Chapter II

REVIEW OF RELATED LITERATURE

The research scholar has gone through the available literature and made sincere effort to go through professional and relevant literature available in the Libraries of Lakshmibai National Institute of Physical Education, Gwalior, Netaji Subhash National institute of Sports, Patiala, Guru Ghasidas University, Bilaspur and Rani Durgawati Vishwavidyalaya, Jabalpur. The scholar has made use of all the studies which have been undertaken in this area so far and which are directly or indirectly related and useful for this study. Even though some of the studies mentioned below are not directly related to the study yet, they are worth mentioning because they indicate some relation with the area of the investigation. The abstracts of the studies reviewed are given below.

Bakshi, (2001) conducted study to assess the Health-related Physical fitness status of the male students studying form 9th to 12th classes in the Higher Secondary School of the Jammu Province. To achieve this objective, the whole of province was divided into six clusters comprising, 99 Higher Secondary school of boys in all. For the collection of data 34 schools were randomly selected from total 99 schools. 17 School belonged to rural area and an equal number of schools belonged to urban areas. As many as 118 subjects were randomly selected from each school for the collection of data.
AAHPER (1987) Health-related Physical Fitness test battery (Cardiorespiratory function, Body composition, modified sit-ups, sit and reach) was applied for the collection at data. The collected data was subjected to statistical treatment. 'F' test was applied to compare fitness status of 13 to 16 years age groups children. "t" test was also applied to compare the Health-related physical fitness status of the boys belonging to urban and rural schools. Four scales namely percentile, T, hall and sigma were also developed for future use. The following conclusion have been drawn:

There has been a significant difference between one age group to other age group among rural and urban boys in all the Health-related physical fitness components.

In modified sit-ups, fourteen and sixteen year boys significantly performed more sit-ups than 15 year boys at rural and urban sample. Cardio-respiratory function of sixteen year rural boys was found significantly better than thirteen, fourteen and fifteen year boys at rural and urban sample. In body composition test the fat contents were minimum in thirteen year boys and maximum in sixteen year boys of urban sample. Fat contents of sixteen year boys were significantly maximum than other age groups were as fifteen year boys possessed significant minimum fat contents that other age groups of rural sample. It sit and reach test thirteen year boys were significantly better flexible than fifteen and sixteen year boys of urban sample.

In thirteen year age group the fat contents of rural boys were significantly more than urban boys. They were also found less flexible than their counter part. However, their cardio-respiratory function was significantly better than urban boys. In fourteen year age group the fat contents in rural boys were significantly more than urban boys. In fifteen year age group the cardio-respiratory function of urban boys was significantly better than the rural
boys. Urban boys possessed more fat contents than rural boys but found significantly less flexible. In sixteen year boys the fat contents of rural boys were significantly more than urban boys, former also performed significantly better in modified sit-ups test but found less flexible as compare to urban boys.

Four scales namely percentile, t, hull and sigma were develop for each of the test variables to measure health-related fitness of each age group for rural and urban boys.

Behnke and Wilmore (1974) discussed overweight when related primarily to well developed musculatures. They show that the average weight of a lean, muscular athlete may well exceed 30 percent of average weight for stature in standard tables. Excess muscle is primarily responsible for the greater lean bulk, but bone may also be ancillary, as revealed by the thickened cortex of long bones in radiography. Weight lifters show some remarkable examples of muscular hypertrophy.

Geser (1965) found that the intercorrelations among these measures for twelve year old boys clustered closely between .797 and .810. The co-relations between each of and skin-folds and the composite of all three tests were .908 for sub scapular, .912 for triceps, and .963 for lateral abdomen.

Fitzgerald (1968) divided college women into three groups according to amounts of fitness: lean, normal, and obese. She obtained significant differences between body density as determined by hydrostatic weighing and by five selected skin fold regression equations for the average, obese, and the whole group combined.

Selzer (1965) determined minimum triceps skin fold thickness indicating obesity for males and females of different ages, scale appears in appendix table A.1: Minimum thickness
was placed at one standard deviation above the mean; thus 16 percent of the population would be undefined as obese.

Geser (1965) obtained the following correlation ranges between the three skin-fold tests and other measures: .72 and .82 for endomorphy, -.59 and -.66 for ectomorphy, and .27 and .38 for mesomorphy and skeletal age, .17 and .44 for Rogers Strength Index and average of eleven cable tension strength tests, -.25 and -.35 for Physical Fitness Index, parallel bar pushups, and standing long jump.

