Chapter III

PROCEDURE

The purpose of this study was to standardize norms for Physical Fitness Tests for Girls in the age group of 13 to 16 years in the State of Goa.

The physical fitness components considered for this study are strength (Standing Broad Jump), muscular endurance (Flexed Arm Hang), cardiovascular endurance (600 meter run and walk), speed (50 meter dash), agility (4x10 meter Shuttle Run) and flexibility (Bend, Touch and Twist Test).

Selection of Subjects

The research scholar obtained the list of secondary schools in Goa, from the Directorate of Education, as also, necessary consent from the Director of Education and the Director of Sports and Youth Affairs, authorising her to administer the proposed battery of tests to the secondary school girls in the age group of 13 to 16 years.

The investigator then reviewed the list of secondary schools in Goa and in order to obtain a sample representative of the entire State, randomly selected five schools from each of the 11 Talukas in Goa, to make the study more authentic and reliable.

Initially, the research scholar proposed to administer the tests to about 4000 girls in the age groups of 13, 14, 15
and 16 years, taking about 1000 girls in each age group, from about 75 schools of all the 11 Talukas in Goa.

However, it was noted that in Goa, which is a very tiny State, as compared to other States in India, there exist a total of only 323 Government and Non-Government Secondary Schools. The distribution of schools in each Taluka varies from a maximum of 57 schools in Saclette Taluka to a minimum of 19 schools in Sattari and Quepem Talukas. The registered number of students also varies from Institution to Institution, from a maximum of about 1200 students to a minimum of 200 students. Most of the schools are co-educational with an adequate number of boys schools and just a few girls schools. The total number of girls is considerably low as compared to boys, as may be seen at Table 1. Hence covering the proposed number of 4000 girls was not really feasible.

Nevertheless, the scholar tested 3500 girls from secondary schools of all the 11 Talukas in Goa. The number of schools tested in each Taluka also differs since some Talukas have a larger number of schools whereas others have just a few schools. For instance, the investigator tested 12 schools in Bardez, whereas only 3 schools could be tested in Pernem. However, it may be noted that the students from these schools hail from the remotest rural villages as also from the urban localities, as may be seen
TABLE 1

STATISTICAL INFORMATION PERTAINING TO THE STUDENT POPULATION IN THE
SECONDARY SCHOOLS IN THE STATE OF GOA DURING 1991-92

<table>
<thead>
<tr>
<th>S.No</th>
<th>Taluka</th>
<th>Number of Schools</th>
<th>Number of Boys</th>
<th>Number of Girls</th>
<th>Total Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PERNEM</td>
<td>24</td>
<td>4607</td>
<td>3950</td>
<td>8557</td>
</tr>
<tr>
<td>2</td>
<td>BARDEZ</td>
<td>49</td>
<td>15846</td>
<td>13900</td>
<td>29746</td>
</tr>
<tr>
<td>3</td>
<td>BICHOLIM</td>
<td>22</td>
<td>6193</td>
<td>4871</td>
<td>11064</td>
</tr>
<tr>
<td>4</td>
<td>SATTARI</td>
<td>19</td>
<td>3388</td>
<td>2248</td>
<td>5636</td>
</tr>
<tr>
<td>5</td>
<td>TISWADI</td>
<td>35</td>
<td>12558</td>
<td>10222</td>
<td>22780</td>
</tr>
<tr>
<td>6</td>
<td>PONDA</td>
<td>35</td>
<td>9634</td>
<td>8521</td>
<td>18155</td>
</tr>
<tr>
<td>7</td>
<td>SANGUEM</td>
<td>21</td>
<td>4133</td>
<td>3055</td>
<td>7188</td>
</tr>
<tr>
<td>8</td>
<td>QUEPEM</td>
<td>19</td>
<td>5590</td>
<td>4392</td>
<td>9982</td>
</tr>
<tr>
<td>9</td>
<td>CANACONA</td>
<td>14</td>
<td>2644</td>
<td>2068</td>
<td>4712</td>
</tr>
<tr>
<td>10</td>
<td>SALCETE</td>
<td>57</td>
<td>20516</td>
<td>19522</td>
<td>39802</td>
</tr>
<tr>
<td>11</td>
<td>MARMAGOA</td>
<td>28</td>
<td>9670</td>
<td>8442</td>
<td>18112</td>
</tr>
<tr>
<td></td>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>323</strong></td>
<td><strong>94779</strong></td>
<td><strong>81382</strong></td>
<td><strong>176161</strong></td>
</tr>
</tbody>
</table>

