Chapter III

METHODOLOGY

In this chapter the procedures and methods were described. It consists of selection of subjects, selection of variables, selection of tests, competency of the tester, instrument reliability, reliability of the test, orientation to the subjects, pilot study to construct training programme, assessment of one repetition maximum (1 RM), training programme, collection of the data, administration of the tests, and experimental design and statistical procedures have been presented.

3.1 Selection of Subjects

The purpose of the study is to find out the effects of different depth of aqua training on selected physical and physiological variables among college men. To achieve the purpose of the present study forty male students in the age group of 19 to 25 years studying in various classes from Lakshmibai National College of Physical Education, Kariavattom, Trivandrum, India during the year 2010-2011 were selected as subjects at randomly.

All the subjects were residents of Lakshmibai National College of Physical Education Hostel, Kariavattom, Trivandrum, India so, they had a similar programme of academic and regular activities offered by the Lakshmibai National College of Physical Education, Kariavattom, Trivandrum. The age, height and weight of the subjects were ranged from 19 to 25 (mean age = 22 ± 7 months) years, 160 to 182 cms (mean height = 168 ± 0.25 cms) and 52 to 65 kg (mean weight = 58.5 ± 0.35 kg) respectively. They were divided into four equal groups of ten each as three experimental groups and one control group, in which, Group - I \( (n = 10) \) underwent the aqua training with water up to knee level (WKL), Group - II \( (n = 10) \) underwent
to aqua training with water up to hip level (WHL), Group - III (n = 10) underwent aqua training with water up to shoulder level (WSL) and Group – IV(CG) (n = 10) acted as control which did not participate any special training apart from their regular curricular activities. The subjects were free to withdraw their consent in case they felt any discomfort during the period of the training programme, but there were no dropouts during the course of this study.

3.2 Selection of Variables

The scholar had gone through the available literature and held discussions with various experts before arriving at a conclusion. The availability of the techniques, feasibility and reliability of the procedure and the outcome were extensively analysed and on the basis of the findings, the problem was selected. After analysing the various factors associated with the problem, certain variables were selected to test during the study.

Most scientific knowledge whether from experience or research aims at understanding and improving the effects of exercise on body. Exercise is now the focus of sports science. Research from several sciences enriches the theory and methodology of training, which has become a science of its own.

Aquatic training has numerous benefits that can really help us to achieve our exercise goals. Every exercise performed in a pool challenges our postural stabilizer muscles. In order to maintain good posture and movement form, our abdominal and back muscles must work constantly against the water currents. In every exercise, even while working another primary muscle group, the shoulder stabilizers and core stabilizers are engaged. With regular training, this additional focus results in
improved posture and body awareness. In the pool, the pressure of water surrounds the body. The water currents provide constant massaging strokes against the body. This pumping action of the water promotes circulation. This can speed recovery after an exercise. Pool training can provide a comfortable alternative for people who cannot exercise on land due to movement restrictions from injuries. No one should exercise when experiencing acute pain. Aquatic exercise may be appropriate for those in post rehabilitation when released for physical activity by their health care providers. Patients who are unable to perform land exercises due to back pain or arthritis may be able to exercise without pain in the water. The buoyancy of water unloads the spine and provides essential support for the body. The compressive effects of water decrease stress of inflamed joints and reduce local swelling.

Based on the above-mentioned principles, the investigator selected aquatic training as the independent variable of the present study.

For every training programme there would be a change in various structure and systems in human body. So, the researcher along with the experts had selected the following variables as criterion variables:

3.2.1. Physical Variables

1. Speed
2. Agility
3. Explosive power
4. Flexibility
3.2.2. Physiological Variables

1. Systolic and Diastolic blood pressure
2. Resting heart rate
3. Cardio-respiratory Endurance (VO₂ max)
4. Vital capacity

