CHAPTER III

METHODS AND MATERIALS
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This chapter describes the selection of subjects, scheduling, selection of variables, reliability of data, instruments reliability, tester competency of tests, subject reliability, orientation of subjects, collection of data and the statistical techniques employed for analysing the data.

3.1. SELECTION OF SUBJECTS

This study was designed to ascertain the level of physical fitness of high school boys in Tamilnadu and the influences of selected yogic and physical exercises on them. To achieve this purpose, 20,000 high school boys from various schools in Tamilnadu were selected at random which are presented in appendix A and B.

The subjects were taught the techniques of AAHPER youth fitness test (1976 revision) items.

The procedure followed in this study, was as per the details given by Johnson and Nelson. The subjects were asked to perform the tests as instructed by the scholar. There were six items in the test and the results were obtained. It was determined whether they were excellent, Above average, Average, Below average or well below Average. Marks were awarded in all the tests for a subject and the total score obtained in all the tests was considered to determine

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1 Johnson and Nelson, op cit., pp. 94 - 245.
2 Bucher and Wuest, op cit., p. 51.
the subject whether he falls in the Excellent, Above average, Average, Below average or Well below average category. The subject was said to have grouped in Excellent category if he has got 480 and above out of 600 marks; Above average category if he has got 360 out of 600 marks; Below average category if he has got 120 out of 600 marks, and the subject was said to have grouped in well Below category if he has got 119 and below out of 600 marks. The maximum marks for each test item was 100. The details of the score are presented in appendix. G.

The readings thus obtained were put to statistical analysis to find out the physical fitness standard.

Among the failed subjects (well below average), One hundred and twenty boys were selected at random and were divided into four groups namely Experimental Group I, Experimental Group II, Experimental Group III and the Control group. Each group consisted of thirty students. The control group had not been given any treatment. The Experimental Group I was given selected yogic exercises, group II was given selected physical exercises and the experimental group III was given both yogic and physical exercises.

3.2. SCHEDULING

The selected students for the experiments were between the ages of Eleven and sixteen years. Treatments were given to the students for half-an-hour daily from Monday to Saturday for Twelve weeks continuously.
in the evenings. The Experimental Group III was put into the treatments on yoga and physical exercises on alternative days.

3.3. SELECTION OF VARIABLES

The scholar reviewed the available scientific literature pertaining to physical fitness from various Journals, research papers presented by the scholars, magazines and various books. Taking into consideration of feasibility criteria, availability of instruments and the relevance of variables to the present study, the following variables were selected.

The six test items involved in the battery were considered to be the most valid, out of a large number of tests administered.

1) Pull-up test
2) Sit-up (Bent knees)
3) 600 yard Run/walk
4) Shuttle Run (4 x 10 yards)
5) Standing long jump
6) 50 yard dash

3.4. RELIABILITY OF DATA

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

\(^3\) Johnson and Nelson, op cit., p.197.
3.5. INSTRUMENTS RELIABILITY

The instruments such as Swiss made stop watches calibrated to one tenth of a second, measuring tapes, Two blocks of wood, chalks, mats, yard stick, horizontal bar, track or football field and a neat floor were used to conduct the tests. Reliability of the Instruments were established particularly by the three timers using the stop watches. Standard tapes were also used.

3.6. TESTER COMPETENCY OF TESTS

The tester competency was evaluated with the reliability of the tests to determine the reliability of the tester. The performance of ten subjects selected at random on the chosen variables were recorded twice under identical conditions by the scholar. The scores, thus obtained were analysed by using Pearson's product moment correlation and are presented in Table-I.

<table>
<thead>
<tr>
<th>Test item</th>
<th>Coefficient of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-up test</td>
<td>0.971</td>
</tr>
<tr>
<td>Sit-up (Bent knees)</td>
<td>0.980</td>
</tr>
<tr>
<td>600 yard Run/walk</td>
<td>0.978</td>
</tr>
<tr>
<td>Shuttle Run (4 x 10 yards)</td>
<td>0.979</td>
</tr>
<tr>
<td>Standing Long Jump</td>
<td>0.971</td>
</tr>
<tr>
<td>50 yard Dash</td>
<td>0.993</td>
</tr>
</tbody>
</table>

3.7. SUBJECT RELIABILITY

The Pearson's coefficient of correlation value of the above test retest also indicated subjects reliability as the same subjects were used under similar conditions by the same tester. Neither motivational technique nor training was given to the subjects.

3.8 ORIENTATION OF SUBJECTS

The subjects were oriented as follows: The method of doing each exercise of AAHPER youth Fitness test was demonstrated and explained to them by the research scholar before conducting the survey. Model performances were given by some students to make the subjects understand clearly the AAHPER youth Fitness Test.

3.9. COLLECTION OF DATA

The investigator adopted the following procedure to administer the test items.

