In this chapter the procedures adapted for the selection of subjects, selection of variables, criterion measures, reliability of data, design of the study, orientation of subjects, administration of tests, training programme, collection of data and statistical techniques for the analysis of the data have been explained.

3.1 Selection of Subjects

For this study Ninety (N=90) College men Kho-kho players studying in various Colleges affiliated to Veer Narmad South Gujarat University, Surat, Gujarat were randomly selected as subjects. Their age ranged from 18 to 25 years.

The subjects were divided at random into three groups of thirty each (n=30). Group - I underwent resistance circuit Training, Group - II underwent Intensive Interval Training, and Group - III acted as the Control group. All of the subjects gave permission to participate in this study after receiving complete information about the experimental methodology.

Sufficient information was provided concerning the procedures and the role of the subjects regarding the collection of data during the experiment and testing period. During the period of the experiment and testing, subjects had the option of withdrawing their consent if they encountered any problems. However, there were no research dropouts, and all of the willing participants cooperated well during the whole investigation.

3.2 Selection of Variables

The following dependent and independent variables were selected in accordance with the opinions of qualified experts in physical education and in accordance with the relevant research review:

I. Depended Variables:

- **Physical Variables**
- Speed
- Endurance
- Agility
- Flexibility
- **Physiological Variables s**
- Resting Pulse Rate

- Vital Capacity
- Blood Pressure (Systolic and Diastolic)

II. Independent Variables:

- Resistance Circuit Training
- Intensive Interval Training

3.3 Criterion Measures

Following a review of the literature and consultation with the expert, the following parameters were selected as the study's criterion measures.

Table 3.1 : Criterion Measure

No	Variables	Test	Units of Measurement
Physical Variables			
1.	Speed	50 M Dash Test	$1/100^{th}$ of a second
2.	Endurance	Coopers 12 Minutes Run / Walk	Distance Covered / Meters
3.	Agility	Illinois Agility Test	$1/100^{th}$ second
4.	Flexibility	Sit and Reach Test	In Centimetre
5.	Explosive Power	Standing Broad Jump	In meter
Physiological Variables			
1.	Resting Pulse Rate	Digital Heart Rate Monitor	In beats per minute
2.	Vital Capacity	Digital Dry Spirometer	In litter
3.	Blood pressure (Systolic and Diastolic)	Automatic Digital Blood Meter	Millimetres of mercury (mm Hg)

3.4 Reliability of Data

The reliability of data was ensured by establish the instrument reliability, tester's reliability and subject reliability.

3.4.1 Instrument Reliability

The researcher tested the equipment's reliability using a variety of devices, including a stopwatch, measuring tape, clapper, cone, sit-and-reach box, digital heart rate monitor, and digital dry spirometer. Each variable is recorded, and the equipment

have also been calibrated with Standard units. All the instruments were in good functioning order inside. Its calibration has been examined and confirmed to be accurate enough to fulfill the study's aims.

3.4.2 Tester Competency

The researcher went through several practice sessions on the correct examination method to make sure he was familiar with the operating technique of the test. In this study, the investigator took measurements of physical variables with aid from the Director of Physical Education, working in various colleges in the south Gujarat region and physiological variables were assessed by Dr. P.R. Ramawat (M.D. Medicine).

3.4.3 Reliability of the Data

Reliability was established through a test and retest method by using ten (n=10) 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. The Pearson correlation coefficient was used to find out the reliability of the data and the results are presented in Table - 3.2.

Table 3.2 : Correlation of Test-Retest Score

Sr. No	Variables	Reliability Co-efficient
1.	Speed	0.80*
2.	Endurance	0.79*
3.	Agility	0.82*
4.	Flexibility	0.81*
5.	Explosive Power	0.83*
6.	Resting Pulse Rate	0.80*
7.	Vital Capacity	0.83*
8.	Systolic Blood Presser	0.78*
9.	Diastolic Blood Presser	0.80*

***Significant (p < 0.01) N-10 r – 0.01 (08) = 0.765**

3.4.4 Subject Reliability

All subjects received a thorough explanation of the exercises and test procedures prior to the test's administration to ensure that they understood them and that they worked well together to produce accurate test results. Prior to the gathering of actual data, subjects are pre-tested. a training course set up under the researcher's direct supervision.

