CHAPTER I

REVIEW OF LITERATURE
CHAPTER - II

REVIEW OF RELATED LITERATURE

Efforts have been made by the research to locate literature pertaining to this study. It was found after reviewing the literature in so many books, Dissertations Abstracts International, Research Quarterly, various research journals and unpublished research theses work done on motor abilities.

A brief review of literature is presented under four sub headings:

1) Test construction and developmental studies
2) Age studies
3) Female and sex studies
4) Miscellaneous studies
TEST CONSTRUCTION AND DEVELOPMENTAL STUDIES

Fleishman (1964) formulated the following nine basic fitness factors which were measured by various fitness tests: extent flexibility, dynamic flexibility, explosive strength, static strength, dynamic strength, trunk strength, gross body coordination, gross body equilibrium and cardiovascular endurance.

Docherty (1968) conducted a longitudinal analysis of the rate and pattern of growth of selected maturity, structural, strength and motor ability measures of boys, 10 to 16 years of age. He found that the yearly velocity rates of skeletal age and most of the functional variables of 100 boys were relatively consistent during six years i.e. 10 to 16, the structural variable showed less consistency.

A study was conducted by Huntington (1968) to find out differences in achievement between groups of boys at different strength levels on selected motor fitness tests. Four tensio-metre tests were administered to 150 elementary schoolboys with the aim to make comparison of high, middle, and low strength groups. The motor fitness tests administered were on agility test battery, a cardio-respiratory endurance
test battery and power test and running-speed test batteries. A statistical analysis of the data led to the conclusion that the cable tensio-metre strength test did not appear to be practical in predicting achievement on selected motor fitness tests.

Shore (1972) constructed a motor fitness test battery for lower elementary grade boys. Thirty experimental test items considered as valid and reliable measures of motor fitness were administered to 238 boys. After analysing the data, two test batteries containing seven items each were developed on the basis of the rotated factor loadings of the test items.

While constructing a scientifically designed evaluative instrument to assess the motor fitness of boys in the primary grades, Dinnuci (1973) identified 30 test items to measure muscular strength, muscular endurance, cardiovascular endurance, power, speed, agility, flexibility and balance. The tests were administered to an incidental sample of 238 boys aged six to nine. An intercorrelational matrix was constructed for a factor analysis of the data, using the Principal Axis Method. Several factors with values of about 1000 and accounting for 67.17 per cent of the variance were isolated. The first of the two test batteries developed included the test items which loaded the highest on each factor and were as follows: Clarke's strength
composite, McClay's endurance ratio, Well's sit-and-reach, base balance on a stick lengthwise; wrist flexion and extension; arm flexion, back flexibility test and modified push-ups. The second test battery, developed for more administrative feasibility, included items which loaded high on each factor and eliminated composite scores and ratios. The items in the second test battery were grip strength, a 300-yard run, Well's sit-and-reach test and base balance on a stick lengthwise, wrist flexion and extension and arm flexion on the back flexibility test and modified push-ups.

C.H. Badami (1980) conducted a study of some aspects of motor development among pre-school children for measuring the development in loco-motor skills. Tests were used to record data on standing, walking, running, climbing, jumping and hopping. For measuring manipulative motor skills, the tests used were ball-playing, spontaneous cubes, play, threading beads, tracing figures, cutting and paper-folding. The pre-school age range studied was two to five and a half. The normative-descriptive approach, using a cross-sectional design, was undertaken for this investigation. A total of 40 children—an equal number of the two sexes—were selected at each age level with an interval of six months. The findings of the study showed that the loco-motor and manipulative-motor skills studied indicated continuous development throughout this period. Variations were observed in the rate
of development of the skills with age. At certain age levels sex differences in some of the items were found significant. Children were found to acquire various loco-motor skills earlier than manipulative motor skills. The study indicated that no systematic differences among the two sexes existed in the development of loco-motor skills during the pre-school age.