(As obtained from the Directorate of Education)
at APPENDIX A. As such, the selected sample is a reliable representative of the entire Taluka.

**Selection of Variables**

The research scholar reviewed the existing standardised tests as available in valuable sources by eminent personalities in the field of physical education and taking into consideration the varied social and cultural traditions prevalent in Goa, the climatic and financial conditions and other factors, such as, availability of playgrounds, equipment, etc., in the secondary schools, formulated an ideal battery of tests to be administered to the Goan girls, which would not only cover the basic components of physical fitness but would also be enjoyable to the students and easy to administer.

Following variables which were acceptable to the subjects were selected:

1. 50 meter dash
2. Standing Broad Jump
3. Flexed Arm Hang
4. 4 x 10 meter Shuttle Run
5. Vertical Jump
6. Bend, Touch and Twist.
7. 600 meter run and walk.
This battery of tests was administered on experimental basis to a total of 150 girls, in the age groups of 13 to 16 years, from 15 secondary schools, covering 3 Talukas of Goa, viz. Bardez (North), Tiswadi (Centre) and Salcette (South), at the below stated testing centres.

1. Chinchinim ground, Salcette.
2. Campal Sports Complex, Panaji.
3. Calangute Ground, Bardez.

This experimental project was undertaken by the research scholar to observe the response of the students and the school authorities to such a programme, as also to assess the feasibility of pursuing her topic of study in terms of financial implications, time consumption, playgrounds available, equipment required and the like.

**Criterion Measures**

The criterion measures chosen to test the hypothesis were:

1. The timing in the 50 meter dash recorded to the nearest hundredth of a second.
2. The distance in Standing Broad Jump recorded in meters to the nearest half of a centimeter.
3. The timing in the Flexed Arm Hang recorded to the nearest hundredth of a second.
4. The timing of 4 x 10 meter Shuttle Run recorded to the nearest hundredth of a second.

5. The distance between the standing reach and the highest jumping reach in the Vertical Jump recorded in centimeters to the nearest half of a centimeter.

6. The number of cycles performed by the subject within a timing of 20 seconds, using the Bend, Touch and Twist Test.

7. The time taken by the subject to cover the distance of 600 meters recorded as the score in minutes to the nearest hundredth of a second.

**Tester Competency**

The scholar selected only such standardized test items as are normally administered by the Physical Education Teachers in the various schools in Goa and availed of the services of experienced, qualified and competent Physical Education personnel, in administering the tests at all the Testing Centres.

A special clinic was also held prior to the administration of the tests at various centres, for the benefit of the outstanding sportspersons and teachers, who also assisted in conducting the tests at various centres, so as to acquaint them with various technicalities, such as, the mode of operating the watches, measuring heights and distances inclusive of the general procedures of administering each test item appropriately.
In view of the above and the fact that the scholar is herself an experienced and qualified Physical Educationalist, she was competent to administer the tests effectively.

**Reliability of Data**

In order to ensure the reliability of the data collected, the research scholar took precautionary measures to administer the tests in a smooth and systematic manner. The scholar selected appropriate tools required for conducting the various tests and duly packed them in a kit bag, which was carried to all the Testing Centres. The same tools were utilised for measuring the performances of the subjects at every Testing Centre.

**Score sheets**

Appropriate score sheets were duly prepared for recording the scores of each test item separately. (See Appendices B & C).

