Chapter III

PROCEDURE

In this chapter the procedure adopted for selection of subjects, criterion measure, reliability of data, administration of tests and collection of data, and the statistical model for analysing the data are described.

Selection of Subjects

The subjects for this study were 800 swimmers of either sexes in the age groups of 11 to 14 years, who had represented their respective States, Union Territories or Districts in the National or State Swimming Competitions. The subjects were also included from amongst swimmers being adopted for various schemes of Sports Authority of India in their respective age groups. All the swimmers have had at least two years of Swimming training and were able to swim all the four Competitive Swimming Strokes. The Swimmers were grouped into four age groups of 100 each as shown below in Table 1. The age records of the swimmers were verified from their training centers and were recorded in completed years.
### Table 1

<table>
<thead>
<tr>
<th>Age Groups (Years)</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>12</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>13</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>14</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1 shows the age groups and the number of subjects selected for the purpose of the study. A total of 400 boys and 400 girls were selected in four different age groups, i.e., 100 each in 11 years, 12 years, 13 years and 14 years.

**Criterion Measure**

The research scholar gleaned through the scientific literature in order to select suitable variables/criterion measures for designing specific fitness norms for the age group Indian Swimmers. Simultaneously, the scholar kept in mind the availabilities of equipments, acceptability to the subjects and the legitimate time that he could devote for conducting the tests, as well as to keep the entire study unitary and integrated. After a thorough discussion with other Swimming experts and with his guide it was decided to select the German Test Battery\(^1\) which had been developed and very extensively used in Germany. The test battery is meant for age group swimmers and determines their overall fitness and Swimming performance. This test battery contains a total of 12 items,

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which are divided in following three parts:

1. **Swimming Performance:**
   1.1. 50m Free Style
   1.2. 50m Back Stroke
   1.3. 50m Breast Stroke
   1.4. 50m Butterfly Stroke

2. **General Athletic Ability:**
   2.1. Chin-Ups (60 sec)
   2.2. Sit-Ups (60 sec)
   2.3. Jumping Over the Bench (sideways-30 sec)
   2.4. Push-Ups (60 sec)
   2.5. Upper Body Lift (back raising for 60 sec)
   2.6. Three Consecutive Broad Jumps

3. **Speed and Endurance:**
   3.1. 60m Dash
   3.2. 2000m Run

**Reliability of Data**

The reliability of data was ensured by establishing the instrument reliability, tester’s reliability, reliability of tests and subjects’ reliability.

**Instruments’ Reliability**

To conduct the various tests and measure selected variables of the German Test Battery, instruments like stop watches, measuring tapes, and clapper etc. were used. Watches were of Casio brand which, along with measuring tapes, were available in the Research Laboratory of Sports Authority of India, Netaji Subhash National Institute of Sports, Patiala. These were
supplied by standard firms which cater to the needs of various research laboratories in India and abroad. Their calibrations were accepted as accurate enough for the purpose of this study.

**Tester's Competency and Reliability of Tests**

To ensure that the investigator was well acquainted with the technique of conducting the tests, he had a number of trials and practice sessions with respective experts at N. S. N. I. S., Patiala and Bangalore. The investigator took all the measurements with the help of other qualified Swimming Coaches and his professional colleagues, who were also made well acquainted with the tests and their testing procedures.

Tester’s competency was evaluated together with the reliability of tests. Reliability of tests was established by test – retest process whereby consistency of results was obtained by Product Moment Correlation. The data collected from a random selection of ten subjects were computed for each variable and correlations obtained have been presented in Table 2.

