CHAPTER II

REVIEW OF RELATED LITERATURE

Man is the only animal that does not have to begin new in every federate generation, but can take advantage of knowledge, which has been accumulated through the centuries. Unlike other animals, man builds upon the accumulated and recorded knowledge of the past.

It is obvious through the comments of different authorities in the field of research that a view of related literature, concerning any particular problem is of great help. From it, the investigators and the research workers get an idea of the work that has already been done in the particular field. They also gather how much remains to be done for clear understanding of the situation, the methods used to collect the required information, the statistical techniques or operations used for the findings and recommendations made in different studies. Thus, the study of the past related literature helps to avoid the risk of duplication provides theories and ideas for further investigation and make available explanation and hypothesis for verification.
Therefore, a systematic, exhaustive and scholarly attempt has been made by the investigator to scan through the related literature, which are available in the form of books, monographs, journals, thesis etc., and a brief view of the studies related to the present problem is described in this chapter.

2.1 Motor Fitness Aspects and Performance

Hassain (1989) conducted a study to determine relationship of selected physical fitness variables (speed, power, cardio vascular endurance and agility) to perform in Basketball. The test was conducted on twenty-five Basketball players from the professional college of physical education as subjects and administered the AAPHER Physical Fitness test to collect the data pertaining to the selected physical fitness variables. The result of the study revealed that agility, cardio vascular endurance and power co-related significantly. Obtained value 0.7, 0.55 and 0.52 respectively whereas speed did not show relationship to the performance (obtained value is 0.08).

Jenner (1971) conducted a research on investigating of best of agility so that he selected hundred students who were divided into
two equal groups as athletes and non-athletes. To measure agility twenty-five tests were used. The findings indicated that performance on agility tests was accounted for fast reaction time, speed of movement, strength and balance, change of position or change of direction, body size and form. A significant difference was found between the mean factor scores for various groups of athletes.

Leighton (1960) has shown that swimmers, baseball players, basketball players, field event performers and champions in wrestling, weight lifting and gymnasts demonstrate flexibility patterns typical for each sport. These patterns are significantly different from those of non-athletes at least with respect of 16 years old boys. An overview of experimental evidence supports the conclusion that flexibility correlates with habitual movements, partners for each person and each joint that age and sex difference are secondary rather than in male.

Promodkumar (1969) suggested that the vital capacity depends on training age and sex. According to him systematic physical training and sports increase the vital capacity. During training expansion, chest is increased and rate of breathing is
reduced. The depth of respiration is increases the endurance of the respiratory muscle and the person has more efficient respiration.

Bachman (1956) determined the relationship between the extension powers of the legs. 26 male Macalister College students were tested on a modified bio-kinetics swing bench. All measurements were measured accurately and reliably. Correlations between the individual abilities on the leg extension and the arm extension taken are low, $r=0.194$ and between the right arm and the right leg their $r=0.041$ and between the left arm and left leg the $r=0.227$. The use of leg power measurements to predict arm power has aroused the curiosity of those involved in comparative swimming. Research findings in generality Vs specialty lead one to question the validity of such predictions.

These Correlations are most significant. It was concluded that extension power abilities are highly specific in nature and that assuming arm power from a leg power measurements.

Oppliger and Spray (1987) in their study stated that error in the measurement of skin folds thickness has been shown to be relatively small when compared with the skin folds variability of the
subjects being measured. (Jackson Pollock Graves, 1986, Marros W.Livingston, 1983; Opplinger, Lohman S. Tipton, 1987 Opplinger et.al. 1983). The results of these studies imply that if skin folds measurements are made on a group of individuals in order to rank them on skin folds thickness within a group or to create group norms, then the measurement error or the skin folds procedure does not appreciably alter the truth but unknown raking based on actual thickness value. However, their knowledge concerning relative errors may not be very helpful when an investigator wants to predict body density from these skin folds measurements with an assurance that these measurements would contribute little error of such predictions.

Most body density predictions are made from multiple linear regression equations where the dependant variable, body density is obtained from hydrostatic weighing and independent variables are measured of such indicators of the age. Girth or anthropometrics measures and individualistic or summed site skin folds measures prediction equation was twice as variable in his or her skin folds measurements using equation 8 or it is 17.4 % of the total prediction. error would result from skin folds measurement error.
Sells (1957) has made a study on relationship between growth performances of primary grade school children. In this study performance in jumping was measured by the standing broad jump. The mean performance of boys showed an increase at successive grade level. The mean performance of girls remained almost same in first and second grade but increased at third grade level.

Henry J. Montoye (1969) conducted on heart rate response to a modified Harvard Step Test. The modification of the test consisted of stepping on to a right inch bench for 3 min at the rate of 24 steps/min. The study was conducted on 2696 males and 2568 females aged 10-69 years who were not excluded for medical reasons. The ECG from which the heart rate was measured and recorded before, during and after exercise.

Resting exercise and post exercise heart rate decreased from age 10 to 25 in males and females and showed little change thereafter.

In both male and females the terminal (3 min) heart rate decreased from 19-35 years, remains constant till the age of 55 and
decreased thereafter. The post exercise heart rate decreased again at age 65 in males and females.

No significant correlation was found between test score and height weight and leg strength. The result indicated no reason for lowering step for shorter adults. In this study low post exercise rates and higher fitness were associated with low resting pulse rate. Physical Education students who were undergoing routine physical training had higher fitness indices and lower pulse rates than medical students.

The study was conducted on 30 inter university football players. All the subjects had 4 years active participation in the game of football. The age of subjects range from 21-24. 20 physical non active football players were taken as control group. This group is not interested to participate in any training camp.

The iron and haemoglobin were estimated for every week during camp. From experimental observation, it is clear that there is a direct relationship between active participation and level of iron and haemoglobin in the blood of football players.
As a conclusion, the footballers having lower level of total iron and haemoglobin have shown lesser interest or sometimes they are not in a mood to go for any training. So proper maintenance of level of total iron and haemoglobin in football players is very important during the physical activity.

Gutin, Gogile and Kerry (1976) determined the relationship between directly measured aerobic power and a variety of fields tests including runs of 12 min 600, 1200 and 1800 yards. Aerobic power was also predicted from sub maximal heart rate while cycling using a modified Astrand Rhyming procedure.

