Research Paper

Volume : 4 | Issue : 5 | May 2015 • ISSN No 2277 - 8179

Effects of Aerobic Exercise on Maximum Oxygen Uptake (Vo_{2max}) in Healthy Adults

Medical Science

KEYWORDS : AEROBIC EXERCISE, $VO2_{max}$

DR. ESHA YESHWANT ANGANE — DEPT. OF PHYSIOLOGY, SETH G.S.M.C & K.E.M.H HOSPITAL

DR. AMIT. A. NAVARE — ASSOCIATE PROFESSOR, DEPT. OF PHYSIOLOGY, SETH G.S.M.C & K.E.M.H HOSPITAL

ABSTRACT

Maximal oxygen uptake (VO2 max) is defined as," The greatest amount of oxygen a person can take in and consume while performing dynamic exercise involving a large part of total muscle mass at sea level." (1)It is considered the best measure of cardiovascular fitness and exercise capacity and represents the amount of oxygen transported and used in cellular metabolism. (2) VO2 maxis accepted as the criterion measure of cardiorespiratory fitness. The idea that the human body cannot survive without oxygen has been known for millennia.The present study was done to study the effects of aerobic exercise on VO2max in 65 healthy adult volunteers in age group of 20- 35 years.The same volunteers were chosen as both study as well as control group in order to minimise the confounding factors and make the study reproducible.Results indicates that VO2max after undergoing aerobic exercise training were better as compared to before undergoing aerobic exercise training.Mean VO2max is more andstatistically significant after undergoing aerobic exercise training than before undergoing aerobic exercise training.

INTRODUCTION:

The past two decades have seen a much-publicised fitness boom in India. From sales of aerobic dance videotapes to popular participation in marathon running, indicators abound that Indians are interested in "working out." However, there is also evidence that a significant proportion of the population, especially the young, engage in little physical activity. Sedentary lifestyle and physical inactivity represent the high prevalence and public health concern in developed and developing countries . Healthy living and physical fitness are closely related. Keeping active in sports, exercise or everyday chores helps us live longer. Active people also have a more positive outlook towards life and the energy to get things done and make things happen. Lifelong rewarding on just an investment of thirty minutes a day Physical activity is known to improve physical fitness and to reduce morbidity and mortality from numerous chronic ailments [3]. One such programme is aerobic or cardiovascular fitness. Aerobic exercise is an important component of pulmonary rehabilitation for patients with chronic obstructive pulmonary disease (COPD) [4].There are various tests to assess the cardiopulmonary fitness of individuals, among which the maximum oxygen uptake (VO_{2max}) is universally accepted as the gold standard. Persons possessing higher values of maximal oxygen uptake (VO_{2max}) have the capacity to yield larger amounts of energy and are capable of performing better in athletic and other field activities. Determination of $VO_{2\ max}$ is thus one of the important criteria to assess the oxygen transport system, or the cardiopulmonary efficiency.A joint committee of American Medical Association and the American Association of the Health, Physical education and Recreation states that," Cardiopulmonary fitness is the endurance of the heart and the lungs to provide increased demand of oxygen and nutrition to the body for prolonged period of activity"[5,6].

AIMS:

This study is aimed to find out effects of aerobic exercise on VO_{2max} in healthy adults.

OBJECTIVES:

To compare $VO2_{max}$ before and after undergoing aerobic exercise training.

MATERIALS AND METHODS :

Selection of subjects:

The study was carried out in 65 healthy adult volunteers in the age group of 20-35years who visited the fitness centre having treadmill facility and had not yet started to exercise but was keen to exercise and ready to volunteer for the study.

Volunteers were selected on basis of inclusion criteria.

The same volunteers were chosen as both study as well as control group in order to minimize the confounding factors and make the study reproducible.

Inclusion Criteria:

1. Healthy adults of age group 20-35 years willing to actively participate in jogging on treadmill.
2. .Volunteers willing to participate in 30 minutes of continuous session of jogging on treadmill 5 times a week with 5 minutes of warm-up exercise before jogging and 5 minutes of cool down exercise after the jogging. They were told to achieve a training intensity of 70-85%.
3. Volunteers willing to undergo sixteen weeks of continuous exercise training.