3.3 Selection of Tests

The present study was undertaken to assess the effects of different depth of aquatic training on selected physical and physiological variables such as speed, agility and explosive power, flexibility, systolic and diastolic blood pressure, resting heart rate, cardio-respiratory endurance and Vital capacity. The investigator analysed various literatures and also consulted many physical education professionals and then selected the following test items, which were standardized, ideal for the chosen subjects and most suitable for the purpose of the study, and it is presented in the Table - I.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Criterion Variables</th>
<th>Test items</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Speed</td>
<td>50 meters dash</td>
<td>seconds</td>
</tr>
<tr>
<td>2</td>
<td>Agility</td>
<td>Shuttle run</td>
<td>seconds</td>
</tr>
<tr>
<td>3</td>
<td>Explosive Power</td>
<td>Standing broad jump</td>
<td>meters</td>
</tr>
<tr>
<td>4</td>
<td>Flexibility</td>
<td>Sit and reach test</td>
<td>centimeters</td>
</tr>
<tr>
<td>5</td>
<td>Blood Pressure</td>
<td>Sphygmomanometer</td>
<td>mmHg</td>
</tr>
<tr>
<td></td>
<td>(Systolic and Diastolic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Resting Heart Rate</td>
<td>Counting the pulse at resting condition</td>
<td>numbers</td>
</tr>
<tr>
<td>7</td>
<td>Vital Capacity</td>
<td>Spirometer</td>
<td>ml</td>
</tr>
<tr>
<td>8</td>
<td>Cardio-Respiratory</td>
<td>Cooper’s 12 minutes run/walk test was converted in to VO₂ max</td>
<td>ml/kg/hl</td>
</tr>
<tr>
<td></td>
<td>Endurance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.4 Competency of the Tester

The researcher has learnt the procedure and method of administering the tests. The researcher had a number of practice sessions in-order to get familiarized with the testing procedures. The tester’s reliability was established by test and re-test methods. The scholar with the help of the master degree students and MPhil scholars of the Lakshmibai national Collage of Physical Education, Kariavattom, Trivandrum, took the measurements.

3.5 Instrument Reliability

The required instruments such as standard synthetic track, cones, stop watches, measuring tape, leveler, sit and reach board, Sphygmomanometer, spirometer, and video camera were taken from the sports store and Exercise physiology laboratory of the Lakshmibai National College of Physical Education, Kariavattom, Trivandrum, India. All the instruments were in good condition and had been purchased from the reliable and reputed companies. Their calibrations were tested and found to be accurate enough to serve the purpose of the study.

3.6 Reliability of the Test

Test and retest method was followed in order to establish reliability of data by using 20 subjects at random. All the dependent variables selected in the present study were tested twice for the subjects by the same personnel under similar conditions. Johnson and Nelson used the intra class co-efficient of correlation to find out the reliability of the data as suggested and the results are presented in Table - II.
Table - II

INTRA CLASS CORRELATION CO-EFFICIENT OF SELECTED CRITERION VARIABLES

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Tests</th>
<th>‘R’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50 meters dash</td>
<td>0.91*</td>
</tr>
<tr>
<td>2</td>
<td>Shuttle run</td>
<td>0.86*</td>
</tr>
<tr>
<td>3</td>
<td>Standing broad jump</td>
<td>0.86*</td>
</tr>
<tr>
<td>4</td>
<td>Sit and reach</td>
<td>0.86*</td>
</tr>
<tr>
<td>5</td>
<td>Sphygmomanometer</td>
<td>0.99*</td>
</tr>
<tr>
<td>6</td>
<td>Resting heart rate</td>
<td>0.98*</td>
</tr>
<tr>
<td>7</td>
<td>Vital Capacity</td>
<td>0.92*</td>
</tr>
<tr>
<td>8</td>
<td>VO₂ max</td>
<td>0.97*</td>
</tr>
</tbody>
</table>

* Significant at .05 level of confidence

3.7 Orientation of the Subjects

The investigator explained the purpose of training programme to the subjects and their role in the study. For the collection of data, the investigator explained the procedure of test on selected dependent variables and gave instructions to the subjects about the procedure to be adopted by them for measuring. Five sessions were spent to familiarize the subjects with the technique involved to execute the aquatic exercise. It helped them to perform the aquatic exercise perfectly and to avoid injuries. The subjects were verbally motivated to attend the training session regularly. Further the control group was specially oriented, advised and controlled to avoid the special practice of any of the specific training programme till the end of the experimental period. The subjects of all the groups were sufficiently motivated to perform their best during testing periods.
3.8 Pilot Study to Construct Training Programme

A pilot study was conducted to assess the initial capacity of the subjects in order to fix the load. To achieve this purpose 15 subjects were selected and they were divided into three groups of five each at random. Group - I underwent the aqua training with water up to knee level (WKL), Group - II underwent aqua training with water up to hip level (WHL) and Group - III underwent aqua training with water up to shoulder level (WSL) under the careful supervision of the researcher. Based on the response of the subjects in the pilot study the training schedule for the three groups was constructed separately. However, the individual differences were not taken into consideration. The basic principles of training were followed while constructing the training programme, form and technique too were emphasized at all stages of the training programme. The load dynamics is given in table III.