**Equipment**

The research scholar selected the following equipment after thoroughly checking their working conditions and accuracy.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Electronic Split Time Watches</td>
<td>8 nos.</td>
</tr>
<tr>
<td>2.</td>
<td>50 meter tape</td>
<td>1 no.</td>
</tr>
<tr>
<td>3.</td>
<td>30 meter tape</td>
<td>1 no.</td>
</tr>
<tr>
<td>4.</td>
<td>15 meter tape</td>
<td>1 no.</td>
</tr>
<tr>
<td>5.</td>
<td>2 meter steel tape</td>
<td>1 no.</td>
</tr>
<tr>
<td>6.</td>
<td>Whistles</td>
<td>4 nos.</td>
</tr>
<tr>
<td>7.</td>
<td>Pens</td>
<td>6 nos.</td>
</tr>
<tr>
<td>8.</td>
<td>Coloured Chalks</td>
<td>2 doz.</td>
</tr>
<tr>
<td>11.</td>
<td>Clapper</td>
<td>1 no.</td>
</tr>
</tbody>
</table>

In addition to the above, the concerned schools were requested to spare additional equipment such as lime powder, relay batons, dumbbells, horizontal bar or pipe, nylon rope/steel wire, iron rods/nails etc.

**Ground Marking**

The investigator made it a point to report at the Testing Centres well in time, prior to the scheduled time of the test, to ensure that the requisite facilities for administering the tests, were as per the specific technical requirements. In such cases
wherein the tracks were previously laid by the schools, she personally re-checked the measurements of the tracks, to ascertain accuracy in measurement of performances of the subjects. In most cases, the research scholar personally laid 200 meter tracks within the available open spaces.

Collection of Data

The research scholar reviewed the scholastic calendar of secondary schools for the academic year 1991-92 and accordingly worked out a tentative schedule for administering the tests in various centres in Goa, keeping in view the school examinations, annual functions, religious festivals, vacations etc.

Intimation to Schools

A detailed circular was forwarded well in advance, to the Principal/Headmaster of the selected schools a copy of which was marked to the Physical Education Teacher, informing them about the investigator's proposed study and requesting them to facilitate her in administering the tests to the girls in their respective schools. The relevant proformas for submitting the list of girls proposed to be tested, as per their age groups, as also an Annexure of the testing procedures were duly enclosed along with the circular, for the perusal of the school authorities. A copy of the circular is enclosed at Appendices D and E.
A self addressed envelope was also enclosed along with the circulars, to enable the school authorities in confirming the programme. Wherever possible, the researcher personally contacted the schools for finalising the programme. However, some of the school authorities, while congratulating the researcher for undertaking such a need based project, regretted their inability to coordinate the programme in their schools, on the dates suggested by the scholar due to unavoidable prior engagements such as, examinations, school gatherings, scout and guide camps, etc. The research scholar was requested to suggest fresh dates.

Although the investigator managed to re-schedule the programmes in some of the schools, it was not feasible to comply with the request of other schools, in view of the final examinations and the paucity of time.

Nevertheless the research scholar successfully administered the tests for a total of 2545 girls of 60 secondary schools in Goa. The schoolwise breakup of successful participants in various age groups is detailed at Appendix F.

Age Groups

In order to facilitate the schools in enlisting the girls for the tests, as per the age groups, and to ensure a wider range of application, the research scholar affixed the lower limit and upper limit to the particular age groups as under:
Group I - 13 years (12 years 6 months to 13 years 5 months).
Group II - 14 years (13 years 6 months to 14 years 5 months)
Group III - 15 years (14 years 6 months to 15 years 5 months)
Group IV - 16 years (15 years 6 months to 16 years 5 months).

The age of the subject was calculated as on the proposed date for administering the test.

**Modality of Test Administration**

In view of the heavy monsoons and the poor ground conditions, the research scholar started the work of collection of data only in the last week of August, 1991.

