

Original Research

Assessment of impact of exercise on lung parameters

Pallavi Diwakar Haldankar

Assistant Professor, Department of Physiology, Venkateshwara Institute of Medical Sciences, Gajraula, Uttar Pradesh, India

ABSTRACT:

Background: Globally, there is concern over the prevalence of obesity brought on by sedentary lifestyles and a lack of physical activity. The present study assessed the impact of exercise on lung parameters. **Materials & Methods:** 90 healthy subjects of both genders were divided into 2 groups of 45 each. Group I subjects performed moderate-intensity continuous exercise and group II subjects performed high-intensity exercise. Pulmonary functions were recorded. **Results:** The mean age in group I was 35.6 years and in group II was 36.2 years, weight was 32 Kgs and 60.8 Kgs, height was 175 cm in group I and 173.4 in group II and waist-hip ratio was 0.92 in group I and 0.87 in group II. The difference was significant ($P < 0.05$). The mean change in TV (litres) was 0.03 and 0.04, IRV (litres) was 0.28 and 0.35, IC (litres) was 0.74 and 0.46, VC (litres) was 0.38 and 0.56, ER (litres) was 0.09 and 0.24, EC (litres) was 0.16 and 0.25 and BHT (seconds) was 1.47 and 4.32 in group I and II respectively. The difference was significant ($P < 0.05$). There was a positive correlation of all three parameters with BHT but it was not significant. The correlation of BHT with IC was strongest, whereas that with VC was weakest. **Conclusion:** Both the moderate-intensity and high-intensity exercise groups showed improvements in VC, IC, EC, and BHT following exercise training sessions.

Keywords: Exercise, Lung parameters, sedentary lifestyle

Corresponding author: Pallavi Diwakar Haldankar, Assistant Professor, Department of Physiology, Venkateshwara Institute of Medical Sciences, Gajraula, Uttar Pradesh, India

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INTRODUCTION

Either 75 minutes of strenuous intensity exercise or around 150 minutes of moderate-intensity exercise each week are considered forms of activity. Globally, there is concern over the prevalence of obesity brought on by sedentary lifestyles and a lack of physical activity.¹ Less than 10% of Indians are physically active, making up a sizable portion of the country's population. Fewer Asian nations are underdeveloped, but the majority are developing.² Even if the proportion of the population living below the poverty line varies across developing and underdeveloped nations, a sedentary lifestyle and a lack of physical activity are being caused by the general public's addiction to television and cell phones.³

An essential component of pulmonary rehabilitation treatments is physical activity. Exercise duration, frequency, progression, modality, individualization, and, most importantly, intensity—which is thought to be the primary factor influencing the physiological advantages of rehabilitation—are the fundamentals of training. Either on a treadmill or a cycle ergometer,

moderate-intensity continuous aerobic exercise for 20 to 60 minutes per session has physiological benefits, according to the American College of Sports Medicine. The latter reduces exercise-induced oxygen desaturation in patients with COPD.⁴

The majority of studies that examined the effects of high-intensity and moderate-intensity exercise on pulmonary functions assessed the parameters of forced expiratory volume (FEV1) and forced vital capacity (FVC) in one second.⁵ The effects of vital capacity (VC), inspiratory capacity (IC), expiratory capacity (EC), and breath holding time (BHT) on lung dynamics and lung endurance during moderate- and high-intensity exercise training, however, have not been thoroughly studied.⁶ The present study assessed the impact of exercise on lung parameters.

MATERIALS & METHODS

The present study comprised of 90 healthy subjects of both genders. All agreed to participate in the study. Data such as name, age, gender etc. was recorded. Subjects were divided into 2 groups of 45 each. Group I subjects performed moderate-intensity continuous

exercise at a heart rate of 50-74% of their maximum heart rate for a duration of 40 minutes, 5 days a week. Group II subjects performed high-intensity exercise for 8 seconds by sprint cycling at 75- 84% of their maximum heart rate followed by 12 seconds of low-intensity cycling for a duration of 20 minutes, three times per week, on a bicycle ergometer. The duration of these exercise training sessions was 12 weeks. Using a computerized spirometer, pulmonary

functions were documented. VC, TV, IRV, and ERV values were recorded. TV and IRV data were added to determine the IC, and TV and ERV values were added to estimate the EC. In order to do BHT, participants were told to inhale deeply and then blow through a mercury manometer's mouthpiece until their blood pressure reached 40 mm Hg. Results were studied and determined statistically. P value less than 0.05 was considered significant.

