Review of literature
REVIEW OF LITERATURE

1. HISTORICAL

Importance of exercise has been realized from times immemorial. Archaeological records of tools, pebbles and choppers are found more than three million years before. About ten thousand years ago the transition from a roaming hunter and gatherer to a stationary farmer began. (Astrand P. O. and Rodahl K., 1986a). Some animals can walk or even run as soon as they are born (Astrand P. O. and Rodahl K., 1986b). Old forms of animals have become extinct and their new forms have developed. There are genetic evolution with changing times.

Development of brain in man was such as the man was destined to move. Locomotive apparatus constitutes majority of body mass. Basic instrument of mobility is muscle (Astrand P. O. and Rodahl K.. 1986c), hunting and searching for food and other necessities in wilds have been a condition for human life for millions of years.

2. PRINCIPLE OF EXERCISE TRAINING

There are two types of skeletal muscle
fibres. Type I fibres are specialized for aerobic energy yield. These are resistant to fatigue, Type II fibers work in anaerobic conditions and are more fatiguable (Astrand P. O. and Rodahl K., 1986d). Edwards R. H. T. et al., (1983) have observed that in fatigue there is failure to maintain the required expected power output. It has a psychological element also. Loser may collapse but the winner usually has the stamina to run extra in jubilation.

The ability of muscle fibre to maintain a high force and the individual's subjective feeling of fatigue depend on the blood flow through the muscle (Astrand P. O. and Rodahl K., 1986e).

Training produces structural and biochemical changes in the muscle which increase the ability of the trained muscle to perform aerobic exercise in better way.

After training rise in blood lactate level is less, \( O_2 \) uptake is less, \( CO_2 \) output and ventilation increase are less. The characteristics of effective training programme are as follows:

Healthy subjects are exercised for 30 minutes per day four to five days per week for four to eight
weeks to achieve a physiological training effect. After a training effect has been achieved regular exercise must be continued or the gains will be lost (Casaburi R., 1992).

It is possible to train the patients also for specific type of exercises which are useful to the patients to relieve the acute distress and also to make them fit to do the day to day works regarding their physical needs and profession. Richard Dekhuijzen et al., (1991) have studied "Target-flow inspiratory muscle training during pulmonary rehabilitation in patients with "COPD". The mean age of the patients was 59 years and the mean FEV₁ was approximately 50% of predicted. All patients participated in a 10 weeks programme. After the training period maximal inspiratory mouth pressure and EMG fatigability of the diaphragm were significantly better. Time for fatigue was increased.

Roger T. K. and Howard P., (1992) have studied "pulmonary haemodynamics and physical training in patients with COPD". According to them, studies of the effects of physical training on pulmonary haemodynamics have been only a few. Occasionally there may be an increase in arterio-venous $O_2$ difference, accounting for
the increase in symptom limited $O_2$ consumption seen in some patients. The often impressive increase in work tolerance after training may be due in part to an increase in muscular co-ordination, as well as to metabolic training effects and psychological factors.

Jones D. R. et al., (1989) have concluded that the aerobic training programme is a safe, short-term procedure and that patients with postpoliomyelitis sequelae respond to training in a manner similar to healthy adults.

Butland R. J. A. et al., (1982) have worked on two, six and twelve minutes walking tests in respiratory diseases. They have observed that the twelve minutes walking test is a useful and reproducible measure of the exercise tolerance. It provides a simple practical guide to everyday disability and does not require expensive apparatus. Nevertheless, it is both time consuming for the investigator and exhausting for the patient. They therefore explored the possibility of using walking tests of shorter duration to assess exercise tolerance. They observed that walking tests of six minutes were as good as twelve minutes walking tests. In chronic obstructive airway diseases these tests were
reproducible (Knox A. J. et al., 1988). Six minute walking test has been used for assessing exercise capacity in chronic heart failure cases (Lipkin D. P. et al., 1986). All subjects preferred performing the six minutes walking test to the treadmill exercise test, considering it to be more closely related to their daily physical activity.

The six minute test is a simple objective guide to disability to patients with chronic heart failure and could be of particular value in assessing patients with severe heart failure but less useful in assessing patients with mild heart failure (Lipkin D. P. et al., 1986).

The distance covered in twelve minute walking was used to test exercise tolerance in chronic bronchitis by McGavin C. R. et al., (1976). The distance covered bore a poor relation to the forced expiratory volume in 1 second but a significant relation to the forced vital capacity and the maximum $O_2$ consumption and ventilation on bicycle ergometer. The test may be a simple practical guide to everyday disability in chronic bronchitis.