The modality of administering the tests was as follows:

**Testing Schedule**

The seven test items included in the test battery were split up into two sets and were conducted on two consecutive days as under:

**First Day:**

1. 50 meter dash
2. Standing Broad Jump
3. Flexed Arm Hang
4. 4 x 10 meter Shuttle Run
Second Day:

5. Vertical Jump
6. Bend, Touch and Twist.
7. 600 meter run and walk.

Testing Centres

The Testing Centres for administering the tests were set up within an individual institution, wherever adequate number of girls were available and wherein no other institutions existed in the vicinity, within walking distance. A common Testing Centre was established in such localities wherein 3 or 4 schools were clustered together.

Equipment and Ground Arrangements

In order to ensure the reliability of the data collected, the research scholar took extreme care to provide standard equipment and necessary playground facilities at each Testing Centre. The tracks were duly marked with lime powder. In almost all centres a standard 200 meters track was laid. However, in some schools, like at St. Joseph's High School, Arpora and at Bal Bharati Vidyamandir Testing Centres, a 200 meters track was not possible, so the subjects had to cover the distance of 600 meters on the road or within the available length of 100 meters of the school playground or by marking a square of 50 meters in an open space. The other two centres wherein the 600 meters
run and walk test was conducted on the road, due to non-availability of grounds, were at Government High School, Rivona, Sanguem and at Immaculate Heart of Mary High School, Goa Velha, Tiswadi. The only Testing Centre wherein a standard 400 meters track was available was at the prestigious Pandit Jawaharlal Nehru Stadium at Fatorda, Salcette. The maximum number of subjects totalling to 170 girls in all 4 age groups were tested in this centre.

The horizontal bar for conducting Flexed Arm Hang Test was available in almost all the centres, except in certain rural schools, such as, at the Mount Carmel Testing Centre, Arambol, Pernem, Mashem Testing Centre, Canacona, Thane, Sattari Testing Centre and at Chauri Testing Centre, Canacona, wherein a natural horizontal bar was improvised by a branch of a pine tree or a mango tree. A bamboo pole or iron pipe across the school gate or affixed to two branches of a tree also served the purpose for conducting the flexed arm hang test.

Substituting bathroom slippers, wooden rods or coconut shells, to batons and dumbbells, added greater enthusiasm to the 4x10 meter shuttle race, which was greatly enjoyed by the testees.

However, while improvising equipment in conducting the tests, adequate care was taken to see that neither the procedure of conducting the test nor the test performance was affected.
Testing Stations

Testing Stations were set up at each Testing Centre to administer the tests systematically and within the scheduled time. The number of testing stations depended on the number of subjects being tested at the testing centre.

The subjects were grouped agewise and each group was assigned to one testing station. Adequate number of officials were appointed at each station. At M.P.T. Vasco Testing Centre and P.J.N.S. Fatorda Testing Centres, this system proved to be most effective in administering the tests to over 150 subjects at a time.

The modus operandi at the Testing Centres was as follows:

The research scholar would note the number of girls that reported for the tests at the centre. The Chief Scorer would then enter the names of the girls in scoresheets as per the test items to be conducted for the day.

Taking into consideration the number of girls and the number of officials available at the centre, the research scholar set up Testing Stations, to conduct each test item separately at each station. Mostly, two stations were set up. In one station, the 50 meter dash test was conducted whilst simultaneously, the standing broad jump was conducted in the second station.
The girls would be split up into two or three groups, according to the number of testing stations set up. If there were two stations, then two groups of subjects were formed. Both the tests were conducted simultaneously. On completion of the tests the groups would interchange their testing stations. After completion of both tests at both testing stations, then the next two events would be taken up at the next stations, viz. the Flexed Arm Hang and the Shuttle Run Tests. The groups interchange their places on completion of the tests at a particular station. At Fatorda Centre, three Testing Stations whereas at M.P.T. Vasco, four Testing Stations functioned simultaneously in view of the large number of subjects. This method was very effective. The scores were duly recorded by competent scorers at each testing station, on the specific scoresheets, against the name of the subject.

