Chapter - III

PROCEDURE

In this chapter the procedure adopted for the selection of the subject, experimental design, reliability of data, criterion measures, training program, collection of data and the statistical technique for the analysis of data have been described.

Selection of Subjects

Fifty six male students studying in ninth, tenth and eleventh classes of Ramjas School, R.K. Puram, New Delhi were selected as subjects for this experiment. These subjects were selected randomly. The age of these subjects ranged from 14 to 16 years. Before the commencement of the scientific investigation, the investigator checked the health record of these students maintained by the school and also at his own level with the help of a qualified Doctor of a local private clinic who conducted a few medical tests to ensure that all the subjects were medically fit to undergo the type of training program they were subjected to. After scrutiny of the health records, medical reports prepared by the doctor and general check up, it was ensured that all the subjects were fit to undertake the work load of experiment.

Prior to the commencement of this experiment a meeting of all the selected subjects was held. The purpose of this study along with the various testing protocols and training programs were explained to them in detail so that there was no ambiguity in their minds regarding the efforts required by them and the hard work they would have to put in. All the subjects were convinced and agreed to cooperate whole heartedly in the experiment.
Experimental Design

Random control group design was adopted for the present experimental study. Fifty six subjects were divided at random into four equal groups of fourteen subjects each i.e. total four groups were formed which were named as Group A, Group B, Group C and Group D in which Group A,B, and C, were experimental groups and group D was control group. The following experimental treatments were assigned to these four groups at random. However these groups were not equated:

1. Circuit training five days a week was assigned to Group A
2. Circuit training four days a week was assigned to Group B.
3. Circuit training alternate days was assigned to Group C.
4. Group D served as control group and was not subjected to any experimental treatment.

Group A, B, and C participated in the planned training program for a period of 10 weeks but all the four groups were tested every alternate weeks for 20 weeks. However, they kept participating in the required physical education classes of the school curriculum.

Reliability of Data

The reliability of the data were ensured by establishing the instrument reliability, testers competency, reliability of tests.

Instrument Reliability

Electronic stop-watches, measuring tape, weight training equipments used in this study were obtained from the reputed supplier of standard firms which cater to the needs of various research laboratories in India. All the instruments
used were available in the Department of Physical Education, Ramjas School, R.K.Puram, New Delhi-110 022. The calibration of these instruments was certified by the suppliers and verified by the investigator himself after their repeated operations and consistency in results.

Tester Competency and Reliability of Tests

As far as the test regarding physiological variables were concerned the scholar took the help of a qualified Medical Doctor of the school who was competent enough to undertake the test of physiological variable such as test of Blood pressure (Systolic and Diastolic) and Haemoglobin of the experimental subjects. The research Scholar conducted motor fitness test included in this study with the help of Qualified Physical Education Teachers. The scholar himself is a qualified physical Education Teacher and possessed competency to conduct the test efficiently and precisely. Therefore, the collected data was considered to be reliable for analysis and interpretations. The tests used to collect the data were standard tests and were considered to be reliable.

Criterion Measure

The criterion measures for testing the Hypothesis were:

SYSTOLIC and DIASTOLIC BLOOD PRESSURE:
Systolic and Diastolic blood pressure of the subjects were measured by Dial sphygmomanometer and stethoscope.

HAEMOGLOBIN : The haemoglobin of the subjects was measured by applying Sahli’s Acid Haematin method test

SPEED : The speed of the subjects was measured through applying 50 meters dash test
AGILITY: The agility of the subjects was measured through 10 mts x 4 times shuttle run test

ENDURANCE: The endurance of the subjects was measured through applying 800 mts run/walk

FLEXIBILITY: The flexibility of the subjects was measured through Wells sit and Reach Test.

EXPLOSIVE STRENGTH: The explosive strength of the subjects was measured by Standing broad jump test

Circuit Training and its events

It is very important to establish the number of exercises and the total circuit time; so that the pulse rate of the subjects to be raised 150-170/minute. The physiological effects of exercise and training depends a great deal on the specificity of training. Cafferty and Morvath (1977) have concluded that training effects would depend upon specific type of exercises, intensity and duration of training program. After going through the related literature, seven exercises were selected for circuit training by the investigator. The sequence of exercises were Bench press, skipping on the spot, leg raising in lying position, Bench stepping, situps, Good morning exercise and squat and jump.