Uppal and Sharma (1984) conducted a study on the relationship of selected motor ability components and physical characteristics to badminton playing ability. The 11 subjects for this study were girl trainees at a National Junior Badminton Coaching Camp. The average age of the subjects was 17 years, the range being from 14 years to 18. Tests of leg strength, agility, choice response movement time (CRMT) and badminton playing ability were conducted in a gymnasium and tests for cardio-vascular fitness were given in the human performance laboratory of the Lakshmibai National College of Physical Education (L.N.C.P.E.), Gwalior. Height and weight were measured by traditional methods and were recorded to the nearest half of a centimetre and the nearest one-tenth of a kilogram, respectively. From the height and weight, the scores' ponderal index was computed. Leg strength was measured by the jump-and-reach test. Agility was measured using 4 x 9 metre run and the CRMT was measured by the Nelson Choice Response Movement Time Test. Agility
and the CRMT was recorded in second to the nearest one-tenth of a second. Scores in badminton playing ability comprised of the number of legal volleys completed by the subject in the stipulated time of 30 seconds. The data was analysed using the zero order correlation, which was followed by partial correlational analysis, wherever necessary, in order to eliminate the influence of certain independent variables.

The results of the study revealed that weight has a significant negative relationship with badminton playing ability and is, therefore, detrimental to good performance in badminton. Leg power and the CRMT had significant correlations with badminton playing ability and could be used as a prediction variable in badminton performance. The ponderal index of badminton players had a significant positive relationship with badminton playing ability and thus indicated that a player with a higher index value was in a position to excel in this sport. Height as a physique characteristic was more important than weight in affecting performance in badminton. The predictive value of leg power improved in assessing badminton playing ability when the influence of height and weight was eliminated in the process of correlating leg power with badminton playing ability.

Singh, Ajmer (1986) conducted a study on the physical fitness of 4000 college students of Panjab University, Chandigarh, Fleishman's test battery was used on 17 to
22-year-old students. In conclusion he found that physical fitness improved linearly according to age and that students belonging to the rural areas were significantly superior in their performance of test items like the standing broad jump, push-ups, the 600m run-and-walk, etc.

Sohi (1986) conducted a study of the development of speed and agility among boys and girls in the six-14 age group. This study was undertaking to investigate the changes in performance in speed and agility among Nigerian children. The focus of the study was on uncovering the pattern of improvement in the performance of boys and girls six to 14 years in age. A cross-sectional population drawn by using all the students of two primary and one secondary schools in a rural area of Ondo State of Nigeria was selected to undergo the test for speed and agility. There were nine sub-groups by age and sex—totalling 969 (499 boys and 470 girls). The purpose of the study was to observe how improvement in performance occurs with age among boys and girls. The subjects were administered two tests comprising motor tasks—one each for speed (50m sprint) and agility (shuttle run)—to record the performance of the subjects. An analysis of the data indicated that the boys showed linear improvement on the motor tasks. The girls improved interruptedly in sprinting and linearly in agility. The boys also out-performed the girls in sprinting. The girls levelled off in their performance earlier than the boys.
Ranganathan (1986) conducted an assessment and an analysis of the motor performance of elementary-school children. The purpose of the study was to assess cross-sectionally the changes in the motor fitness of elementary children of six through 11 years of age. Fifty boys in six age groups from six to 11 years were randomly selected and standard motor fitness test items were administered to them. To gauge the different motor fitness components of strength, muscular endurance, cardio-vascular endurance, speed, power agility and flexibility, tests of push-ups, the 600m run-walk, 50m dash, the standing broad jump, the 4 x 10 metres shuttle run and trunk flexion were used. The reliability of all the tests were established using the test-retest method. All tests were conducted with the help of persons competent in this field and the scores were recorded separately. The results indicated that performance advanced with increases of age, except in the case of the shuttle run and trunk flexion, where decreasing performance was shown after age nine. Finally, the study revealed that (a) the strength of the arms increased noticeably as the children grew older; (b) the explosive power of the legs improved significantly every year in elementary-school stage; (c) a high increase in cardiovascular endurance after every year was noticed among the students of nine, 10
Singh, G. and Kalpana Debnath (1986) conducted a study on 16 male gymnasts who had attended a four-week national coaching camp held at the Motilal Nehru School of Sports, Rai (Haryana). All the subjects were lodged in a hostel and were given a similar kind of diet and other facilities. The following tests to measure motor abilities were administered at the beginning of the camp: Rope climbing (four metres without the feet touching the rope), the time being recorded in seconds, dips on parallel bars (maximum number); pull-ups on the horizontal bar (maximum number); abdominal strength (sit-ups with a jack-knife action from a lying position maximum number); the standing broad jump (for explosive leg strength); double-leg circles on the pommelled horse; and a trunk flexibility test. The daily training schedule for the gymnasts consisted of training for three hours in the morning and three hours in the evening for six days a week, Monday to Saturday. Since the coaching camp was preparatory in nature, emphasis was laid on physical conditioning, teaching and training in individual events. From the results of the study it was concluded that a four-week intensive training schedule in the preparatory period could be quite beneficial in improving certain components of motor abilities such as strength, endurance and explosive
strength in elite gymnasts. However, certain other motor components, like speed and flexibility, might not be developed significantly within such a short duration of training.

