Chapter II

REVIEW OF RELATED LITERATURE

The dire need for standardization of norms for physical fitness tests for girls in the State of Goa, as already emphasized in the Introductory Chapter, induced the research scholar to undertake this need based problem for research.

Consequently, the investigator visited some of the leading libraries in the country, such as, the libraries of Lakshmibai National College of Physical Education, Gwalior, Netaji Subhas National Institute of Sports, Patiala, University College of Physical Education, Bangalore, Goa University, St. Xavier's College, Goa, Poona University and Central Library, Goa, to review the existing literature and research studies having relevance to the topic under study.

Some of the related literature is presented here to give depth and breadth to the work undertaken.

The AAHPER\(^1\) Youth Fitness Test project represented the first attempt by the physical education profession to establish national norms. The test battery was originally developed in 1957 by a special committee of the AAHPER Recreational Council.

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The Youth Fitness Test now consists of 6 items for boys and girls of age groups 10 to 17 and College men and women. The norms were revised to up-to-date it and make more scientific after comparing the achievements of the Youth of Great Britain, Japan, etc., with the American norms.

Busch\(^2\) conducted a normative study of the AAHPER Youth Fitness Test for girls in grade 7 through 10 in the State of South Dakota.

One school was selected to represent each region or section of the South Dakota High School Activities Association. The number selected from each school was in proportion to schools enrolment. The AAHPER Youth Fitness Test was administered to 1,000 South Dakota girls in grades 7 through 10. Norms were established by computing every fifth percentile. The scores of South Dakota girls were compared with those of National girls, using age only. The medians of South Dakota girls were then compared with the medians of the National girls on each test item. The medians of South Dakota girls were higher than those for National girls on all items, except the flexed arm hang.

The scores of South Dakota girls tended to show improvement as age increased whereas the scores for National girls tended to level off or drop.

Alston\textsuperscript{3} conducted a study on the Physical Performance of High School Girls on 3 Physical Tests.\textsuperscript{4} The Virginia Physical Fitness Test, AAHPER Youth Fitness Test and North Carolina Physical Fitness Test were administered to 60 girls in grades 9, 10 and 11. The correlation between the Virginia and the AAHPER Tests was .89, between the AAHPER test and the North Carolina .79 and between the two State tests .80. The mean differences of the 3 tests in standard score terms were not significant at the .01 level. The 3 tests gave essentially equivalent results for assessing the physical fitness of high school girls.

Ball\textsuperscript{4} compared the 4 methods of developing physical fitness in Junior High School Girls by matching girls in Searcy Junior High School, Searcy, Arkansas, into 4 groups on basis of motor fitness tests for High School girls by Evangelina and Cureton. The 4 methods compared were calisthenics, isometric exercises,


rope jumping and the regular physical education programme. After three months the motor fitness test was repeated. All groups gained significantly at the .05 level with the greatest improvement resulting from the calisthenic programme.

Elizabeth prepared the percentile norms for girls in the age group of 12, 13, 14 and 15 on the North Carolina AAHPER Tests. The norms were prepared for each of the Five Test items: sit-ups, side stepping, standing broad jump, modified pull-ups and squat thrusts. The sit-up item provided effective differentiation on the percentile scale for each age group. The concentration of scores in the middle of the distribution for the side stepping test and the squat thrust test resulted in effective discrimination in the centre of the ranges for all age groups. The standing broad jump test provided the greatest ranges and the best differentiation of scores on the percentile scale for the age groups. The modified pull-ups test failed to differentiate the lower end of the distribution for all age groups but did discriminate above the 20th percentile.

Brown gave four item motor fitness test to Washington State University Freshman men for two years and was validated against Roger's Physical Fitness Index, the strength index and the subjective rating of the development (sub-fit) class students by their instructions. No significant difference between means and standard deviations were found for the two sets of data and the norms based on them were statistically sound.

Clarke and Broekhoff summarized the results of Oregon studies contrasting boys and girls who participated in and did not participate in physical education.

Beckford conducted a study to evaluate the physical fitness level of Navajo girls 14 to 16 years old. AAHPER Youth Fitness Test was administered on the subjects selected from seven schools of the region to measure the physical fitness level. Also norms were established on basis of sources obtained from test results from these schools.