3.5 Design of the Study

To determine the effects of resistance circuit training and intensive interval training on physical and physiological variables, a pre-test-post-test randomized group design with two experimental groups and one active control group was used. Selected ninety subjects were divided at random into three groups of thirty each (n=30). Group - I underwent resistance circuit Training, Group - II underwent Intensive Interval Training, and Group - III acted as the Control group. The experimental groups were trained for a period of eight weeks. The training sessions were conducted three alternate days a week. Measurement of all the variables were taken for all the groups before and after the experimental period of eight week.

3.6 Orientation to the Subjects

To ensure their sincere effort, the researcher met with subjects, experts, and other technical staff members in physical education. He explained the significance and goal of his research. To dispel any scepticism or uncertainty regarding the effort and physical exertion that went into making this research successful, the test technique was also thoroughly explained to the participants. The investigator gave the subjects complete assurances of their true and enthusiastic support. In the sake of this scientific investigation, subject-matter experts and other certified authorities have voluntarily consented to offer their full support and assistance.

3.7 Training Programme

To achieve the purpose of the present study, training programs namely resistance circuit training and intensive interval training were designed by the researcher with the help and guidance of research supervisors, sports training experts and coaches. Resistance circuit training and intensive interval training have separate training plans with corresponding levels of difficulty. When developing training plans, both

individual characteristics and the fundamentals of sports training, such as load progression and specificity, were taken into consideration.

Experimental group during the training period; they followed their respective training program. Group - I underwent resistance circuit training and group - II was given intensive interval training, for three alternate days in a week for eight weeks under the careful supervision of the investigator. The control group - III did not participate in any specific training except your regular schedule.

The resistance circuit training and intensive interval training, which included 10 minutes prior warming up and 5 minutes relaxation procedure after training programme for three days per week for 08 weeks. The training sessions were held between 6.30 to 8.00 in the morning. The length of the training intervention for this study was based on the fact that eight weeks has been shown to be sufficient to provide significant changes in college male students. The detailed procedures of these three training programs were dealt with in detail.

3.7.1 Resistance Circuit Training

Resistance circuit training programs consist of series, usually 08-10, of resistance exercises for different body parts. The external resistance can be dumbbells, barbells, resistance tub, medicine ball or any other object that causes the muscles to contract. Resistance circuit training Group – I was gone for resistance circuit training exercises for three days in a week (Monday, Wednesday and Friday) for total eight (08) weeks.

Week	Duration of time	Workload (1RM)	Set	Rest between exercise	Rest between set
1	30 sec	50%	1	15 sec	-
2	30 sec	50%	2	15 sec	2 min
3-4	35 sec	60%	2	20 sec	2 min
5-6	40 sec	65%	2	25 sec	3 min
7-8	45 sec	70%	2	25 sec	3 min

- This workout was including exercises with free weights, weight machines, resistance bands, own body weight, medicine balls and weighted bags.

- Step up, Squat, push up, sit ups, lunges, leg press, Leg extension, hip extension, heel raise, bench press, shoulder press, barbell biceps curl, crunches, planks, medicine ball twisting etc.

3.7.2 Intensive Interval Training

In intensive interval training; the exercise was done at relatively higher intensity with intervals of incomplete recovery. With these the intensive interval training program was composed for 40-60 minutes per session which includes ten minutes prior warm-up and five minutes of warm down. Further the training program was implemented to the subjects on three alternate days (Tuesday, Thursday, Saturday) of a week. The training schedule with the 70% of intensity of their maximum heart rate for first two weeks. After every two weeks of training periods the intensity was increased by 5%.

