CHAPTER-III

METHODOLOGY

3.1 Introduction

The methodical process by which the researcher begins with the first identification of the problem and conclusion with it is known as research methodology. The methodology's part is to conduct the research in a reliable and scientific way.

The methodology used in the selection of subjects, selection of variables, selection of tests, orientation to the subjects, competence of the tester, reliability of the instruments, reliability of the data, pilot study, training programme, collection of the data, administration of the tests, experimental design and statistical techniques were discussed in this chapter.

3.2. Selection of Subjects

To accomplish this objective, 90 male long distance runners from the Surat district who have competed at least once in distance running competitions longer than 3000 meters were selected at random and they were in 17 to 22 years of age. The selected subjects were divided randomly into three equal groups of thirty (n=30), including experimental and control groups. Group - I (n = 30) participated in slow continuous training, Group - II (n = 30) participated in alternate pace endurance training, and Group - III served as the control group.

Table – 3.1

Characteristics of Participants by Group

Name of the Groups	Total Numbers of Players	Age (Yr)
Slow Continuous Training Group	30	20.17 ± 1.21
Alternate Pace Endurance Training Groups	30	20.90 ± 1.37
Control Group	30	20.60 ± 1.16

The kind of training and assessment schedule employed in the study was explained to the players. They followed the same lifestyle, dietary habits, exercise regimens, and ambient conditions; therefore there was no need to exert any control over these variables.

3.3. Selection of Variables

The researcher examines the scientific literature from books, journals, periodicals, magazines, and research papers that is relevant to the subject. The following physical and physiological variables were selected while taking the feasibility criteria into account.

3.3.1 Depended Variable

➢ **Physical Variables**

- Speed Endurance
- Cardio Respiratory Endurance
- Endurance
- Abdominal Strength Endurance
- Leg Strength

➢ **Physiological Variables**

- Heart Rate
- Vital Capacity
- Blood Pressure

3.3.2 Independent Variables

- Slow continuous Training
- Alternate Pace Endurance Training

3.4. Selection of Tests

The following standardised tests were used to test the selected variables in accordance with the literature, and the results are shown in Table 3.2.

Table – 3.2

Selection of variables and tests

Sr. No	Criterion Variables	Test Items	Unit of Measurement
Physical Variables			
1	Speed Endurance	300 m Run	In second
2	Cardio Respiratory Endurance	Coopers 12 minutes Run	Distance covered In Meters
3	Endurance	1600 m Run	In Minutes
4	Abdominal Strength Endurance	Bent Knee Sit Ups	Number of correctly Sit-ups in One minute
5	Leg Strength	Leg Dynamometer	Kilogram
Physiological Variables			
5	Heart Rate	Digital Heart Rate Monitor	Number of beats per Minute
6	Vital Capacity	Digital Dry Spirometer	Score was recorded in Liter
7	Blood Pressure (Systolic and Diastolic)	Sphygmomanometer	Millimeters of mercury (mm Hg)