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These norms were compared to National Norms found in the manual accompanying the AAHPER Youth Fitness Test. The result of the study gave an indication of the overall fitness level of 14-, 15-, and 16-year old Navajo Girls of the seven test items. The Navajo norms were below the National norms on 5 test items and above on soft ball throw and 600 yards run and walk.

Barnam[^9] studied the AAHPER Youth Fitness Test Battery and administered the test to 78 girls in grade VIII at Mitchell Junior High School. The girls were classified by the Neilson-Cozens classification Index and compared with National norms. The girls were above the average in the sit-ups, standing broad jump, 600 yards run and walk, 50 yard dash and shuttle run, below in the soft ball throw and modified pull-ups. The differences were attributed to their physical education programmes.

Prem[^10] undertook a normative study of the Physical Fitness of Male Teenagers of the State of Jammu and Kashmir in the ages 13 through 19 years. The variables considered were, pull-ups (arm and shoulder girdle strength) bent knee sit-ups


(abdominal strength) standing broad jump (explosive strength) 50 meters dash (speed) shuttle run (agility) and 600 meters run-walk (cardio-vascular endurance). He concluded that the subjects belonging to age group 16 through 19 years showed better performances in all variables over the other age group of 13 through 15 years.

Colgan\textsuperscript{11} compared the AAHPER Youth Fitness Test and a proposed fitness test to determine whether the tests measured the same fitness components. Girls and boys (N = 326) from St. John's English School in Waterloo, Belgium (grade 5 - 12) were evaluated in both tests.

The fitness items used were the 6 items of the AAHPER Youth Fitness and 3 items recommended by ARAPCS Committees, viz; mile run, skin measurement and sit-ups. Both the tests when statistically treated revealed that the AAHPER Youth Fitness and the proposed test were measuring different components of fitness. It was concluded that AAHPER Youth Fitness measures "motor performance," while the proposed fitness test measures "fatness" and "endurance." AAHPER Youth Fitness measures

the same components for males and females, but age interacts with performance to a great extent in females.

Meeks\textsuperscript{12} made a comparison of physically fit and physically unfit Junior High School Girls. The AAHPER Youth Fitness Test was administered to 264 girls at Holman Junior High School, St. Ann, Missouri. The 27 girls who scored highest on the test were designated as the "Fit Group" and the 27 girls who scored lowest were designed as the "Unfit Group." These groups were compared in academic achievements by grade point average, personality by the California Test of Personality and Social Acceptance among their peer group by a sociometric design. The physical fitness students had better personalities, made better grades and were more socially accepted by their peers than the physically unfit students.

Rieger\textsuperscript{13} made a study of the effect of participation in three Recreational Activities on the Physical Fitness of the Ninth and Tenth Grade Girls. The AAHPER Youth Fitness Test Battery was administered to 112 girls in Grades IX and X. Then


the subjects were divided into a badminton, bowling, dance and control group by modified random selection. The activity group had 18 periods of instruction and the control group went to study hall before re-testing. Mean differences within groups were tested. Comparisons in the mean change made in the 7 test items by the experimental groups with that of the control groups, showed that the badminton group had four, the bowling group had one and the dance group had two significant improvements.

Beltrao conducted a comparative study of the Physical Fitness of Brazilian Girls and the United States Standards for girls of the same age groups. The AAHPER National Youth Fitness Test was administered to 232 Brazilian High School Girls. The results were compared with the standards for girls in the United States. The comparison of median scores within each age group showed that the Brazilian girls had consistently better results in the standing broad jump and the 600 yard run and walk than the girls represented by the standard. The United States girls had a higher median score in the soft ball throw in every age group. No consistent differences were found in the other test events.

Harryman\textsuperscript{15} studied the contribution of Physical Education and Athletics to the Physical Fitness of Shoreline High School Boys. The AAHPER Youth Fitness Test was administered twice to non-participants in physical education and athletics team groups. The results indicated that the level of physical fitness was related to the level and intensity of physical activity. Students who were not participating regularly in physical activity, decreased in physical fitness.