Lung function tests in Indian adult subjects
have been done by Kamat S. R. et al., (1982). They have done these tests on persons coming from different parts of the country engaged in various type of activities. It has been concluded that economic (Nutritional) factors may largely account for differences in lung functions among Indians and other ethnic groups (Udwadia F. E. et al., 1987).

3. EFFECTS OF EXERCISE TRAINING ON NORMAL AND ATHLETES

Ekblom B. et al., (1968) have studied the effect of training on circulatory response to exercise. Submaximal and maximal work was performed by eight male students aged 19-27 years. Oxygen uptake, heart rate, cardiac output (dye dilution technique) and blood pressure were determined. The maximal $O_2$ uptake increased from 3.15 to 3.68 litres/min. The maximal heart rate was unchanged. The main cause for increased cardiac output was the stroke volume (from 112 to 127 ml). The mean blood pressure during and the peak blood lactate concentration after the maximal work were significantly higher after the training. The mechanical efficiency during submaximal work was improved. At a given submaximal oxygen uptake heart rate, the stroke volume were unchanged and the arteriovenous oxygen difference
was higher after training.

Assessment of cardio-pulmonary efficiency in athletes and non athletes have been done by Das Gupta P. K. and De A. K., (1991). Higher VO₂ max observed in athletes was due to higher stroke volume and arterio venous O₂ difference. Though athletes had higher breathing reserve at VO₂ max work load, their dyspneic index and ventilation volume at VO₂ max did not differ significantly from non athletes suggesting that athletes were economical in expending energy for work of breathing during exercise.


Autonomic nervous system adaptation to short term exercise training have been observed by La Rovere M. T. et al., (1992). They have reported beneficial effects of physical training in post myocardial infarction patients. Physical training induced a significant increase in exercise duration. These data suggest that in post myocardial infarction patients, four weeks of physical training may induce an improvement in the autonomic balance with a restoration towards
normal in the reflex activity of the system i.e. there is a shift from sympathetic hyperactivity to para sympathetic hyperactivity.

Hoof R. V. and his colleagues, (1989) have studied the effect of endurance training on blood pressure in sedentary men. A decrease of blood pressure was observed at rest. This was for Diastolic blood pressure which fell by 5 mmHg, but there was no change in systolic blood pressure.

4. PSYCHOLOGICAL EFFECTS OF EXERCISE TRAINING ON NORMAL PERSONS

Effects of aerobic exercise on depression have been studied by Martinsen E. W. et al., (1985). The study suggests that a moderate increase in maximum $O_2$ uptake (15 to 30 %) was sufficient to obtain an antidepressive effect from the training programme.

Edwards R. H. T. et al., (1983) have reported about failure to maintain the required expected power output. According to them, it has a psychological element, looser may collapse, winner has the stamina to run, extra in jubilation.
5. EFFECTS OF EXERCISE TRAINING ON PATIENTS SUFFERING FROM CARDIO-RESPIRATORY AND NEUROMUSCULAR DISEASES

Cardio-respiratory fitness evaluation by shuttle test in asthmatic subjects during aerobic training have been done by Ahmaidi S. B. et al., (1993). It has been concluded that this training has sufficient validity to assess VO2 max to register cardio-respiratory modifications over course of individualized aerobic training programme in mild and moderately asthmatic children. It can be used to adjust training intensities for such programme.

Davey P. et al., (1992) have worked on ventilation in chronic heart failure and the effects of physical training on such ventilation. They have concluded that the exercise training reduces the ventilatory abnormalities in chronic heart failure.

Clark C. J., (1992) has studied the role of physical training in asthma, medically supervised training can significantly improve "cardiovascular fitness" variables and submaximal ventilatory and metabolic responses. Breathlessness is decreased over a
Wenger N. K., (1992) has conducted research on exercise testing and training on the elderly coronary patients. Appropriately prescribed and designed exercise training can improve physical and psychological functional status and encourage maintenance of an independent lifestyle. Exercise testing in addition to helping identify elderly coronary patients at high risk of recurrent events who warrant added therapies, can guide the recommendation for their exercise regimen.

Recent studies by Rossi P., (1992) on "Physical training in patients with congestive heart failure" have suggested beneficial effects of training in subjects with moderate or even severe left ventricular dysfunctions by showing increased exercise tolerance or peak O\textsubscript{2} consumption, on aerobic threshold, peak leg blood flow, peak central arterio-venous O\textsubscript{2} difference and decreased lactate accumulation.

Exercise training in patients with chronic air flow obstruction is helpful in removing the air flow obstruction (Lake F. R. et al., 1990).