Singh, Reet Mohinder (1986) prepared physical fitness norms for high school boys of Punjab State. Data were collected on 5000 subjects selected randomly from various schools in the State. The test battery administered consisted of eight items, i.e. the standing broad jump, sit-and-reach test, agility run, sit-ups with bent knees, 50-metre dash, push-ups, cricket ball throw and the 600-metre run-and-walk. He found a significant relationship between the age and performance of the subjects (12 to 15 years boys). Socio-economic status yielded a significant association with the performance of the subjects only in the agility run, sit-ups and bent-knee tests. Urban subjects performed significantly better than their rural counterparts in the standing broad jump, agility run, 50-metre dash and cricket ball throw tests, whereas the rural subjects were found significantly better in the sit-and-reach and 600-metre run-walk tests.

Singh, Hardayal (1986) conducted a study on the motor abilities of untrained Indian school boys, 10 to 16 years old, with the intention of comparing these abilities with those of school boys of Europe and North America. Boys from the following six Indian states were the subjects for the study:
Panjab, Manipur, Madhya Pradesh, Gujarat, Karnataka and West Bengal. The subjects were randomly selected from schools. The total number of subjects was 3384. The following tests were administered to the subjects: the shuttle run (4 x 9 m), forward-bend-and-reach test, the 50-m sprint, standing shotput throw (4 kg), standing broad jump, bent-knee sit-ups (30 sec) and 800-metre run-and-walk. He used the Hull Scale for norm development. For further analysis of data, t-test was used. The following conclusions were drawn:

(1) The boys of India are shorter and lighter than the boys of Europe and North America.

(2) The Indian boys are poorer than the boys of Europe and North America in abdominal and leg strength, speed, endurance, agility and trunk flexibility. Boys of Manipur, however, seem to equal their counterparts from Europe and North America in leg strength. They are much better than boys of Austria in trunk flexibility.

(3) The yearly rate of increments in height, weight and motor abilities of Indian boys is lower than that of boys of Europe and North America.

Kaur, Daljit (1989) conducted a study on the physical fitness of high school girls of Panjab falling age group 12 to 15. The purpose of this study was to prepare norms for the girls of
Punjab belonging to this age group. The norms were prepared on Fleishman's Physical Fitness Test Battery. The study also intended to show how development in physical fitness takes place in this age group. Further, efforts were made to compare the levels of physical fitness of urban and rural girls of Panjab. Data were collected on 4000 girls. The test battery administered consisted of 11 items: twist-and-touch, shuttle-run, softball throw, hand-grip, push-ups, leg-lifts, cable jump, balance-A Test, 600-metre run-and-walk, standing broad jump, 50-metre dash. Percentile norms for physical fitness tests were found to be valid and suitable to assess the physical fitness levels of the high school girls. The urban girls were found superior in most test items as compared to the rural girls. There was a linear relationship of fitness with age, except in the variable of flexibility.

AGE STUDIES

Serl (1963) analysed the relationship between the performance and growth characteristics of fifth and sixth-grade children. As many as 150 boys and girls of a school in the city of Gwalior, from classes VI, VII and VIII, were selected to serve as subjects for the study. The AAHPER Youth Fitness Test was administered to both a control group and an experimental group of boys and girls participating in a five-month programme of prescribed activity. The AAHPER Motor Fitness tests items administered to the subjects were:
50-m run, bent-knee sit-ups, pull-ups, standing broad jump, shuttle run (4 x 10) and nine-minute run-walk. The height and weight of the subjects were also recorded. All the subjects were fully residential students. Thus the dietary habits, lifestyle, etc. were the same for all subjects. The findings revealed that children in the planned programme performed better than those in the controlled programme and the girls benefited more than the boys.