Since very high correlations, ranging from .87 to .97 were obtained, this established the investigator's competency to administer the tests as well as reliability of tests.
#### TABLE 2

**RELIABILITY CO-EFFICIENTS OF TEST-RETEST SCORES**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variables/Tests</th>
<th>Co-efficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50m Free Style</td>
<td>.94*</td>
</tr>
<tr>
<td>2</td>
<td>50m Back Stroke</td>
<td>.89*</td>
</tr>
<tr>
<td>3</td>
<td>50m Breast Stroke</td>
<td>.90*</td>
</tr>
<tr>
<td>4</td>
<td>50m Butterfly Stroke</td>
<td>.92*</td>
</tr>
<tr>
<td>5</td>
<td>Chin-ups 60 sec</td>
<td>.89*</td>
</tr>
<tr>
<td>6</td>
<td>Sit-ups 60 sec</td>
<td>.93*</td>
</tr>
<tr>
<td>7</td>
<td>Jumping Over the Bench (sideways 30 sec)</td>
<td>.88*</td>
</tr>
<tr>
<td>8</td>
<td>Push-ups (60 sec)</td>
<td>.91*</td>
</tr>
<tr>
<td>9</td>
<td>Upper Body Lift (Back raising for 60 sec)</td>
<td>.94*</td>
</tr>
<tr>
<td>10</td>
<td>Three Consecutive Broad Jumps</td>
<td>.87*</td>
</tr>
<tr>
<td>11</td>
<td>60m Dash</td>
<td>.90*</td>
</tr>
<tr>
<td>12</td>
<td>2000m Run</td>
<td>.97*</td>
</tr>
</tbody>
</table>

**N = 10**

\[ r_{0.01} (8) = .765 \]

* Significant at .01 level of confidence.

From Table 2 it is evident that tester’s reliability was significantly high thus, establishing the competency of the scholar to administer the tests. The correlation co-efficient also indicated the reliability of the tests selected since very high correlations were obtained when the tests were repeated.
Subjects' Reliability

The above test – retest (co-efficient of correlation) method also established that subjects' reliability was significant at .01 level of confidence, as the same subjects were used under similar conditions by the same tester and no motivational techniques were used nor any training given. The subjects were assured that their scores would be kept confidential and that these tests had nothing to do with their selection or rejection from their teams.

Administration of Tests and Collection of Data

Prior to testing of the subjects on different tests, a meeting of all the subjects selected from different States / Districts / Centres along with their parents (wherever applicable) and coaches was called. At such meetings the purpose of the study, requirements of testing procedures, demonstrations and explanations of various tests were explained in order to make them understand the things they were required to do to fulfill the basic requirements of the study. The subjects were assured that their scores would be kept confidential and that these tests had nothing to do with their selection or rejection from their teams. All the subjects, their parents and coaches agreed to cooperate voluntarily in the testing procedures as explained to them. Their parents and coaches also exhorted them to put in their best efforts in the interest of this scientific investigation. Though, no special techniques of motivation were used to motivate the subjects to put in their best efforts, yet the subjects were very enthusiastic and cooperative throughout the collection of data.

The data on the swimmers were collected during the months of July and August, 1999 at various training centres and clubs in India where competitive
swimming was being promoted. Help was taken from the coaches in charge of respective centres / clubs. These coaches were fully made conversant with the testing procedures. Tentative dates were finalised with them and the researcher personally visited each of these centres / clubs.

Before administering the tests the subjects were briefed about the purpose of the study and the reasons why they should take part in the study and give their best. All tests were explained to them thoroughly and required numbers of trials were given in order to familiarise them with the tests. To ensure uniform testing conditions, the subjects were tested in the morning and evening sessions at all the centres. Sufficient rest interval was provided between the tests so that the subjects were able to give their best performances.

As per the literature of the German Test Battery the 12 test items were conducted on two consecutive days. Part – I of the test was conducted on 1st day evening; Part – II on the second day morning and Part – III on the second day in the evening.

**Part – I: Swimming Ability**

**Personnel and Material Used:**

Starter, Time Keepers, Judges at Finish, Clapper, Stop Watches and Score Cards.

**Procedure:**

Swimming Ability of all the selected swimmers in all the four strokes was recorded under standard conditions as per FINA rules. Sufficient warming up exercises were given on both land and inside water before the tests. The subjects were asked to swim as fast as possible for a distance of 50m in each stroke with a proper start from the starting platforms on the starting signal from
the starter. Three subjects were made to swim at a time in order to provide them a competitive environment. Three time keepers, with Casio digital watches recording up to two decimal digits, were assigned for each swimmer. The time keepers switched on their watches along with the starting signal and stopped as the subjects finished the race as per rules of each stroke. The official timing, as per FINA rules, was recorded in seconds up to two decimal digits. Each subject was provided about half an hour rest between each 50m of the four strokes which were swam in order of Free Style, Back Stroke, Breast Stroke, and Butterfly Stroke.