This study showed that in children training reduced sub maximal heart rate without effecting maximal oxygen uptake implying that maximal oxygen uptake and sub maximal heart rate are to some extent of each other. Therefore the relation between sub maximal heart rate and the other measures were also determined.

40 students of the tenth and twelfth classes were selected at random for his study. The subjects were randomly assigned into experimentally and control group with each 20 student. Sphygmomanometer and a stethoscope measured the blood
pressure. Measurements were taken before and after the experiment. The initial duration of the training is 45 min with the speed of running at uniform face for each subject was so determined as to raise his pulse rate between 140-150/min, which is essential to produce training effect.

This study investigated that the endurance training employing slow continuous running method will significantly reduce resting systolic and diastolic blood pressure of the boys at secondary school level. No significant change was found in resting and exercise blood pressure in control group.

Groff (1934) was found to be a better means of classification of girls at the 1960 Olympic in Rome. They observed the difference in age, height and weight of the athletes in different event, but found that the body shapes of the athletes were similar in their respective events.

Hirata (1966) noticed that throwers at different levels of competition are heavier and taller, with muscular arms and wider shoulders.
According to Sundararajan (1979) most jumping events require proportionately long leg, running broad jump integrates initial speed running with exquisite jumping ability, depending mostly on the skeletal measures on the height of the jump.

Ritchson (1968) studied 100, fourth grade boys and girls data. The following variables were collected and correlated age, height, weight leg length, body movement time, 50 yards dash, shuttle run and standing broad jump. The main scores on APHER test items were compared to national norms. Several significant correlations were found with height being weight with leg strength leg length with 50 yard dash.

According to Cooper and William (1970) in addition to many things physical characteristics like leg length and the range of movement of the hip joints, the extent of the leg extension before the leg leaves the ground, the angle the leg makes with the horizontal seems to determine the stride length.

Gallagher (1964) investigated the relationship of agility to performance in women's inter collegiate basketball. The hypothesis that high positive relationship would exist between items of the test
(Mc Cauliff Agility Components test) and performance. The lack of evidence to support the hypothesis was attributed to some unexpected peculiarities of the sample and several recommendations were made.

Anusa (1979) conducted a study, selecting 46 subjects who were well-conditioned soccer players with at least two years playing experience at the college level. They were tested for running speed, power, agility, maximum VO2, strength anaerobic capacity and flexibility. In addition, 11 anthropometrics measurements consisting of skin folds and diameters were taken. Soccer playing ability served as the criterion and was measured by the rakings of threes experienced soccer coaches based on selected soccer skills and strategies. Analysis of data was by zero order correlation and multiple r analysis resulting in the following conclusions; age (experience) is the best single predictor of playing ability, max VO2 and running speed are considered important factors in soccer performance. Flexibility, agility, lactate concentration and leg powers are not considered as valid indications of playing ability.

Lamp (1954) investigated the volleyball playing ability of sub junior high school students in relation to various physiological and
growth factors. Statistical analysis of the volleyball tests showed them to be objective, reliable and valid measures of playing ability of both boys and girls and the factors of age, height, weight and strength. The study revealed that the volleyball tests are reasonably objectives reliable and valid. There is no significant difference among boys and girls in their ability at this age to perform the skills of volleyball.

Age and height are more closely related for girls than for boys performance in volley ball skills. Height is more important than the other growth factors for boys in relation to volleyball skill tests. For both boys and girls there is a slight positive relationship between strength and volleyball playing ability. A comparison of scores and pubescent status indicate that there is a decided relationship between these factors for Junior High School boys. The more mature boys at each chronological age score higher than the less matured boys. For the girls all pubescent groups show early increase in performance with age in all the maximum increase for the pubescent and post pubescent groups appears to come between 12-75 and 13-25 years. Peak scores for the pubescent and post
pubescent groups appear to come in the 14th year followed by a decline or leveling of scores.

Sridhar (1984) studied to determine the relationship of power, agility, flexibility, muscular endurance and circular respiratory endurance to playing ability in volleyball. 30 volleyball players of LNCPE, Gwalior acted as subjects. Power was measured by Sargent Jump and agility by side step test, flexibility by Trunk Flexion test, muscular endurance by pull ups and bend knee, sit ups and circular respiratory endurance by one minute lateral jump test. The playing ability was the subjective judgement of a panel.

Medued (1966) studied the height and weight of sportsmen and sports women in a city. The greatest deviations regarding heights in the positive sense were observed in Basketball players, volleyball players and swimmers. Whereas wrestlers, boxers and figure statues were among the sportsmen showing deviations in height in the negative sense.

Thomas Childress (1972) in his study period to identify and determine effectiveness of selected physical variables in predicting a basketball performance through a faster and discriminative analysis.
The test items were selected through review of the related literature as valid measures of the components of height school playing ability. The test items were administered to 106 high school Basketball players and the resultant data were analyzed through factor analysis. Seven factors were isolated and six were identified as agility, speed, relative muscular strength, total body movement time and manual dexterity. Two test batteries were constructed. The first consisting of Seven test items, the second was composed of ten test items. The results of this study indicated that the components of basketball ability could be isolated, measured and utilized to construct an evaluation tool for classifying players into two populations identified as successful and unsuccessful.

Sonia H. Abdo (1966) conducted a study on leg length, height and weight factors in relation to cardiovascular efficiency of college women. Chest width and pelvic width were also among the factors studied data collected from 193 subjects, were inter related. The results indicated that excess weight had effect on cardiovascular efficiency deleteriously while leg strength correlated positively with step test performance. The linear correlation between cardiovascular efficiency and Ponderal index was significant but the
regression line levelled off for women with high cardiovascular efficiency.

Pearey (1973) carried out a study in which measurements were obtained on 114 college men to determine the relationship between the power and strength of the thigh and leg muscles and the extent to which this relationship was affected to limb length. Pearson Product Moment and partial were positive but low (0.20 to 0.30) between jump and reach scores and speed in extending the legs as measured by a 200 seconds chromoscope. There was no appreciable change in these correlations when thigh and lower leg measurements were held constant.

