Chapter II

REVIEW OF RELATED LITERATURE

The research scholar made sincere efforts to locate the literature related to this study. The relevant studies gleaned from various sources which the research scholar has come across in the library of the Lakshmibai National College of Physical Education, Gwalior are abstracted in this chapter.

A group of thirty untrained college males, aged 18 to 20 years, volunteered for tests on 100, 200, 400 and 800 yards, run as well as on 1, 2 and miles run. This study was conducted by Shreer and no practice sessions were given for the track running. In addition, the subjects were tested for maximal aerobic capacity (Max. O$_2$ intake) on the treadmill and anaerobic work capacity (as measured by method of Margaria). It was concluded that distance beyond half-mile are significantly related to the aerobic work capacity and distances upto and including quarter mile are significantly related to anaerobic work capacity.

Harvey carried the study on twenty white males and twenty black males who were enrolled in various service courses in the health and physical education department at Lamar University,

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Becumont, Texas, during the full semester of 1975. All subjects were subjectively chosen in an attempt to have subjects as physically homogenous as possible. Both groups of subjects were tested a bicycle ergometer for physical perceived exertion (PPE) under conditions of endurance at work loads of 300, 600, 900, 1200 and 1500 kg./min. The Borge Scale were employed to quantify subjects rating of exertion. Perceived exertion following explosive efforts was obtained at heart rate level of 140, 150, 160 and 170 beats per minute. Subjects pedaled the ergometer at the rate of 160 revolutions per minute and indicated their perceived exertion by calling out the appropriate number on the Borge Scale. The ergometer was set at 900 kgm./min. throughout the explosive effort testing. Aerobic capacity data were obtained by employing the predicted maximal oxygen consumption test developed by Astrand and Rhyming. Subjects pedaled a bicycle ergometer for six minutes with a work load of estimated to produce a heart rate between 130 b.m.p. and 150 b.m.p. The subjects were tested for anaerobic capacity by employing the Margaria Kolemen Power Test. Equipment required for the power test included a stairway and a Depon Automatic Performance Analyser with two switch mats. Finally he concluded that the subjects rating of exertion of black subjects in prolonged endurance performance apparently do not differ from the perception of effort of white subjects. Secondly, the subjects rating of exertion of black subjects, under short explosive performance are not different from the perception
of efforts of white subjects. Thirdly, the predicted maximum oxygen consumption of black subjects does not differ from that of white subjects, and lastly the anaerobic capacity of black subjects resulting from a test of power is greater than the anaerobic capacity of white subjects.

Coleman et al.\(^3\) studied the nine college basketball athletes to determine the effects of a season of competition on the aerobic and anaerobic energy sources. Pre and post season variables of resting and recovery heart rates, performance of the treadmill test (time), maximal oxygen intake (ml./kg. min.) and the scores of Margaria Anaerobic Capacity Test (vertical velocity) were studied. Analysis of data yielded non-significant decrease in recovery heart rate, treadmill performance time, and VO\(_2\) max., a non-significant increase in resting heart rate and anaerobic power and a significant increase in vertical velocity from pre to post test. The results of this investigation suggest that the training regime in basketball was of sufficient intensity to maintain cardio-respiratory function and improve anaerobic performance.

Caru et al.\(^4\) compared the maximum anaerobic and maximum aerobic muscular power of young football players with corresponding

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non-athletic subjects. He found that the average maximum anaerobic muscular power in football players were significantly higher than non-players. On the contrary the maximum aerobic power does not differ significantly between two groups.

Mathews et al.\(^5\) determine the oxygen consumption for seven subjects who rode a bicycle ergometer at 60 rpm. under three different pace conditions. The first condition involved a study pace with a work load was made heavier every two minutes. The subjects worked at 100 watts for the first two minutes, 200 watts for the next two minutes, and 300 watts for the last two minutes, 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 six minutes. Net oxygen consumption was measured for each of the three conditions. The study pace was found to be significantly more efficient.