3.5 Research Flow Chart
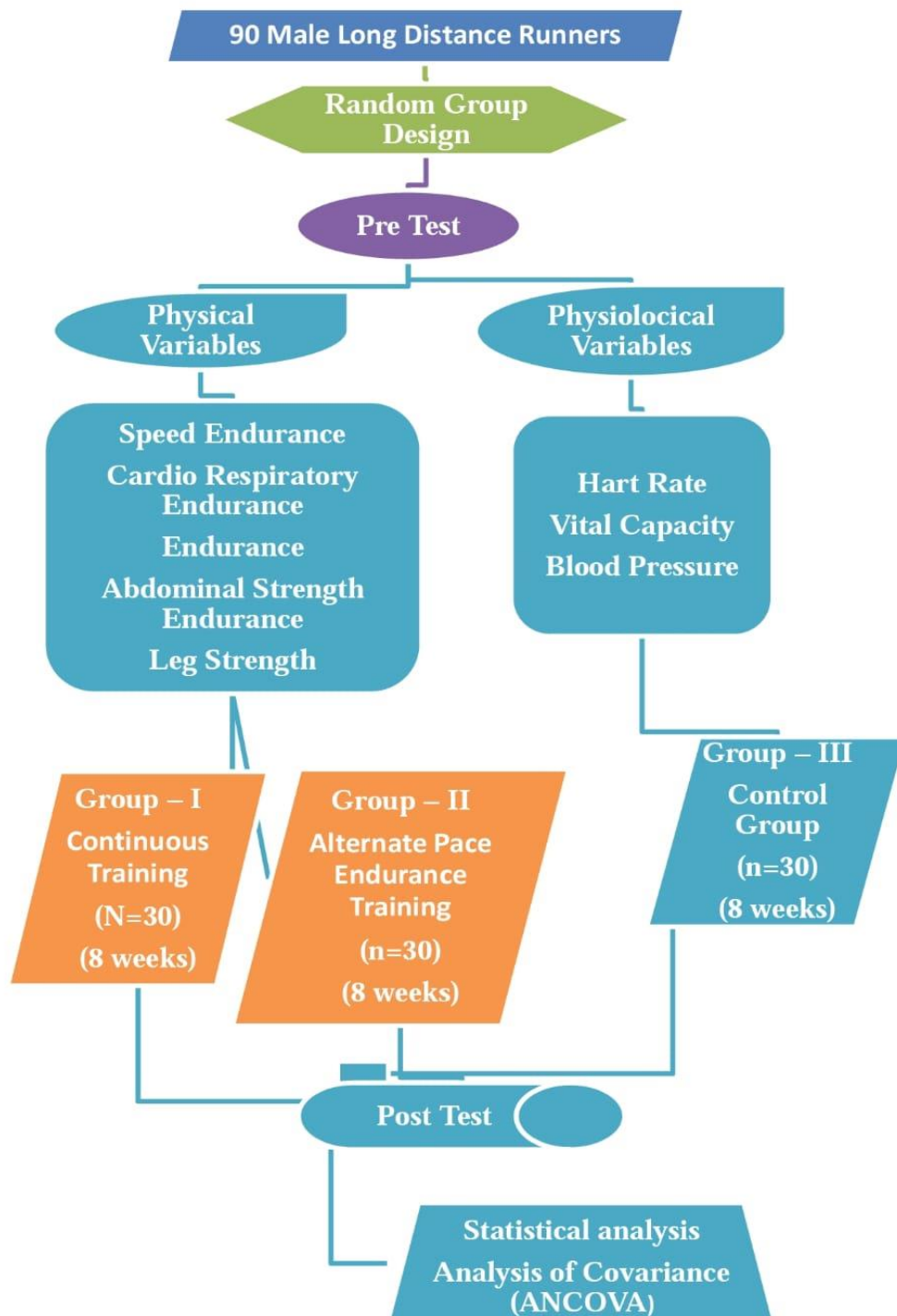
Selected 90 long distance runners were initially pre-tested by the researcher. The subjects' pre-test performance (raw score) was converted into a composite score and based on this the subjects were randomly divided into three equal groups of thirty (n=30) each including experimental and control groups. Group - I (n = 30) participated in slow continuous training, Group - II (n = 30) participated in alternating pace endurance training, and Group - III (n = 30) served as the control group.

The two experimental groups were participating in the training given 3 days a week for 8 weeks. After taking into account the advice of knowledgeable coaches and sports training experts, the slow continuous training and alternate pace endurance training programmes were created. The regular curriculum was offered to the control group. All groups were retested on all selected variables after the conclusion of the eight-week training programme, and the results were kept as a post-test score. The collected data was then analysed using the appropriate statistical techniques.

3.6 Reliability of Data

By establishing the instrument reliability, tester competency, tester's reliability and the subjects' dependability, the data's reliability was ensured.

3.6.1 Instrument Reliability

Stopwatches, measuring steel tapes, leg dynamometer, digital heart rate monitor, digital dry spirometer and Sphygmomanometer were among the tools purchased for this study's evaluation of the dependent variables from the Navyug Arts College, Surat and Physiotherapy College, Surat. The instrument calibrations had been reviewed and approved as authentic for use in achieving the study's objectives.

3.6.2 Tester Competency

In this study, the investigator conducted physical measurements with the assistance of professionals in the fields of physical education and sports, and a student from the College of Physiotherapy in Surat assisted in the assessment of physiological variables. The investigator and his assistant practiced conducting tests in accordance with protocol multiple times to ensure that they were both comfortable with the procedures.

3.6.3 Reliability of Data

The reliability of the data was established using the test and retest procedure with nine players selected at random from each of the three groups. The same team tested all of the dependent variables selected for the current study twice under identical

circumstances. The dependability of the data was determined using the Co-efficient correlation and the findings are shown in table 3.3.

Table 3.3

Correlation Co-Efficient of Test-Retest Score

Sr. No	Variables	Reliability Co-efficient
1	Speed Endurance	0.83*
2	Cardio Respiratory Endurance	0.84*
3	Endurance	0.86*
4	Abdominal Strength Endurance	0.87*
5	Leg Strength	0.84*
6	Heart Rate	0.89*
7	Vital Capacity	0.91*
8	Blood Pressure (Systolic and Diastolic)	0.92*

***Significant ($p < 0.01$)   N-09   r – 0.01 (07) = 0.798**

3.6.4 Subjects Reliability

Since the same tester had administered the test-retest for the same subjects under the same circumstances, the coefficient correlation values obtained from test-retest scores also supported the reliability of the subjects.

