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# COMBINED EFFECTS OF AEROBIC EXERCISE ON PHYSIOLOGICAL AND BIOCHEMICAL ASPECTS AMONG IT PROFESSIONALS FROM TRIVANDRUM CITY

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## INTRODUCTION :

Health is a common theme in most culture in fact all communities have their concepts of health as part of their culture. Among definition still used, probably the oldest is that health is the "absence of disease". In same culture, health and harmony are considered equivalent, harmony being defined as "being at peace with the self, the community, God and cosmos". The ancient Indians, the Greeks shared this concept and attributed disease to disturbance in bodily equilibrium of what they called 'humors' The determinants of health are not yet clear; the current definition of health are elusive and there is no single yard – stick for measuring health. There is, thus, a great scope for the study of the 'epidemiology' of health.

During the past few decades, there has been reawakening that health is fundamental human right and worldwide social goal that essential to the satisfaction of basic human needs and to an important quality of life and that is to be attained by all people.

'Aerobic capacity' describes the functional capacity of the cardio respiratory system, (the heart, lungs and blood vessels). Aerobic capacity is defined as the maximum amount of oxygen the body can use during a specified period, usually

during intense exercise. It is a function both of cardio respiratory performance and the maximum ability to remove and utilize oxygen from circulating blood. To measure maximal aerobic capacity, an exercise physiologist or physician will perform a $VO_2$ max test, in which a subject will undergo progressively more strenuous exercise on a treadmill, from an easy walk through to exhaustion. The individual is typically connected to a respirometer to measure oxygen consumption, and the speed is increased incrementally over a fixed duration of time. The higher the measured cardio respiratory endurance level, the more oxygen has been transported to and used by exercising muscles, and the higher the level of intensity at which the individual can exercise. More simply stated, the higher the aerobic capacity, the higher the level of aerobic fitness. The Cooper and multi-stage fitness tests can also be used to assess functional aerobic capacity for particular jobs or activities.

The degree to which aerobic capacity can be improved by exercise varies very widely in the human population : While the average response to training is an approximately 17% increase in $VO_2$ max, in any population there are "high responders" who may as much as double their capacity, and "low responders" who will see little or no benefit from training. Studies indicate that approximately 10% of otherwise health or no benefit from training. Studies indicate that approximately 10% of otherwise healthy individuals cannot improve their aerobic capacity with exercise at all. The degree of an individual's responsiveness is highly heritable, suggesting that this trait is genetically determined.

Modern technology has enabled present day society to exist in a world where the concept of hard or even moderate physical work is almost absolute. We are constantly looking for different ways to make life even easier. People of present times have experienced more changes and crises than any other generation. As a result many people lack physical fitness this leads on to the various changes in the body. This changes and crises have altered the human environment.

A fit person possesses at least adequate level of health related fitness components and each of the skill related fitness components. Boy composition, cardio vascular fitness, flexibility, muscular endurance and strength are the health related components of physical fitness. Agility, balance, coordination, power, reaction time and speed are the often considered to be the main components of skill-related physical fitness. A minimum amount of physical fitness is very essential for disease prevention and health promotion.

Fitness is operationalised in the present day western societies with a focus on two goals – performance and health, Performance relate fitness refers to those components of fitness that are necessary for optimal work of sport performance. Health related fitness refers to those components of fitness that are affected favorably or unfavorably by habitual physical activity and related to health status. One of the most important aspect of health related fitness is the cardiovascular endurance or the aerobic capacity of an individual. Aerobic means in the presence of Oxygen. Hence aerobic fitness can be defined as the ability to take in, transport and utilize Oxygen. Since aerobic fitness involves so many important organs and systems. It tells much about of these components and about the health in general. That is when aerobic fitness is high, physically and mental health is enhanced.