<table>
<thead>
<tr>
<th>Week</th>
<th>% of load</th>
<th>Rep.</th>
<th>Set</th>
<th>Work efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Work (sec)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rest (sec)</td>
</tr>
<tr>
<td>1&amp;2</td>
<td>60%</td>
<td>3</td>
<td>1</td>
<td>16.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32.00</td>
</tr>
<tr>
<td>3&amp;4</td>
<td>65%</td>
<td>3</td>
<td>1</td>
<td>14.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29.6</td>
</tr>
<tr>
<td>5&amp;6</td>
<td>70%</td>
<td>3</td>
<td>2</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27.6</td>
</tr>
<tr>
<td>7&amp;8</td>
<td>75%</td>
<td>3</td>
<td>2</td>
<td>12.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25.6</td>
</tr>
<tr>
<td>9&amp;10</td>
<td>80%</td>
<td>3</td>
<td>3</td>
<td>12.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24.00</td>
</tr>
<tr>
<td>11&amp;12</td>
<td>85%</td>
<td>3</td>
<td>3</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22.6</td>
</tr>
</tbody>
</table>

1. 5 % of load has been increased in every alternative weeks
2. For distance time has been taken and accordingly load was fixed.
### Load Dynamics for Experimental Group II (WHL)

<table>
<thead>
<tr>
<th>Week</th>
<th>% of load</th>
<th>Rep.</th>
<th>Set</th>
<th>Work efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Work (sec)</td>
</tr>
<tr>
<td>1&amp;2</td>
<td>60%</td>
<td>3</td>
<td>1</td>
<td>15.4</td>
</tr>
<tr>
<td>3&amp;4</td>
<td>65%</td>
<td>3</td>
<td>1</td>
<td>14.2</td>
</tr>
<tr>
<td>5&amp;6</td>
<td>70%</td>
<td>3</td>
<td>2</td>
<td>13.2</td>
</tr>
<tr>
<td>7&amp;8</td>
<td>75%</td>
<td>3</td>
<td>2</td>
<td>12.3</td>
</tr>
<tr>
<td>9&amp;10</td>
<td>80%</td>
<td>3</td>
<td>3</td>
<td>11.5</td>
</tr>
<tr>
<td>11&amp;12</td>
<td>85%</td>
<td>3</td>
<td>3</td>
<td>10.9</td>
</tr>
</tbody>
</table>

1. 5 % of load has been increased in every alternative weeks
2. For distance time has been taken and accordingly load was fixed.

### Load Dynamics for Experimental Group III (WSL)

<table>
<thead>
<tr>
<th>Week</th>
<th>% of load</th>
<th>Rep.</th>
<th>Set</th>
<th>Work efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Work (sec)</td>
</tr>
<tr>
<td>1&amp;2</td>
<td>60%</td>
<td>3</td>
<td>1</td>
<td>19.2</td>
</tr>
<tr>
<td>3&amp;4</td>
<td>65%</td>
<td>3</td>
<td>1</td>
<td>17.7</td>
</tr>
<tr>
<td>5&amp;6</td>
<td>70%</td>
<td>3</td>
<td>2</td>
<td>16.5</td>
</tr>
<tr>
<td>7&amp;8</td>
<td>75%</td>
<td>3</td>
<td>2</td>
<td>15.4</td>
</tr>
<tr>
<td>9&amp;10</td>
<td>80%</td>
<td>3</td>
<td>3</td>
<td>14.4</td>
</tr>
<tr>
<td>11&amp;12</td>
<td>85%</td>
<td>3</td>
<td>3</td>
<td>13.6</td>
</tr>
</tbody>
</table>

1. 5 % of load has been increased in every alternative weeks
2. For distance time has been taken and accordingly load was fixed.
3.9 Assessment of 1RM

The assessment of 1RM is explained in the below table.