In the light of above circuit training was administered to three experimental groups, namely, Group A, Group B, and Group C. The circuit training program was planned and prepared by the investigator in consultation with experts also in the field of training method.

The set of exercises in circuit training method included in the program have been shown in figure 3.1
The subjects moved to the next station in an anticlockwise after completion of exercise at one station.

**GROUP A**

5 days a week training group

Training days: Monday, Tuesday, Wednesday, Thursday and Friday

Rest days: Saturday and Sunday

**SCHEDULE OF THE EXPERIMENTAL TREATMENTS FOR TEN WEEKS**

**First and Second Weeks**

<table>
<thead>
<tr>
<th>a)</th>
<th>Intensity of Load</th>
<th>40-50% of the maximum</th>
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<tbody>
<tr>
<td>b)</td>
<td>Duration of each exercise</td>
<td>30 second on each station</td>
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<tr>
<td>c)</td>
<td>Rest pause after one exercise</td>
<td>15 seconds</td>
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<td>d)</td>
<td>Influence time for exercise</td>
<td>210 seconds</td>
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<td>stimulus was fixed at</td>
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<td>e)</td>
<td>One rotation in circuit training</td>
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<tr>
<td>f)</td>
<td>Rest phase after each round</td>
<td>180 seconds</td>
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<tr>
<td>g)</td>
<td>Rounds of circuit training</td>
<td>3</td>
</tr>
<tr>
<td>h)</td>
<td>Testing of physiological and</td>
<td>2nd weeks Saturday</td>
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<td></td>
<td>Motor variables</td>
<td></td>
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**Third and Fourth Weeks**

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<tr>
<th>a)</th>
<th>Intensity of load</th>
<th>40-50% of the maximum</th>
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<tr>
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<td>Rest pause after one exercise</td>
<td>15 seconds</td>
</tr>
</tbody>
</table>
d) Influence time for exercise stimulus was fixed at : 210 seconds

e) One rotation in circuit training was fixed at : 300 seconds

f) Rest phase after each round : 180 seconds

g) Rounds of circuit training : 3

h) Testing of physiological and Motor variables : 4th weeks Saturday

Fifth and Sixth Weeks

a) Intensity of load : 50-60% of the maximum

b) Duration of each exercise : 30 second on each station

c) Rest pause after one exercise : 15 seconds

d) Influence time for exercise stimulus was fixed at : 210 seconds

e) One rotation in circuit training was fixed at : 300 seconds

f) Rest phase after each round : 180 seconds

g) Rounds of circuit training : 3

h) Testing of physiological and Motor variables : 6th weeks Saturday

Seventh and Eighth Weeks

a) Intensity of load : 50-60% of the maximum

b) Duration of each exercise : 30 second on each station
c) Rest pause after one exercise : 15 seconds
d) Influence time for exercise stimulus was fixed at : 210 seconds
e) One rotation in circuit training was fixed at : 300 seconds
f) Rest phase after each round : 180 seconds
g) Rounds of circuit training : 3
h) Testing of Physiological and Motor variables : 8th weeks Saturday.

Ninth and Tenth Weeks

a) Intensity of load : 60-70% of the maximum
b) Duration of each exercise : 30 second on each station
c) Rest pause after one exercise : 15 seconds
d) Influence time for exercise stimulus was fixed at : 210 seconds
e) One rotation in circuit training was fixed at : 300 seconds
f) Rest phase after each round : 180 seconds
g) Rounds of circuit training : 3
h) Testing of Physiological and Motor variables : 10th weeks Saturday
GROUP - B

4 days a week training

Training days: Monday, Tuesday, Wednesday and Thursday.

Rest days : Friday, Saturday and Sunday.