Ponthieux and Barker\(^6\) found fifth and sixth grade Negro boys superior to white boys of the same grade levels in five of the seven items of AAHPER Test. Negro girls surpassed white girls on four of the seven items, the white girls surpassed the


Negros on two, and there was no significant differences in the girls performances on the one remaining test.

Forty-six untrained female subjects were studied by Milburn⁷ to determine if the cardio-vascular benefits from an aerobic dance programme equaled those of a jogging programme. The Subjects ranged in age from 18 to 29 yrs. and included 19 from a jogging class, 15 from an aerobic dance class and 12 from bowling classes used as a control group. Both broups trained 4 days per week, 30 min. per day for 7 weeks. All subjects were given pre (T₁) and post (T₂) volitional maximal treadmill test using the Modified Astrand Protocol. A target HR, based on 75 per cent of the max. HR value attained on the initial maximal test, was assigned. Training HRs were monitored and recorded daily. The joggers and dancers worked as an average intensity of 83% and 84% respectively, over the training period. An ANOVA with Repeated Measures followed by a Scheff’s Post Hoc Test was used to analyse the following variables: \( V_E \) max., max. HR, body weight, run time and max. \( VO_2 \) in lit./min.\(^{-1} \) and ml./kg./min.\(^{-1} \). Significant increases \( P < .05 \) were found for both the joggers and dancers in \( V_E \) max., run time and both absolute and relative max \( VO_2 \). A significant decrease \( (P < .05) \) in max. HR was found for both experimental groups. No significant difference \( (P < .05) \) was observed

in body weight for either the joggers or dancers. The control
group showed no significant difference (P < .05) in any of the
variables measured from $T_1$ to $T_2$. It was concluded that both
aerobic dance and jogging are effective exercises modalities for
improvement of cardio-vascular fitness.

Wilgus\textsuperscript{8} conducted a study of a comparison of efficiency
between aerobic and anaerobic work in which oxygen consumption
was determined for seven subjects riding a bicycle ergostat under
three pace conditions, slow-fast, fast, slow and steady. The last
was the most efficient.

Sloan\textsuperscript{9} administered the Harvard Step Test to compare
the physical fitness of college in South Africa, United States
of America and England. It was observed that the fittest male
physical education students were the English and the South Africans
were fitter than the Americans. English female students of physical
education were not significantly fitter than the South Africans
but were fitter than Americans.

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\textsuperscript{8}William Eugene Wilgus, "A Comparison of Efficiency Bet-
ween Aerobic and Anaerobic Work" Completed Research in Health,
Physical Education and Recreation 5 (1963) : 63.
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\textsuperscript{9}A.W. Sloan, "Physical Fitness of College Students in South
Africa, United States of America, and England" Research Quarterly
34 (May 1963) : 244.
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Quirk and Sinning\textsuperscript{10} conducted a study of six male and six female subjects who performed maximal bicycle ergometer work and skipped rope at selected rates. Measures included oxygen uptake, oxygen debt, blood lactate and heart rate. No significant differences were found between treatments for females for any measure. Rope skipping placed high demands on both aerobic (females 92 per cent \(\text{VO}_2\) max., male 76.88 per cent) and anaerobic capacities (females 100 - 106 per cent lactate values after maximum bicycle exercise, males, 58-72\%). In males, who did not reach \(\text{VO}_2\) max. during rope skipping it was verified that the \(\text{VO}_2\) requirements do not increase with skipping rate over a relatively wide range, but that extremely high rates do require more energy from both aerobic and anaerobic sources. Differences in tolerance of males and females to rope skipping were distributed to the lower aerobic power and higher body fat of females.