3.7. Orientation to the Subjects

The researcher gave the subjects an explanation of the study's purpose and their role in it. The investigator provided directions on how to conduct tests on the selected dependent variables and detailed the method to be followed in order to collect the data. The subjects underwent four sessions to become familiar with the methodology needed to carry out the slow continuous and alternate pace endurance training. Additionally, the control group was specifically directed, counseled, and controlled to avoid the special practice of any of the unique training programmes until the end of the experimental period. This helped them to do the given training flawlessly and avoid injuries. During training and assessment, all of the participants were adequately motivated to give their best effort.

3.8 Training Porgramme

The experimental groups were underwent eight weeks of slow continuous training (Group – I) and alternative pace endurance training (Group - II) on three alternative days of the week. Each training programmes had duration of 60 to 90 minutes and a morning routine from 6.30 to 8.00. The control group did routine workouts without any specialised training. Prior to and throughout each session, the individuals were strictly supervised as they completed their various programmes. Ten minutes of stretching and jogging activities served as their warm-up and cool-down. Throughout the entire training programme, the subject's stature was regularly assessed. No injuries were noted, however muscle discomfort from earlier weeks decreased in the final phase.

3.8.1 Slow Continuous Training

The slow continuous groups adhere to a personal training programme during the training session in addition to their regular daily activities as scheduled. The slow continuous training group trained three days per week Monday, Wednesday and Friday for an eight weeks training period from 6.30 am to 8.30 am at the Botawala Hostel Ground in Surat.

The intensity of the training was 50 to 70% of their maximum heart rate up to 120-140. The subjects began training by running for 30 to 45 minutes each day including warm up. Training always began with a few minutes warm up and was followed by outdoor continuous slow running.

Week	Monday	Wednesday	Friday	Load intensity %
1-2	Progressive Run	Strides Run	Hills workout	40% to 60%
3-4	Progressive Run	Track Running	Resistance Workout	40% to 60%
5-6	Progressive Run	Strides Run	Fartlek Workout	50% to 70%
7-8	Progressive Run	Track Running	Hills and Resistance Workout	50% to 70%

- **Progression Run**: Progression running is a type of speed work that involves beginning a run at a comfortable, slow pace and ending the run at a faster pace.

- **Strides Run:** Strides refer to very short run with mordent and long that are usually done before running or workout or else immediately after running.

- **Hills Training:** Hills are simply the best way to build running strength. Up and Speed hills, short hill sprints.

- **Track Running:** Track refers to a session that includes a series of speed intervals.

- **Resistance Training:** it should refer resistance training with send weight, resistance band running of mordent level and parachute run**.**

- **Fartlek Training:** Fartleks work on speed and strength by alternating distance and paces during run.

3.8.2   Alternate Pace Endurance Training Group

The alternate pace endurance training group adhere to a personal training programme during the training session in addition to their regular daily activities as scheduled. The slow alternate pace endurance training group trained three days per week on Tuesday, Thursday and Saturday for an eight weeks training period from 6.30 am to 8.30 am at the Botawala Hostel Ground in Surat.

The alternate pace endurance training group was trained for 3 days per week up to 8 week. In this training exercise is done continuously but with changing pace or speed. The Intensity of the training will be 65 to 75 % of their maximum Heart rate range between 130-140 beats/minute. The total duration ranges from about 15 minutes to 1 hour. Because of change of speed which is pre-planned.

Weeks	Tuesday	Thursday	Saturday	Intensity
1-2	**Progressive Run:** Progression Runs improve stamina and allow the body to adapt to the load of running.	**Split Intervals Training:** Running two different paces in one interval.	**Hills Training:** running two different paces in one interval	55 % to 65 %
3-4	**Progressive Run:** Build your pace over the course of each run by starting at a slower than Recovery Pace and finishing at a faster than Recovery Pace.	**Tempo:** controlled pace that can be run as long intervals	**Fartlek Training:** Fartleks work on speed and strength by alternating distances and paces during a continuous run.	55 % to 65 %
5-6	**Progressive Run:**	**Split Intervals Training**	**Resistance: Training:**	65 % to 75 %
7-8	**Progressive Run:**	**Space Turn**	**Fartlek Training:**	65 % to 75 %

3.9 Administration of Tests

3.9.1 Physical Variables

1. Speed Endurance

Test: 300 meter run test

Purpose: This test is intended to measure acceleration and speed.

Equipment: Stopwatch, clapper and score card.

Procedure: A single, 300-meter maximum sprint is done as part of the test, and the timing is recorded. Four subjects were tested simultaneously for this test. Every subject had taken a standing position behind the starting line. The commands "on York mark" and "go" were used in the heading. The stopwatches were started at the beginning, and the time was recorded when the competitors crossed the finish line.

Scoring: Time was recorded in the nearest 1/100th of a second.