Mishra (1983) studied the relationship of selected physical and physiological variables. The performance in 50 meter front crawl swimming. The subjects were 25 professional male students of physical education studying in LNCPE Gwalior. Data was collected on arm length (Roger's Physical Fitness Index) ankle flexibility (goniometer) vital capacity (spirometer) and body surface area (Bunn Bois). Performance was recorded in seconds. Pearson Product Moment correlation was computed to assess the
relationship of physical and physiological variables to speed on fifty meter swimming. It was concluded that:

1. There was no significant positive relationship between arm strength ankle flexibility and vital capacity to swimming speed.

2. There was no significant relationship between body surface area and swimming speed.

Wharton studied the Youth Fitness test as a predictive measure of skill development in field hockey. 107 senior high school girls who had no previous field hockey training were used as subjects. A significant relationship was found between the scores on the Youth Fitness Test and the field Hockey achievements as measured by the Schimittal's French field Hockey Achievements tests.

Kamaljeet Singh (1978) conducted a study in order to evaluate the physical fitness of hockey players. A sample of 67 randomly selected male hockey players acted as subjects from the total hockey playing population of Punjab. The subjects were tested in the Fisherman's basic physical fitness test, which included extend flexibility, dynamic flexibility, explosive strength, static strength.
dynamic strength, trunk strength, co-ordination, equilibrium and endurance. The data were statistically analysed by computing mean, range and standard deviation.

The following conclusions were drawn:

The scores of the subjects in hand grip, softball throw, shuttle run and 600 yard run and walk test were much more than in other tests indicating higher levels of explosive strength and static strength of arms cardio respiratory endurance and leg explosive strength.

Physiological aspects and Performance

Karpovich (1966) stated that pulse rate is affected by age, body position, food intake, time of the day, and physical activity. He also stated men who are physically fit show a smaller differences between declining and standing pulse rate than do men in general. The testing pulse rate of highly trained athletes may be twenty or even thirty beats slow than the pulse rate of persons not in training.

Irwin and Theckin (1985) stated that pulse rate can vary among children and can be altered by activity level of stress. A new
born's heart rate is between 100 to 160 beats per minute. From one to four years of age, the heart rate can range from 80 to 120 beats per minute. It is most important to monitor any sudden change of irregularity in heart rate. If the heart rate raises or drops significantly in response to treatment, this change should be noted and reported. Modification of discontinuation of the treatment session may be appropriate.

Katch, Freedson and Stausody (1976) investigated the difference in actual and predicted vital capacity and residual lung volume in sixty-three male subjects who have classified as either large, medium or small using a sizing technique based on weight and height criterion. Vital capacity and residual volume were significantly different (P>0.05) between the three different groupings of subjects (small, medium, large) when attempting to predict vital capacity of residual volume from height, weight density, lean body mass, percent fat, chest girth and age. The standard errors of prediction ranged 9 to 11 percent for vital capacity and +17 to 19 percent residual volume.

Tatarinov (1965) points out that systematic physical training and sports favour an increase in the vital capacity of the beings. He
adds that the vital capacity of the beings in female is lower than 
males and it is higher in young people as compared with old people.

Uppal and Tudian (1964) studied the comparative effects of 
different frequencies of endurance training of cardio respiratory 
endurance. According to their findings, the cardio respiratory 
endurance of secondary school students can be effectively improved by 
administering a progressive programme of interval training to 
bring out significant improvement in cardio respiratory endurance, 
varied frequencies of training that is twice, thrice and five days 
many employed. Endurance training works out during interval 
training method, administered thrice and five days a week and 
more effective in developing cardio respiratory endurance as 
compared to workouts thrice a week.

Reaction time training is utilized to shorten the delay between 
a stimulus and response. This is accomplished by exercise to 
eliminate cerebral decision making functions proceeding the 
response. The objective in the process is to transfer from volitional to 
reflex control movement patterns. Although more reflexes are 
developed prematurely, most are learned. Armin Hary, the great 
German Sprinter and winner of the 100 meters race at Rome
Olympics in 1960, gained his lead in the first 10 yards because of its phenomenal reaction time. In order to improve in reaction time, the athlete must practice movement characteristics of sports in which he plans to participate and each of these movements must be prepared as rapidly as possible.

Shirely A. Green, (1973) determination for haematocrit haemoglobin concentration and maximum VO2 were ascertained for four sprinters and three distance runners three times during the academic team before and after two periods of different training for the group. The subjects were members of an Inter collegiate track team at Texas Women University, Deuton, Texas. The percentage of changes in the variables of the individual and the group following the intensive training periods were described. It was concluded that the intensity of the work in the sprinters training programme was greater for the sprinters than the intensity of work in the distance runners programme was for the distance runners.

Santo and Frankdel (1976) conducted a study to find the effects of physical conditioning programmes on selected physiological components of men of college age. The subjects were seventy six men from a junior college. They were divided into four
different physical conditioning programmes, one was a contract group which had no formal conditioning programme.

In the results the interval conditioning Aerobic conditioning and physical education conditioning groups showed significant increase in cardiovascular efficiency comparing to control group.

The interval conditioning group showed that resting systolic blood pressure was significantly lower in comparison to the control group. The interval conditioning group showed significantly more recovery heart rates following a maximal work. The control group did not improve its cardiovascular efficiency.

In his study he did the experiments to trace out the effects of training in different age groups. In his study, the effects of sports activities on the cardiovascular system was studied. This problem presents many difficulties because personal life, mental, social and other important factors cannot be ignored.

The author is of the opinion however that the present training methods show good effect clinically but caution should be taken regarding extreme exercise in the very young where myocardial disorders may arise. On the other hand it can be said that moderate
exercise or well programmed exercise in old age shows good clinical results and may add to the life span.

Ponroy and White (1976) summarized health records spanning 30 years of 355 men who had once played football. Cause of death was ascertained in 87 cases. Coronary heart disease was reported. In 25 it was found that the coronary group was engaged in less vigorous physical exercise programme developed coronary disease. The conclusion is again well warranted that vigorous physical activities tend to protect against coronary artery disease.

The purpose of the study was to determine the effect of aerobic dance on cardiovascular function and physical work capacity of young and middle aged women.

VO\textsuperscript{2} max, heart rate during sub maximal tread mill walking, resting heart rate and blood pressure and body composition were determined before and after a week of aerobic dance condition programme in twenty eight women (18 experimental and 10 control). Experimental subjects participated 45 minutes of aerobic dance for thrice in a week, control group did not participate in any strenuous physical activity.
It was concluded that aerobic dance performed 30-45 minutes thrice a week control group did not participate in any strenuous physical activity.

