ORIGINAL RESEARCH PAPER

Physiology

KEY WORDS:

A STUDY ON EFFECTS OF PHYSICAL EXERCISE ON PHYSICAL FITNESS AND THEIR CORRELATION WITH RECOVERY OF PULSE RATE AFTER ESTABLISHING A POSSIBLE MODE OF COMMUNICATION.

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ABSTRACT

There are many studies associating physical exercise and their effect on physical fitness. Our purpose was to study the physical exercise and their effect on physical fitness. Physical exercise is the most important and well documented preventive measure for most of the life style diseases. Our purpose was to study the correlation between effect of exercise on pulse rate and how the pulse rate recover after exercise. Physical exercise is important not only to gain the state of complete physical, mental, and emotional health but also to maintain physical fitness which includes strengthening of muscles and immune system, improving cardio-respiratory efficiency, increasing bone density and so on. **The result of this study showed that there is definite difference between two groups in recovery of pulse rates. Many studies have been conducted all over the world on beneficial effects of exercise on the cardio-respiratory variables.**

INTRODUCTION :

Physical exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness. It is performed for various reasons including strengthening of muscles and cardiovascular system, sharpening athletic skills, weight loss or maintenance, as well as for the purpose of enjoyment. Frequent and regular physical exercise boosts the immune system, and helps prevent the "diseases of affluence" such as heart disease, cardiovascular disease, Type 2 diabetes and obesity(1)(2). Physical fitness is considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic diseases, and to meet emergency situations.

Physical exercise is the most important and well documented preventive measure for most of the life style diseases. Physical exercise is important not only to gain the state of complete physical, mental, and emotional health but also to maintain physical fitness which includes strengthening of muscles and immune system, improving cardio-respiratory efficiency, increasing bone density and so on. Many of these wonderful effects of exercise are mediated mainly by a hormone named as Irisin (3).

OBJECTIVE :

To find out a correlation between level of exercise on physical fitness and their correlation with pulse rate.

METHODOLOGY :

This is a cross-sectional study in which we have selected 69 moderately exercising males of age group 25-40 years from Bhopal City. The participants were divided into two groups:

Group-1:- Moderately exercising males performing the aerobic exercises for not more than six weeks i.e. the group of beginners.

Group-2:- Moderately exercising males performing same exercises for more than six months up to 5years i.e. the group of regular exercising people.

Only those participants were taken into the study who fulfilled our inclusion criteria.

INCLUSION CRITERIA:

- Persons doing regular exercise
- Males of 25-40 years age
- Moderately exercising male beginners
- Moderately exercising males doing aerobic exercises for variable duration up to 5 years
- Individuals giving consent for the study

CRITERIA FOR EXCLUSION:

- Males less than 25 years of age
- Males more than 40 years of age
- Females
- Males suffering from any endocrinal disorder, hypertension , coronary artery disease and asthma
- Individuals not giving consent for the study

On the **Day 1** after obtaining permission from the Head of the Department of Physiology, the subjects were explained the study procedure and written consent was obtained from them. Then all the participants were subjected to a self-made questionnaire to get information regarding their personal, present, past, family, socioeconomic and medical history in detail. Special information about their exercise schedule was also obtained through the questionnaire regarding type, duration and length of time of exercise After taking detailed history, the physical examination including general as well as systemic examination particularly the Respiratory system and Cardiovascular system was done.

Then the subjects were explained and trained to record the basal body temperature from electronic digital thermometer, at the same time the subjects were also explained about the fasting status (overnight fasting) for fasting blood sugar to be measured on Day 2. Subjects were provided the digital thermometer to record the basal body temperature on day 2 and then come for examination between 7am-9 am.

ADAPTATIONS TO PHYSICAL EXERCISE :

1.Cardiovascular and Respiratory Adaptations

Endurance training leads to significant cardiovascular and respiratory changes at rest and during steady state exercise at both submaximal and maximal level of work. The magnitude of these adaptations largely depends on the person's initial fitness level, on mode, intensity, duration, and frequency of exercise; and on the length of training (e.g., weeks, months, years).

a.Long-Term Cardiovascular Adaptations

Cardiac output at rest and during submaximal exercise is essentially unchanged following an endurance training program. However, at or near maximal level of work, cardiac output is increased substantially up to 30% or more (4). There are important differences in the responses of stroke volume and heart rate to training. After training, stroke volume is increased at rest, during submaximal and maximal exercise; conversely, post training heart rate is decreased at rest and during submaximal exercise but is usually unchanged at maximal level of work. The increase in stroke volume appears to be the dominant change and explains most of the changes observed in cardiac output.