SCHEDULE OF THE EXPERIMENTAL TREATMENTS FOR TEN WEEKS

First and Second Weeks

a) Intensity of load : 40-50% of the maximum
b) Duration of each exercise : 30 second on each station
c) Rest pause after one exercise : 15 seconds
d) Influence time for exercise stimulus was fixed at : 210 seconds
e) One rotation in circuit training was fixed at : 300 seconds
f) Rest phase after each round : 180 seconds
g) Rounds of circuit training : 3
h) Testing of Physiological and Motor variables : 2nd weeks of Friday

Third and Forth Weeks

a) Intensity of load : 40-50% of the maximum
b) Duration of each exercise : 30 second on each station
c) Rest pause after one exercise : 15 seconds
d) Influence time for exercise stimulus was fixed at : 210 seconds
e) One rotation in circuit training was fixed at: 300 seconds
f) Rest phase after each round: 180 seconds
g) Testing of Physiological and Motor variables: 4th weeks Friday

Fifth and sixth Weeks

a) Intensity of load: 40-50% of the maximum
b) Duration of each exercise: 30 second on each station
c) Rest pause after one exercise: 15 seconds
d) Influence time for exercise stimulus was fixed at: 210 seconds
e) One rotation in circuit training was fixed at: 300 seconds
f) Rest phase after each round: 180 seconds
g) Testing of Physiological and Motor variables: 6th weeks Friday

Seventh and eighth Weeks

a) Intensity of load: 50-60% of the maximum
b) Duration of each exercise: 30 second on each station
c) Rest pause after one exercise: 15 seconds
d) Influence time for exercise stimulus was fixed at: 210 seconds
e) One rotation in circuit training was fixed at : 300 seconds
f) Rest phase after each round : 180 seconds
g) Testing of Physiological and Motor variables : 8th weeks Friday

**Ninth and Tenth Weeks**

a) Intensity of load : 60-70% of the maximum
b) Duration of each exercise : 30 second on each station
c) Rest pause after one exercise : 15 seconds
d) Influence time for exercise stimulus was fixed at : 210 seconds
e) One rotation in circuit training was fixed at : 300 seconds
f) Rest phase after each round : 180 seconds
g) Testing of Physiological and Motor variables : 10th weeks Friday

**GROUP - C**

**Alternative days training**

Training days : Alternative day
Rest days : Every alternative day

**SCHEDULE OF THE EXPERIMENTAL TREATMENTS FOR TEN WEEKS**

**First and Second Weeks**

a) Intensity of load : 40-50% of the maximum
b) Duration of each exercise : 30 second on each station

c) Rest pause after one exercise : 15 seconds

d) Influence time for exercise stimulus was fixed at : 210 seconds

e) One rotation in circuit training was fixed at : 300 seconds

f) Rest phase after each round : 180 seconds

g) Testing of Physiological and Motor variables : 2nd weeks Friday

Third and forth Weeks

a) Intensity of load : 40-50% of the maximum

b) Duration of each exercise : 30 second on each station

c) Rest pause after one exercise : 15 seconds

d) Influence time for exercise stimulus was fixed at : 210 seconds

e) One rotation in circuit training was fixed at : 300 seconds

f) Rest phase after each round : 180 seconds

g) Testing of Physiological and Motor variables : 4th weeks Friday

Fifth and Sixth Weeks

a) Intensity of load : 50-60% of the maximum

b) Duration of each exercise : 30 second on each station

c) Rest pause after one exercise : 15 seconds
d) Influence time for exercise stimulus was fixed at: 210 seconds

e) One rotation in circuit training was fixed at: 300 seconds

f) Rest phase after each round: 180 seconds

g) Testing of Physiological and Motor variables: 6th weeks Friday

Seventh and eighth Weeks

a) Intensity of load: 50-60% of the maximum

b) Duration of each exercise: 30 second on each station

c) Rest pause after one exercise: 15 seconds

d) Influence time for exercise stimulus was fixed at: 210 seconds

e) One rotation in circuit training was fixed at: 300 seconds

f) Rest phase after each round: 180 seconds

g) Testing of Physiological and Motor variables: 8th weeks Friday

Ninth and Tenth Weeks

a) Intensity of load: 60-70% of the maximum

b) Duration of each exercise: 30 second on each station

c) Rest pause after one exercise: 15 seconds

d) Influence time for exercise stimulus was fixed at: 210 seconds
METHODS AND PROCEDURES FOR CONDUCTING CIRCUIT TRAINING