Nelson and Dorociak (1982) studied the reduction of testing time while improving the reliability and validity of the three AAPERED Health-Related Physical Fitness Test items that require subject effort to take them; 1½-mile run, 1-minute sit-ups, and sit and reach. Comparisons were made between administering each test without practice (traditional method) and with practice (rehearsal method). The test-retest intra-class reliability coefficients for the traditional and rehearsal methods respectively were: .84 and .97, sit-ups; .41 and .96, sit and reach; above .95 for both methods, 1½-mile run. Further, considerably better mean scores were obtained by the rehearsal group for all tests. The authors concluded that the method used by the rehearsal group was very satisfactory with regard to reliability and validity. Also, the time required for testing was greatly reduced because of student familiarity through practice routines. Due to the practice testing, the tester needs only to observe and verify correct procedures and scoring.

Muhammad (1998) compared the health-related fitness components among athletes of various sports. The purposes of this study were: (1) to determine the relationship among Health-related physical fitness components and coach's rating of athletes' ability. (2) To compare the health-related physical fitness
components among male teams and female teams. (3) To compare gender effects of the health-related physical fitness tests.

The number of participants in this study were 71 National Collegiate Athletic Association Division II (10 female basketball players, 11 male basketball players, 13 volleyball players, 17 soccer players, and 6 male golfers) athletes. Tests used in this study were one-mile run, bench press, leg press, curl-ups, sum of skin folds, and the modified sit and reach.

Some significant relationships among the variable were observed. However, the results did not reveal any significant relationship between coach's rating and any of health-related physical fitness components. Significant differences existed on the one-mile run, absolute bench press, curl-ups, and the relative bench press tests among the male teams. Significant differences existed on the one-mile run, absolute bench, press, absolute leg press, curl-ups, and sit & reach tests among the female teams. Significant differences existed between the female basketball team and the male basketball team on the absolute bench press, absolute leg press, curl-ups, body composition, and the relative bench press tests. Significant differences existed between female distance runners and male distance runners on the one-mile run, absolute bench press, absolute leg press, curl-ups, body composition, and the relative bench press tests. Significant differences existed between female golfers and male golfers on the absolute bench press, body composition, and the relative bench press tests.

The results of this study supported the following conclusion: (1) How a coach rates an athlete is not related to the athlete's performance on the health-related physical fitness components
tests. (2) Gender has no effect on the sit & reach test and relative leg press test. (3) Male athletics have different abilities in cardiovascular endurance, flexibility, muscular endurance, and muscular strength. However, they have similar body fat percentages. (4) Female athletes have different abilities in cardiovascular endurance, flexibility, muscular endurance, and muscular strength. However, they have similar body fat percentages.

Shephard Berridge and Montelpare, (1990) conducted study on the general of the "Sit and Reach" Test : An analysis of flexibility data for an aging population. They allude that Head rotation, shoulder extension and rotation, ankle plantar and dorsiflexion, hip flexion, and sit and reach (SR) scores were examined in 41 women and 39 men, aged 45-75 years. The SR gave more reproducible data than the other measurements (intraclass test-retest correlation over 8 months, r=.83). SR scores were independent of standing height (r =.068) but were greater in women ( p<.002). The flexibility at all joints were less than reported for young adults. There were age-related decreases of flexibility scores for the head and shoulder joints (p < .01), with a parallel trend ( p< .05) for ankle plantar flexion and S.R. scores ( the last only after inclusion of an age-gender interaction term). A principle components analysis identified three factors (tentatively identified as general trunk, ankle, and shoulder flexibility) accounting for 55.9% of total variance. SR scores had a moderate correlation with the first factor ( r=.61) but only weak correlations with the second and third. Although the SR test is most reliable simple instrument, it provides only limited information about the flexibility at other joints in an older population.
Shukla, (1999) conducted study on health-related physical and physiological fitness on Indian sportsman and nonsportsman. The samples of study were 400 (200 sportsman and 200 nonsportsman for the purpose of study. Indian sportsman were from state of U.P., Bihar, Bengal, Delhi, Maharashtra and Punjab. Their age ranged from 18 to 28 years (Average 24.1 years). For the purpose of physical and physiological characterisation, the height and weight were taken into consideration. AAHPERD test was used to find out physical fitness and physiological fitness the following variables were taken into consideration such as Blood pressure, Pulse pressure, Grip strength (right and left), aerobic power and anaerobic power and vital capacity.