It was concluded that aerobic dance performed 30-45 minutes thrice a week significantly improves physical work and cardiovascular efficiency.

Elner W. Yoest, (1975) in his study made an experiment on 57 boys of junior high school and 43 college males from physical education classes to find out the relationship between cardiovascular fitness and selected body measurements. The measurements determined on each group were age, height, weight, skin fold triceps body density, body fat, lean body mass and the body surface area. The Ohio State University step test was administered on both groups. Pearson A was used to determine the relationship of body measurements to step test performance. The finding indicates that the subjects adolescent or adult who possess larger percentage of lean body mass registered higher score on the step test.
Edward Coyle, Himmest (1986) in their study have investigated the effect of detraining on cardiovascular responses to exercise and role of blood volume. In this study they had determined whether the decline in exercise stroke volume observed when endurance trained men stop training for a few weeks associated with a reduced blood volume. In addition to it Athen had determined to extent to which cardiovascular function could be restored in detrained individuals by expanding blood volume to similar level as when trained. They found that the decline in cardiovascular function following a few weeks of detraining is largely due to reduction in blood volume, which appears to limit ventricular filling during upright exercise.

Uppal and Junidan studied the comparative effect of different frequencies of endurance training on cardio respiratory endurance. According to their study the cardio respiratory endurance of secondary school student can be effectively improved by administering a progressive programme of interval running. To bring about significant improvement in cardio respiratory endurance, varied frequencies of training, that is, twice, thrice or five day a week may be employed. Endurance training workouts
using running method, administered thrice and five days a week are more effective in developing cardio respiratory endurance as compared to workout twice a week.

The pre and post-test control group research design was employed for this study. The subjects were randomly assigned to either the experimental group (Interval weight training programme) or the control group (circuit weight training programme). The subjects were pre and post tested after 6 weeks training for muscle strength, power and cardio respiratory function.

Six weeks of interval weight training procedures significantly increases in strength and power. Six weeks of interval weight training is superior to circuit weight training and does not produce statistically significant improvement in cardio respiratory function.

Frank del Santo, (1977) selected 76 college men to study the effect of regular physical education programme. Cardio respiratory fitness was measured using the Harvard Step Test and 12 minutes run test and three minutes shuttle run. It was concluded that regular physical education programme group improved
significantly in cardio respiratory fitness when compared to control group.

Davis (1973) in his study selected 1189 University students to study the effects of three different intensive training programme on cardio respiratory fitness. The subjects were assigned to one of the experimental or control group. The methods of training employed were rest load training procedure, continuous running and high intensity running.

The subjects followed prescribed work out percentage for 30 min/ session and three sessions a week. It was concluded that three training groups showed significantly greater improvement in cardio-respiratory fitness than did the control groups.

Padmavathi (1959) and other conducted a study on blood pressure of low and high-income groups in Delhi, variation of blood pressure with age and weight determined. With the low income group there was a little rise in blood pressure with the age except with increase in body weight. In the high-income group the body weight and pressure were higher in every decade than in the low income group.
There was a consistent rise in blood pressure with body age and weight. The low-income group had lower systolic blood pressure than high income group, where diastolic blood pressure was lower after age 40. The increase in blood pressure over 140/90 was low among all classes in India. The lower body weight is appeared to be the important factor to have less blood pressure.

Keen and Sloan (1958) studied the observation on the Harvard Step test. Two groups, one of 46 medical students and other 22 physical education students were given Harvard Step test.

Pierce, Rosenek and Stone (1993) investigated the response of Lactate (La) heart rate (HR) and rating of perceived exertion (RPE) to acute resistance exercise following a high volume weight training programme. Twenty three untrained male subjects were divided experimental (GE N-15) and control group (C, N=8). A pretest was performed and following 8 weeks of training by GE all subjects were retested. Results showed that peak (La) decreased as a result of training. GE displayed a significant reduction in heart rate at the end of each set. Significant decreases in RPE were also observed. These findings suggested that 8 week high volume weight training programming emphasizing large muscle group can reduce the
physiological and perceived stress associated with resistance exercise.

Larson (1941) pointed out that both heart rate and blood pressure are effects by the following aspects. Exercise, age, sex divisional changes, season and climate, attitude changes in posture, digestion, air and water movements loss of sleep, respiration metabolism and emotional and nervous condition. These factors increase considerably the complexity of cardiovascular measurement.

Bird and Hay (1987) observed variations in heart rate with pre exercises food. Students were studied during multistage cycle ergometer tests.

The tests were repeated on 5 occasions following the ingestion of different pre exercise meals and the results were compared. A glucose adoption was taken 3 hours prior to the exercise resulted in the lowest heart rates at each work rate. The highest heart rate at each work was recorded following the ingestion of glucose one hour before exercise. The results of this study indicate for those
attempting to predict maximal oxygen uptake from sub-maximal heart rate.

According to John and Kasch (1974) there are 3 main mechanisms by which the heart is improved by physical exercise.

1. Improved balance between myocardial oxygen supply and demand.

The availability of oxygen to myocardial tissue is defined by the ratio of vascular oxygen supply over myocardial oxygen consumption. Any form of this quotient below one, signifies myocardial Ischmemea. This occurs where diminished oxygen supply is available as in coronary stenosis, Arterial hypotension or low oxygen saturation of the blood. The trained individual is more capable of improving the relationship between the supply and demand of the untrained.

1. Increase the size and capacity of the heart.

2. Improved oxygen transport system.

Vaccaro, Clarke and Wrena (1979) conducted a study on Physiological profiles of Elite women Basketball players. In this
study the subjects were 15 members of the University of Maryland Women's Basketball team. Results of the analysis-included means for height and weight were greater than those of the average female and most other women athletes. Mean percentage of fat was less than females and no athletes but somatotype was similar to normal young women.

Alteri (1975) selected 63 college females between 17 and 22 years of age to study the effects of endurance and interval running on selected physiological parameters. Resting pulse rate was one of the physiological parameters selected. Analysis of data revealed that both treatments revealed significantly lowered resting pulse rate.