David B. Jordan (1967) studied the strength and motor development of boys aged seventh through 12 years. There were 886 subjects of ages 11 and 12 and 876 of eight and nine years. A moderate degree of inter-age consistency was found for bar push-ups, the standing broad jump, 60-yard shuttle run and cable tension strength. The highest average strength index for these were for bar push-ups. A statistical comparison of strength and motor ability means for advanced and rotated maturity groups revealed continuous significant differences for the two gross strength patterns—cable-tension strength and average strength index. When the growth patterns of high and low physical fitness index (PFI) groups were compared, continuous significant differences were obtained for bar push-ups and average strength index over the four-year period.
Espenschade (1968) observed that girls' scores on the Brace-test of General Motor Ability did not improve after the age of 14, while boys' scores showed steady improvement from eight to 18 years of age. She concluded that all studies agreed in showing increasing ability with age in running, jumping and throwing for boys from the earliest measures made in childhood through the early school years. But they reached their maximum in running and jumping as early as 13 years of age and showed a little change after 13 in distance throwing. She has also stated that since physical size and strength continue to increase after this age level, the discontinued growth in motor ability could not be attributed to the attainment of physical maturity. She further found that girls improve in agility up to age 14, but then decline.

Haley (1972) conducted a study on motor fitness. The sample included children studying in grades one through six. Thirty boys were randomly selected from each grade. Their ages ranged from five years, nine months to 12 years two months. Twelve motor performance tests were administered to these 180 subjects. The tests were designed to measure sprint speed, power, agility, reaction time, static balance, dynamic balance, hip flexibility and elbow flexion strength. A one-way analysis of variance design was utilized to determine if a significant difference occurred among the six grades on
each test item. If the obtained F-ratio was found to be significant, the Scheffe Multiple Comparison Procedure was employed to determine where the actual difference occurred.

The results of the analysis of variance in Haley's study revealed a significant difference between the grade levels on all 12 variables. Scheffe' Test indicated that performance increased through the elementary grades. The highest increases were between grades one and two and between grades five and six with the middle grades providing a plateau effect. The performance scores formed a curvilinear relationship of all variables. The following conclusions were drawn:

1. Motor performance scores on all variables tend to increase as age increases.

2. Motor performance scores on all variables except elbow flexion strength do not increase as drastically in the middle grades as in the early and late elementary years.

3. Strength does not reach a plateau stage during elementary school.

4. Dynamic balance does not increase significantly from grades one to three.

Jerry Conard Welch (1974) cross-sectionally analysed the development of agility to select one or more test items
which could assess the agility of boys and girls aged five through 17. The five selected test items were a 30-foot shuttle run, the Illinois Agility Run, the Scott Obstacle Race, the dodge run and zig-zag run. The 'F' ratio noted significant differences at the .01 level of significance between the age levels on every test for both boys and girls. The Duncan Multiple Range Test noted significant differences between the following age levels: 5-6, 7-8 and 8-9 for boys and 6-7 and 7-8 for girls. No significant differences were obtained between the following levels: 9-10, 10-11, 14-15, 15-16 and 16-17 for boys and 9-10, 10-11, 11-12, 16-17 for girls. The Illinois Agility Run was selected by factor analysis as the best test of agility for all age groups for both sexes.

Huntley (1974) investigated the effect of physical activities upon the physical fitness and motor ability of students of first, second and third grades. He tested 1961 students. An analysis of the results revealed that physical fitness and motor ability improve significantly due to physical activities. It was further found out that a greater contribution of physical fitness and motor ability resulted in group participation in basic movement and rhythmic activities, especially participation in games and related activities.

Breiham (1979) investigated the motor performance of four, six and eight-year-olds to test two proposed hierarchies
of motor skill development. Using predetermined pass-failure criterion, product and process components for each task were evaluated and the scores transformed into dichotomous data, were then subjected to an ordering theory analysis to test the hierarchical nature of motor development tasks for each of the three age levels. The results did not support the proposed hierarchies of motor skill development, but certain development factors were found present at each age levels. There was a more obvious clustering of skills among the eight-year-olds than among four and six-year-olds. Fine motor skills were very much isolated from the other motor tasks in the hierarchy.