Kumar and Sathe, (1999) studied the relative effect of health-related fitness and Skill-related fitness on sports proficiently of students of physical education. The subjects for the study were the male students of school of physical education, Devi Ahilya Bai Vishwavidyalalaya, Indore who had atleast participation in inter-collegiate tournament in the year 1995-96, Health-related fitness test and skill-related fitness test were conducted on all student of school of physical education. Product moment correlation and t-test was applied as a statistical tool. They concluded in this study that on the basis of the analysis of data, which show and that no difference exist due to the Health-related fitness and Skill-related fitness on sports proficiency. But the correlation value indicates that skill-related fitness are more related than health related fitness with sports proficiency. So It may be concluded that a high skilled sports person shows a high correlation with sports performance but the contribution of Skill-related fitness and Health related fitness are equal.

Chinn, (1973) examined directly the relationship among health status, family and socio-economic factors and academic achievement. She found several significant inter-relations
between health problems including emotional cues, educational ranking and social ranking. The study supported the assumption that health problems are related to classroom problems, but it indicated that relationship was unclear and need further studies.

Findings moderately support the assumption that health problems related to class rooms achievement. A close examination of this relationship reveals that it is compared by other variables, most of which can be grouping under family socio-economic status.

Das, (1980) prepared physical fitness norms for classes nine through eleven of Delhi administration schools. In each school, ten percent of students were tested on the items of AAHPER youth fitness test and N.P.F.P. battery 'A' The items in the N.P.F.P. battery were the same as included in the syllabus of C.B.S.E. Percentile norms were prepared in the statistically analysed which included the abdominal strength of the Indian students seemed to be very poor as compared to those of American students. The performance of students of class IX was were poor in all items of fitness tests and there was a remarkable performance in class X and XI through still lower than that of students in America except in pull up measuring shoulder girdle strength.

Robins, (1985) made an attempt to develop percentile norms for Urban students in grade 1-9 based on their performance on both the AAHPER youth fitness test (YFT) and AAHPER Health-related fitness test (HRFT). The two tests were administered to Urban school students. Percentile tables were constructed for each test items based on age and sex. Urban means were compared with national means. The result indicated that Urban students performed better on events measuring agility, speed and cardiovascular endurance. The national group
performed better on events measuring abdominal muscular endurance and flexibility.

Singh, (1986) Conducted the study on physical fitness norms of Punjab State high school boys and found that the percentile norms for physical fitness test items were found suitable to assess the physical fitness level of Punjab state high school boys ages 12 to 15 years. He also found that there was significant relationship between age and performance of the subjects in physical fitness tests and the performance of the older boys had been better than the younger boys. It was also found that the area to which the subjects of this study belonged did not give similar results on all the physical fitness test items.

Blackwell, (1991) : prepared an inventory for an assessment to attitude at high school students towards Health-related physical fitness.

An assessment instrument for measurement of high school students attitude toward health-related fitness and to determine whether the student have positive attitude toward health-related fitness than students who have not participated in such a course.

He concluded that participation in mandated fitness course appeared to improve student attitudes toward Health-related fitness in general and toward each of the components of Health-related fitness and that student who have positive attitudes toward general Health-related fitness are likely to have positive attitude towards each of the components of Health-related fitness. Additionally, it was shown that attitudes toward Health-related fitness do not seen to be related to gender.

Chatterji, Mandal and Das, (1991) completed a cross-sectional study of physical and motor fitness measurements was
undertaken on 629 healthy, Indian (Bengalee) school-going boys of 9-18 years. The study brought to light gradual increase in physical and motor fitness measurements with the advancement of age except physical fitness score. Major increments were recorded between 13 and 15 years of age. All the fitness test scores showed significant positive co-relations with age, height and weight but Dash, Shuttle Run and PFI showed significantly negative relationship. Indian boys of the present study were superior in Sit and Reach and inferior in Vertical Jump to the Bengalee boys of comparable ages. These boys showed higher values in Vertical Jump than American boys after the age of 13.