3.9.1. AAHPER YOUTH FITNESS TEST (1976 REVISION)

Pull-ups

The purpose was to measure the muscular endurance of the arms and shoulder girdle in pulling the body upward.

The performers were instructed to assume the hanging position with the overhand grasp (palms forward) and pull their body upward until the chin is over the bar. After each chin-up, they were asked to return to a fully extended hanging position. The exercise was repeated as many times as possible.
Only one trial was allowed unless it was obvious that the students could do better with a second chance. Swinging and snap-up movements were not encouraged. The scholar checked this by holding an extended arm across the front of the performer's thighs. The knees were not allowed to flex during the pull and kicking motions were also not allowed. The performers were not permitted to use Reverse grip.

The score was based on the number of completed chin-ups.

**Sit Ups (bent Knees)**

The purpose was to measure the endurance of the abdominal muscles.

From a lying position on the back, performers were instructed to flex their knees over the yard stick while sliding their heels as close to their seat as possible. The yardstick was held tightly under the knees until the performer was instructed to slowly slide his feet forward. At the point where the yardstick dropped to the mat, the scholar marked the heel line and seat line to indicate how for the feet should remain from the seat during the bentknee situp exercise. The performers were asked to interlace the fingers behind the neck and perform sit-ups alternating the left elbow touch of the inside right knee and the right elbow touch of the inside left knee. The exercise was repeated as many times as possible.

The performers were informed to keep their feet flat on the floor and were permitted to place their feet separated a few inches.
The back of the hands were allowed to touch the mat each time before curling to the sit-up position. Taping the yardstick to the floor for the seat line helped performers to maintain proper distance between seat and feet.

The total number of repetitions were recorded for the score. Repetitions were not counted when finger tips didnot maintain contact behind the head, the knees were not touched or the performers pushed off the floor with the elbow.

600 yard Run/walk

The purpose was to measure cardiovascular efficiency.

Subjects were permitted to use the standing start. Each runner was assigned a spotter. The scholar gave the commands, "Ready? Go!" The subjects were told that they could walk whenever they felt it was necessary. Each spotter positioned himself at the finish line where he could hear the timer, who began counting aloud the times every second as the runners crossed the finish line.

The time in minutes and seconds was recorded as the score.

Shuttle Run (4 x 10 yards)

The purpose was to measure the agility of the performers in running and changing direction.
Performers were instructed to start behind the starting line on the signal "go". They ran to the blocks, picked up one, returned to the starting line and placed the block behind the line. They then repeated the process with the second block. The scholar allowed some rest between the two trials.

The performers were stressed to run as hard as possible across the finish line with second block. Marking tape was used to designate the starting and finishing line.

The score for each performer was the length of time required (to the nearest tenth of a second) to complete the course. The scholar recorded only the best trial.

Standing Long ump

The purpose was to measure the athletic power of their legs in jumping forward.

With the feet parallel to each other and behind the starting mark, the performers were guided to bend the knees and swing the arms and to jump as far forward as possible.

If the performers fell backwards upon landing, the measurement was made between the starting line and the nearest part of the body touching the landing surface.
The number of inches between the starting line and the nearest heel upon landing was the score. Three trials were permitted. The best trial was recorded as the score.

50 Yard Dash

The purpose was to measure speed.

Two subjects were permitted to run at the same time. Standing start was used. The commands, "Are you ready?" and "Go" were given.

The starter dropped his arm during the command so that the timer at the finish line could start the timing.

The elapsed time from the starting signal to the runner crossing the finishing line was measured to the nearest tenth of a second.

As mentioned earlier in this chapter, one hundred and twenty weak subjects were selected at random and were divided into Four Groups of thirty each namely Experimental Group I, Experimental Group II, Experimental Group III and Control Group. Selected yogic exercises were given as the treatment for experiments Group I and selected physical Exercises were given as the treatment for experimental group II for six days a week, half-an-hour daily for the total period of Twelve weeks. The same yogic and physical exercises were given on alternative days for experimental Group III. Treatment was not given for control group. After the treatments were given to the selected
subjects, AAHPER youth Fitness Test items were applied again and the performance was also counted as it was done before. The details are presented in Appendix C,D,E and F.

For the experimental group 1, the following ten selected yogic exercises were given in order to determine the improvement of fitness level prescribed by Iyengar, Sreekumaran and Sivananda.

3.9.2. Yogic exercises

Tolasana (Fig. 3.1)

The subjects were instructed to sit erect with legs stretched forward; to place the right foot gently at the left hip-joint and the left foot similarly at the right hip-joint, to keep the Heels nearer to the naval; to keep the spine erect; the soles of the feet were turned up. The subjects were asked to rest the palms on the floor beside the hips; to raise the trunk and balance only on the hands; to stretch out the arms; to rest on the floor; uncross the legs, recross them the other way and again balance on the hands. Breathing was normal and they were told to remain for 60 seconds to release the legs one by one thereafter.