RESULTS

Table I Baseline characteristics

Parameters	Group I	Group II	P value
Age (years)	35.6	36.2	0.94
Weight (Kgs)	63.2	60.8	0.81
Height (cm)	175.0	173.4	0.57
Waist- hip ratio	0.92	0.87	0.19

Table I shows that mean age in group I was 35.6 years and in group II was 36.2 years, weight was 63.2 Kgs and 60.8 Kgs, height was 175 cm in group I and 173.4 in group II and waist- hip ratio was 0.92 in group I and 0.87 in group II. The difference was significant (P< 0.05).

Table II Assessment of pulmonary function

Parameters	Group I	Group II	P value
TV (litres)	0.03	0.04	0.07
IRV (litres)	0.28	0.35	0.12
IC (litres)	0.74	0.46	0.01
VC (litres)	0.38	0.56	0.05
ER (litres)	0.09	0.24	0.05
EC (litres)	0.16	0.25	0.45
BHT (seconds)	1.47	4.32	0.01

Table II, graph I shows that mean change in TV (litres) was 0.03 and 0.04, IRV (litres) was 0.28 and 0.35, IC (litres) was 0.74 and 0.46, VC (litres) was 0.38 and 0.56, ER (litres) was 0.09 and 0.24, EC (litres) was 0.16 and 0.25 and BHT (seconds) was 1.47 and 4.32 in group I and II respectively. The difference was significant (P< 0.05).