Lincoln\textsuperscript{16} conducted a study of the relationship between Physical Fitness and Grade Point Averages of Tenth Grade Boys at Sammamestr High School. The Washington State Physical Fitness Test Battery for Junior - Senior High School Boys was administered to 173 boys in grade 10. Their mean physical fitness scores and grade point averages correlated positively and significantly at the .05 level. The high and low grade point average groups differed significantly at the .05 level in physical fitness. The mean physical fitness of the total group matched that of the middle grade point average group.


Babcock studied the Physical Fitness of Delaware Boys and Girls in Grades Five through Twelve. Age, height, weight and AAHPER Physical Fitness scores were obtained from 6,761 boys and girls 10 to 17 years of age. Except for shuttle runs by boys and girls, the Delaware norms between the 25th and 75th centiles were equal to or higher than the National norms on the basis of either age or classification index. The Delaware norms also tended to be higher at the 50th and 100th centiles. Differences between small, medium and large schools were too scattered to indicate consistent trends.

Ikeda undertook a comparative study of Physical Fitness of children in Iowa (U.S.A.) and Tokyo (Japan). A physical fitness test battery including sit-ups, standing broad jump, shuttle run, forward bend, dash, grasshopper and bent-arm hang for girls and pull-ups for boys was administered to 172 girls and 178 boys in Iowa and 221 girls and 174 boys in Tokyo, ranging from 9 to 12 years. Height, weight, knee finger length and leg length

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were recorded. Subjects were drawn from various sized towns and situations as similar as possible. A two factor (race and age) analysis of variance was used.

The two samples were homogenous in age except for 9 year old boys and girls. The Iowa boys and girls were taller, heavier and had longer legs than the Japanese. Except for sit-ups, the Japanese groups exceeded the Iowa groups in all fitness tests. Age seemed to have no effect on performance in the bent arm and sit-ups for girls, the forward bend for boys and the grasshopper for both sexes. Negative correlations were found between forward bend and finger-knee length, forward bend and leg length, bent-arm hang and weight, pull-ups and weight and the weight/height ratio and sit-ups. Dash and leg length and weight/height ratio and forward bend were positively correlated. The correlation between these items were not absolutely consistent, but the 2 groups showed similar pattern of growth and performance. A checklist showed that the Japanese children had more chances for activity in physical education classes although the classes were larger and the facilities less desirable.

Bos\textsuperscript{19} summarised and compared the performances of

\textsuperscript{19}Bos Ronald R, "An Analysis of the Youth Fitness Project Data and a Comparison of this Data with Comparable Data Recorded to 1940," Completed Research in Health, Physical Education and Recreation Vol. 4 (1962) : 50.
U.S. children in Grades 5 through 12 to various pre-1940 test results from similar groups. Boys performances by age in pull-ups, sit-ups, standing broad jump and 50 yard dash were essentially similar. Present mean performances for boys based on the classification index was inferior in pull-ups, standing broad jump and 50 yard dash to performance reported in 3 studies conducted in California, with the major discrepancies at the elementary and junior high level rather than the senior high level. Present girls performances in 50 yard dash and standing broad jump were essentially similar to pre-1940 performances, except that the present older girls compared less favourably than the younger. Present girls performances in the sit-ups were markedly inferior. Present girls performance in the 50 yard dash on the basis of the Classification Index were poorer than those in the "California Studies."

Singh prepared physical fitness norms for high school boys of Punjab State. Data were collected on 5000 subjects from various schools in the State. The test that was administered consisted of eight items, viz: standing broad jump, sit and reach test, agility run, sit-ups bent knee, 50 m. dash, push-ups (chairs),

cricket ball throw and 600 m. run and walk. The percentile norms for physical fitness tests were found to be valid and suitable to assess the physical fitness level of the high school boys in the age group of 12 through 15 years.

Glassow and Krause\textsuperscript{21} conducted a study on motor performance of girls age 6 to 14 years. Here group achievement scores for elementary school girls for the 30 yards run, standing broad jump and overarm throw were presented to add to the limited information now available on children in the first 3 grades, 1 through 8 and 6 through 14 years.