Week	Days	Schedule	Intensity	Set	RR	RS
1-2	Tuesday	4x40 m 5x30 m 5x20 m	70 %	1	Active Reset	2 min
	Thursday	2x100 m 2x150 m 1x200 m		1	Active Reset	2 min
	Saturday	4x50 m 4x40 m 4x30 m		1	Active Reset	2 min
3-4	Tuesday	4x40 m 5x30 m 5x20 m	75 %	2	Active Reset	2.30 min
	Thursday	2x100 m 2x150 m 1x200 m		2	Active Reset	2.30 min
	Saturday	4x50 m 4x40 m 4x30 m		2	Active Reset	2.30 min

Week	Days	Schedule	Intensity	Set	RR	RS
5-6	Tuesday	4x50 m 5x60 m 5x70 m	80 %	2	Active Reset	3 min
	Thursday	2x150 m 2x200 m 1x300 m		2	Active Reset	3 min
	Saturday	3x70 m 4x75 m 4x80 m		2	Active Reset	3 min
7-8	Tuesday	4x60 m 5x70 m 5x80 m	85 %	2	Active Reset	3 min
	Thursday	3x150 m 2x200 m 1x400 m		2	Active Reset	3 min
	Saturday	5x70 m 4x75 m 3x80 m		2	Active Reset	3 min

***Active Reset** – (Ex. 30 m run/30 m waking)

***RR** – Rest between Repetitions

***RS** – Rest between Set

3.8 Administration of the Tests

The investigator clearly stated the purpose of the investigation to the subjects and provided directions on how to do each test one at a time in order to analyze the physical and physiological factors.

Every experiment was demonstrated by the researcher, who also answered any questions the subjects had. To get relevant findings, the test results were tallied and statistically processed. Throughout the instruction and test administration periods, the individuals were very engaged and cooperative.

Each test was demonstrated by the investigator and doubts of the subjects were clarified. The scores obtained in each test were tabulated and statistically calculated to arrive at meaningful conclusions. Subjects were highly cooperative throughout the training period and the test period.

3.8.1 Physical Variables

3.8.1.1 Speed

Purpose: In order to measure the individuals' speed.

Equipment: Measuring tape, starting clapper and stopwatch

Procedure: At a distance of 50 meters, two lines (the start and finish lines) were drawn. With a standing start, subjects were lined up behind the starting line. At the "Ready" and "Clap" signals, the players begin a 50-meter run. One trial is all that is permitted.

Scoring: Using a stopwatch, the time it took the runner to cross the finish line after the run's start signal was measured to the nearest hundredth of a second.

3.8.1.2 Endurance

Purpose: To measure cardio respiratory endurance.

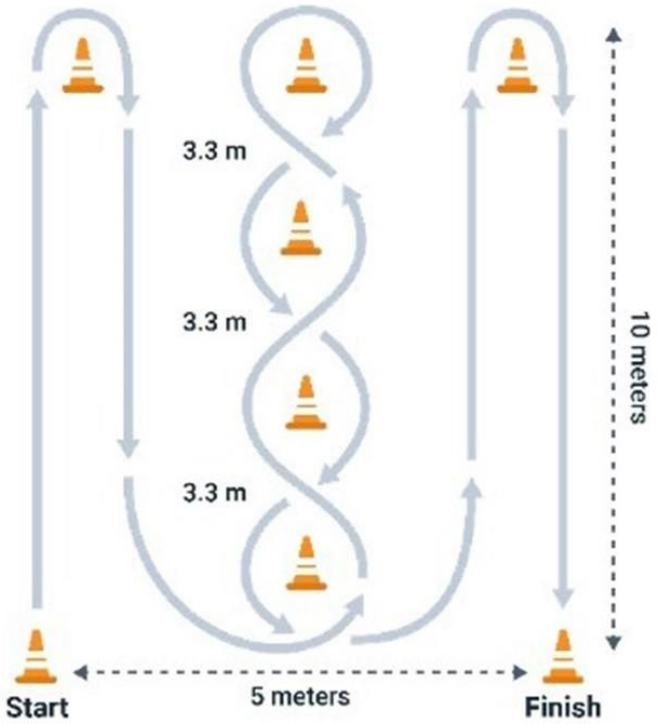
Equipment: 200 m running track, stop watch, marking cones and score sheet.