Cureton and Warren, (1990) developed the criterion standards for youth Health-related fitness level a new development in the testing of physical fitness of youth is the use of criterion-referenced standards (CRS). Although three national youth Health-related physical fitness (HRPF) tests currently have CRS, a detailed description of the procedures used in their development has not been published nor have the standards has been questioned. The purposes of this tutorial are (a) to discuss briefly issues related to the development of CRS for HRPF tests, (b) to provide a detailed description of procedures used in development of mile run/walk test CRS as an example, and (c) to illustrate how these standards can be validated. The objective is to stimulate discussion and critical evaluation of (RS for youth HRPFF tests).

Drabik, (1989) analysed the general endurance of children aged 8-12 years in the 12 min run test. The purpose of this study was to define the level of general endurance and to suggest appropriate norms in this respect. The investigation was based on a sample of over 5000 children aged 8-12 years. Their endurance was examined by means of the 12 min run test which was preceded by two months of preparatory training. The results
recorded turned out to improve with age. The results achieved by the boys were on average by 272 m better than those achieved by girls. The sex determined differences in the 12 min run performance and in somatic characteristics were observed in children aged 12 years.

Robison, Uppal. Bose (1981) : Stated in his findings that, Boys and girls studying in grades one and two can participate together in the physical activities involving speed, explosive leg strength and agility and those physical activities in which shoulder strength is dominating component, boys in grade one and two are superior to girls in the same grade and hence , they should participate in such activities separately. Boys studying in grades three and four are superior to girls in their physical activities which involve explosive leg strength and shoulder strength. Boys studying in grade five are superior to girls in physical activities in which speed, explosive leg strength, agility and shoulder strength are dominating components. Hence they should engage in such activities separately.

Sodhi and Singh, (1985) compared the Indian and Nigerian children of 10 to 14 years age. In this study physical growth (height and body weight) and motor abilities test (Standing broad jump and 50m sprint) were conducted to assess the motor development of boys from both countries and were compared. The results indicated that the Nigerian boys had a higher rate of growth as compared to Indian boys and in motor performance the Nigerian boys out performed the Indian boys.

Espenschede , (1956) Compared the motor fitness of boys and girls for age ten and one half through fifteen and one half years. She found that before thirteen and a half years there were only slight difference between boys and girls in the agility control, strength and static balance elements of the brace test.
After that boy's scores increased up to 17 years, but girls scores tended to decrease.

Smoll, (1967) collected the data from the grade 4 and 11 levels from 24 boys and 24 girls participating in a longitudinal growth study. Static strength measures of the ankle extensors, hip flexors and extensors, and knee extensors were measured with a cable tensiometer. Motor performance was represented by standing broad jump and 30 yard dash. The analysis depended primarily on zero order and multiple co-relations. Height and weight, separately as in combination, were poor predictors of performance within the age and sex groups. The aggregate lower limb strength had a moderate positive relation with performance. Performance in the broad jump during adolescence can be predicted more accurately than in the dash on the basis of growth strength, and performance taken during middle childhood.

Slaughter, Lohman and Boileau, (1982) studied the relationship of anthropometric dimensions to physical performance in children. This study was designed to determine whether anthropometric dimensions account for a significant amount of variation in physical performance in 7-12 year old children [N=159]. The physical performance measures consisted of three tests of running [mile run, 600 yard dash, and 50 yard Dash] and two test of jumping [standing board jump and vertical jump]. Anthropometric dimension consist of skin-fold and circumference alongwith height and age improved the prediction of performance than age on height. It was concluded that physical performance measures in children can be estimated with moderate success from a combination of skin-folds and circumferences along with age and height and that anthropometry may provide additional information to body size and age with respect to performance expectation of children.
Slaughter, Lohman and Misner, (1982) conducted a study entitled "Association of Somatotype and body composition to physical performance in 7-12 year old girl". The subjects were 50 girls with a mean age of 9.9 ranging from 7.2 through 12.7 years. Somatotypes were measured by Health-Carter's anthropometric method. Body composition was estimated as fat and lean body mass from K measurement using a whole body counter. Physical performance measures consisted of three tests of running: mile run, 600 yard run and 50 yard dash and two tests of jumping: standing broad jump and vertical jump. Moderate relationships were found between somatotype components, measures of body size and measures of body composition with the physical performance. Variables of jumping and running. The first component [relative linearity] were more closely related to physical performance than the second component [relative muscle-skeletal development in relation to height]. Percent fat and the first component when each one combined with age, height and weight accounted for a similar amount of variation in running and jumping performance. LBM when combined with age, height and weight accounted for significant of variation in running and jumping performance that the second component when combined with age, height and weight. The authors suggest that different combinations of anthropometrics measures derived from multiple regression analysis might be found to replace the standardised deviation from height approach used by Health and Carter in research relating to the muscular component to physical performance in children.

