 90 min. in a week. One group trained

25 H.E. Leedy et. al " relationship between physical performance items and body compositions" Research Quarterly 36 (May 1965) pp 158

twice a week while other group thrice a week. Training intensity and duration were identical in both groups.

Significant changes (P<0.05) were established within each group in VO$_2$max, time on treadmill and percent body fat. The group which three times per week had significant decrease in fat percentage. It appears that aerobic dance performed 2 or 3 times weekly is effective in producing changes in Cardio-respiratory fitness and body composition when appropriate intensity and duration are used.