

EFFECT OF ONE MONTH DIAPHRAGMATIC BREATHING ON PEAK EXPIRATORY FLOW RATE AND BREATH HOLDING TIME

Praveen Bhardwaj*, Jayanti Pant¹, Reena Bhardwaj²

* Associate Professor, 1 Assistant Professor, Department of Physiology, 2 Associate Professor, Department of Pharmacology, Government Medical College, Haldwani – 263139 (India).

* Correspondence: pant.jayanti@gmail.com

Abstract

Practice of yoga based relaxation techniques has been associated with various physiological changes in our body. The long term practice of these techniques has been reported to improve the pulmonary functions. However, the study on effects of short term diaphragmatic breathing on lung functions is yet lacking. Therefore, the present analytical study was conducted to find the changes in pulmonary functions after practising diaphragmatic breathing for one month among (n=40; 20 males and 20 females) 1st year MBBS students aged between 18-22 years. Peak expiratory flow rate (PEFR) and breath holding time (BHT) was recorded in these subjects before and after one month of practising diaphragmatic breathing. There was a significant increase in both PEFR and BHT after 1 month of diaphragmatic breathing manoeuvre depicting the beneficial effects of diaphragmatic breathing on pulmonary functions.

Key words: Yoga; Pulmonary functions; Peak Expiratory Flow Rate; Breath Holding Time

Introduction

Sedentary lifestyles could be associated with less efficient pulmonary functions. Involvement in certain physical activities, sports or yoga could help in respiratory muscle strengthening and

improvement in pulmonary functions.^{1,2} The physiological and psychological benefits of yoga have been demonstrated in several studies.²⁻⁴ Various studies have reported benefits in both peripheral nerve function as well as central

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neuronal processing.^{5,6} Diaphragmatic breathing has been the primary mode of training used for patients suffering from chronic obstructive lung diseases.⁷ Moreover, diaphragmatic breathing is an extremely important component of yoga training and yogic exercises have been found to produce remarkable physiological changes and have scientific basis.^{2, 3} There are a number of reports on the effects of long term yoga based relaxation techniques to improve lung functions.⁸⁻¹⁰ However, to the best of our knowledge, the acute effects of diaphragmatic breathing on pulmonary functions in healthy young adults have not been much studied. Moreover, literature is deficient on the effect of yoga training on Peak Expiratory Flow Rate (PEFR) and Breath Holding Time (BHT) and therefore the present study was undertaken.

Material & Method:

The present study was performed after obtaining the approval of the Ethical committee of the college. This study was conducted in the department of Physiology, Government Medical College, Haldwani among 1st year MBBS

students in the age group of 18-22 years. Forty students (20 males and 20 females) participated in the study. Questionnaire was used to collect information about familial history of diabetes mellitus, hypertension, and personal history of smoking, tobacco intake or alcohol consumption. Dietary history was also taken. Further, the anthropometric parameters like age, weight, height, body surface area were recorded of all the subjects. Earlier studies have revealed that PEFR is correlated with age, height and weight.^{11,12} In both men and women age showed significant negative correlation whereas height showed positive correlation with pulmonary functions.¹³ Taking these studies into consideration the anthropometric parameters were recorded.

A Subject who was physically and mentally fit, was a non smoker, was free from any respiratory or cardiac disease or any other systemic disease, was co-operative and capable of understanding the procedure and did not perform any other form of physical or yogic exercise during the study period was included in the study. Informed consent of each subject was taken.

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Procedure of diaphragmatic exercise:

1. Subject was asked to sit erectly and comfortably.
2. He/she was asked to put one hand on his/her chest and the other on abdomen.
3. Then he/she was asked to slowly inhale through nose and breathe out slowly at a rate of 6-8 breaths/min.
4. The subject was further asked to feel the abdomen which expanded with hands during inhalation.

The parameters recorded were peak expiratory flow rate (PEFR) and breath holding time (BHT).

Peak Expiratory Flow Rate (PEFR) Recording:

PEFR was recorded directly by using Wright's Peak Flow Meter having a range of 60-800 L/min. The subject was asked to take a deep inspiration with maximum effort and then he/she was instructed to blow out forcefully through the mouth piece into the instrument. The test was performed in standing position with nose clip applied. After a few practice trials, the highest of the three test readings was taken as the final

reading. Test was performed between 9-11 am to avoid the effects of diurnal variation.¹⁴

Breath Holding Time (BHT) recording:

BHT was recorded by asking the subject to count the number 1,2,3,..., till he could hold his breath. The test was performed in sitting position with nose clip applied. The time was recorded in seconds using a stopwatch.

Statistical Analysis

The pooled data obtained from the study were subjected to SPSSV16 (SPSS windows version 16 software). Paired t-test was applied. A p value < 0.05 was considered significant.

Results :

Effect on PEFR

The basal value of PEFR in males was 406.8 ± 5.1 L/min and in females was 293.5 ± 7.3 L/min (Fig 1). After practising diaphragmatic breathing for 1 month, there was a significant improvement in PEFR in both males and females (Fig 1).

Effect on BHT

The initial BHT was 19.6 ± 0.42 sec and 17.1 ± 0.45 sec in males and females respectively (Fig 2). There was a significant increase in BHT in both males and females after practising diaphragmatic breathing for 1 month (Fig 2).