Selected variables:-

a. Physiological Variables : a) Resting Heart Rate

|  |  |  | b) Blood Pressure |
| b. | Psychological Variables | : | a) Self Esteem |
|  |  |  | b) Stress |
| c. | Bio Chemical Variables | : | a) Low Density Lipoproteins (LDL) |
|  |  |  | b) High Density Lipoproteins (HDL) |

## MEHODOLOGY

Fifty women (N=50) working in Techno park Trivandrum were selected as the subjects. They were equally divided in to two groups (n=25) of which one group acted as experimental group and other group acted as control group. All the subjects were tested before and after the studies.

**The tested variables were :-**

| 1. | Physiological Variables | : | a) Resting Heart Rate |
|  |  |  | b) Blood Pressure |
| 2. | Psychological Variables | : | a) Self Esteem |
|  |  |  | b) Stress |
| 3. | Bio Chemical Variables | : | a) Low Density Lipoproteins (LDL) |
|  |  |  | b) High Density Lipoproteins (HDL) |

## Procedure

## RESTING PULSE RATE

Purpose:- The purpose of the test was to measure the resting heart rate.

Equipment:- A stop Watch

Procedure :-

The investigator recorded the pulse rate by pupating the radial artery for one full minute for each subjects. Before taking the pulse rate the subjects were asked to sit on a chair and relax. The resting pulse was taken at early morning.

Scoring:- The number of pulse rates counted in one minutes.

## BLOOD PRESSURE

Purpose:- The purpose of the test was to measure the blood pressure of the subject.

Equipment:- Standardized sphygmomanometer and a stethoscope.

Procedure :-

Standardized sphygmomanometer and a stethoscope were used to use for measuring blood pressure. The subject was placed in comfortable position before the measurement was taken. While taking blood pressure the subjects left arm was completely based to make certain that the clothing didn't constrict the blood vessel. The measurement was taken with the subject in sitting position. The calf was wrapped around the arm evenly with lower edge approximately one inch above the anticabital space. It was made sure that the stethoscope was free from contact with the calf. The calf was inflated until the artery was fully collapsed to the extent that no pulse beat could be heard. Pressure of the calf was then slowly released as the investigator watched the gauge. When sound of the pulse become audible the reading in millimeter of increasing (mmof Hg) at that instant was recorded as the systolic pressure. The pressure was further released gradually as the sound of the pulse change in intensity and quality. The index of the diastolic pressure was noted in mmof Hg when the heart beat sound completely ceased.

## SELF ESTEEM

Purpose:- The purpose of this test was to measure the self esteem of the individual.

**Equipment:- Standardized Questioner.**

**Procedure :-**

The questioner was administered to all subjects for the study by the investigator himself. The object of the study was explained to the subjects. Incase of any doubts about questions that was clarified by the investigator.

## SCORING OF SELF ESTEEM

Rosen berg's self esteem scale is a ten item questionnaire with fair choice for each item ranging from

Strongly agree .........................1
Agree .........................2
Disagree .........................3
Strong disagree .........................4

Some of the statement have reverse wording to control the response bias. Scoring for statement 3,5,8,9 and 10 were reversed in calculation. Total score sub scale were indicated below.

1................4
2................3
3................2
4................1

One this scale a high numerical score indicated low self esteem while a low numerical score indicated high self esteem. A score of 10 is minimum represent the highest self esteem, while the maximum is 40, represents the lowest possible self esteem.

# STRESS

**Purpose:-** The purpose of this test was to measure the self stress inventory of the individual.

**Equipment:-** Standardized Questioner.

**Procedure:-** The questioner was administered to all subjects for the study by the investigator himself. The object of the study was explained to the subjects. In case of any doubts about questions that was clarified by the investigator. The total test consists of three tests. These tests are given below. All these data were calculated separately and examined the differences if any.

## STRESS INVENTOY AND COPING STRATEGIES BY GIRDANO AND EVERLY (1979)

The purpose of the test is to assess the degree of stress due to:

a. Frustration and inhibition (test 1)
b. Vulnerability and over load (test 2)
c. Compulsive, Time urgent and aggressive behavioral traits (test 3)

The three factors have 10 item each, each question have four possible responses, Negative statement's responses were reverse, subject responded to each statement using four points scale varying from.