The circuit training program was conducted in a 30'x20' fitness room of Ramjas School, R.K. Puram, New Delhi. There were seven stations, each of which had a different kind of exercise i.e. Bench press, skipping on the spot, Leg raising in laying position, Bench stepping, sit ups, Good morning exercise and squat and jump as shown in figure 3.1.

Each Station was located at an equal distance. To conduct circuit training, the scholar positioned himself in the center of the circuit with a stop watch in his hand. At a time seven subjects were allowed to participate in circuit training. The scholar used the command "Performers Ready"............. "Begin"............"Stop:"............"Rotate Stations".............to keep the circuit going smoothly. The subjects moved to the next station in an anticlock wise after completion of exercise at one station and likewise the subjects completed the exercises on all stations and after completion of one round in a particular time, the subjects were allowed to take rest for about 3 minutes to bring down the pulse rate to 110-120/min. which was raised through exercise to about 160-170/min. The subjects were able to take next work with a pulse rate at 110-120/min without undue fatigue. The subjects took total three rounds in the
CIRCUIT TRAINING MODEL

FIGURE - 3.1
First four weeks and four rounds in sixth and eighth week and on the tenth week the subjects took five rounds in all.

The three experimental groups i.e. Group A, Group B, and Group C were given treatments for ten weeks, and the load was also revised after every two weeks of training as given in schedule of the experimental treatments for ten weeks. The three experimental groups as well as control group were tested on selected physiological and motor fitness variable after every two weeks of training.

After suspension of training the testing process continued upto ten weeks with in an interval of two weeks to find out the carry over effect of training on experimental variables.

Conduct of test and Collection of Data

The necessary data were collected by administering the tests for selected physiological variables i.e. systolic blood pressure, diastolic blood pressure, haemoglobin and selected motor fitness variables i.e. speed, agility, endurance flexibility, explosive strength following standard procedures of test administration. The tests were conducted on all the four groups prior to experiment, during experiment and after experiment with an interval of two weeks each upto ten weeks during training. Similarly, the test was also administered after suspension of circuit training period for another ten weeks so that the level of fitness retained by the various groups could be ascertained. All the tests were administered in fitness room and play grounds of Ramjas School, R.K. Puram, New Delhi.
A brief orientation of test protocol was explained to the subjects to remove their anxiety. To ensure uniformity in testing condition, the subjects were tested between 12.30 p.m. to 2.45 p.m. by the same individual and researcher.

**Blood pressure**

The blood pressure (systolic and diastolic) was measured with the help of standard sphygmomanometer. The armlet was applied at the left arm, so that the middle of the rubber tied over the inner side of the arm with its lower edge one inch above the bend of the elbow. It fitted closely and evenly. The stethoscope was placed firmly but rightly at the bent elbow just below the cuff. The bag was inflated until the pulse ceased and then allowed to fall by releasing air pressure gently. The systolic blood pressure was recorded at the point where the taping sound was heard. The pressure was further lowered and the diastolic was recorded when the sound became muffled.

**Blood haemoglobin Content**

Sahil's Acid Haematin method was used for the estimation of haemoglobin content in the blood, using Sahil's Haemometer supplied by a well known company of West Germany. The instrument was designed and calibrated in accordance with the standards laid down by the German Medical Associate.