Bhatnagar, Singal and Grover, (1988) conducted a study entitled. Somatometric variables and body components in relation to socioeconomic status. The investigation was based on the cross-sectional sample of 155 normal female children ranging in age 6 to 16 years. Out of this, 80 children belong to higher
socio-economic group in those cases their parental income is more than Rs.2000/- p.m. and remaining 75 children are from lower socio-economic group with their parental income less than Rs. 1000/- p.m. The former are studying in modern schools. Each subject has been measured for ten somatometric variables weight, height, four diameters [humerus, bicondylar femur, bicondylar, ankle and wrist] and four skin and subcutaneous tissue folds [biceps, triceps. Supra-iliac and subscapular]. In body component percentage of fat, absolute fat and lean body mass has been calculated from skin and subcutaneous tissue folds and body weight in all the somatometric variables and body components.

Dhara, Chatterje and Pal, (1995) Compared physical performance and body dimension between tribal and non-tribal school students. In the present investigation, body dimension and sports performance ability of tribal and non-tribal boys were evaluated. The study was conducted on 35 school boys (age range 14 to 17 years) selected from tribal and non-tribal population. Different anthropometric dimensions, e.g. height, weight of hip, arm girth, thigh girth, calf girth chest girth of the boys were measured. To evaluate their sports performance different tests, viz. broad jump, shuttle run, push up, flying start and Hamstring looseness were performed. Results showed that there was significant difference in body dimension between tribal and non-tribal boys except for weight, arm girth and thigh girth. Tribal boys showed significantly better sports performance abilities than that of non-tribal students. The broad jump score and push up score were found to be significantly correlated with calf girth and arm girth respectively. It was concluded that a sports talent search programme should be undertaken among the tribal boys.
Harman, (1967) administered the AAHPER youth fitness test to 100 rural and 100 urban boys. The urban boys were superior to the rural boys and the difference was significant at the .01 level. The two samples were weaker on the same components of physical fitness.

Hincon and Waddell, (1970) conducted study on two sample of fifth and tenth grade girls and were administered six items of AAHPER youth fitness test and were matched according to Mares. Both the conditioning exercise and sports methods group scored higher on strength power and flexibility of the muscles on both the initial and final test. Both groups made the largest percentile gain in speed, agility, flexibility and endurance. The difference between means of the retest scores for the two groups was not statistically significant.

Dhal, (1971) conducted a study on possible difference between Negro and white boys on measures of physical fitness. Three sub-test of AAHPER youth fitness tests were administered. The subject consisted of 100 Negroes and 100 white boys from Texas school. A 't' test difference between means were used. Negro boys obtained higher means scores than white boys on muscular explosiveness. Negro boys also scored significantly higher than white on overall physical fitness level.

Bissonette, (1974) studied to identify the nature of physical fitness possessed by elementary school boys through factor analysis. Twenty four physical fitness evaluation items were administered to 112 boys of seven and eight years of age. The data collected were correlated to maximize three loading on each factor. Five similar physical fitness factors were identified for all ages. They were named body fat, body dimensions, static strength, hip flexibility, recovery pulse and muscular endurance.
Brar, (1975) compared the physical fitness of the different socio economic groups. The AAHPER youth fitness test was administered to the subjects thirty in each group, taken from central school Gwalior and railway colony school, Gwalior. The data was compared by converting the raw score using 't' scores. It was concluded that the socio-economic difference did not have any effect on physical fitness of an individual. The subjects belonging to the lower socio-economic groups were as good as subjects belonging to the higher socio-economic groups.

Andrews, (1976) undertook a study to establish fitness level with those of Canadian boys. AAHPER physical fitness battery (1966) consisting of one minute speed sit-up, the standing broad jump, the shuttle run, flexed arm hang, 50 yard dash and 300 yard run were administered. A test was applied to compare the mean scores of the South African and Canadian students. The results were found to be significantly in favour of the South African boys. Physical fitness norms for Nigerian boys and girls of 11 to 18 years of age were constructed by Anyanwa. The test items included were shuttle run, push-ups for boys, chair push-ups for girls, flexed knee, sit-ups, 45 meter dash, standing long jumps, and pull-ups for boys, flexed arm hang for girls, nine minute run for subjects 11-12 years and 12 minute run for subjects 13-18 years. A comparison of the mean scores of the United States and Nigerian youth showed that at the upper age levels, the United States youth had better physical fitness status than their Nigerian counterparts, whereas at the lower age level there was much difference.