4......Almost always true
3......Usually true
2......Usually false
1.....Almost always false

Question number 1 and 10 in test one are calculated in a reverse manner.

## Scoring a Test

The test scores is calculated by talking the scores of all three section separately and a score of 25 or more in any factor indicated that the person in vulnerable to stress.

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**LOW DENSITY LIPOPROTEINS (LDL)**

**&**

**HIGH DENSITY LIPOPROTEINS (HDL)**

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Purpose :- The purpose of this was to measure the amount of cholesterol in terms Low density lipoprotein and High intensity lipoprotein.

Procedure: A standardized Laboratory is used to find out the Lipid profile test. The lipid profile test would give the values of LDL and HDL.

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### Experimental Design

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Random group design was used in this study. The subjects numbering 50 sedentary women of working in Tecnopark Trivandrum, divided in to experimental control group, consisting of 50 subjects each. Among the sedentary women one group was randomly assigned the training programme and the other acted as control group. The subjects were selected at random and assignments of treatment were also at random. The experimental groups were given an aerobics programme thrice a week for a period of three months. The training programme was same throughout and the only difference being the increase in load after every one and half weeks and the increase in the sets after the first and two weeks.

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## Administration of the Training Programme

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The experimental group had to under to dance aerobic programme thrice a week ie on Monday s, Wednesday s, and Friday s for the period of three months. The control group did not involve in any session of training. The training was of low impact as the age group was 22-25 years. The aerobic activity included the exercise

of the whole body. Exercise was done to music. The aerobic included warm-up, work out (Aerobic dance) and cool down session for 35 minutes duration.

## ANALYSIS OF DATA AND RESULTS OF THE STUDY

A total of 50 subjects were divided into two equal groups, each group consisting of twenty five subjects, out of which one group acted as experimental group and other group served as control group. The experimental group underwent the aerobic exercise for a period of twenty four weeks and the control group did not take part any sort of exercise programme. All the subjects of the two groups were tested on selected variable. Physical, physiological, biochemical and psychological parameters. The test were conducted prior to and after the training period.

To find out the difference in each variable due to the application of aerobic exercise programme, t-test was applied to examine the differences.

### Findings

Finding pertain the effect of Aerobic programme on each of the selected variables have been given below.

### Table I
### THE STATISTICAL RESULTS OF THE EXPERIMENTAL GROUP ON SELECTED VARIABLES

| Variables | Stage | Mean | Std. Deviation | Mean Difference | T-Value | P-Value |
|---|---|---|---|---|---|---|
| Resting pulse rate | Pre Test | 81.633 | 5.968 | 2.767 | 3.160* | P<0.01 |
| | Post Test | 78.867 | 5.704 | | | P<0.01 |
| Systolic Blood | Pre | | | | | |

| Variable | Test | Mean | SD | Mean Difference | t-value | Significance |
|---|---|---|---|---|---|---|
| Pressure | Test | 121.400 | 4.673 | 2.833 | 2.980* | $P<0.01$ |
| | Post Test | 118.567 | 5.380 | | | $P<0.01$ |
| Diastolic Blood Pressure | Pre Test | 82.533 | 5.882 | 2.433 | 2.880* | $P<0.01$ |
| | Post Test | 80.100 | 6.127 | | | $P<0.01$ |
| High density Lipoprotein | Pre Test | 43.267 | 5.589 | -1.267 | 2.901* | $P<0.01$ |
| | Post Test | 44.533 | 5.111 | | | $P<0.01$ |
| Low Density lipoprotein | Pre Test | 100.533 | 9.885 | 3.167 | 7.889* | $P<0.01$ |
| | Post Test | 97.367 | 8.962 | | | $P<0.01$ |
| Self Esteem | Pre Test | 20.767 | 3.471 | 1.467 | 4.980* | $P<0.01$ |
| | Post Test | 19.300 | 3.621 | | | $P<0.01$ |
| Stress Inventory Test-1 | Pre Test | 24.133 | 5.257 | 2.133 | 6.127* | $P<0.01$ |
| | Post Test | 22.000 | 5.173 | | | $P<0.01$ |
| Stress Inventory Test-2 | Pre Test | 24.300 | 4.942 | 1.800 | 6.058* | $P<0.01$ |
| | Post Test | 22.500 | 5.118 | | | $P<0.01$ |
| Stress | Pre | | | | | |

| Inventory Test-3 | Test Post | 24.600 | 4.658 | 1.600 | 3.788* | P<0.01 |
| | Test | 23.000 | 4.969 | | | |