Reliabilities of written day scores were reported. Correlation of year to year scores and of the first grade scores with those of grades 3 through 5, showed that individuals tend to remain in the same relative position within the group during the elementary school years. This paper added to present knowledge of motor performance of elementary school children by reporting observations derived from achievements scores of girls during a five year period.

Robson and his colleagues conducted a study on a simple physical fitness test battery for elementary school children. They conducted the test on 152 boys and 150 girls of Kendriya Vidyalaya, Gwalior. The test battery was practicable, more simple than the existing physical fitness tests and measured most of the essential motor qualities of elementary school children. Norms were prepared for classifying school children into ability group by assessing their physical fitness.

Humphrey conducted a study to investigate the physical fitness level of third grade pupils taught by specialists and non-specialists. 100 specialists and 100 non-specialists were randomly selected from 20 schools in Greenly, Colorado. The AAHPER Youth Fitness Test was administered consisting of following items: sit-ups, sit and reach, skinfold measurement, one mile run and walk. Comparison was made with the test results, between all subjects taught by specialists and those taught by non-specialists and between females taught by specialists and non-specialists. The two group 't' test was used to make the comparison.

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Analysis revealed that the specialist group had significantly higher scores. The specialist males scored significantly higher on sit-ups, sit and reach, skinfold measurement and one mile run and walk when compared with non-specialists. The specialist females scored significantly higher on the skinfold measurement than the non-specialist females.

Bitcon constructed norm tables for grades 9-12 by taking pull-ups, 2 minute sit-ups, standing broad jump and a 300 yard shuttle run and showed its validity against the AAHPER Youth Fitness Test. Validity and reliability coefficients were .934 and .961 respectively.

Beulah administered a test to compare selected tests of fitness for elementary children, the ease objectivity of administration, discriminatory power and preference of the children. There were 58 children in 1st grade, 48 in 3rd grade and 52 in 5th grade. Results indicated that one minute sit-ups were superior to two minute sit-ups. The endurance run and squat side step

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were not satisfactory tests for this age. The dash and obstacle race were highly correlated. Interest in the test appear to be inversely related to grade level and experience in fitness testing.

Alexander administered an over all test of fitness to 387 female volunteers between the ages of 14 and 76 years. The test battery included a test for cardio-vascular endurance (12 minute bicycle test), muscular endurance (1 minute speed sit-ups, flexed arm hang) muscular strength (grip strength, 30 second speed push-ups), flexibility (sit and reach, back extension) and percent body fat (skinfold measurement). Height, weight and resting blood pressure were also recorded for each of the participants. The subjects were devided into five age groups and the test results were compared between groups to determine the trends in fitness test scores. The following trends were identified from the test results from the youngest to oldest age groups: an increase in body weight, percent body fat, systolic and diastolic blood pressure; and a decrease in maximum oxygen uptake, maximum exercise, heart rate, submaximal exercise heart rate, muscular strength, muscular endurance, flexibility and standing height.

The relative fitness levels of females in distinct age groupings were examined. The results indicated that there was a progressive decline in all fitness components with age. The decrease in fitness was seen to be the most marked in dynamic strength and muscular endurance components, while flexibility and isometric (grips) strength were relatively well maintained. Progressive decline in cardio-respiratory endurance over various age groups and increase in both, systolic and diastolic blood pressure.

BookWalter\textsuperscript{27} constructed the motor fitness test, using a twelve-item standard, involving at least two measures each of strength, velocity, motor ability and endurance.

The following four indices have been developed and validated for high school and college age men:

Motor Fitness Index I - (Chin + push-ups) (Vertical Jump)
Motor Fitness Index II - (Chin + push-ups) (Standing Broad Jump)
Motor Fitness Index III - (Straddle Chins + push-ups) (Vertical Jump)
Motor Fitness Index IV - (Straddle Chins + push-ups) (Standing Broad Jump)

The validities of the above indices with a twelve-item criterion are as follows:

Index I .859; Index II .818; Index III .841 and Index IV .812. As these coefficients of validity are of approximate size, the instructor may select the index most applicable to his program and facilities.