Ray, (1979) compared the physical fitness of the tribal and the urban students in Tripura. He administered the AAHPER youth fitness test on tribal and urban students studying in M.B.B. college, Agartala. Their age ranged from 16 to 20 years. The mean difference between the physical fitness of urban and tribal
student was not found statistically significant at .05 level of confidence. It was found that urban tribal students were better in pull up and softball throw for distance and their performance was statistically significant at .05 level of confidence. But the remaining five test items i.e. 50 meter dash, 600 meter run/walk, sit-up, shuttle run and standing broad jump, the performance of none of the groups was found statistically significant at .05 level of confidence.

Taddonio, (1982) Compared the physical fitness of public school students from economically backward areas with national norms and also made a comparison of the physical fitness of public school students from high poverty areas with those from low poverty areas. AAHPER youth fitness test was used to measure the physical fitness of the subjects. The results revealed that there was no difference in physical fitness of boys or girls from the economically deprived sample and boys and girls represented by the 1975 national, norms. No differences were found in physical fitness of boys or girls from the high poverty areas and the low poverty areas.

Devi, (1984) constructed motor fitness norms for secondary school girls. For this purpose, she selected eighty students of central school No.1 Gwalior, from grade eight and nine as subjects for this study. AAHPER youth fitness test was administered on all the subjects. Based on mean and standard deviation value, T-scales, 6-sigma scales and hull scales were prepared for each test items. Also, it was concluded that a common scale of AAHPER youth fitness test could be used for the grades eight and nine and 6-sigma scales and hull scales were more suitable than T scales.

Haywood, Clarke and Mayhew, (1986) observed the development of strength and flexibility in adults in enhanced by
training is competitive sports. Much less is know about such physiologic changes in young children. The present study compared the effects of training between female gymnasts and swimmers, aged seven to twelve years. Anthropometric measures, specific and general strength tests, and flexibility measures were taken. Swimmers were significantly taller, heavier and greater lean body weight than gymnasts. Although there was no significant difference between the two groups, waist, girth, specific arm pulling strength and ankle and trunk flexibility reflected possible differential involvement of body areas in the two sports. Participants appeared to maintain flexibility and percent fat over the seven to twelve years age range, while increasing body size and strength during that time, Involvement in these two sports makes positive contributions towards body composition, strength and flexibility in young girls.

AAHPERD health related fitness test measures back and hamstring flexibility. 825 young females were administered two trials of three tests The measurements included the sit and reach test, passive hamstring flexibility. The correlations between the sit and reach test and total back flexibility, upper back flexibility and lower back flexibility were low. These findings indicate the sit and reach test has moderate criteria related validity when used as an assessment of hamstring flexibility in the health-related fitness test.

Titchenal, Dobbs and Stern, (1988) investigated the effects of exercise on skinfold (SF) thickness was assessed in 21 male runners (age 25 to 73 years). Measurements were made before and after running a 42.2 kms marathon. To ensure that measurements were made to identical SF sites before and after exercise, the chest, abdomen and thigh were marked in ink. Mean finishing time was 246+18 minutes ranging from 188 to 357 minutes. Body weight was reduced during the marathon by
23+0.2 Kg. (P 0.0001). Sum of SFS was increased in 17 men, unchanged in 3, and decreased in one; changes ranged from -0.5 to +8.0 mm. using the equation of Jackson (1980). Percent body fat was over estimated after exercise by 0.7 to +0.2 percentage points (P 0.0001) with changes ranging from -0.2 to 2.5 percentage points. Consequently, percentage body fat was over estimated by an average of 7 percent (range -2 to 26 percent). Pronounced pitting edema was observed, suggesting that increased SF thickness was due to transient subcutaneous edema.

Starks, (1990) analysed three methods of teaching physical fitness and their effect on strength, flexibility and cardiovascular endurance. To determine these effects, group means on hand strength, leg strength, flexibility and cardiovascular test were calculated. Physical fitness changes from pre-testing to post-testing were determined for the total group, females and males, physical education majors and majors in other disciplines, married and single subjects on each physical fitness test. Means were tested utilizing the SPSS dependent 't'-test method of data analysis.