Graph I Assessment of pulmonary function

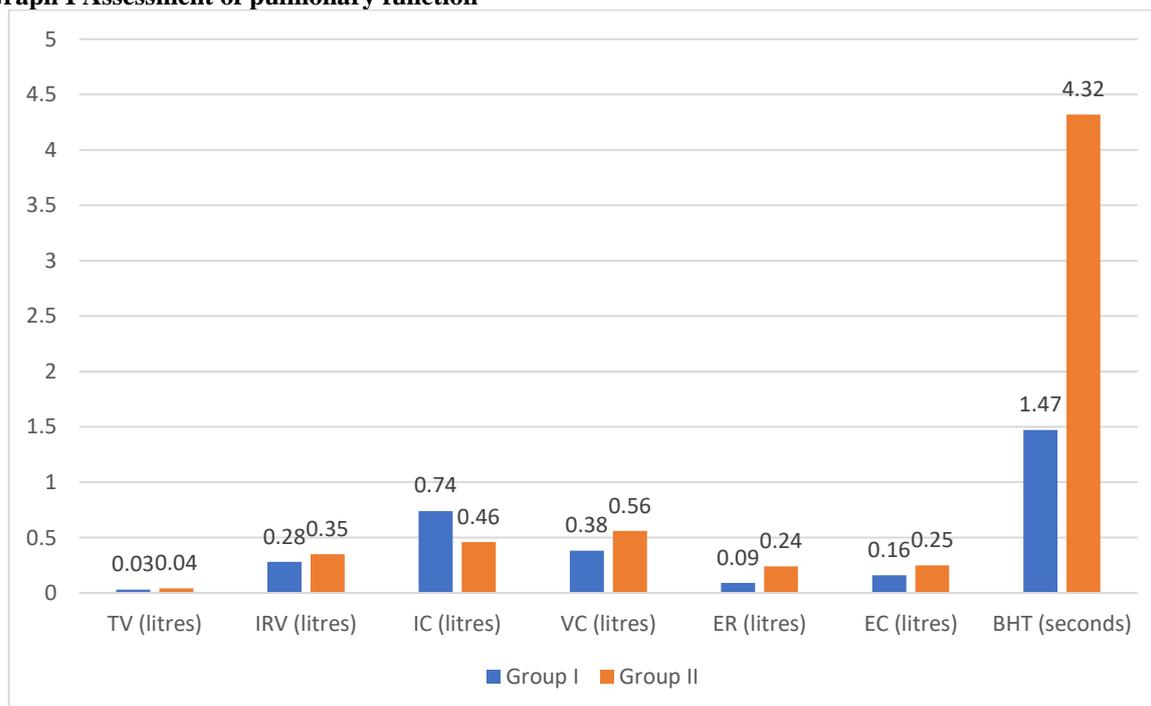


Table III Correlation between pulmonary functions and breath holding time (BHT)

Parameters	R value	P value
IC and VHT	0.41	0.15
VC and BHT	0.25	0.36
EC and BHT	0.38	0.74

Table III shows that there was a positive correlation of all three parameters with BHT but it was not significant. The correlation of BHT with IC was strongest, whereas that with VC was weakest.

DISCUSSION

Sedentary lifestyles have a similar effect on the prevalence of non-communicable diseases in nations all over the world. Exercise affects muscle mass and neuromuscular stability in addition to improving cardiovascular health.⁷ On the other hand, a sedentary lifestyle, obesity, frequent eating, and pollution in the environment can all lead to impaired lung function, cardiorespiratory illnesses, and higher rates of morbidity and death.⁸ In today's environment, people are more conscious of health and exercise due to their hectic lifestyles. 8. Taking time out of a hectic schedule is a practical issue, and it becomes challenging to continue exercising regularly.⁹ The present study assessed the impact of exercise on lung parameters.

We found that the mean age in group I was 35.6 years and in group II was 36.2 years, weight was 32 Kgs and 60.8 Kgs, height was 175 cm in group I and 173.4 in group II and waist- hip ratio was 0.92 in group I and 0.87 in group II. Nourry et al¹⁰ examined how short-term running training affected the pulmonary function of healthy prepubescent children during rest and exercise. After eight weeks of high-intensity intermittent running training, one trained group (TrG) (n = 9; three girls and six boys; age = 9.7 +/- 0.9 year) was compared to a control group (ContG) (n = 9; four girls and five boys; age = 10.3 +/- 0.7 year). TrG showed greater values for minute ventilation, peak oxygen consumption, and post-training tidal volume at peak exercise. Decreased end-tidal partial oxygen pressure (P < 0.05) and increased end-tidal partial carbon dioxide pressure (P = 0.026) were linked to a decreased ventilatory response to exercise DeltaV(E)/DeltaV(CO (2)) in TrG following training at sub-maximal exercise (P = 0.017). Following training, TrG showed lower dead space volume compared to tidal volume at every exercise level (P < 0.05). In prepubescent children, eight weeks of high-intensity intermittent running training improved resting pulmonary function and resulted in deeper exercise ventilation, indicating more efficacy.

We observed that the mean change in TV (litres) was 0.03 and 0.04, IRV (litres) was 0.28 and 0.35, IC (litres) was 0.74 and 0.46, VC (litres) was 0.38 and 0.56, ER (litres) was 0.09 and 0.24, EC (litres) was 0.16 and 0.25 and BHT (seconds) was 1.47 and 4.32 in group I and II respectively. We found that there was a positive correlation of all three parameters with BHT but it was not significant. The correlation of BHT with IC was strongest, whereas that with VC was weakest. Whitelaw et al¹¹ investigated how a

bigger lung volume raises BHT and lessens the discomfort of breath retention. After holding breaths at different lung capacities, they examined the pressure waves produced by diaphragm contractions. They discovered that fewer people had more noticeable expiratory muscle activity, and that the activity rose with each breath hold. Therefore, as our work showed, the increased EC with cardiorespiratory exercise training may be due to the force-length and geometric characteristics principle.

CONCLUSION

Authors found that both the moderate-intensity and high-intensity exercise groups showed improvements in VC, IC, EC, and BHT following exercise training sessions.

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