Procedure: On a 200 m track, Cooper completed a 12-minute run/walk test. At regular 10-meter intervals, the track's inner lane was marked. The subjects were instructed to line up behind the starting line, and when the word "ready, go" was given, they either started to run or walk. Subjects were instructed to cover the greatest distance possible by running or walking in 12 minutes. The eleventh minute of the test came to an end, and the subjects were notified that only one minute remained. The individuals halted when the whistle blew to signify the end of the twelve minutes so the investigator or his assistant could measure the distance covered. **Scoring:** Total distance covered was measured in meters.

3.8.1.3 Agility

Purpose: The length of the course was 10 meters and the width (distance between the start and finish points) was 5 meters. Four cones were used to mark the start, finish and the two turning points. Another four cones were placed down the centre an equal distance apart. Each cone in the centre was spaced 3.3 meters apart. Subjects should

lie on their front (head to the start line) and hands by their shoulders. On the 'Go' command the stopwatch was started, and the athlete got up as quickly as possible and ran around the course in the direction indicated, without knocking the cones over, to the finish line, at which the timing was stopped.



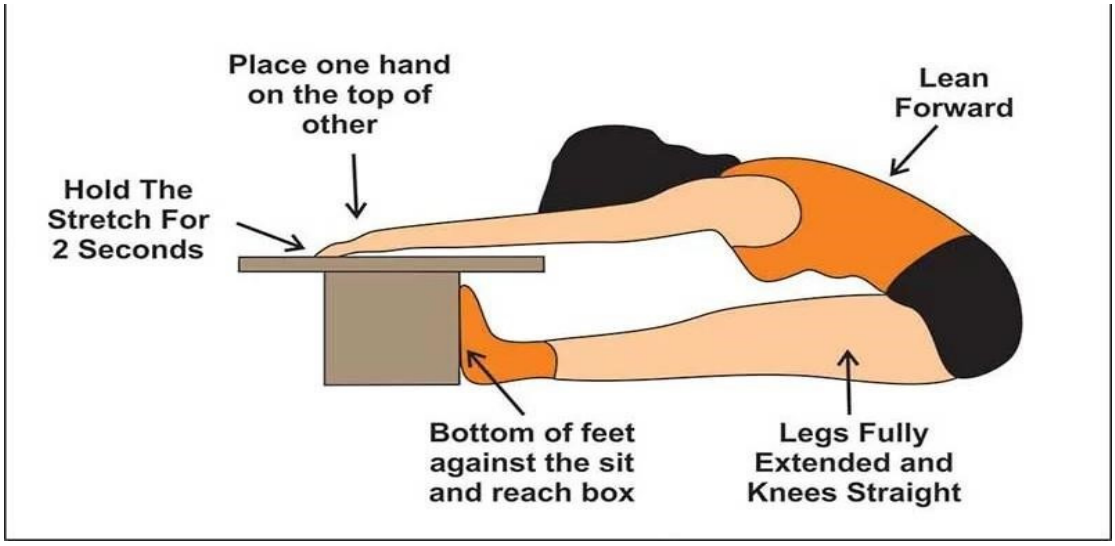
3.8.1.4 Flexibility

Purpose: The test was to measure the Flexibility of the subjects.

Equipment: Sit and Reach Box

Procedure: Sit on the ground with your legs straight ahead for this test. Take off your shoes. The box is pressed flat against the bottoms of the feet. The tester can help by holding one leg down while the other is locked and forced flat to the floor. The individual extends as far forward as they can along the measuring line with their palms facing down and their hands stacked or placed side by side. Make sure that both hands are at the same level and are not extending further than the other. The patient reaches out after a few practices reaches and maintains that position for at least one to two seconds while the distance is measured. Verify that there are no jerking motions.

Scoring: The measurement was recorded in Centimetre.