The research scholar personally supervised the functioning of each testing station and checked the scoresheets from time to time.

In most of the centres there was a controlled group of subjects, as such, the need to set up testing stations did not arise. The investigator controlled the administration of the tests, one after the other, with the assistance of her competent band of officials.
On completion of the first day test items, the scholar would re-check the list of students submitted by the schools. It was noted that the age groups were wrongly calculated. So, the investigator re-grouped the girls and prepared fresh lists of such erring institutions, and obtained the signatures of the Heads of the Institutions on the next day, to ensure that the records of girls eligible in a particular age group were duly recorded. A good number of under-age and overage girls, who did not fit within any of the age groups, had to be discarded. Such girls, were dropped from participating in the second days tests. However, in view of the great enthusiasm of such non-eligible girls, the investigator permitted them to pursue the tests.

It was also noted that quite a few girls dropped out of the tests on the second day. They either failed to report or excused themselves due to indisposed health.

Response of Schools

The response of schools to the proposed battery of tests was indeed encouraging. All the selected Institutions participated whole heartedly in the project. They spared no efforts in coordinating the Academic Schedules with the Testing Programmes. The Heads of the Institutions not only spared the services of the Physical Education Teachers and students, but even allocated additional subject teachers and time, to ensure the successful
conduct of the tests. All facilities were provided inclusive of track marking. In certain institutions the Physical Education Teachers took up the work of laying tracks, preparing horizontal bars, jumping pits, etc., for the tests. The response of the schools, Headmasters, Teachers, Physical Education Teachers and even peons, was indeed most encouraging. A good number of Headmasters and Principals personally visited the programmes at the Testing Centres to ensure that everything was going on smoothly. They were extremely happy to see the response of students and appreciated the smooth and systematic manner of administering the tests.

Response of Students

The response of students was unbelievable! They were extremely cooperative and very disciplined, full of zeal and affection. They performed the tests most enthusiastically. In certain cases, the scholar had to compel some indisposed girls to discontinue the tests, especially those with previous fractures, operations or such as those who were recuperating from other maladies like malaria, jaundice, flu, etc. The girls who were not physically healthy were also kept out, but they were involved in administering the tests, so as not to dishearten them. The research scholar pursued her work, more so, due to the hard work and sweat of the young Goan Girls!
The investigator administered the tests for 3500 girls from 60 secondary schools. However, after discarding the non-eligible girls, the drop outs, etc., the raw scores of only 2,545 girls could be consolidated for preparing norms for physical fitness tests. The raw scores of only such students that completed all the test items and fitted within the specified age groups were entered in the consolidated score sheets (Sample enclosed at Appendix G). These scoresheets were completed immediately on completion of the second day tests and were duly filed for analysis of data.