Frederick (1979) made a study to determine motor ability differences along five age groups composed of black and white boys and girls in the performance of a 20-yard run vertical jump, standing broad jump, balance on the right foot, balance on the left foot, kicking for a distance, throwing for accuracy and kicking for accuracy. The children were also measured for height, weight and eye-hand-foot coordination. The following findings emerged:

1. Significant differences were found among the five groups for all eight motor tasks.

2. The differences among the age groups were greater for older children.
3. The boys scored significantly higher than the girls in throwing for accuracy, throwing for distance and the vertical jump.

4. The black children scored significantly higher than the whites in the vertical jump. There was no interrelationship between the eight motor performance tasks.

Frederick concluded that (1) children between the ages of three and a half and five and a half improved in performance as they increased in age; (2) black children are superior to white children in the vertical jump; (3) boys are superior to girls in throwing and jumping; and (4) girls are superior to boys in balance activities.

Motor development is one of the areas where emphasis on observing changes in the motor behaviour of children, occurring as a result of growth, maturation and experience, is becoming central to research endeavours. Schmidt (1982), after reviewing various studies, pointed out that by the time an individual reaches the age of 18 he experiences large improvements in his motor behaviour. The manner in which motor proficiency improves as children grow old has also been reviewed extensively by Cratty (1979).

The differences in motor performance as motor outcomes
are indicative of physical fitness and such differences can stem from multifarious influences of varied factors interacting in complex combinations. Besides, hereditary factors, which cannot be controlled, perhaps interact significantly with all-pervasive environmental factors. Factors like, climate, culture, lifestyle, etc. do form a module for the expression and realisation of potential motor abilities. One of the natural processes of unfolding growth and development is chronological age. Chronological age carries both hereditary and environmental influences and has been seen associated with motor development (Cratty, 1979; Harre, 1982; Sohi 1986a, 1986b). During childhood and adolescence it is normal to see increases in height and weight—two easily observable components of physical growth. However, the changes in motor activity patterns need a systematic study from the development point of view.

**FEMALE AND SEX STUDIES**

Baise and Peasley (1937) selected three different groups of women in order to study the relation of reaction time, speed and agility of major muscles. One was selected on the basis of demonstrated skill in either tennis, golf or archery; the second on the basis of demonstrated inability in physical education activities; and the third group was composed of those
students who had shown low scores in the Brace Motor Ability Tests. It was concluded that training of individual in tennis, golf and archery classes, the groups meeting two hours a week for seven weeks did not significantly affect their scores on the S.A.R. tests.

Lane (1966) conducted a study to determine the relationship between physical fitness and the motor ability of high school girls. The AAHPER Youth Fitness Test and the Humiston Motor Ability Test were administered to 69 girls, aged 14, before and after a planned physical fitness programme. The group improved on both tests and the correlation between physical fitness and motor ability was higher after the planned fitness programme.

Meeks (1966) in her study compared physically fit and physically unfit girls and their academic achievements with other variables. The AAHPER Youth Fitness Test was administered to 264 girls at Holman Junior High School St. Ann, Missouri, U.S.A. The 27 girls who scored the lowest were compared in academic achievement by grades point averages. The physically fit students achieved better grades than physically unfit students.

Douglas (1968) did a study of high school girls divided into three groups on the basis of their performance in motor ability tests. Group A contained subjects who participated
in the regular physical education programmes. Group B had low-ability subjects who went through special exercises; and Group C contained subjects with mixed levels of motor ability. Groups A and B did not differ from each other on a post motor ability test, although both groups improved significantly while comparing the three groups on skill tests. Group A was better than the other two groups in the softball throw, a volleyball test and a half-minute basket shooting test. Group A performed significantly better than Group B on two of the skill tests.

Fifty-nine boys and 64 girls were studied by Coleen (1969) in order to determine the effects of physical activities suggested by Kephart upon the development of motor ability, perceptual ability and academic achievement among first grade boys and girls. Pre-test and post-test motor ability data were collected for 44 experimental and 48 control subjects on the following variables: squat thrust, a side-step test, the 30-yard dash, a 25-foot run-and-sit test, a 50-foot hopping test, ball-bounce test; one-foot standing-balance time and balance-beam walking. Complete pre-test and post-test data were collected for 54 experimental and 48 control subjects on the perceptual forms test, teacher ratings of reading ability and overall academic ability and the Metropolitan Readiness and Achievement Test. Complete post-test data for 55 experimental and 51
control subjects were collected on lateral preference items and on lateral awareness.