Stuart and Collins (1959) compared the vital capacity of 20 athletes to an equal number of non-athletes and found that the mean vital capacity of the athletes was significantly higher than that of the non-athletes. The probability value with the 't' test was 0.023, which was less than 0.05 which indicated significant difference in vital capacity was due to regular training.
Bale and Davis (1978) possessed body build explosive strength, grip strength and cardio respiratory fitness of a group of 43 top class female field Hockey players and sports women. The Hockey players were thus divided into 4 groups according to their respective playing positions on the field and the above morphological strength and fitness variables were examined in relation to their field positions. The somatotype and body composition of the forwards and half back were similar but both these groups were lighter, hard with low body fats and lean body weight than the backs and goalkeeper. The halfbacks were fitted both in the rest of explosives strength and in the test cardiovascular fitness.

Clark and Decuties (1969) has determined the relationship between the standing broad jump as a test of leg power and the international anthropometric and strength characteristics of 12 years old boys. The subjects were tested within two months of their birthdays. This had the effect of largely partial out chronological age in the correlations. Seven of the sixteen correlations with jump all experimental variable strength tests were compared utilizing Wherry Doolittle method of test selection. The highest multiple
correlation obtained was 0.694, the independent variables below flexion strength and leg length. It may be concluded that leg power as evaluated in the study is dependent in part upon the body size and muscular strength. However, this trait is also distinctive in as much as the co-efficient of multiple correlation was .482.

Alexander (1970) studied that the basketball performance of female and related it to any of the health charter somato type components. But the taller players scored more points and they have collected more rebounding. The top ten players on the following anthropometric measures, hymerous diameter, biceps girth, calf girth and weight.

A study was done on the 10 Illinois State University wrestling team. Each subject was tested for 5 consecutive days on a total of 18 anthropometric physical and performance measures. During this period, held in wrestling season, the subjects used the traditional methods normally followed in reducing the weight for the forthcoming meet.

The subjects were tested in order to determine whether percentages of body weight loss significantly affected the
performance. The mean scores and standard deviation of each measurement were taken daily on 10 wrestlers during 5 days weight reduction period. A down ward trend in the mean scores from day to day was revealed measures except knee flexion and hip flexion.

Cooper and Glasscow (1972) express if all can move segment at all same angular speeds those with longer limbs will have greater linear velocities. Some authors have suggested that the distance of the muscular attainment from the joint will differ in individuals. The greater the distance, the longer the efforts arm.

According to Bunn (1972) the longer the power arm of the lever, the greater the amount of force, the shorter the power arm in relation to the length of the weight arm, the smaller is the moment of force but the more immediate in action.

Backe (1964) conducted a study by connecting anthropometric measures with hop step and jumps. Eighty seven secondary school boys acted as subjects in this study. He found significant relationship between body height leg length and performance in hop step and jump event. Similarly significant relationship was found between anthropometric measurement with height, leg
length, body weight and physical performance measures like speed, strength and distance covered in running broad jump for boys as reported in some other studies.

Krakower (1964) in his study attempted to determine the relationship between anthropometric variables and performance in running and high jump. The results of study reflected little influence on the skeletal measures on the running and jumping performance. Specially he pointed out that a combination of height, leg length and breadth of the foot is found to be significantly related to high jump performances. It was also found that the skeletal symmetric peculiar to the track group and they had long legs, short body and broad feet calisch indicated. The importance of possessing a lengthy arm as might do well to use the three fingers grip because it provides better control.

James Marrow and his associates (1979) obtained various anthropometric, strength and speed variables on 180 inter collegiate women volleyball players and related them to team success. Factors analysis of the measured variables showed that the variables could be dimensioned as body size, speed and the strength. Multiple discriminate analysis showed that the team were significantly
different on the factors of strength and speed. Team centroids were plotted in 2 dimensional discriminate spaces and the graphic representation showed that the stronger, faster, leaner teams were the most successful in tournament play. Multiple discriminate analysis identified upper body strength and fat weight as most important in differentiating between players of the most and least successful teams.

According to Asmussen (1971) the greater height in throwers will be of further advantage by making the flight of the implement longer before it touches the grouping.

Pere (1954) reported the top ranking track and field athletes and related various body measurements to performance. Throwers were tallest in this material and they seemed also to benefit most from their height. The correlation between the upper limb length/ with stature and performance was significant in throwers and long distance runners.

Karakomer (1964) in his study attempted to determine the relationship between anthropometric measure and performance in
running high jump. The results of this study showed little influence of the skeletal measures on the height of the jump.

However a combination of height, leg length and breadth of foot is found to be significant related to performance in high jump.

Gene Hooks (1962) says in most games and sports too big and tall have a decisive advantage in executing the skill performance. The lengthy arms and legs given him additional range of movements over a smaller and shorter player and athletes, and height and range of movements is accompanied by strength and speed and his skill is usually beyond the limits of the little man.

Tanner (1964) studies about the advantage of showing lengthy arm as “the longer of the arm the greater the movement impaired to the object, thrown at the instant it left from the hand”.

Stuart and Collinss (1968) selected twenty athletes on various university team engaged in competition and twenty athletes (no regular exercise or manual labour for 20 years) were paid as to age height weight and body surface area tested for vital capacity and maximum breathing capacity results showed that the athletes had a significantly higher vital capacity than the non athletes.
Rasch (1968) studied the relationship of arm length, weight, length to speed arm movement. In this study, the length, strength and weight of the arm and its segments are measured and correlated with the maximum speed of voluntary movement. From the experimental findings recorded there is no satisfactory, significant correlation between the speed of voluntary movement of the hand fore arm and the weight, length and strength of the arm and its segments.

Relph Blackman (1936) conducted wrist study that grip strength tests are likely to prove valuable to athletic coaches in selecting players and substitute for any game involving large muscular activity and in deciding when to further or not return tired players to game.

Caston (1977) conducted a study on grip strength and wrist strength measurements. He looked on advanced players (N=12) and beginning (N=12) women golfers. A significant difference was noted in the left palmer, radial and lunar flex measurements.

Jackal (1973) carried out a study on the third and fourth grade boys and girls. Measurements were taken on right left grip strength
endurance and ranging time. The right 11.54 Kg and 10.25 Kg from the hand. The Pearson Product Moment has indicated the measures of variable of right and left hand grip strength.