Burris\textsuperscript{11} studied the measurement of aerobic capacity in college women. College women volunteers (\(N = 30\)) served as subjects to determine the reliability of selected circulatory, respiratory and metabolic responses to progressively increasing loads during treadmill working, the reliability of maximal treadmill


and running performance, and the relationship of performance on a 12 min. run test to max. $O_2$ consumption measured during a progressive treadmill test. The subjects performed three trials of the 12 min. run test, and 2 or 3 trials of a progressively treadmill test in which the speed was held constant at 3 mph. and the grade was increased 2.5 per cent each 2 min., until exhaustion, measurement of the circulatory, respiratory and metabolic responses were made every 2 min. throughout the progressive tests and during a pre-work test and warm-up and post-work recovery. Maximum performance on both the treadmill test and the 12 min. run correlated substantially (.73 to .77) with max $VO_2$ and optimal work capacity. The observed circulatory, respiratory and metabolic parameters showed a common tendency to be more reliable in work than during rest or warm-up. Heart rate systolic blood pressure, respiratory rate, tidal volume, inspired volume, and $O_2$ consumption became increasingly reliable as the work loads increased.

An investigation was undertaken by James and David\textsuperscript{12} to determine possible age and race differences between black and Concasian girls aged six, seven and eight years. Ninety female subjects were administered 28 test items measuring speed, muscular power, agility, flexibility, balance, muscular endurance and

cardio-vascular endurance. Few significant differences were observed between adjacent ages, but eight years females were significantly superior to the variable used. For race comparisons, no significant differences was noted. The black subjects were significantly superior on two measured of agility while the Concasion subjects performed significantly better and time limit shuttle run and grip strength.

To evaluate the effectiveness of a 10 min. run/walk test as an indicator of cardio-respiratory fitness, 19 girls aged 12, 13 and 14 years were tested for VO\(_2\) max. and VO\(_2\) at specific velocities, by Beard.\(^{13}\) Two 10 min. run/walk tests were performed on separate occasions. Linear equations were determined between velocity and VO\(_2\) for the total group of 7 track participants, and 12 non-participants. Comparisons were made between the prediction equations of VO\(_2\) max. of the present study and those of Balke, Cooper, Margaria and Dill which utilized average running velocity. The reliability of measured VO\(_2\) and treadmill velocity was .89 (P < .01) with a linear relationship of Y = .208 V + 5.78. There was a significant (P < .01) reliability of .72 of measured VO\(_2\) max. with distance run in the field test. A significant difference (P < .01) was demonstrated by a dependent t-test between the 5 prediction methods. Comparison of measured and predicted

by values indicated that maximal aerobic power of adolescent girls could be adequately estimated by relating distance run in a 10 min. field test to a linear equation of velocity to $VO_2$ association. It was concluded that the relationship between velocity and $VO_2$ was significantly different for 12 to 14 years old girls as compared to adults.

Johnson\textsuperscript{14} tested the thirty-eight and thirty-four male SHS varsity swimmer on the Margaria Anaerobic Power Test for assessment of anaerobic work capacity for both males and females. Findings reveal that when identical training programmes are engaged in by both male and female SHS swimmers gain over the season in aerobic and anaerobic work capacity. Male sprinters do not differ from male distance swimmers in either aerobic or anaerobic work capacity. It was also found that males exhibit increase in anaerobic work capacity through the season however, only males increase in aerobic work capacity.

Matheny\textsuperscript{15} compared with forty-seven direct and derived anthropometric measurements of fifty-one American Negro and fifty-one white male college students at the State University


\textsuperscript{15}Eleanor Matheny, "Some Differences in Bodily Proportions Between American Negro and White Male College Students as Related to Athletic Performance" \textit{Research Quarterly} 10 (December 1939) : 41.
of Iowa. The Negro were found to exceed the whites in weight, arm length, forearm length, hand length, elbow width, leg length, lower leg length, foot length and width, knee width, shoulder breadth, chest depth, and width, neck girth and limb girths, all relatives to stature, while the whites excelled the Negros in sitting height, total fat, hip width and ilium width.

Huntinger\textsuperscript{16} studied the differences in speed between American Negro and white children in performance of 35 yard dash and concluded that differences in the mean scores of the 402 Negro children and 390 white children used in this study indicated that the Negro children were superior in speed, as measured by the 35 yard dash, to the white children of three grade levels. To determine the significance of the obtained differences between the six group, the 't' ratios were computed. The Negro boys had statistically significant faster times in the 35 yard dash at the fourth and fifth grade levels while the Negro girls had statistically significant faster time at all three grade levels.