It may also be seen that from the 2,545 girls tested the maximum number of girls fall in the 13 years group and the least number of girls are in the 16 years group. This is due to the fact that the schools in Goa, operate for only half a day i.e. from 8.30 am. to 1.30 pm. and the school authorities are reluctant to spare the girls from higher classes, as they have to complete the portions included in the syllabus, within the limited time, well before the final examinations held in the month of March for the Std. X students. The inclusion of the X + II + III system in Goa, further decreased the number of girls tested in the 16 years age groups, as most students pass out from school on an average age of 15 years. The Talukawise statistical information of girls from 60 secondary schools in Goa who successfully completed the tests in the age group of 13 to 16 years in detailed at Table 2.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Taluka</th>
<th>Number of Schools</th>
<th>13 yrs.</th>
<th>14 yrs.</th>
<th>15 yrs.</th>
<th>16 yrs.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BARDEZ</td>
<td>12</td>
<td>12</td>
<td>131</td>
<td>109</td>
<td>82</td>
<td>388</td>
</tr>
<tr>
<td>2</td>
<td>BICHOLIM</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>65</td>
<td>41</td>
<td>178</td>
</tr>
<tr>
<td>3</td>
<td>CANACONA</td>
<td>6</td>
<td>6</td>
<td>57</td>
<td>56</td>
<td>32</td>
<td>326</td>
</tr>
<tr>
<td>4</td>
<td>MARMAGOA</td>
<td>6</td>
<td>6</td>
<td>11</td>
<td>145</td>
<td>47</td>
<td>201</td>
</tr>
<tr>
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<td>PERNEM</td>
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<td>3</td>
<td>52</td>
<td>35</td>
<td>47</td>
<td>134</td>
</tr>
<tr>
<td>6</td>
<td>PONDA</td>
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<td>87</td>
<td>35</td>
<td>37</td>
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</tr>
<tr>
<td>7</td>
<td>QUEPEM</td>
<td>4</td>
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<td>48</td>
<td>49</td>
<td>30</td>
<td>127</td>
</tr>
<tr>
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<td>SANGUEM</td>
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<td>4</td>
<td>38</td>
<td>53</td>
<td>53</td>
<td>144</td>
</tr>
<tr>
<td>10</td>
<td>SALCETTE</td>
<td>6</td>
<td>6</td>
<td>132</td>
<td>101</td>
<td>63</td>
<td>334</td>
</tr>
<tr>
<td>11</td>
<td>TISWADI</td>
<td>5</td>
<td>5</td>
<td>43</td>
<td>48</td>
<td>41</td>
<td>194</td>
</tr>
</tbody>
</table>

GRAND TOTAL: 60 742 772 425 2545
Testing Procedures

The tests were administered adopting the following procedures:

50 Meter Dash

**Purpose**

To measure speed.

**Facilities and Equipment**

50 meters six lanes were duly marked with lime powder, with a starting line and a finish line. Six electronic watches with split timer were used. In major testing centres like at Fatorda and Vasco 8 lanes were marked and 8 watches were used.

**Testing Personnel**

One starter, six to eight timers and one recorder administered the test.

**Procedure**

Six to eight subjects from the same age groups were made to take their positions behind the starting line. The remaining girls were also arranged in rows of six to eight, placed one behind the other, about 2 meters from the starting line, behind the subjects positioned on the starting line. This system saved time and facilitated the starter in giving rapid starts to various groups. The starter gave the command "On your mark" ... "Set",...
... "Go", simultaneously using the hand clapper to start the race at the word "Go." The subjects ran along the 50 meters distance as fast as possible. The timers stopped the watches when their respective subjects crossed the finish line. One trial was permitted.

**Scoring**

The time elapsed from the starting signal "Go" until the runner crossed the finish line, read to the nearest hundredth of a second, was recorded in the score sheet against the name of the concerned testee.¹

**Standing Broad Jump**

**Purpose:**

To measure the athletic power of the legs in jumping forward.

**Facilities and Equipment**

Standard jumping pits were used in most centres, except in some, wherein this test was conducted on suitable, levelled open space or along the 50 meters track. The take off line was duly marked with lime powder. A measuring tape was used to measure the distances covered by the subjects.

¹Clarke, Application of Measurement to Health and Physical Education, p. 179.
Testing Personnel

Two testers held the tape at both ends. One tester held the rolled end of the tape and stood near the take off line. The other stood near the landing and holding the tape with a stick passed through the loop. A scorer recorded the performances on the scoresheet.

Procedures

The subject was made to stand on the take off line with feet parallel to each other and slightly apart behind the starting mark. To perform the test, she was asked to raise the arms overhead whilst raising her body upwards on her toes, then swing the arms downwards and backwards while lowering her body in a half sitting position with knees slightly bent and then thrust the body forward with a forceful forward swing of the arms and simultaneous extension of the knees, to cover maximum distance with a jump. Three trials were permitted.