This article reports the results of three studies on various strength and anthropometric factors entering dominantly into co-ordinated movements of the arm and shoulder girdle area, best results were obtained with arm strength formula based on the number of pull ups and push ups performed by the subjects. The factors with height multiple correlative relationship with their formula was girth of flexed-tensed upper arm, standing height and strength of the shoulder inward rotator muscles.

Marrion J.L. Alexander (1973) designed this study to investigate the relationship between the somatotype rating and other selected anthropometric measures and the Basketball players. The subject was the 53 participating in the 1974 Canadian women inter collegiate athletic union Basketball Championship performance was evaluated during the six games of the championships. The result indicated that none of the Basketball performance measures was significantly related to any of the Health related somatotype component. However, total Basketball
performance points scored and rebounding were related to the height of basketball players. So that the taken players were generally more highly skilled. The top 10 players on the following anthropometric measures: humerus diameter, biceps girth, calf, girth and weight.

John Piscope (1962) compared skinfolds and other anthropometric measurements of 647 Italian, Jewish and Negro pre adolescent boys from Boston, Massachusetts and skinfolds were measured at three sites. Other measurements included height, weight, bi-illiac diameter and selected girth. The largest percentile scores were found in the Jewish group. Analysis of variance was employed to compare the body fat, height and weight of each group; significant difference between ethnic groups at the one percent level.

M. Lundergan (1960) conducted a study changes in skinfolds and girth measurements of women varsity basketball and field hockey players. He conducted the study, pre and post season subcutaneous fat, girth and weight measures were made on women varsity field hockey players and 17 women varsity basketball players at Pennsylvania State University. Results of a comparison
of pre and post mean scores indicated that the field Hockey players showed a decrease in fat at the arm unbilicathing sides, with a reduction in girth at arm, iliac and umbilical site with a reduction in girth of the things.

J.M. Tanner (1964) compared the athletes of different countries and different events and concluded that many differences have been pointed out between competitors of various events of track and field as differences in leg length and hip width. He also compared the weight lifters of Nigro and White races and finds that the athletes seem to have the longer arms and legs.

Harrison H. Clark (1954) reported from his study the relationship of strength and anthropometric measures of various arm strength criteria for mesomorphic and correlational 0.73 and 0.74 were obtained between girths of the flexed upward rotator muscle.

Salkum and Mathur (1985) measured that anthropometric measurements and body composition of the 150 female athletes. Insignificant differences (P<0.5) were observed between the anthropometric variables and body composition of University and
National level athletes. The measurements were significantly different (P<0.05) between athletes and non-athletes and between the athletes and different sports (Volleyball, Basketball, throwers, sprinters and distance runners). Men Difference in various measurements within the athletic group has been attributed to physical demand of each sport.

**Psychological aspects and Performance**

Clarena (1969) studied the factors associated with success in volleyball of 28 women university players for their intramural tournaments at Illinois State University. Two experienced Volleyball coaches judged each player by observing the game and that was taken as a criterion variable. The following variables were also measured, height, weight, leg extension, strength using adjustable dynamometer, skinfolds, the large caliper, jumping ability by using jump and reach test and apparatus constructed by the investigator to measure the reaction and movement time. Through the test and correlations it was found that jumping ability and reaction time were significantly related to successful volleyball playing ability. A multiple correlation of 0.718 was obtained from the criterion variable and the other 9 variables. An r of 0.53 was
obtained from the criterion and reaction time and jumping ability and one of 0.52 from the criterion and jumping ability plus weight. The regression equation computed in this study could be used to predict success in volleyball playing alone.

Shondell (1972) identified the physical anthropometric parts of successful collegiate volleyball players. Coaches were interviewed and literature was reviewed to determine physical characteristics of volleyball players. An initial group of 23 and measurements was selected to measure the characteristics of successful players.

A jury of the four judges served to provide the criterion based on overall volleyball performance. 93 subjects completed all 123 items. Statistical techniques utilized, provided inter correlation coefficient variables, step wise regression, co-efficient and constants, the square of the multiple correlation co-efficient for the regression equation at each step. It was concluded that power appeared to be most significant factor in successful volleyball performance and six-item battery as invalid prediction of volleyball performance.
Torida, Adeniran and Ogunieni (1987) conducted a comparative study of the body composition and anthropometric characteristics of elite male basketball (N=15) and volleyball (N=15) players and male non-athletes at the University of Nigeria. The ages of the subjects ranged from 19 to 29 years. Analysis of variance and Newmen Cauls Post Hoc methods were used to determine significant differences in the physical characteristics of the groups. The basketball players were significantly taller and markedly larger, humerus width than the volleyball and the non-athlete groups (P < 0.57). The non-athletes had significant higher percentage of body test values than both the groups of athletes (P < 0.05). The basketball (4.30) and volleyball (4.40) players who were predominantly ectomesomorphic significantly higher ectonomorphic (P < 0.5) than the non athletic (2.5). The difference observed between the athletic groups are related to the morphological factors, example, influence. the basic components of competitive performance.

Yoest (1973) conducted a study on the relationship between cardiovascular fitness and skeletal anthropometric measurements. 51 eighth grade boys and 43 college male subjects were selected. from each group. A cardio vascular test was administered to both
age groups to determine cardiovascular fitness. The Ohio State University Test was administered to the college men and modified version of the same was used for the younger subjects. Pearson’s Product Moment correlations were used to determine the relationship of the body measurements to the performance of step test. The factors of age, height, and lean mass and body surface did not significantly limit step test performance. The factors of body compositions were principal indicators permit body significantly limited the college men’s step tests performance but not that of the 13 to 15 years old boys. The study suggested that the subjects, adolescents or adults, who possessed large percentage of lean body tissue, registered higher scores on the step test.

Carger and Wessel (1968) examined quite extensively the relationship between certain anthropometric measures and certain tests of strength and motor ability in physical education majors and non majors strength tests included grip strength and pulling strength, back lift, leg left and total strength. The results indicated that the majors had significantly higher scores on all six tests.

Spirduro (1973) took measurements on 144 college men to determine relationship between speed of movement and strength in
thigh and lower leg extension and determined whether this is affected by limb length. Pearson product moment correlation between strength and speed were negligible (0.14 or less) with no appreciable change in partial correlations when holding limb length (thigh and lower leg) constant.