<table>
<thead>
<tr>
<th>% of Load</th>
<th>Experimental Group – I (WKL)</th>
<th>Experimental Group – II (WHL)</th>
<th>Experimental Group – III (WSL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1RM= 20 m= 9.6 sec</td>
<td>1RM= 15 m= 9.2 sec</td>
<td>1RM= 10 m= 11.5 sec</td>
</tr>
<tr>
<td>60%</td>
<td>9.6X 100/60=16.00</td>
<td>9.2X100/60=15.4</td>
<td>11.5X100/60=19.2</td>
</tr>
<tr>
<td>65%</td>
<td>9.6X 100/65=14.8</td>
<td>9.2X100/65=14.2</td>
<td>11.5X100/60=17.7</td>
</tr>
<tr>
<td>70%</td>
<td>9.6X 100/70=13.8</td>
<td>9.2X100/70=13.2</td>
<td>11.5X100/60=16.5</td>
</tr>
<tr>
<td>75%</td>
<td>9.6X 100/75=12.8</td>
<td>9.2X100/75=12.3</td>
<td>11.5X100/60=15.4</td>
</tr>
<tr>
<td>80%</td>
<td>9.6X 100/80=12.00</td>
<td>9.2X100/80=11.5</td>
<td>11.5X100/60=14.4</td>
</tr>
<tr>
<td>85%</td>
<td>9.6X 100/85=11.3</td>
<td>9.2X100/85=10.9</td>
<td>11.5X100/60=13.6</td>
</tr>
</tbody>
</table>

3.10 Training Programme

The training programmes undergone three days a week for twelve weeks of training. The training days are Monday, Wednesday and Friday between 7.30 am to 9.15am. The load was progressively increased once in two weeks. Every between two weeks the intensity was increased 5% from 60% of 1RM to 85% of 1RM. The volume, sets per repetition progressively increased one to four weeks as a 1x3 repetitions, five to eight as a 2x3 repetitions and nine to twelve as a 3x3 repetitions respectively. For all weeks rest intervals between the set was constant to 5 minutes.

The training programmes for different depth of aquatic training groups are given in Appendix-A.
3.10.1 Aquatic Exercises

3.10.1.1 Ankling

Action

Instead of lifting the whole foot from the floor as an athlete would running, alternately lift one heel, then the other. Pump both the arms in opposition to your legs.

(MaryBeth Pappas Gaines, 1993)
3.10.1.2 High Knee Lift

**Action**

Alternatively lift one knee, then the other, moving your arms and legs in opposition to each other to elevate the body. Lift the right knee and the left arm. Put right foot down and bring arm back to the side. Lift the left knee and right arm. Put left foot down and bring back to the side. *(MaryBeth Pappas Gaines, 1993)*
3.10.1.3 Straight Leg Drill

**Action**

March with straight legs. Lift your right leg from the hip, knee straight. At the same time, reach forward with your left arm. Put your foot down and bring your arm to your side. Lift your leg from the hip, knee straight. At the same time, reach forward with your right arm. Put your foot down and bring your arm to your side. Start with the legs first mastered. Keep the pelvis aligned by bracing the spine between contracted abdominal and buttocks muscles. *(MaryBeth Pappas Gaines, 1993)*
3.10.1.4 Knee Lift Kick

**Action**

Lift the right knee toward chest, no higher than the hip height. At the same time, reach your opposite arm forward from the shoulder, palm first. Then kick your right leg forward from the knee. Bend your knee then return your foot to the floor of the pool and bring your arm to your side. *(MaryBeth Pappas Gaines, 1993)*
3.10.1.5 Butt Kick

**Action**

Pull in the abdominals. Reach forward with right arm and lift the right heel toward the buttocks, keeping the thighs parallel to each other and perpendicular to the floor. Return the arm and leg to starting position. Reach forward with left arm and lift the left heel toward the buttocks, keeping the thighs parallel to each other and perpendicular to the floor. (*MaryBeth Pappas Gaines, 1993*)
3.10.1.6 Carioca

**Action**

Feet parallel to the ground. Bring the right leg across the left leg, simultaneously turns the upper body opposite to the leg movement (left side) by using
arms and bring back the leg to the reverse direction of the body. Do the same on other side. (LA84 Foundation, 2008)

3.10.1.7 Skipping Kick

**Action**

Lift the right knee toward chest, at the same time, reach your opposite arm forward from the shoulder, palm first. Then lift your left leg upward toward chest.
Bend your knee then return your foot to the floor of the pool and bring your arm to your side. (LA84 Foundation, 2008)