Scoring

The two officials holding the tape accurately measured all the three jumps of each subject, except those that were faulty. The distance in meters was measured from the end of the take off line towards the landing pit and the nearest body mark of the subject on the landing pit. Total three trials were permitted and the best trial was recorded as the score.
Instructions

The researcher duly instructed the subjects with one or two demonstrations as to how the test was to be performed. The subjects were permitted to perform practice jumps outside the testing pit, to execute correct movements and ensure better test scores. They were also instructed to jump with both feet simultaneously off the ground. One legged jumps were not considered. The subjects were also requested to take the jump and move their bodies forward, so as not to spoil their jumps by falling backwards due to loss of balance. They were also asked to move ahead to come out of the pit and not to walk backwards.²

Flexed Arm Hang

Purpose

To measure the endurance of arms and shoulder girdle in flexed arm hang position.

Facilities and Equipment

A horizontal bar about 1½ inches in diameter, was used, raised to a height so that the tallest girl could not touch the ground from the flexed arm hang position. A pipe across the school gates and branches of a tree and even tree branches at

suitable heights were used to conduct the test in some rural testing centres wherein standard horizontal bars or gym bars were not available. A stopwatch was also used to check the performance of the subject.

Testing Personnel

One timer and the research scholar administered the test. A scorer recorded the scores. In some centres wherein lady officials were available, the test was conducted simultaneously on two subjects. In such cases, two timers were appointed.

Procedure

The bar was adjusted approximately to the standing height of the tallest subject. A stool was kept handy to enable the smaller and shorter girls to climb on the stool and comfortably grasp the bar. The research scholar or any lady officials, at times the other girls assisted the subject in raising herself to a position, where the chin was above the bar. The bar was grasped by the subject in an overhand grasp. The subject was then assisted in getting to the "Hang" position, with elbows flexed and the chin above the bar. The subject had to hold the hang position for as long as possible. The timers started the watches as soon as the subjects assumed the "hang" position and stopped the watches as soon as the chin
touched the bar or fell below the bar or even when the subject tilted the head back to keep the chin above the bar.

**Scoring**

The time lapsed from the starting of the watch at the "hang" position to the stopping of the watch at the dropping of the chin below the bar or otherwise, was recorded to the nearest hundredth of a second by the scorer.

**Instructions**

The research scholar demonstrated the test with relevant explanation to the subjects prior to administering the test on the subjects.³

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### 4 x 10 meter Shuttle Run

**Purpose**

To measure the ability of the performer in running and changing direction.

**Facilities and Equipment**

A 10 meters line was drawn across the 6 lanes from the starting line of the 50 meters track. Two circles of a diameter of 30 cms. were marked with lime powder on each lane, one behind the starting line and the other beyond the 10 meters line.

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The dumb-bells or relay batons were placed in the circles beyond the 10 meters line. In rural centres, coconut shells, wooden splints or chappels were used, en lieu of batons or dumbbells, which created greater enthusiasm amongst the subjects. 6 to 8 stop watches and 6 to 8 pairs of dumbbells/relay batons were used.

**Testing Personnel**

One starter, a recorder, six to eight timers.

**Procedure**

The subjects were arranged in rows of six to eight girls each and were placed behind and away from the starting line. The girls in the first row were requested to take their positions just behind the starting line. The starter gave the command "Ready" and "Go". At the word "Go" the timers started their watches and the subjects ran as fast as they could, picked up one baton and brought it back to place it within the circle behind the starting line. Then they ran again and brought back the second baton which they carried across the starting line. The timers stopped their watches when their subjects crossed the starting line with the second baton.

**Scoring**

The time lapsed from the start of the race at the word "Go" to the end of the race when the girl crossed the starting
line with the second baton, was duly recorded by the scorer, to the nearest hundredth of a second. Two trials were given and the best trial was recorded.

**Instructions**

The investigator explained the mode of performing the test with demonstrations. Necessary instructions were also given in respect to the start and finish of the race. They were also told not to throw or flick the batons in the circle at the starting line.\(^4\)

**Vertical Jump**

**Purpose**

To measure the power of the legs in jumping vertically upward.