**Part – II: General Athletic Ability**

1: **Chin Ups:**

**Personnel and Material Used:**

One Judge, Chining Bar and Stop Watch.

**Procedure:**

The subject was asked to hang with both arms in vertical position on a horizontal bar with over-arm grip. He then pulled himself up, taking his chin over the bar, by keeping his body straight. After that he relaxed and hanged down by stretching his arms completely. Immediately he pulled himself up for the next count. Only the successful chin-ups performed in one minute time were registered in his / her name.
2. **Sit-Ups:**

**Personnel and Material Used:**

One Judge, Ground mat, Rope, Stop Watch, and Stick / Rod.

**Procedure:**

The subject was asked to lie down on his back (supine position) with knee bent either on the floor or on the mat. A partner was pressing his legs. The hands were kept behind the neck. Then the subject raised his upper body by keeping his elbows parallel to the ground and touching either his knees or the rope suspended besides his knees with his forehead. The successful Sit-ups performed in one-minute time were registered in his name.

3. **Jumping on the Bench (Side Ways):**

**Personnel and Material Used:**

Bench, Stop-watch and a Judge.

**Procedure:**

The subject was asked to stand with his feet together on the side of the bench. He then jumped over the bench with both feet together. Height of the bench was one foot. The number of successful jumps over the bench for 30 sec. were registered in his name.

4. **Push Ups:**

**Personnel and Material Used:**

Ground mat 5 to 8 cm. thick, Stop-watch, Box 5 – 8 cm and a Judge.

**Procedure:**

The subject was asked to keep the hands at shoulder width and the feet together on a hard surface. Arms and body fully stretched. The fingers of the hands were pointing forward. A mat of 5 to 8 cm thick was placed in front of
the subject and he was asked to bend his arms to the point where his chin touched the mat. The body was kept in one line while lowering and raising. The successful push-ups performed in one minute time were registered in his name.

5. **Upper Body Lift:**

**Personnel and Material Used:**

Box, Mat, Stick, Partner, Stop-watch and a Judge.

**Procedure:**

The subject was asked to take up prone position on a box. A partner was pressing his legs. The hands were kept behind the neck with fingers crossed. The upper body was kept in line with the box. A rope was tied at a proper height from the Box, which could be touched with chin by the subject. The successful attempts in one-minute time were recorded in his name.

6. **Three Consecutive Broad Jumps:**

**Personnel and Material Used:**

Measuring tape, Chalk piece and a Judge.

**Procedure:**

The subjects were asked to attempt three consecutive broad jumps in continuous actions with both feet together. Each subject was given three attempts out of which the best distance was recorded in metres. Track & Field rules were observed for the conduct of the jump.

**Part III: Speed and Endurance:**

1. **60m Dash:**

**Personnel, Material and Facility Used:**

Time-Keepers, Stop-watches, Starter, Clapper and Athletic track.
Procedure:

The subject was asked to run at his maximum speed with crouch start and a proper starting command i.e. "on your marks" - "set" - "go" (Clapper). Only one attempt was given. The time was recorded in seconds up to two decimal digits.

2. **2000m Run:**

**Personnel, Facilities and Material Used:**

Athletic track, Time-Keepers, Stop Watches, Starter and Loud hailer.

**Procedure:**

The subject was asked to run a distance of 2 km (two and a half rounds in 400m Track) with proper start "on your marks" - "go" (Clapper). Only one attempt was given. The time was recorded in minutes and seconds up to two decimal digits.

**Statistical Analysis**

The data collected by administering tests was statistically treated to form norms for male and female swimmers in the four age groups. In order to construct the norms on the selected variables, Percentile Scale was used.