3.10.1.8 Water Jogging

Action

Stride or jog forward. Maintain the neutral position throughout the exercise. Push relatively straight arms forward and backward at the sides as jog front. Turn the hands each time so that the palms press against the water. Use the arms in opposition
to the legs, when the step forward with right leg and bring the left arm forward and vice versa. (MaryBeth Pappas Gaines, 1993)

3.11 Administration of the Tests

3.11.1 Speed

50 Meters Dash (In seconds)

Purpose

The purpose of this test was to measure speed of the subjects.

Equipment

Starting Clapper, measuring tape, cones and stop watches.

Procedure

After the warm-up the subject was asked to take position behind the starting line and to wait for the signal. The tester gave the commands ready and claps, so that these were audible easily to the subjects at the starting line and the timers at the finish line. The subject ran across the finish line, which was drawn at 50 mts from the starting line, as fast as possible.

Scoring

The score was the time elapsed to the nearest tenth second between the starting signal and the subject crosses finish line. (Devinder K.Kansal, 2008)

3.11.2 Agility

Shuttle Run (In seconds)

Objective

To measure the performer’s running and changing direction.

Equipment and Material

Marking tape, stop watches and two block of wood (2”x2”x2”).
Administration of the Test

The distance of shuttle run from starting line to return line is 10 meters. The performer was asked to stand behind the starting line on the signal “GO”, and ran to the blocks, picked up one returned to the starting line, and placed block behind the line; he then repeated the process with the second block. Some rests between the two trials were allowed.

Scoring

The score for each performer is the length of time taken (to the nearest tenth of a second) to complete the course. Record only the best trial. (Johnson and Nelson, 1998)

3.11.3 Flexibility

Sit and Reach Test (In centimeters)

Purpose

To measure the flexibility of the back and leg (hamstring muscle).

Equipment

Testing box

Procedure

The subject was asked to remove shoes and placed his feet against the testing box while sitting on the floor with straight knees. The subject was asked to place one hand on top of the other so that the middle fingers of both hands were together at the same length. The subject was instructed to lean forwards and placed hands over the measuring scale lying on the top of the box. The subject was asked to slide his hands along the measuring scale as far as possible without bouncing and to hold the farthest position for at least one second. With a line on the floor.

Scoring
The subjects were given three trials and the best among the three trials were his test score. (Devinder K.Kansal, 2008)

3.11.4 Explosive Power

Standing Broad Jump (In meters)

Purpose

To measure explosive power in horizontal direction.

Equipment

Long jump pit, Steel measuring tape.

Procedure

The subject was asked to stand behind the starting line with the feet parallel to each other. The subject was instructed to jump as farthest as possible by bending knees and swinging arms to take off for the broad jump in the forward direction. Three trials were given with a minute rest in between.

Scoring

The distance between the starting line and the nearest point of landing provided the scores of the test. The best trial was recorded as the test score. (Devinder K.Kansal, 2008)

3.11.5 Resting Heart Rate

(In Numbers)

Purpose

The purpose of the test was to find out the number of pulse rate of the subjects at rest.

Instrument

A stopwatch, pencil and score sheet was used to assess the pulse rate at rest.
Procedure

The resting heart rate of the subjects was recorded in the sitting position at immediate after wake-up. Before taking the resting heart rate the subject was asked to relax in a sitting position for 30 minutes. To record the heart rate, the finger tips were placed on the radial artery at the subjects wrist in such a manner that palpation was clear and the number of palpation was counted for one minute.

The pulse rate was taken at the wrist in such a manner that palpitation was clearly felt by the fingertips. The measurement of palpitation was counted for one minute.

Scoring

The pulse rate was recorded for one minute from each subject. (Mathew et al. 1985)

3.11.6 Blood Pressure

Systolic and Diastolic Pressure (In mmHg)

Purpose

The purpose of the test was to find out the blood pressure of the subjects.

Instrument

Sphygmomanometer and stethoscope.