Exclusion Criteria:

1) Subjects with history of bronchial asthma, COPD, Tuberculosis and known cardiac and respiratory diseases.
2) Subjects with history of smoking ,alcohol, severe chest trauma, obvious chest and spinal deformity.
3) Subjects who were chronically ill.
4) Subjects on medications for long duration.
5) Subjects with history of any major surgery (cardiac , pulmonary , abdominal) related to study.
6) Subjects undergoing any physical conditioning program.

Equipment's:

1) Stepping bench of 16.25inches height or 41.3centimetres for Queen's College step test.
2) Stop watch.
3) Metronome

Study procedure:

Written informed consent of all the participants was taken prior to testing. History was taken in detail and clinical examination was done to rule out any abnormalities.

Pulse rate (beats/min):

Pulse rate was recorded in sitting position by palpating the radial artery for one minute after adequate rest.

VO_{2max}:

Estimation of VO_{2max} by Queen's College Step Test:

1. The entire procedure was explained in detail to the participants prior to the commencement of the test.

2. VO_{2max} was measured indirectly by the Queen's College Step Test:[7]

The Queen's College Step Test is a 3 minute step test in which a stepping bench of height 16.25 inches (41.3cm) was employed.The participants were asked to perform each stepping cycle to a four – step cadence, "up-up-down-down" at a rate of 24 complete step ups per minute for boys and 22 complete step ups per minute for girls regulated by a metronome. At the completion of the test, participants remained standing comfortably while their pulse rate was measured from 5th to 20th sec. of the recovery period. This 15 sec. pulse rate was then counted to beats/min (15sec PR × 4).

3. Aerobic capacity (VO_{2max}) was indirectly determined by the following equations.

For males –VO_{2max} (ml/kg/min.) = 111.33– (0.42 × pulse rate in beats/min).

For females –VO_{2max} (ml/kg/min) = 65.81– (0.1847 × pulse rate in beats/min).

RESULTS:

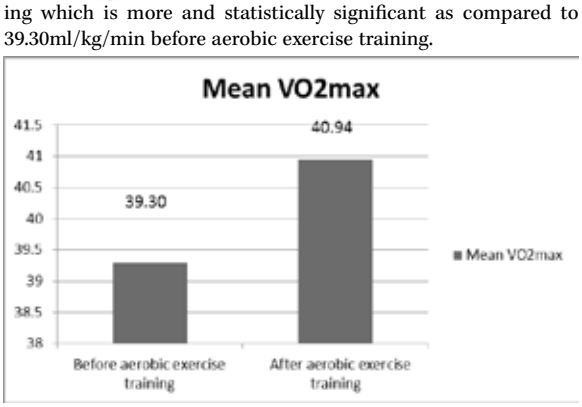
In this study 65 healthy adults in age group of 20-35 years were taken and their VO_{2max} was studied and compared before and after undergoing aerobic exercise training. Results were entered in Microsoft Office Excel 2007 and analysed using the Statistical Package for Social Sciences (SPSS) version 16. Data was expressed as Mean± Standard deviation. Test used is paired't' test. P value of <0.05 is considered as significant.

Table 1:- Comparison of VO_{2max} before undergoing aerobic exercise training and after undergoing aerobic exercise training.

Parameter	Before aerobic exercise training. (Mean ± SD)	After aerobic exercise training (Mean ± SD)	P value
VO_{2max}(ml/kg/min)	39.30±2.41	40.94±2.56	0.0001*

By paired t Test, * Significant

Mean VO_{2max} was 40.94ml/kg/min after aerobic exercise training which is more and statistically significant as compared to 39.30ml/kg/min before aerobic exercise training.



Graph 1:- Comparison of Mean VO_{2max} before undergoing aerobic exercise training and after undergoing aerobic exercise training.

DISCUSSION:

Physical inactivity and low cardio-respiratory fitness are recognized as important causes of morbidity and mortality. [8] It is generally accepted that people with higher levels of physical activity tend to have higher levels of fitness and that physical activity can improve cardiorespiratory fitness .