In an investigation Malhotra, Joseph and Sengupta\textsuperscript{17} took 24 subjects of Indian Pre-olympic Coaching-cum-selection Camp


prior to the Munich Olympic 1972 and concluded that excess in percentage of fat is a hinderance of $\text{VO}_2 \text{ max}$ as a measure of endurance.

Christine, Lillian and Gary$^{18}$ conducted a study on body composition and aerobic requirements of male and female marathon runners (seven male and four female). It was determined that experienced female runners as well as male runners were able to work to a high fraction of their aerobic capacity during actual marathon competition and both female and male marathon runners had more lean body mass. Further no significant differences in these parameters were observed between the male and female runners studied.

Shoats$^{19}$ compared the black and white male faculty members on selected cardio-vascular risk factors. Subjects were sixty-four black faculty members from Langston University and seventy-two white faculty members from Oklahoma State University. Variables measured were blood pressure, exercise habits, blood lipids and percentage body fat. There were no significant differences between the 2 groups in blood pressure, total on HDL cholesterol. There were significant more smokers and fewer exercises among

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the blacks. A step-wise regression revealed little relationship between all variables and blood pressure.

Ludy et al.\textsuperscript{20} determined the relationship between body composition and physical performance and related items and to determine whether or not certain physical performance and related items might be useful in estimating body composition in terms of total lean body mass and percent lean body mass as measured by potassium 40 determination 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 research in physical education in particular for estimating gross body composition using certain physical performance items.

Cureton\textsuperscript{21} determined the relationship between three independent body composition measures 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 weighing with residual volume determination, total body potassium (grams) obtained by whole body counting.

\textsuperscript{20}L.E. Ludy et al. "Relationship Between Physical Performance Items and Body Composition" \textit{Research Quarterly} 36 (May 1965) : 158.

\textsuperscript{21}Kirk J. Cureton, "Relationship Between Body Composition and Physical Performance in Prepubescent Boys" \textit{Abstracts of Research Papers AAHPER Convention} (1973) : III.
of redicative potassium 40, and the sum of ten skinfold thickness measurements obtained using large skinfold calipers. The physical performance items included the seven items of AAHPER Youth Fitness Test, Vertical Jump, One Mile Run and Four Dynamometric Strength Test. It has concluded that other factors or combination of others is of more importance in predicting the physical performance items investigated except in case of static strength where fat free weight appears to be the dominant factors.

In their study relating to somatotype and body composition to physical performance on seven to twelve years old boys, Slaughter and associates\(^\text{22}\) concluded that somatotype was not highly related to physical performance. However, ponderal index correlated better with performance scores. Somatotype components have lower correlations with running and jumping variables than body composition or body size variables.

The purpose of the study was to compare non-sports women belonging to north and south regions of India on the aerobic and anaerobic performances. A total of four hundred subjects were selected for the purpose of the study of which two hundred subjects were from the North region and two hundred from the South.

\(^{22}\)M.H. Salughter, T.G. Lohman and J.E. Misher, "Relationship of Somatotype and Body Composition to Physical Performance in the Seven to Twelve Year Old Boys" Research Quarterly 48 (March 1977) : 159.
region. The study was conducted by Singh Dev\textsuperscript{23} on a Comparative study of aerobic and anaerobic performance of non-sports women belonging to North and South regions of India. Aerobic performance of subjects was measured by using Cooper's 8 min. Run/Walk Test and anaerobic performance was measured by the Sargent Jump Test. To compare the women students from North and South regions of India on aerobic and anaerobic performances paired 't' test was applied and to test the hypothesis the significance level chosen was .05.

The analysis of the data revealed that the non-sports women belonging to north region of India were significantly better on the aerobic performance as compared to the non-sports women of south region. On the other hand the analysis further revealed that on the anaerobic performances the non-sports women from south were found to be significantly superior as compared to their counterparts from the north.

\textsuperscript{23}Reena Singh Dev, "A Comparative Study of Aerobic and Anaerobic Performance of Non-sports Women Belonging to North and South Regions of India" (Unpublished Master of Philosophy Dissertation, Jiwaji University, 1987).