A significant difference was found between the experimental and control group on each of the following measures of motor ability: grip strength, squat thrust, side-stepping, run-and-sit, 50-foot hop on the right foot and left foot, total Brace score, total Johnson score and standing balance on the right foot and left foot. The experimental group improved more on all the above measures except grip strength. For perception and academic measures, the only significant difference found between groups was in the measure of internal awareness, in favour of the experimental group. A conclusion drawn from this study was that change in gross motor ability elicited by Kephart-type gross-motor activities does not necessarily affect change in the perceptual or academic ability of the average first grader.

A study by Hill (1972) investigated among primary grade children the relationship of reaction times and movement times with the variables of age, sex, motor ability and physical fitness. To achieve this purpose the Iowa Brace Test of Motor ability, the Glover Physical Fitness Test, a reaction time test, and a movement time test were administered to 133 male and 123 female subjects between five and eight years old. A statistical treatment of the
data revealed the following relationship; (1) both reaction time and movement time decreased significantly with increasing age; (2) significant sex differences in reaction time and movement time which had been reported for older age groups were also apparent in the case of the age group employed in this study; (3) the neurological functions of reaction time and the physiological functions of movement time were significantly related; (4) both of these functions were also significantly related to each item on the physical fitness test; and (5) both reaction time and movement time correlated significantly with the motor ability criterion. However, in combination with the other variables considered, they had no value in the prediction of motor ability.

Harry (1982) studied the performance differences between males and females to investigate the relationship between selected physical performance tests and body fitness in preadolescent boys and girls. Measures of age, height, weight, skinfold thickness at two sites and performance scores on the vertical jump, standing broad jump, modified pull-ups, 40-yard dash, and 400-yard run were obtained on 563 elementary school children. The results of a one-way ANOVA indicated that there was a significant difference between boys and girls on all the physical performance tests. Although the boys were slightly taller and heavier and
scored better than the girls on the performance tests, there was no significant difference between the sexes in the sum of two skinfolds. Separate regression equations for the sum of two skinfolds by performance on each test indicated that body fatness was only marginally related to performance. These findings indicated that although body fatness inversely related to the ability to move the total body weight, it was of minimal importance in explaining performance differences between young boys and girls.

Uppal and Rajinder Singh (1983) conducted a study on 13 girl students in the first year Bachelor of Physical Education class of the L.I.C.P.E., Gwalior. The subjects were randomly selected and their ages, as taken from the college health records, ranged from 16 to 19 years. All the subjects resided in the hostel of the college. They had a regular schedule in physical education and conditioning as per the programme of the college and this was same for all the subjects. The programme consisted of 30 minutes of conditioning in the morning, involving endurance running, free hand exercises and general strengthening exercises and regular practical instruction classes in swimming, rhythmics, gymnastics, volleyball, kabaddi, basketball and track and field events.
The subjects participated in the above programme five days a week. On Saturdays the subjects participated in an intra-mural programme and Sunday was a holiday for all. The subjects were administered flexibility tests like the sit-and-reach test, standing-bobbing test, shoulder flexibility test and spine flexibility test. The tests were administered before and after eight weeks of regular participation in standard physical education programmes. For determining the significance of the differences between initial and final means the 't' test was employed. The level of significance chosen was 0.5. Regular participation in a programme of physical education and conditioning for eight weeks effectively improved flexibility of the hip, trunk shoulder and spine as measured by the sit-and-reach test, standing-bobbing test, shoulder flexibility test and spine flexibility test, respectively.