Results indicates that VO_{2max} after undergoing aerobic exercise training were better as compared to before undergoing aerobic exercise training. Mean values of VO_{2max} are more and statistically significant after undergoing aerobic exercise training than before undergoing aerobic exercise training.

In the present study, mean VO_{2max} is more andstatistically significant after undergoing aerobic exercise training than before undergoing aerobic exercise training. Training increases $VO_{2\ max}$ by increasing the cardiac output secondary to high stroke volume, and an increase in arterio-venous $0_{2\ differences}$. It appears that physical training increases $VO_{2\ max}$ by about 50% due to an increase in cardiac output and the rest 50% due to increased extraction of 0_2 by working muscles,which is reflected in an increased arterio-venous 0_2 difference [9].

Future Scope:

To evaluate the effects of aerobic exercise on other systems.

The most beneficial mode of aerobic exercise for different age groups and different socio-economic groups.

SUMMARY AND CONCLUSION:

The present study was done on 65 healthy adults in age group of 20-35 years to compare the effects of aerobic exercise on VO_{2max} before and after commencement of jogging on treadmill. Healthy adult volunteers in the age group of 20-35years who visited the fitness centre having treadmill facility and had not yet started to exercise but was keen to exercise and ready to volunteer for the study were selected. Their VO_{2max} was recorded by Queen's College Step Test before commencement of aerobic exercise training.Volunteers performed aerobic exercise for 16weeks duration. At end of 16weeks VO_{2max} tests was recorded again. VO_{2max} parameters before and after undergoing 16 weeks of aerobic training were compared to find out the effects of aerobic exercise.Paired't'-test was used for statistical analysis.

Results indicate that VO_{2max} after undergoing aerobic exercise training are better than before undergoing aerobic exercise training.. Mean value of VO_{2max} is more and statistically significant after undergoing aerobic exercise training than before undergoing aerobic exercise training. The study revealed that the aerobic capacity (VO_{2max}) is improved after undergoing aerobic exercise training. Regular aerobic exercise is related to better cardiorespiratory efficiency.Hence regular physical activity causes many desirable physiological, psychological and physical changes in the individual. Thus lifestyle modification by including daily physical activity for better health is suggested.

Volume : 4 | Issue : 5 | May 2015 • ISSN No 2277 - 8179

REFERENCE

1) Uchechukwudimkpa. Post- exercise heart rate recovery:an index of cardiovascular fit-ness. Journal Exercise Physiology online. 2009;12(1):19-22. | 2) Shea SA: Behavioural and arousal – related influences on breathing in humans. Exp Physiology.1996 ;(81)1-26. | 3) Chaitra B , Vijay Maitri. Effect of aerobic exercise training on peak expiratory flow rate: A pragmatic randomized controlled trial.Int J Biol Med Res. 2011; 2(3): 789-792. | 4) Chaitra B, Pandurang Narhare, Nagaraja Puranik and Vijay Maitri. Moderate intensity aerobics training improves pulmonary function in young Indian men. Biomedical Research 2012; 23 (2): 231-233. | 5) Joint committee of American Medical Association and Association of Health, Physical Education and Recreation. "Exercise and Fitness". Journal of American Medical Associa-tion. 1958; 16: p.14, 174. | 6) Journal of Health Physical Education and Recreation.1964; 35:No.5, 42. | 7) Dasa B, Ghosh T, Gangopadhyay S. A comparative study of physical fitness (PFI) and pre-dicted maximum aerobic capacity (VO2max) among the different groups of female stu-dents in West Bengal, India. International Journal of Applied Sports Sciences. 2010; 22 (1): 13-23. | 8) Twisk JW, Staal BJ, Brinkman MN, et al. Tracking of lung function parameters and the longitudinal relationship with lifestyle. Eur Respir J.1998;12:627-34. | 9) P.K. Das Gupta and A.K.De. Assessment of cardiopulmonary efficiency in athletes and non- athletes. Indian J Physiol Pharmacol.1991; 35(4):245-248.