*Significant at 1% level

## Table II
## THE STATISTICAL RESULTS OF THE EXPERIMENTAL GROUP ON SELECTED VARIABLES

| Variables | Stage | Mean | Std. Deviation | Mean Difference | t-Value | P-Value |
|---|---|---|---|---|---|---|
| Resting pulse rate | Pre Test | 82.657 | 5.036 | 0.733 | 1.068 | P<0.05 |
| | Post Test | 81.833 | 5.246 | | | P<0.05 |
| Systolic Blood Pressure | Pre Test | 120.833 | 7.715 | -0.700 | 1.691 | P<0.05 |
| | Post Test | 121.533 | 7.394 | | | P<0.05 |
| Diastolic Blood Pressure | Pre Test | 82.800 | 6.381 | -0.067 | 0.311 | P<0.05 |
| | Post Test | 82.867 | 5.917 | | | P<0.05 |
| High density Lipoprotein | Pre Test | 42.633 | 4.789 | 0.233 | 0.891 | P<0.05 |
| | Post Test | 42.400 | 5.203 | | | P<0.05 |
| Low Density lipoprotein | Pre Test | 102.333 | 9.789 | -0.067 | 1.461 | P<0.05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Post Test | 102.400 | 9.412 | | | P<0.05 |
| Self Esteem | Pre Test | 20.500 | 3.037 | 0.167 | 0.751 | P<0.05 |
| | Post Test | 20.333 | 3.745 | | | P<0.05 |
| Stress Inventory Test-1 | Pre Test | 24.667 | 5.047 | 0.233 | 1.421 | P<0.05 |
| | Post Test | 24.433 | 4.651 | | | P<0.05 |
| Stress Inventory Test-2 | Pre Test | 23.933 | 4.989 | 0.867 | 0.812 | P<0.05 |
| | Post Test | 23.067 | 5.126 | | | P<0.05 |
| Stress Inventory Test-3 | Pre Test | 24.700 | 4.316 | 0.467 | 1.528 | P<0.05 |
| | Post Test | 24.233 | 4.384 | | | |

No Significant at 5% level

## RESTING PULSE RATE

The pre-test mean score of experiment group in Resting Pulse Rate is 81.633 with standard deviation 5.968 and that of post test mean is found to be 78.867 with standard deviation 5.704. So the mean difference is 2.767. To example whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t value is 3.16. Since the obtained t-value is greater than the corresponding P-value and the difference is statistically significant at .01 level.

The table II shows that the pre test mean score of control group in Resting Pulse Rate is 82.567 with standard deviation 5.036 and that of post test mean is found to be 81.833 with standard deviation 5.246. So the mean difference is 0.733. To examine whether this difference between the means is statistically significant, a

paired sample t-test is performed. The calculated t value is 1.068. Since the obtained t-value is less than the corresponding P-value, and the difference is not statistically significant at .05 level.

## SYSTOLIC BLOOD PRESSURE

It is evident from the table 1 that the pre test mean of experimental group in systolic blood pressure is 121.400 with the standard deviation 4.673. The post test mean is found to be 118.567 and standard deviation 5.380. Hence the mean difference is 2.833. To examine whether this difference between the mean is statistically significant, a paired sample t-test is corresponding P-value and the difference is statistically significant at .01 level.

The table II shows that the pre test mean score is 120.833 of control group in Systolic Blood Pressure with standard deviation 7.715 and that of test mean is found to be 124.533 with standard deviation 7.394. So the mean difference is -0.700. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 1.691. Since the obtained t value is less than the corresponding P-value, and the difference is not statistically significant at .05 level.