Procedure

The subjects were asked to report early in the morning and were allowed to reflex for half an hour by lying down on the mattress. After ensuring that the subjects were relaxed mentally and physically, they were asked to sit in a chair and the cuff of the sphygmomanometer was placed on the right upper arm of the subject. The stethoscope was placed over the brachial artery downstream from the cuff.
The pressure cuff on the upper arm was inflated by pressing the rubber bulb and the cuff was inflated till no sounds were heard in the stethoscope, as the pressure off the cuff has collapsed the brachial artery.

The pressure in the cuff was then gradually reduced by deflating the cuff through the valve. As the cuff started deflating gradually small sound called “korotkoff” sounds were heard through the stethoscope, at this stage the mercury level in the manometer was recorded and this recording was taken as systolic blood pressure.

**Scoring**

The pressure of the cuff that was indicating on the manometer when the first “korotkoff” sound was heard and was recorded as the systolic blood pressure. As the deflation continued and the pressure started falling at one stage the “korotkoff” sounds disappeared as the pressure was no longer sufficient to occlude the vessel.

The cuff pressure shown in the manometer was recorded as soon as the “korotkoff” sounds disappeared and this reading was considered as diastolic pressure. *(Cromwell et al, 1992)*

### 3.11.7 Vital Capacity (In ml)

**Purpose**

To measure the subjects vital capacity.

**Equipment**

Spirometer, paper, pencil and score sheet.

**Procedure**
The volume of air that can be moved out of the lungs after maximum inspiration is called vital capacity. The vital capacity is measured with the help of spirometer. The subject is asked to inhale with his maximal effort and then to exhale with his maximal effort in the spirometer’s mouth piece (with the nose clip through the nostrils.) As the subject exhales into the spirometer, the spirometer records the subjects vital capacity in millilitres.

Scoring

The reading was taken according to the movement of the needle indicating point recorded by millilitres. (Devinder K. Kansal, 2008)

3.11.8 Cooper’s 12 minutes run/walk test is converted into VO₂ max (In ml/kg/hl)

Purpose

To find out the VO₂ max.

Equipment

400-metre track, stopwatch, cones, whistle and an assistant.

Procedure

The subject suppose to run as for as possible in 12 minutes. After proper warming up 10 minutes the assistant gave the command “GO”, started the stopwatch and the subjects commenced the test. The assistant kept the subject informed of the remaining time at the end of each lap (400m). The assistant blew the whistle when the 12 minutes elapsed and recorded the distance the subjects covered to the nearest 10 metres.

Scoring

An estimate of VO₂ max was calculated as follows:

\[(\text{Distance covered in metres} - 504.9) ÷ 44.73. \] (Johnson and Nelson, 1986)
3.12 Collection of Data

The data were collected on speed, agility, explosive power and flexibility, systolic and diastolic blood pressure, resting heart rate, cardio-respiratory endurance and vital capacity by administrating 50 meters dash, shuttle run, standing broad jump and sit and reach test, blood pressure, resting heart rate and cardio-respiratory endurance was assessed by using sphygmomanometer, counting the pulse at resting condition and Cooper’s 12 minutes run/walk test and it was converted into VO$_2$ max. Pre test data were collected two days before the training programme and post-test were collected two days after the last training session.

3.13 Experimental Design and Statistical Procedures

The experimental design used for the study was similar to random group design involving forty subjects, who were divided into four groups, three experimental groups and a control group of ten each.

This study consisted of three independent variables, the Experimental Group - I (n = 10) underwent the aqua training with water up to knee level (WKL), Experimental Group - II (n = 10) underwent to aqua training with water up to hip level (WHL), Experimental Group – III (n = 10) underwent aqua training with water up to shoulder level (WSL) and Group – IV (n = 10) acted as control which did not participate any special training apart from their regular curricular activities. The subjects in all the four groups were tested prior (pre-test), and after twelve weeks (post test) on speed, agility, flexibility, explosive power, blood pressure (systolic and diastolic), resting heart rate, vital capacity and cardio-respiratory endurance (VO$_2$ max).
max). This study was aimed at finding out the effects of different depth of aquatic training on selected criterion variables.

The data collected from the four groups prior to experimental treatment as pre-test data and after twelve weeks of training as post test data on selected criterion variables. The collected data were statistically examined to find the significant difference on the dependent variables, applying the analysis of covariance (ANCOVA) was used. No attempt was made to equate the groups in any manner. Whenever, ‘F’ ratio for adjusted post test mean was found to be significant Scheffe’S post-hoc test was used to determine which of the paired mean differ significantly.