Abdulnour's (1987) study intended to (a) establish Kuwait's national physical fitness norms in terms of every fifth percentile by gender/age and gender/grade by administering the AAHPER Youth Fitness Test to 6502 or 8% of the boys and girls aged 14 through 17 attending public (government) secondary schools in grades nine through 12; (b) to compare Kuwait's data with those of high school boys and girls in the United States of America as indicated by their performance
on the AAHPER Youth Fitness Test survey of 1975; and (c) to compare the mean differences in physical fitness among three groups of boys and three groups of girls attending public secondary schools in Kuwait. The fitness tests included pull-ups for boys and flexed-arm-hang for girls, flexed-leg sit-ups, the shuttle run, standing long jump, 50-yard dash and a 600-yard run. A two-stage cluster sample was used to select the subjects in Kuwait. A t-test for the independent sample was used for a comparison of the Kuwaiti and American surveys. The level of significance was set at .05. The ANOVA method was applied. Whenever the F-test was found to be significant at the .05 level, the Scheffe Procedure was followed to deduce where reliable differences existed. The statistical analysis revealed that (1) the physical fitness status of boys and girls attending public secondary schools in Kuwait was significantly lower than that of their counterparts in the USA; (2) the physical fitness levels of the six groups of boys and girls in Kuwait's public secondary schools differed significantly in certain comparisons generally. Kuwaiti male and female students in the credit unit system performed better than their Kuwaiti and non-Kuwaiti counterparts in the general system. In brief, boys and girls in Kuwait demonstrated low levels of physical fitness. Different programmes and further research to improve the fitness of youngsters in Kuwait were recommended.
Landiss (1935) designed a study to compare eight selected physical education activities in the development of physical fitness and motor ability of students participating in these activities. The criteria for determining these two factors of physical fitness and motor ability were physical fitness tests. The results indicated that an improved physical fitness rating was achieved in equal measure by those who participated in conditioning and by those students who participated in tumbling gymnastics, etc., the activities least apt to increase the students' scores in physical fitness test. It was further found from the study that the group participating in wrestling and tumbling gymnastics made a significant gain in the Larson test of motor ability.

Tuttle and Beebee (1941) and Davis and Berger (1973) compared college athletes and non-athletes on the basis of scholastic achievement, but found no differences. Jones (1967) observed that fitness did not seem to be related to academic achievement for university students. Bruntley (1967) found that physical fitness, motor ability and static strength test batteries associated with under-achievers did not account either for an adequate amount of variance for prediction of intelligence levels or for prediction of
intelligence levels or for prediction of academic achievement levels.

Frank (1963) conducted a research study on certain physical fitness components and sports skills among subjects of rural, urban and parochial school background. He examined the effects of different elementary school experiences upon achievement in certain aspects of physical fitness and sports skills. He tested 85 grade nine boys (27 with a rural background, 38 with an urban background and 20 with a parochial school background) for speed, power, muscular endurance and skill in different games. The investigations showed that boys with rural, parochial or urban experiences did not differ in physical fitness, but that boys from urban and parochial schools were superior in sports skills.

When examining the relationship between mental and motor performance at various stages, somewhat conflicting results are noted in existing literature. Hart and Shay (1964), Arnett (1968) and Thomas (1969) observed a positive relationship between physical fitness and grade point averages and stated that physical fitness could not be used as a predictive device for academic performance, nor could academic performance be used for prediction of physical fitness.

Brault Donald (1965) comparing the performance of elementary school children on the Kraus-Weber Test of
minimum muscular fitness with achievements on selected motor fitness measures like pull-ups, timed sit-ups, dynamometer thrust-and-pull, baseball or softball throws, three standing broad jumps, a 35 or 50-yard dash, trunk flexion, trunk extension and short potato race, treated the data for the sex and age groups separately by the chi-square and the analysis of variance and noted that children who passed all the Kraus-Weber Test items performed significantly better than those who failed on one or more items. This held valid for all performance tests except for the measures of running speed and throw for seven-year-olds.

Lauro Geraldine (1963) conducted a study on the motor performance of primary grade black and white children six to seven and eight years old and concluded that static balance, dynamic balance, broad jump and jump-and-reach measures improved significantly from six to eight years. Flexibility sex comparisons showed that boys were consistently superior in static balance and flexibility, but few of the differences were significant. Racial comparisons indicated that black children were significantly better in jump-and-reach and three of the six broad-jumping groups.

Hill (1972) investigated the relationship between the motor ability and physical fitness of children five through eight years old. He selected 133 male and 123 female...
subjects and administered them the Iowa Brace Test of Motor Ability and the Glover Physical Fitness Test. Statistical treatment revealed that physical fitness had no value in the prediction of motor ability.

Physical and mental well-being are closely inter-related. Physical education believe that regular participation in physical activity programmes could enhance the mental development of children (Baley & Field, 1976, and Cowell & France, 1963).

Research indicates that there are distinct personality differences relating to the physical fitness of individuals. Young and Ismail (1976), on the basis of their research findings, endorsed this view. Similarly, Lashley's (1972) findings indicated that there is a significant relationship between personality characteristics and levels of physical fitness.