## DIASTOLIC BLOOD PRESSURE

The table I shows that the pre test mean of experimental group in Diastolic blood pressure is 82.533 with the standard deviation 5.882 and that of post test mean is found to be 80.100 and standard deviation 6.127. However the mean difference is 2.433. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 2.880. Since the obtained t-value is greater than the corresponding P-value and the difference is statistically significant at .01 level.

The table II shows that the pre test mean score is 82.800 of control group in Diastolic blood pressure with standard deviation 6.381. The post test mean is found to be 82.867 with standard deviation 5.917. So the mean difference is -067. To examine whether this difference t-test is performed. The calculated t value is .0311.

The obtained t value is less than the corresponding P-value, and the difference is not statistically significant at .05 level.

## HIGH DENSITY LIPOPROTEIN (HDL)

The pre-test mean of experimental group in High density Lipoprotein with standard deviation 5.598 and that of post test is found to be 44.553 with standard deviation 5.111. So the mean difference is -1.267. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 2.901. Since the obtained t-value is greater than the corresponding P-value, and the difference is statistically significant at .01 level.

The table II shows that the pre test mean score of control group in High Density Lipoprotein is 42.633 with standard deviation 4.789 and that of post test mean is found to be 42.400 with standard deviation 5.203. So the mean difference is 0.233. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 0.891. Since the obtained t-value is less than the corresponding P-value, and the difference is not statistically significant at .05 level.

## LOW DENSITY LIPOPROTEIN (LDL)

The table I shows that the pre test mean is 100.533 of experimental group in Low Density lipoprotein with the standard deviation 9.885 and that of post test mean is found to be 97.367 and standard deviation 8.962. Hence the mean difference is 3.167. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 7.889. Since the obtained t-value is greater than the performed. The calculated t-value is 7.889. Since the obtained t-value is greater than the corresponding P-value and the difference is statistically significant at .01 level.

The table II shows that the pre test mean score of control group in Low density Lipoprotein is 102.333 with standard deviation 90789 and that of post test mean is found to be 102.400 with standard deviation 9.412. So the mean difference is -0.067.

To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 1.461. Since the obtained t-value is less than the corresponding P-value, the difference is not statistically significant at .05 level.

## SELF-STEEM

It is evident from the table I that the pre-test mean of experimental group in Self-Esteem is 20.767 with the standard deviation 3.471 and that of post test mean is found to be 19.300 and standard deviation 3.621. Hence the mean difference is 1.467. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 4.980. Since the obtained t-value is greater than the corresponding P-value and the difference is statistically significant at .01 level.

The table II show that the pre test means score of control group in Self-esteem is 20.500 with standard deviation 20.333 and that of post test mean is found to be 3.037 with standard deviation 3.745. So the mean difference is 0.167. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 0.751. Since the obtained t-value is less than the corresponding P-value, and the difference is not statistically significant at .05 level.

## STRESS

## STRESS INVENTOY TEST-1 (Frustration and Inhibition)

The pre-test mean of experimental group in Stress Inventory test-1 (Frustration and Inhibition) is 24.133 with standard deviation 5.257 and that of post test mean is found to be 22.000 with standard deviation 5.173. So the mean difference is 2.133. To examine whether this difference between the means is statistically significant, a paired sample t-test is performed. The calculated t-value is 6.127. Since the obtained t-value is greater than the corresponding P-value, the difference is statistically significant at .01 level.

The table II show that the pre test mean score is 24.667 of control group in Stress inventory test-I (Frustration and inhibition) with standard deviation 5.047 and that of post test mean is found to be 24.443 with standard deviation 4.651. So the mean difference is 0.233. To examine whether this difference between the mean is statistically significant, a paired sample t-test is performed. The calculated t-value is 1.421. Since the obtained t-value is less than the corresponding P-value, the difference is not statistically significant at .05 level.