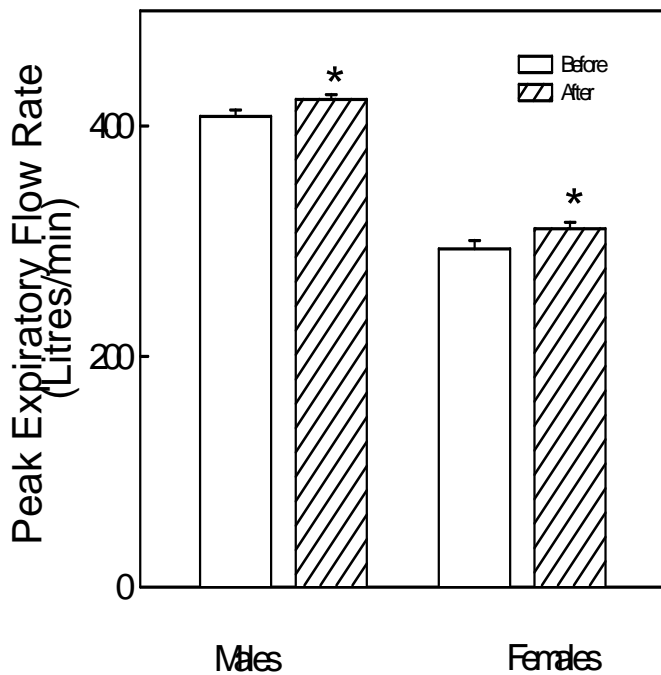


Fig 1. PEFR in males and females before and after 1 month of practising diaphragmatic breathing is shown. An asterisk mark denotes significant improvement in PEFR after diaphragmatic breathing in both males and females (* p = 0.0018 in males and p = 0.000008 in females, as compared to before values (Student's T-test for paired observations).

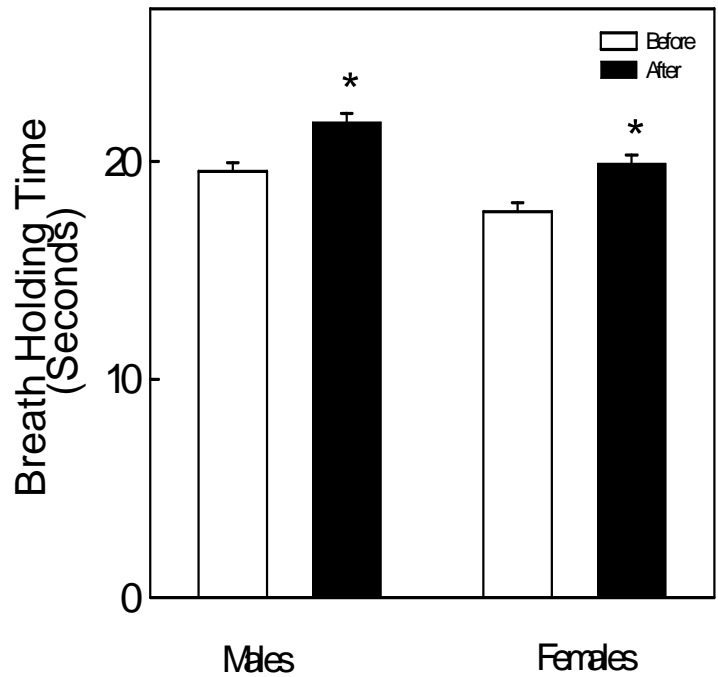


Fig 2. BHT in males and females before and after 1 month of practising diaphragmatic breathing is shown. An asterisk mark denotes significant improvement in BHT after diaphragmatic breathing in both males and females (* p = 0.0000025 in males and p = 0.0000019 in females, as compared to before values (Student's T-test for paired observations).

Discussion

The results of the present study showed that the subjects who have performed diaphragmatic breathing for one month showed marked improvement in PEFR and BHT. The results of our study can be compared with the results of the study performed earlier by Prakash et al which showed that Pranayam (a yogic practice) has beneficial effect on respiratory efficiency.¹ Pranayam includes various exercises like Bhastrika, Kapalbharti, etc which involve forceful inspiration followed by forceful expiration.^{1,15} On the contrary, the subjects in the present study were asked to slowly inhale through nose and breathe out slowly at the rate of 6-8 breaths/min.

Diaphragmatic dysfunction and alteration of thoraco-abdominal movements are common in patients with COPD. Breathing strategies have been considered an important component of pulmonary rehabilitation and refer to a range of techniques which includes diaphragmatic breathing. In clinical trials, where diaphragmatic breathing was conducted

for 4 weeks relieved the respiratory symptoms and improved the exercise tolerance.¹⁶ Further, it is reported elsewhere that practice of deep diaphragmatic breathing in COPD patients is associated with improvement in blood gases and also induces significant increase in tidal volume.¹⁷

During yoga practice, one can control the stimuli to the respiratory centres. Control over the respiratory centres improves cardio-respiratory endurance which might be responsible for increase in PEFR and prolongation of BHT in subjects practising diaphragmatic breathing.¹⁸ Yogis who are engaged in various breathing exercises have significantly higher PEFR presumably due to respiratory muscle conditioning. Therefore, diaphragmatic breathing can be of great use for the sedentary workers or professional workers who have no time to do physical or yogic exercises. Such persons can practice diaphragmatic breathing as it can be performed while sitting even at workplace. By adopting this practice one can overcome stress and can

develop better pulmonary function performance.

Acknowledgement: The authors are grateful to the medical students who have given their full cooperation and support for the study. The authors are also thankful to Mr Mahendra Singh Adhikari for his technical support.

Competing Interest: None declared

Funding: Nil

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