Viparitakarani (Fig. 3.2)

The subjects were asked to lie on their back full length, legs together, arms by the side, to press the elbows and palms on the floor; to raise their legs to vertical position; to lean the legs towards

7 Sivananda, op cit., pp. 77-86.
FIG. 3.1. TOLASANA
FIG. 3.2. VIPARITAKARANI
the chest and face; to raise the trunk from the floor; to raise the legs and trunk higher upwards; to support the body at the hips with both the hands; to raise the legs then to vertical position. Breathing was normal throughout. They were asked to stay and release for 60 seconds.

To return, the subjects were directed to lower the legs towards their face; to press the arms by the sides on the floor; to lower the trunk slowly; and to carry the legs back to the starting position.

Matsyasana (Fig. 3.3)

The subjects were asked to sit erect with legs stretched forward; to place the right foot gently at the left hip-joint and the left foot similarly at the right hip-joint; to keep the heels nearer to the naval; and to keep the spine erect. The soles of the feet were turned up.

Then, they were instructed to lie flat on the back with the help of their hands; to press the elbows and palms down on the floor; to bend the neck and trunk backward like an arch; to fix the crown of their head on the floor; to catch hold of the right foot with left hand and left foot with right hand; and to press the elbows down by the sides. Breathing was normal. They stayed in that position for 60 seconds.
To return, they were asked to release the hands from the feet; to lie down on the floor; to get up with the help of their hands; and to release the legs one by one.

Halasana (Fig.3.4)

The subjects were instructed to lie on their back at full length, legs together, arms pressing down by the sides; to raise their legs to vertical position slowly; to lean the legs towards the stomach, chest and face as they raised their trunk from the floor; to raise the trunk then still higher; to place the toes immediately beyond the head; to keep the knees unbent; to press the arms then firmly down; to push the toes away from the head as they raised their trunk higher to the vertical position; to take the arms then beyond the head, interlock the hands; to press the palms against the crown of their head; to press the elbows on the floor by the sides and to put the feet to the farthest limit. They were asked to do the asana slowly. Breathing was normal. They remained in the attainable pose for 60 seconds. The subjects were then told to return slowly in the reverse order.

Bhujangasana (Fig.3.5)

The subjects were asked to lie down on their chest and stomach full length; to put their palms below their shoulder; to keep elbows close to the body raising their face, chest and stomach from the floor; to bend the spine backwards; and to let the lower part of the body from the naval downwards right up to the toes touch the
FIG. 3.5. BHUJANGASANA
ground. Breathing was normal. The students were told to stay for 60 seconds. They were then asked to return slowly in the reverse order.

**Shalabhasana (Fig. 3.6)**

The subjects were instructed to lie on their stomach and chest full length; to stretch arms along the sides with clenched fists; to raise slowly both the legs together backward up without bending the knees; to put the whole weight of the body on the chest and the hands; and to raise the head also slightly. Breathing was normal throughout. The students were asked to remain for 60 seconds and to return, they were told to bring the legs down slowly.

**Dhanurasana (Fig. 3.7)**

The subjects were asked to lie on their stomach; to fold the legs backward and catch hold the ankles with respective hands; to push the heels away from the buttocks and raise the knees and thighs from the floor to raise their chin and chest up; to look up without bending elbows; and to bring the knees together and raise their feet higher to the maximum possible limit by pushing the heels away from the back. A good convex arch was formed resembling a bow and a string. Breathing was normal. Students were told to stay for 60 seconds. To return, they were asked to bend the knees, lower the entire body down to the floor and release the hands.
FIG. 3.6. SHALABHASANA
FIG.3.7. DHANURASANA
Paschimottanasana (Fig.3.8)

The subjects were asked to sit with legs stretched forward, feet together, knees pressing down; to place their hands on the knees and bend down forward; to slide their hands forward to reach the ankles and toes as they lean forward; to bend down further; to catch hold of the big toes with their hands; to keep knees unbent; and to bend down fully and place the forehead on their knees. Breathing was normal. They were asked to stay for 60 seconds. The students were then asked to return to the reverse order.

Vrksasana (Fig.3.9)

The subjects were asked to stand erect, heels and toes together, palms pressing the thighs on both the sides; to bend the right leg at the knee and place the right heel at the root of the left thigh; to rest the foot on the left leg joining the palms and raise the arms and separate the palms, straighten the right leg, and stand again erect; to repeat the pose standing on the right leg. The left heel should be at the root of the right thigh. Breathing was normal. They were asked to stay for 60 seconds and to return slowly to the reverse order.