## STRESS INVENTOY TEST-2 (Vulnerability and Over Load)

The table I show that the pre test mean of experimental group in stress Inventory test-2 (Vulnerability, and over load) is 24.300 with the standard deviation 4.942 and that of post test mean is found to be 22.500 and standard deviation 5.118. Hence the mean difference is 1.800. To examine whether this difference between the mean is statistically significant, a paired sample t-test is performed. The calculated t-value is 6058. Since the obtained t-value is greater than the corresponding P-value, the difference is statistically significant at .01 level.

The table II shows that the pre test mean score of control group in Stress Inventory test-2 (Vulnerability and Over load) is 23.993 with standard deviation 4.989 and that of post test mean is found to be 23.067 with standard deviation 5.126. So the mean difference is 0.867. To examine whether this difference between the means is statically significant, a paired sample t-test is performed. The calculated t-value is 0.812. Since the obtained t-value is less than the corresponding P-value. The difference is not statistically significant at .05 level.

## STRESS INVENTOY TEST-3 (Compulsive, Time-urgent and Aggressive Behavioral Traits)

It is evident from the table I that the test mean is 24.600 of experimental group in Stress inventory test-3 (Compulsive, Time urgent and Aggressive Behavioral Traits) with the standard deviation 4.658 and that of post test mean is found to be 23.000 and standard deviation 4.969. Hence the mean difference is 1.600. To examine whether this difference between the mean is statistically significant, a paired sample t-test is performed. The calculated t-value is 3.788. Since the obtained

t-value is greater than the corresponding P-value, the difference is statistically significant at .01 level.

The table II shows that the pre test mean score of control group in Stress Inventory test 3(Compulsive, Time-Urgent and Aggressive Behavioral Traits) is 24.700 with standard deviation 4.316 and that of post test mean is found to be 24.233 with standard deviation 4.384. So the mean difference is 0.467. To examine whether this difference between the mean is statistically significant, a paired sample t-test is performed. The calculated t-value is 1.528. Since the obtained t-value is less than the corresponding P-value, the difference is not statistically significant at .05 level.

## DISCUSSION OF FINDING

Obesity results from a combination of environmental factors, like : low level of physical activity, excessive intake of high-energy food, and genetic predisposition to storage of fat. Excess fat weight compromises health and is evidence by a higher rate of coronary heart disease, hypertension, dyslipidemias, diabetes, gallstones, osteoarthritis, and cancers of the reproductive organs in the obese population.

The potential benefits of regular physical activity in reducing obesity are well documented. Regular exercise expends calories that can result in reduced fat storage in the body's fat cells. At the same time, exercise designed to build muscle fitness increases lean body tissue (muscle), which can result in a lesser relative percentage of fat in the body and a higher resting metabolism. Physical activity has great potential for reducing the incidence of obesity in our society.

Women are genetically pre-determined to have a greater amount of body fat that men. Women need more body fat in order to maintain the normal reproductive process of menstruation and pregnancy. In addition, fat is absolutely essential for many other human physiological process such as nerve conduction, insulation of organs and insulation from cold, proper skin health, and transport of vitamins, to name a few.

Exercise plays an important role in weight control by increasing energy output, calling on stored calories for extra fuel. Recent studies show that not only

does exercise increase metabolism during a workout, but it causes your metabolism to stay increased for a period of time after exercising, allowing you to burn more calories.

## KEY FINDINGS

The study enlighten the effect of Aerobic exercise programme on Physiological, Biochemical and Psychological parameters of fifty female students Tecnopark, Trivandrum acted as the subject of the study. The experimental group underwent the Aerobic training programme for a period of three months and control group did not take part any exercise programme.

The effect of Aerobic exercise programme on the selected variables in experimental group seems to be the best exercise programme because it was proved that has got a tremendous significant impact on all the variables tested. This programme had improved the Physiological variable where the Resting Heart Rate and Systolic and Diastolic blood pressure decreases due to the exercise programme. The same way this programme improved the Biochemical parameters in which the High Density Lipoprotein (HDL) increased where as the Low Density Lipoprotein (LDL) decrease. Finally this study also examined the effect of this exercise programme on the Psychological aspects too. This Aerobic exercise programme improved the level of Self-esteem and also reduced the mental stress.

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