**Equipment and Materials**

A smooth wall surface of the school building of about 3.60 meters height from the floor, a jump board marked off in centimeters, chalk dust (magnesium) and damp cloth.

**Testing Personnel**

Two testers and one scorer were appointed to conduct

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the test.

Procedure

A jump board marked with horizontal lines one centimeter apart, was fastened to the wall, so that, the lower edge was just below the standing height of the shortest girl to be tested.

The subject was then requested to stand sideways against the wall, barefeet and heels together, with her index fingers of the hand nearest to the wall chalked with magnesium. Keeping the heels on the floor, she was asked to reach upward as high as possible and make a mark on the board with her chalked fingers. Then she was asked to jump as high as possible to make another mark on the board at the height of her jump. Three or four such jumps were permitted.

Scoring

The distance between the chalk mark of the standing reach and the mark of the highest jumping reach was recorded as the score to the nearest half centimeter. Readings were taken at eye level to ensure accuracy in the readings and a damp cloth was used to erase chalk marks after each reading.

Instructions

The test was duly demonstrated to the subjects with relevant instructions prior to the commencement of the test.
Double jumps were not permitted. Subjects were not allowed to take any running steps to gain speed.\(^5\)

**Bend, Touch and Twist**

**Purpose:**

This test measures the dynamic flexibility factor and is proposed to measure speed with which the subject could flex, extend and rotate his spine.

**Equipment and Material**

A smooth wall surface of the school building, a chalk and a stop watch.

**Testing Personnel**

A Chief timer, judges and a scorer.

**Procedure**

Six to eight subjects were made to stand with their back to the wall, so that she could bend over without hitting her buttocks to the wall and the feet shoulder width apart.

An 'X' was marked on the wall, directly behind the subject's back and at shoulder level. Another 'X' was marked on

the floor between the feet of the subjects.

On the signal "Go" the subjects had to bend over, touch the 'X' on the floor with both hands, straighten up, twist to the right and touch the 'X' on the wall with both hands. This represented "one cycle." The next cycle was the same except that the subjects had to twist to the left and continue to alternate the side to which they twisted in each successive cycle.

Scoring

The subjects score was the "number of cycles" completed in 20 seconds.6

600 meter Run and Walk

Purpose

To measure cardiovascular efficiency (endurance).

Facilities and Equipment

Six to eight stop watches and a 200 meter track. A 400 meters track was used at Fatorda Testing Centre. In some centres an open square measuring 50 meters on each side were used, whereas, in some other centres the event was conducted on tarred

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roads, to cover the distance of 600 meters.

**Testing Personnel**

6 to 8 timers, 6 to 8 spotters, 4 track umpires (testees), a starter and a recorder.

**Procedure**

Six to eight subjects were tested at a time. The subjects were grouped as per their age groups and were told to relax by the side of the track. A timer and a spotter were assigned to each subject. The starter gave the command "Ready"? and "Go." The subjects took up a standing start position. At the command "Go" the subjects started running whilst simultaneously the timers started their watches. The timers stopped their watches as soon as their respective subjects crossed the finish line on covering the 600 meters distances, either running, jogging or walking.

**Scoring**

The time lapsed from the command "Go" to the finish of the race by the concerned subject, was recorded as the score in minutes to a hundredth of a second.

**Instructions**

Adequate instructions in respect to the test were given to the subjects. They were told to run as near as possible to
the curb of the track and not away from the curb. A curve start was given. Subjects were not permitted to cut across the track or run within the curb. Subjects were also told to walk and complete the race if necessary.\footnote{Mathews, \textit{Measurement in Physical Education}, p. 119.}

\textbf{Analysis of Data}

The data was analysed using the following statistical procedures:

1. Computation of Means and Standard Deviations and these values were also utilised for preparing Sigma and Hull Scales.

2. Computation of percentiles (pentile points) for developing Percentile Scale.

3. 't' test was employed for comparing the subjects representing different age groups in selected test items. The level of significance chosen was .05.