In the study of H.S. Sodhi and his associates (1974) anthropometric measurements height, weight and sitting height were taken for 57 hockey players of 5 upper level teams of Punjab University, Patiala, who participated in Inter-collegiate competition of the university. The data were divided into four groups. The goal keepers, backs halves and forwards according to their special positions in the field. The results indicate that all the measurements decline gradually from keeper forwards 3 the back ward line players. The former being heaviest and tallest as compared to the later. The substantial height was also given.

Cureton (1951) studied 22 track and field champion athletes of united States and reported typical trackmen to be slight in skeletal frame work with longer fore legs relative to thigh and longer legs relative to the length of the trunk but were exceedingly well muscled. The jumpers, hurdlers and valuators were relatively slim
in skeletal build and were typically taller with longer legs and shorter trunks.

Cureton stated, "The success of athletic champions is not fully explained by inherent anthropological body type measurements because among men of approximately the same physical type there are great differences in performance. Developing the proper skill takes many years of patient training of the muscular system.

According to Evelyn (1962) there are about 5,00,000 red cells in each cubic mm of blood. They are small circular and biconcave and when seen singly pale puff in color in the blood. White blood cells are larger and less than red there are from 6000 to 10000 with an average of 8000 red cells in each cubic millimeter of blood.

Zaumer and Kaplan (1965) in their study took twelve human subjects and assigned them into two groups of equal numbers. One group trained isometrically and the other served as a control. Resting blood samples were taken 1,3,5,7 and eight and half a week after initiation of training. Blood was examined for coagulation time, haemoglobin concentration and for erythrocytes, leucocyte and platelets counts. Packed cell volumes were determined before
and after training. Scores indicative of muscular strength were recorded throughout training. Isometric training may have produced a chronic disease in coagulation time. It had no effect on Haemoglobin concentration or on erythrocytes, leucocyte and platelet counts. Increases in scores indicative of muscular strength were statistically significant.

**Haematological aspects and Performance**

According to Arthur (1976) in the normal man, the average number of red blood cells per cubic millimeter is 5200000 (+ 300000) and in the normal women 4,700,000(+300,000). The number of red blood cells varies in the two sexes and at the different ages. Also the altitude at which the person lives affects the normal red blood cells.

He further states that the adult has approximately 7000 white blood cells per cubic millimeter of blood. The normal percentage of the different types of white blood cells are approximately the following:

- Poly morpho nuclear neurophils 62.0 %
- Poly morpho nuclear cosinophils 2.3 %
- Poly morpho nuclear basnophils 0.4 %
Monocytes 5.1 %
Lymphocytes 30.3 %

The main reason for white blood cells being present in the blood is simply to be transported from the bone marrow or lymphoid issue to the areas of the body where they are needed. Therefore, it is to be expected that the life of the white blood cells in the blood would be short.

According to Morehouse and Miller (1976) the red blood cell is frequently increased in the early stages of exercise probably because of simple haemo-concentration (transfer of fluid from the blood to the tissues). During more prolonged exercise fluid passes into the blood and the resulting dilution of course lower the red blood cells count very strenuous exercise may also cause an increased rate of destruction of red blood cells due to compression of the capillaries by muscular contraction and to increased velocity of blood flow, this is especially noticeable in persons of sedentary habits who sporadically indulge in exercise.

According to Samson (1978) the average red cells count in the adult male is 5.5 millions per cubic millimeter. In the female, it is
4.8 millions per cubic millimeter. A brief period of vigorous exercise may increase the count, mainly owing to the passage of fluid circulation.

According to Eyleen (1979) for his study took fifteen members of the men's variety cross-country team as subjects. Blood samples were taken from the subjects twenty times during the courses of the season. Each sample was analysed for haemoglobin content, red cell count and white cell count. The subject times from six competitive meets were recorded. Analysis was made by Zero order correlation and multiple correlation. The conclusion was given as a single measure of haemoglobin. White cell count or red cell count taken prior to a meet does not accurately predict running performance. The change in blood components from one reading to the next just prior to a week is not a good indicator of running performance. The average value of several readings of blood components prior to a meet does not accurately predict running performance although the findings were contradictory in this analysis.

According to Maddali (1999) the study group consisted of 77 professional football players in preseason training. All players
concentrations of serum nitrite and of other serum chemicals were
determined during their preseason evaluations and compared with
the concentrations in 40 serum samples taken from 25 of those same
players who required intravenous dehydration for severe
generalized muscle cramps after a training session. Players weight
and percentage of body fat were significantly higher in players who
received intravenous fluids than in players who did not. The serum
of players requiring intravenous hydration showed evidence of
skeletal muscle breakdown (increases in lactate dehydrogenase,
creatine phosphokinase, aspartate aminotransferase, and alanine
aminotransferase) and of dehydration (elevations in protein, blood
urea nitrogen, and cholesterol). The major finding, however, was
nearly 300% increase in serum nitrite concentrations in players
requiring rehydration. There were no correlations between
concentrations of nitrate and of any other serum chemicals. These
data support the hypothesis that large amounts of nitric oxide are
synthesized in professional football players after strenuous exercise
with severe muscle cramps. Though this study provides a basis for
evaluating the relationships, it does not mention whether this
increase in nitric oxide was due to exercise or muscle cramps or both.

According to Schokman C.P., (1999) this study describes pre and post competition mean energy and macro nutrient intakes of 40 elite Australian Football players. Carbohydrate intake, expressed both as a percentage of total energy intake (En%) and as grams per kilogram of body mass (g/kg BM). Pre-game carbohydrate intake (53.6% En) was significantly greater (p < .01) than post-game (49.7% En). However, expressed as g/kg BM, pre-and post game macronutrient intakes did not differ significantly. Protein and fat intake (as g/kg BM) fell within guidelines, whereas energy intake (13.2 MJ/day or 153.8 kJ/kg BM) was lower than expected. Results suggest that for athletes engaging in endurance team sports where body mass and energy requirements vary considerably, carbohydrate recommendations are more appropriately expressed as g/kg BM rather than En %.