Several factors contribute to the increase in stroke volume from

endurance training. Endurance training increases plasma volume by approximately the same percentage that it increases stroke volume (5). An increased plasma volume increases the volume of blood available to return to the right heart and subsequently to the left ventricle. There is also an increase in the end diastolic volume (the volume of blood in the heart at the end of the diastolic filling period) because of increased amount of blood and increased return of blood to the ventricle during exercise (6). This acute increase in the left ventricle end-diastolic volume stretches its walls, resulting in increased force of contraction. Endurance training also results in long-term changes in the structure of the heart that augment stroke volume.

Short-term adaptive responses include ventricular dilatation; which allows end-diastolic volume to increase without excessive stress on the ventricular walls. Long-term adaptive responses include hypertrophy of the cardiac muscle fibers (i.e., increases in the size of each fiber) permitting greater force to be exerted with each beat of the heart, thus emptying more of the blood from the left ventricle (7). Both these changes (ventricular dilatation and hypertrophy) contribute to increase stroke volume during exercise. Endurance training increases the number of capillaries in trained skeletal muscles, thereby allowing a greater capacity for blood flow in the active muscle (8). This enhanced capacity for blood flow is associated with a reduction in total peripheral resistance; thus allowing the left ventricle to exert a more forceful contraction against a lower resistance to eject more blood (9).

Arterial blood pressure at rest, blood pressure during submaximal exercise, and peak blood pressure all show a slight decline as a result of endurance training in normotensive individuals (10). However, reduction is greater in persons with high blood pressure. After endurance training, resting blood pressure (systolic/diastolic) will decrease on an average by -3/-3 mmHg in persons with normal blood pressure; by -6/-7 mmHg in borderline hypertensive persons, and by -10/-8 mmHg in hypertensive persons (10).

b.Long-Term Respiratory Adaptations

The major changes in the respiratory system from endurance training are an increase in the pulmonary ventilation as a result of increases in both tidal volume and respiration rate, and an increase in pulmonary diffusion at maximal level of work primarily due to increases in pulmonary blood flow particularly to the upper regions of the lungs.

2.Metabolic Adaptations

Significant metabolic adaptations occur in skeletal muscle in response to endurance training. The size and number of mitochondria increase substantially as does the activity of oxidative enzymes. Myoglobin content in the muscles is also augmented increasing the amount of oxygen stored in individual muscle fibers (11), but this effect is variable (12). Such adaptations combined with the increase in capillaries and muscle blood flow (noted in a previous section) greatly enhance the oxidative capacity of the endurance-trained muscles.

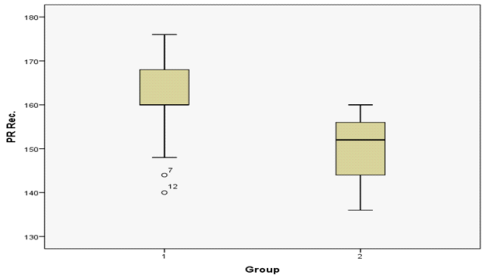
STATISTICAL ANALYSIS:-

Data thus obtained were analyzed by t-test with the help of SPSS-20 (Software Package used for Statistical Analysis) software for statistical analysis.

OBSERVATION AND RESULT :

Table : Comparision of Recovery Pulse Rate between Group 1 and 2

Groups	Sample size (N)	Mean Recovery pulse rate per min.	Standard Deviation (SD)	t - Value	P - Value
1	30	161.60	8.38	5.946	0.000
2	30	149.73	7.02		



The above table and Graph shows:

- Group-1 having the mean recov. pulse rate of 161.60 8.38 per minute.
- Group-2 having the mean recov. pulse rate of 149.73 7.02 per minute
- Statistically significant difference was observed in recovery pulse rate of both the groups.Group-2 doing exercise since more than 6 months the recovery pulse rate is less indicating good physical fitness.

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