2. Cardio Respiratory Endurance

Test: Coopers 12 minutes run test.

Purpose: The test's objective was to gauge measure subject's level of aerobic fitness.

Equipment: Ground, stop watch, marking cones and score sheet.

Procedure: The 200-meter track was marked at regular intervals of 10 meters. After being instructed to take a position behind the starting line, the subjects began to run after hearing the words "set, Go." The participants were instructed to travel the most distance possible in 12 minutes by either running. During the test, the subjects were informed that there was one minute left after the eleventh minute. When the whistle blew to signify the conclusion of the twelve minutes, the participants halted long enough for the researcher or her helper to record the distance travelled.

Scoring: The overall distance covered was expressed in meters.

3. Endurance

Test: 1600 m Run

Purpose: The test measures aerobic fitness and leg muscles endurance.

Equipment: Running track, marker cones, stopwatch.

Procedure: The objective of this exam is to finish the 1600 meter run in the quickest amount of time. All competitors are required to form a line behind the starting line at the beginning. The athletes were start running at their own pace on the order "go," at which point the stopwatches were started at the beginning, and the time was recorded when the competitors crossed the finish line.

Scoring: Each athletics overall time for finishing the race, time was noted in minutes and seconds.

4. Abdominal Strength Endurance

Test: Bent Knee Sit Ups

Purpose: To evaluate the abdominal muscles' endurance

Equipments: Yoga mat, stopwatch and scorecard.

Procedure: On a mat, the subjects were instructed to lie on their backs with their legs bent. Her elbows were tucked in and her hands were clasped behind her neck. The partner was instructed to maintain a flat heel on the mat while keeping the ankles down. The partner was instructed to maintain a low stance with the heel still in touch with the mat. The subjects were instructed to sit, exhale, elevate their upper bodies towards their thighs, and then slowly touch their bodies to the ground while inhaling. One minute was spent repeating the activity.

Scoring: The score for abdominal muscle strength was the number of sit-ups done to the nearest whole number.

5. Leg Strength

Purpose: To measure leg strength.

Equipments: Leg strength dynamometer

Procedure: The participant was instructed to stand on the dynamometer's base with their legs spread wide and their knees bent about between 100 and 120 degrees. Straightening your arms while holding the bar in the middle with your palms facing your body and your head straight was advised. The height of the subject was taken into consideration when adjusting the chain and bar attachment. The tester set the dial back to zero before starting the test. The patient was then instructed to pull the bar with all of his or her might in order to straighten their legs without bending their backs. During the exam, jerky movements were not permitted.

Scoring: The best three performances, which were measured in kilograms.

3.9.2 Physiological Variables

1. Heart Rate

Purpose: To measure Resting heart rate

Equipment: Digital Heart Rate Monitor, scorecard

Procedure: In the morning, the subjects' heart rates were recorded while they were seated. The patients were instructed to sit in a chair and rest for 30 minutes prior to taking their heart rates. During a minute of rest, the resting heart rates of all subjects were recorded using digital heart rate monitor. The most straightforward technique is often to measure the carotid or radial pulse (at the finger).

Scoring: Numbers were recorded to represent the amount of beats in one minute.

2. **Vital capacity**

Purpose: To measure lungs capacity

Equipment: Digital Dry Spirometer, score card.

Procedure: The subjects were requested to stand comfortably near to the digital spirometer; take deep breath in as possible. After a deep inhale, they asked to exhale deeply into the digital spirometer. Nose clips were used to prevent leaking of air from nostrils and 'filter mouth pieces' were used to prevent from spread of microorganisms

Scoring: Each test subject was given three chances, and the best was recorded

3. Blood Pressure

Purpose: To measure Blood pressure.

Equipment: Sphygmomanometer

Procedure: Blood pressure was measured by Automatic Digital Blood Meter in units of millimetres of mercury (mmHg). The readings are always given in pairs, with the upper (systolic) value first and followed by the lower (diastolic) value.

Scoring: The systolic and diastolic blood pressure recorded in the digital blood meter was recorded in the score sheet.

3.10 Collection of Data

The necessary data was collected by administering the test for the selected physical and physiological variables, before the eight-week experimental period. All test elements were explained to them before the tests were administered. Pretest data was collected today's prior to the start of the treatment period and posttest data was collected immediately after completion of the experimental treatment period of slow continuous and alternate pace endurance training and control group. The collected data was processed with appropriate statistical techniques.

3.11 Statistical Techniques for Analysis of Data

In order to find out the effect of slow continuous and alternate pace endurance training on selected physical and physiological variables of long-distance runners. The univariate analysis of covariance (ANCOVA) and the post hoc pair wise comparison using the LSD test analysis.

The data were compiled and analysed using the statistical package for the social science (SPSS) for window computer software.

For testing the hypothesis, the level of confidence was set at 0.05 levels.