Chakrasana (Fig.3.10)

The subjects were asked to stand erect, heels and toes together, palms pressing the thighs on both sides; to raise the left arm slowly upward on the left side up to the shoulder level; to turn the palm
FIG. 3.8. PASCHIMOTTANASANA
FIG. 3.9. VRKSASANA
FIG. 3.10. CHAKRASANA
upward and raise the arm higher to join the left ear; and to bend the neck and trunk to the right as they push the right hand downward to touch the right side of the right knee. Breathing was normal. They were asked to stay for 60 seconds. Students were instructed to return slowly to the reverse order and to repeat the same technique on the other side also.

The subjects were asked to do the asanas on a folded blanket laid on a level floor. Before the start of doing yogic exercises, students were told to do prayer in the padmasana posture for two minutes.

**Padmasana (Fig. 3.11)**

The subjects were asked to sit erect with legs stretched forward; to bend the right leg and place the right foot on the left thigh; to join the heel of the right foot against the left; to place the left foot on the right thigh and press the heel against the right groin; to place the hands on knees, stretch the palms fully, and join the tip of the index fingers with the thumb of respective hands; and to gaze gently at the tip of the nose.

Then the students were instructed to do the asanas and to repeat them all twice. They ended their daily session with doing savasana for eight minutes in order to relax themselves.
FIG. 3.11. PADMASANA
Savasana (Fig.3.12)

The subjects were asked to lie on their back at full length, legs 30 to 40 cm apart, arms by the sides with palms upwards, eyes gently closed with attention on deep breathing. They were told to relax completely and breathe out slowly.

The subjects of Experimental Group III did the above on alternative days.

3.9.3. Physical Exercises

Physical Exercises that are prescribed by Mills, Tyson, Hoare for improving fitness were given as treatment for the subjects and are given as below:

Burpees (Fig.3.13)

The subjects were asked to start in a standing position then drop down into a crouch to make a squat thrust with both legs, press-up, then standup again and so on.

Spirals (Fig.3.14)

The subjects were instructed to stand with feet fairly wide apart and hands clasped together behind neck, swivel torso round sharply

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10 Hoare, op cit, pp. 89 - 104.
FIG. 3.12. SAVASANA
FIG. 3.13. BURPEES
FIG. 3.14. SPIRALS
backwards (and slightly upwards) to the left, then back the square position. It was done in opposite direction also.

**Trunk Twists (Fig.3.15)**

The subjects were guided to bend forward from the waist, touching the left foot with the right hand with other arm swinging high in the air and the eyes following it. They were asked to repeat with the other arm with a vigorous swing from side to side.

**Leg overs (Fig.3.16)**

The subjects were informed to lie down facing the sky extending the arms sideward. They were asked to touch both legs to each side of the body.

**Wide Hurdling (Fig.3.17)**

The subjects were told to sit on floor with legs wide apart; to twist torso to the left touching big toe with right hand. They repeated in opposite direction with right foot and left hand - "hurdling style."

**Dorsals (Fig.3.18)**

The subjects were instructed to lie on chest, hands clasped together behind neck, feet together, left chest as far as off the ground as possible as down again.
FIG. 3.15. TRUNK TWISTS
FIG. 3.16. LEG OVERS
Fig. 3.18. Dorsals
Squat thrusts (Fig.3.19)

The subjects were asked to crouch down with hands on the floor about shoulder-width apart. Keeping the weight on the hands, they were told to thrust both legs back, then jump one leg back at a time, bringing the other leg vigourously forward.

Side Lunges (Fig.3.20)

The subjects were instructed to keep the feet wide apart, arms forward and palms facing the ground. They were asked to lean slightly down to the right and half lunge sideways right (without moving feet) until left knee nearby touches ground. They repeated the exercise to the left also.

Tuck Jumps (Fig.3.21)

The subjects were directed to jump high on the spot, lifting knees high and together.

Slide leg raising (Fig.3.22)

The subjects were instructed to swing each leg high to the side with a hop on the supporting leg in between. The hands were allowed to rest on the hips.

The subjects of Experimental group II started their session daily with warming up which included jogging and stretching for five minutes, then the treatment for 20 minutes and ended with warm down for
FIG.3.20. SIDE LUNGES
five minutes. Stretching followed with Jogging were done in cooldown. The Subjects of Experimental group III did the above on alternative days.

3.10. STATISTICAL TECHNIQUE

The obtained data were analysed by using one way Analysis of variance (ANOVA) for the significance of difference. The results were calculated by using the following procedure of ANOVA cited by clarke and clarke\textsuperscript{11} to find out the F-ratio.

\[
F = \frac{(MS)_b}{(MS)_w}
\]

where

\[(MS)_b = \text{Between the set variance}\]
\[(MS)_w = \text{Within the set variance}\]

with

\[(N-K)(K-1)\] for degrees of freedom

\[N = \text{number of scores}\]
\[K = \text{number of groups}\].