The haemometer puppeteer the haemometer tobs and the stirrer were thoroughly cleaned and dried. In the haemometer tube N/10 Hydrochloric Acid was taken upto the 20th division on the percentage scale,. The tube than was placed in the comparator in the space provided for it. The pricking needle was sterilized by swabbing it with rectified spirit and then heated over the flame of a
Bunsen burner. The top of the left ring finger of the subject was cleaned using rectified spirit. The finger was allowed to lay up and then punctured boldly with the pricking needle. Exactly 20 cubic millimeters of blood was drawn into the N/10 HCL contained in the haemometer tube and thoroughly mixed by rinsing the pipette with the acid several times. The tube was then allowed to stand in the Comparator for about ten minutes for the maximum development of colour. Distilled water was added drop by drop to the mixture. With every drop of distilled water added to solution, it was stirred thoroughly and then the tube was taken out of the comparator and the stirrer was removed from the tube. The reading on the haemoglobin scale on the tube was read at the level of lower meniscurs of the solution avoiding parallax error. The scale was provided in grams of haemoglobin content per 100 ml of blood.

**Speed Test (50 meters Dash)**

**Equipment used and Marking**

**Clapper and stop watches**

50 meters distance was measured with the parallel lines with a gap of 1.22 metres in between two consecutive lines.

**Description of the Test:**

All the subjects ran in sports shoes. Sitting start was adopted by all. The starting command used by research scholar was "On your marks", "set" and in place of "GO" the clapper was sounded. Before appearing in the test the subjects were instructed to keep their own lanes. Four stop watches were used by the time keepers at the finishing line to record the time of each subject.
Scoring

The elapsed time from the starting signal until the runner's torso crossed the finish line was recorded to the nearest one tenth of a second as score for each subject.

Agility (10 metres x 4 times shuttlerun)

Equipment: Four blocks of wood, 2 inches x 2 inches x 4 inches, and stop watches (2 in number)

Description: Two parallel lines were marked on the ground 10 metres apart. Two blocks were placed behind one of the lines. On signal, the subject started from behind the line and ran up to the blocks, picked up one and ran back to the starting line and placed the block behind it. Again ran back to pick up the second block, which he carried back across the starting line. Two trials were given to each subject.

Scoring. The better time of the two trials to the nearest tenth of a second was recorded as a raw score.

Endurance Test (800 metres run-walk)

Equipment used and Marking

Clapper and stop watches

200 metres track was marked by the research scholar

Description of the Test:

All the subjects ran in Sports shoes. Standing start was adopted by all. The starting command used by research scholar was "On your marks" and in place of "GO" the clapper was sounded. Before appearing in the test, the subjects were instructed to overtake from right side. Two subjects ran at a
time. One stop watch was used for each subject by the time keeper at the finishing line to record the time.

The elapsed time from the starting signal until the runner’s torso crossed the finish line was recorded in minutes and seconds for each subject.

**Flexibility (Wells sit and reach test)**

Equipment. The equipment consists of a 24 x 8 inch piece of plywood with lines drawn horizontally at half-inch intervals. The center line was marked 0, the inch lines on one side were numbered from 1 up, and those on the opposite side were numbered from 1 up. The support for the scale was in form of a plus sign made of 11-inch boards and the stem board. Footprints were outlined on the surface of the cross board one on either side of the stem board. The scale was attached to the upper edges of the support in such a way that when the subject seated on the floor with feet against the foot prints, the zero line coincided with the near surface of the cross board and minus values were towards the subject.

Description. The subject placed in the footprints on the cross board, then the subject reached forward, plans down, along the scale. The maximum distance reached was recorded as the measure of flexibility.

Scoring. Recording was done in inches.

**Explosive strength (standing broad jump)**

Equipment. Take-off board, Measuring tape.

Description. A take-off line was drawn near one edge of a jumping pit. The subject was asked to take his position with toes just touching the take-off line, feet slightly apart. Taking off from the both feet simultaneously, he jumped to
cover maximum possible horizontal distance, landing on both feet, while jumping, he crouched slightly and swung the arms to aid the jump. Three trails were given to him, the best of three being credited as his score. The horizontal distance between the take off line and the nearer break made in landing was measured.

Scoring. Recording was done in centimeters.

**Statistical Design**

The collected data was computerized and analysis of covariance (ANCOVA) was applied to find out the significant difference of mean gain among the four groups they have shown every two weeks of the experimental durations. ANCOVA was also applied to find out the deconditioning trend of post training of the scores collected after every two weeks.