Indices I and III are preferable because of their higher validity coefficients.

Uppal\(^{28}\) studied the effect of eight weeks participation in physical education and conditioning program on flexibility of women students and found that the flexibility of the hip, trunk, shoulder and spine improved effectively, as measured by the sit and reach test.

Anderson\(^{29}\) conducted studies in strength testing for high school girls. It was found that in sargent jump and strength index, when combined, gave a better correlation. Strength tests were correlated with test of endurance and the correlations were uniformly low. Strength test for girls seemed to give lower correlation


when compared with boys.

Berger\textsuperscript{30} presented "Effects of dynamic and static training on vertical jumping ability. He concluded that the groups in his study that trained dynamically, improved significantly more in vertical jump than did the groups that trained statically or trained strictly by jumping vertically.

Knuttgen\textsuperscript{31} compared the physical fitness of Danish school children with that of the American school children, by administering the AAHPER Youth Fitness Test. He concluded that the scores of the 70 per cent of the boys and 80 per cent of the Danish girls exceeded American mean scores.

Das\textsuperscript{32} prepared norms for evaluating performances in physical fitness for classes 9th, 10th and 11th in the Government Higher Secondary Schools of the Union Territory of Delhi.

Twenty per cent of the schools in rural and urban areas in the same population were taken up for this study. In each school ten per cent of students were tested on the items of


AAHPER Youth Fitness Tests and NPFP Battery 'A'. The items in NPFP were the same as included in the syllabus of Central Board of Secondary Education. Norms were prepared for the boys of IX, X and XI classes and was statistically analysed. It was concluded that a comparison of the obtained data with the data of American students show that the Indian students of Classes IX, X and XI seem to be very poor in abdominal strength. The performance of students of Class IX in all items of Youth Fitness Tests was poor and there was a remarkable spurt of performance in classes X and XI though still lower than that of students in the United States of America except in pull-ups measuring shoulder girdle strength.

Watson conducted a study to evolve norms for Nebraska boys and girls. The test items for the Neb Ele Physical Fitness Test were standing Long Jump or Vertical Jump, 50 yard dash, sit-ups, stick jump and 300 yards distance run. The items for secondary test were pull-ups or flexed arm hang, 50 yard dash, standing long jump, sit-ups, side step and mile or 9 minute run or 12 minute run. A random sample of schools in Neb (1%) was selected to participate in the establishment of these norms. The

norms were established for each test item for girls, boys and groups according to chronological age. Percentile tables were constructed. Based on the results following recommendations were suggested. There should be a test item included in the ELE Test, Grade 1 - 6, to evaluate shoulder girdle strength. Norms need to be established for 1½ mile or 12 minute run. The secondary girls need to establish norms for the girls chin-ups.

Herman\(^{34}\) 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.

Rosmussen\(^{35}\) found that the median scores of South Dakota boys at all ages were higher than those of the National Sample in all items except pull-ups and shuttle run.

Sittmann\(^{36}\) conducted a study to develop norms for North East Missouri State University Students enrolled in the

\(^{34}\)Herman Boone, "A Comparison of Physical Fitness Level of Urban and Rural Boys," Completed Research in Health, Physical Education and Recreation 10 (1967) : 86.


health and physical fitness concept classes. 372 male and 648 female subjects were tested for the sum of 6 skinfolds, predicted percent fat, predicted VO$_2$ max, grip strength, leg strength, back strength, vertical jump distance and vertical jump power. Means, standard deviations and range for all variables were calculated. Classification was based on sex. Percentiles in increments of 5 were constructed for each variable in each classification.

Zuti and Corbin$^{37}$ conducted a research on physical fitness norms for college freshmen. They took 3000 freshmen of Kansas State University within the age of 17.6 to 19.5 years. The tests were conducted for strength test, flexibility body composition, cardio-vascular fitness. The results appear to indicate that the college freshmen at Kansas State University were above average and the standards were appropriate for their use at National level.

Box$^{38}$ prepared percentile norm tables for selected measure of strength, power, agility, flexibility, body composition, cardio-vascular and muscular endurance from data collected in five schools of the Unity Christian School System of Hudsonville.

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