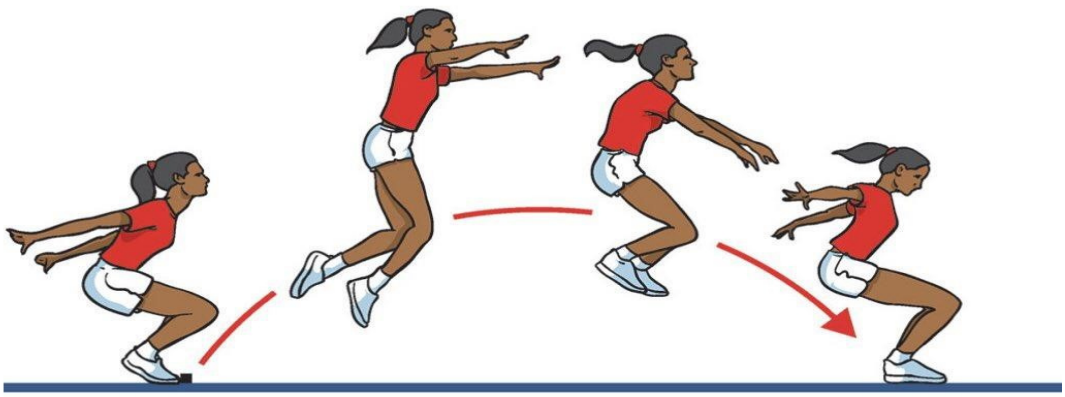
3.8.1.5 Explosive Power

Purpose: The test was to measure the Explosive power.

Equipment: Jump peat, Measuring Tape, Lime Powder, Thread, Score Sheet.

Procedure: The subject was asked to stand with his feet apart, parallel to each other and toes just behind the take off line, prior to jumping, the subject was asked to take a preliminary movement by flexing his knee and swinging his arms possible. The subject attempted to jump as far as possible, landing on both foot without failing backwards. All subjects were allowed three attempts on the Standing Broad Jump test

Scoring: The Measurements of the Jump was taken from the outer line of the take-off line and the nearest point of contact his body on the landing. Record the longest distance jumped from the best of three attempts was recorded as the score. Measurement was taken to the meter.



3.8.2 Physiological Variables

3.8.2.1 Resting Pulse Rate

Purpose: To measure resting pulse rate per minute.

Equipment: Stopwatch and chair.

Purpose: The pulse rate of all the subject were recorded in a sitting position in the morning session between 6.00 am before taking the pulse rate, the subjects were asked to sit in a chair and relax for 15 min. To record the pulse rate, the three finger tips were placed or the left radial artery at the wrist in such a manner that pulse was clear.

Scoring: The number of pulse was conducted for 15 seconds and then multiplies by four to record for full minute.

3.8.2.2 Vital Capacity

Purpose: To measure lungs capacity

Equipment: Digital Dry Spirometer

Procedure: By using a digital dry spirometer and small computer program, vital capacity was determined. Before the test, subjects were instructed to take a deep breath. Then, after inhaling as fully as possible, the subject slowly and steadily let out air with the aid of a clip, taking care to prevent air from escaping through the nose or around the edges of the mouse piece. The examiner carefully considered the results and chose the best of the three.

Scoring: Three chances were given to each test subject, and the best of those was recorded.

3.8.2.3 Blood Pressure

Purpose: To measure Blood pressure.

Equipment: Blood pressure cuff, Digital sphygmomanometer.

Procedure: Blood pressure was measured by a digital blood monitor. A blood pressure cuff is placed on the upper arm and just above the elbow. And with just a push of a button, the monitor is activated and automatically displays systolic and diastolic blood pressure based on changes in blood volume in the arteries.

3.9 Collection of the Data

The data was collected on the selected physical and physiological variables as per the methods described above. The pre-test data were collected prior before the training programme and post test data were collected immediately after the eight weeks of resistance circuit training, intensive interval training from two experimental groups and a control group.

3.10 Statistical Techniques

The data collected from the three groups before and immediately after the training program were statistically analysed on the selected criteria variables with Analysis of Covariance (ANCOVA). as long as he "F" ratio for adjusted post-test means was significant, Scheffe's post hoc test was followed to determine which of the paired mean differences was significant. In all cases, a confidence level of ($p<0.05$) was set to test the hypothesis.