Singh, (1993) conducted a study of physical fitness status of students of department of physical education, Punjab University, Chandigarh and Kurukshetra University, Kurukshetra. He collected data on 34 males subjects and 27 females students by using AAHPER physical fitness test. The students of Kurukshetra University were found superior on overall physical fitness status where as girls of Punjab University were significantly better than Kurukshetra University in speed and agility components. However, no significant difference was observed in the overall physical fitness between the subjects of both universities.
Sharma, (1997) conducted a study to construct and standardize motor fitness for elementary school children of Delhi. His sample included five hundred boys and girls. The study was conducted in two phases. In the first phase he developed motor fitness battery by using factor analysis technique. The battery consisted of five motor fitness test namely.

1. Softball throw.
2. Toe touching.
3. Double foot balance.
4. 50 meter dash.
5. 300 meter run/walk for girls and boys.

In the second phase he developed percentile scale on all the five components of motor fitness for future use.

Devi , (2000) conducted a comparative study of physical fitness and psychological traits of tribal and non-tribal high school students on a sample of 1200 drawn from high altitude. Fleishman physical fitness test battery was used for the purpose. She concluded that :-

(1) The tribal (boys and girls) were found superior in explosive strength than the non-tribal (boys and girls).

(2) The non-tribal (boys and girls) were better in extend flexibility than the tribal (boys and girls).

(3) The tribal boys were found superior in agility and dynamic flexibility to the non-tribal boys.

(4) The non-tribal boys were better in endurance than the tribal boys.
(5) The tribal girls were better in speed and endurance than the non-tribal girls.

(6) The non-tribal (boys) of lower altitude were better in dynamic flexibility than the non-tribal boys of higher altitude.

Gill, Brar, Sandhu, Mann, (1988) : Concluded in his research work that the group of high self concept density differs from average and low self concept groups having significantly higher mean physical fitness score the group mean difference of physical fitness scores, of average and low self concept group are not statistically significant.

Singh , (1988) : conducted a study to know the relationship between physical fitness and academic achievement of school boys, he conducted that :

i. Physical fitness increase with the increase in the level of the grade.

ii. There is no significant relationship between academic achievement and physical fitness.

iii. The grade X area interaction effect in respect of flexibility and cardiovascular endurance test is in favour of rural boys with marked variation between rural and urban boys at various level of the grade and within the grades.

iv. Area effect does not give similar results on all the physical fitness test on the flexibility and cardiovascular endurance tests rural boys performed significantly.

Rajni, Negi and Singh, (1994): Concluded that fact in their research that there are significant difference in body weight, body height, strength, speed endurance, agility and flexibility between
trained and untrained Indian girls of 10 to 14 years. There are significant difference within the different age groups of trained girls in body height, weight, standing broad jump set ups 10 meter dash. However the 13 and 14 years old trained girls differ significantly from each other (P.05) only in standing broad jump.

Day, Sinha, Derbrary, (1997): compared anthropometric and motor quality of girls 8-14 years age of eastern and north-east region of India. The study was carried out on 700 healthy school going girls of NER and NER of India to evaluate and compared the different anthropometric and motor quality variables. All the fitness score showed positive correlation with age, height and weight, but 30 m. run, agility run and 800 m. run showed significant negative relationship. Height and weight were found to be strong predictor of strength and anaerobic performance, where adiposity as reflected y some of skinfolds is the weakest predictor of running, jumping and endurance performance. The percentile values of test scores indicated that NER girls are superior to ER girls in weight between 8-12 years of age but the trend in height was just reverse. It may also be concluded that the regional variation for different anthropometric and motor quality variables may be attributed due to geographical variation, environmental influences, genetic factor, nutritional variation and difference in socio-economic status of ER and NER girls.

American Academy of Pediatrics, (2000): conducted study an physical fitness and activity is school. Schools are in a uniquely favorable position to increase physical activity and fitness among their students. This policy statement reaffirms the American Academy of Pediatrics' support for the efforts of schools to include increased physical activity in the curriculum, suggests ways in which school can meet their goals in physical fitness and encourages pediatricians to offer their assistance.
The recommendations in this statement are consistent with those published in 1997 by Centre for Disease Control and Prevention.

Halder, Khanna, Banerjee, (1987) Concluded in his study that in such sports events where strength is the determinant factor, the tribal students if find opportunity may prove to be better performance than the non-tribal students and hence they may be provided with proper training and other factors to come up at the national level.