Walsh et.al (1999) the study was to assess the effect of an acute bout of high-intensity intermittent exercise on saliva IgA concentration and alpha-amylase activity, since this type of training is commonly incorporated into the training programmes of
endurance athletes and games players. The performance of the intermittent exercise bout did not affect the saliva IgA concentration, but caused a five-fold increase in alpha-amylase activity (P<0.01 compared with pre-exercise) and a three-fold increase in total protein concentration (P<0.01). The present study clearly demonstrates that this is not appropriate, since there is an increase in salivary protein secretion rate immediately after exercise (571+/-77 microg x min(-1) compared with 218+/-71 microg x min(-1) pre-exercise; P<0.05). The increased saliva alpha-amylase activity after exercise may improve the protective effect of saliva, since this enzyme is known to inhibit bacterial attachment to oral surfaces. The saliva alpha-amylase secretion rate was lower immediately pre-exercise than at any other instant, which may have been due to anticipatory psychological stress, although the subjects were all familiar with interval exercise. This emphasizes the need for true resting non-stressed control conditions in future studies of the effects of exercise on saliva constituents.

Peterson et.al. (1999) made a study to investigate any difference in bone mass at different sites between female long-
distance runners with amenorrhea and those with eumenorrhea. We compared 10 amenorrheic and 10 eumenorrheic athletes to determine whether athletes with amenorrhea have lower BMD in multiple skeletal regions, including weight-bearing lower limbs. There were no significant differences between the groups but there was a strong tendency towards a lower estradiol level and a higher osteocalcin level in the amenorrheic group. A free estradiol index (FE2) was derived as the ratio of estradiol to sex hormone binding globulin (SHBG). It was significantly lower in the amenorrheic group. No difference in their daily intake of total energy, protein, carbohydrates, fiber, calcium, and vitamin D was observed. However, both groups showed a surprisingly low energy intake in relation to their training regimens. Stepwise regression analyses revealed that weight was the best predictor of spine BMD in both groups. Estradiol and FE2 were significant predictors of the BMD of the proximal femur in the eumenorrheic group, but did not predict any BMD site in the amenorrheic group. In conclusion, amenorrhea in athletic women affects trabecular and cortical bone in both axial and appendicular skeleton. However, some of the discrepancy can be explained by a lower body weight. Physical weight-bearing
activity does not seem to completely compensate for the side effects of reduced estrogen levels even in weight-bearing bones in the lower extremity and spine.

Influence of the preparation "Polyen" has been studied on indexes of lipid acids contents in blood plasma, erythrocyte membrane and serum albumin of high-qualified volleyball-players. It was shown that "Polyen" has favourable effect on different metabolic pathways of lipid acids, that allow to recommend this preparation as additional component in food ration for training sportsmen. (Popichev, M. I. et.al. 1999)

Popichev et.al. (1999) determined that in erythrocytes of professional volley-ball players given biopreparation "Polien" containing polyunsaturated fatty acids glycolysis and pentose phosphate pathway reactions are intensified and glutathione reductase activity decreased. At the same time the affinity of haemoglobin to oxygen stabilized in the sportsmen before and after intensive muscle load.

Flyvbjerg A. (2001) studied various growth factors have been proposed to the players in the development of diabetic microvascular complications. In particular, growth hormone (GH)
and insulin-like growth factors (IGFs) have a long history in diabetes, with measurable effects on the development of diabetic kidney disease in experimental animal models through changes in a complex internal system. Furthermore, new data obtained in knock-out (KO) mice with GH receptor (GHR)/GH-binding protein (GHBP) gene disruption have shown that these animals are protected against diabetes-induced renal changes. The recent development of specific inhibitors of GH action, i.e. specific GHR antagonists (GHRAs), has opened the possibility that this group of inhibitors may be used as therapeutic agents in conditions where GH and IGFs have been suggested to play a pathophysiological role, such as late complications of diabetes. Accordingly, new data from studies in diabetic mice treated with a GHRA (G120K-PEG) from the onset of diabetes, showed normalization of the diabetes-associated renal hypertrophy and glomerular enlargement and, most importantly, a lowering effect on the diabetes-induced rise in urinary albumin excretion (UAE), a marker of renal damage. In addition, late intervention with GHRAs alone or in combination with angiotensin-converting enzyme inhibitors in non-obese diabetic mice with manifest renal changes, showed regression in
some of the diabetes-associated renal changes (e.g. UAE and renal pertrophy). These experimental data strongly suggest that GHR blockade may present a new concept in the treatment of diabetic renal complications. Future studies are arranged to characterize fully the clinical potential of GHRAs as drugs for treatment of diabetic complications in general.

Haluzikova et.al. (2000)\(^5\) Made a study to follow the influence of the regular hard physical training on the serum leptin levels. Therefore, the serum leptin levels in top rugby players, top race walkers and age and gender-matched control group were compared. The relationship between serum leptin concentrations and body mass index and body fat content was also studied. It was found that serum leptin levels in rugby players were significantly higher than in race walkers group, but lower than in control one. Serum leptin levels in race walkers were lower than those of rugby players and of control group. The body fat content in race walkers was lower than in resting two groups. There was no significant difference in body fat content between control and rugby players' group. Serum leptin levels correlated positively with body mass index and body fat content both in control and in rugby players
group. No statistically significant relationship was found between leptin and body mass index or body fat content respectively in race walkers group. It was concluded that serum leptin levels in top sportsmen are lower than in non-sporting healthy age and gender-matched controls. The lower leptin levels in top sportsmen are probably in part the result of lower body fat content and in part the result of complex neurohormonal adaptation on the long term physical training.

Haluzik et.al. (1998) Compared the body weight, the body mass index (BMI), the body fat content (measured by caliper as skinfold thickness) and the serum concentrations of leptin, triglycerides, total, high density and low density lipoprotein (LDL) cholesterol in 14 top rugby players and 10 healthy controls. We found that serum leptin, total and LDL cholesterol concentrations were significantly lower in the rugby players group than in the control subjects. The body weight and BMI were significantly higher in the rugby players, while the body fat content was only slightly (non-significantly) higher in the control group. The serum leptin concentrations in both groups positively correlated with the BMI and body fat content and also with LDL concentrations in the
control group. The serum leptin concentrations in the rugby players were lower than in the non-sporting subjects despite a similar body fat content in both groups. We would therefore suggest the possibility that regular hard physical training decreases serum leptin concentrations not only by the decrease of total body fat content, but also by a separate mechanism, which is not directly dependent on the changes in the amount of body adipose tissue.