Tuteja (1973) did a comparison between rural and urban high school students with regard to physical fitness. The AAHPER Youth Fitness Test and the P.E.D. Test were conducted to get a single score for both physical fitness tests of rural and urban high school students. The 't' test was employed for testing the differences between rural and urban students. It was concluded that there was no significant difference between them in physical fitness and motor ability performance.
Roy (1979) did a study to compare the physical fitness of tribal and urban students in Tripura State. He administered the AAHPER Youth Fitness Test to 60 tribal and 60 urban students studying in college. Their ages ranged from 16 to 20 years. The mean difference between the physical fitness of urban and tribal students was not found statistically significant at the .05 level of confidence. It was found that the urban students were better in pull-ups and softball throw for distance and their performance was statistically significant at the .05 level of confidence. But in the remaining five test items, i.e. the 50-metre dash, 600-metre run-walk, sit-ups, shuttle run and the standing broad jump, the performance of none of the groups was found statistically significant at .05 level of confidence.

Sharida (1981) compared the levels of physical fitness of school children in Basrah, Iraq, with the norms of the AAPHER Youth Physical Fitness Test, laying emphasis on daily activities and physical education programmes in the school curriculum. Another purpose was to establish a tentative set of norms for the physical fitness of Iraqi youth. He concluded that advantages of the physical fitness programmes in the U.S.A. were evident through the actual performance of children.

Chandrashekhar (1981) compared the physical fitness components of football and basketball players. He
used Fleishman's test battery of physical fitness. The results of the study showed that basketball players were comparatively superior to football players in flexibility and dynamic flexibility. The football players were significantly better in leg explosive strength, abdominal strength and gross body coordination.

Johnson and Nelson (1932) suggested that a physical fitness test should include at least one item each of strength, flexibility, muscular and cardiovasculatory endurance, speed, power, balance, agility and co-ordination. But most of the studies suggest that there are five major areas—strength, flexibility, balance, co-ordination and endurance.

Uppal and Roy (1936) investigated certain motor fitness components as predictors of soccer playing ability. They hypothesised that predictions could be made on the basis of motor fitness with regard to the playing ability of soccer players. Thirty male soccer players from Jiwaji University, Gwalior, were selected as subjects for the study. They were administered five tests for motor fitness components, namely speed (50m-dash), agility (4 x 10m shuttle run), maximum leg strength (leg dynamometer) explosive leg strength (standing broad jump) and cardio-respiratory endurance
(Cooper's 12-minute run/walk test). The soccer playing ability of the subjects was assessed with the help of a panel. The statistical design of the data collected included zero order correlation, multiple correlation and prediction equation and the Wherry-Doolittle method of regression equation. The findings of this study revealed that the independent variables were related significantly to soccer playing ability. Since the multiple correlation coefficients were higher than zero-order correlation coefficients, for better performance in soccer all the independent components chosen were recommended for consideration. Soccer playing ability could be predicted with the help of developed predictional equation.

The review of the related literature demonstrate that a leap has been taken forward in the area of motor fitness. Some tests have been developed and the phenomenon of motor ability development has partially been investigated. A pertinent issue that has come to the surface is that some of the fitness tests are being used by the Indian researchers in the absence of the norms relating to the Indian population. This appears to be a major flaw in the area of research in motor development.

There are some studies that have been focused to construct norms of Indian population. These studies include,
Daljit Kaur (1989), Ajmer Singh (1988), KoteMohinder Singh (1986) and Hardyal Singh (1986). However, these researchers have not covered the age group of 7 to 11 years. This study is a first attempt to cover the girls of Panjab in the age group of 7 to 11 years, since no notable attempt has been made on this age group.

Some cross-sectional studies have been conducted to highlight the development patterns of motor fitness components at different age levels. Starting from the age of 12 years and above. However, there appears to be some contradictions and variations as the results of these studies do not demonstrate similarity.

From the growth and development point of view and from the point of view of motor activity including competitive sports, the age group of 7 to 11 years is very, very important as the foundation of efficient movement and skill learning are strengthened at this level. This investigation is an attempt to study the motor fitness components of speed, agility, flexibility, endurance and strength of the Panjab girls from 7 to 11 years. The study might highlight the relationship of the age with the above mentioned components. In addition to that the norms pertaining to the motor fitness has also been developed. Further interaction effects of residence (rural and urban) and the interaction effects of different age levels have been investigated.