



ORIGINAL RESEARCH PAPER

Physiology

EFFECTS OF YOGA ON PULMONARY FUNCTION

KEY WORDS: pulmonary function, yoga, spirometer

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ABSTRACT

Introduction:From ancient times our ancestors had practised yoga to lead a healthy life.Yoga respiratory training (pranayama) may improve pulmonary function.
Aim and Objective:To compare the pulmonary function tests in yoga practitioners and in normal individuals.
Materials and methodology:Fifty females in aged 40-60yrs with a BMI of 18 -24 kg/m², practising pranayama for more than 1 year were taken in the study group. Fifty females age and BMI matched ,who are not practising yoga were taken in the control group. Pulmonary function test was carried out using a portable spirometer (spirobank-G). Statistical analysis done by student ' t ' test.
Results:The present study revealed statistically significant higher pulmonary function parameters among study group compared to controls.
Conclusion:Long term yoga practice will improve pulmonary function and prevent its decline due to aging.

Introduction:

From ancient times our ancestors had practised yoga to lead a healthy life. With regular yoga practice they have postponed the impact of ageing on their health and lifestyle. People who practice yoga regularly lead a healthy life. Ageing is associated with a physiological decline in lung function.Yoga respiratory training(pranayama) may improve pulmonary function.

Pulmonary function tests are being carried out to make proper assessment of lung function non invasively. Pulmonary function tests aim at assessing the multi various aspects of ventilation, diffusion and perfusion. The modality of exercise that is most economic and having beneficial effect on health has now become the topic of research [1].

Yoga training not only involves physical training, it includes postural asana,controlled breathing (pranayama) and proper relaxation. Hence it is an integrated training. Many people are now practicing yoga for health promotion. It is imperative to do continuous research work on yoga training to provide scientific and updated information to society for its benefit. The pulmonary function assessment is a long-term predictor for overall survival rates [2]. Many studies show the favorable effect of yoga on PFTs and respiratory pressures [2-9].

Aim and Objective:

To compare the pulmonary function tests in yoga practitioners and in normal individuals.

Materials and methodology:

Ethical committee of Madurai Medical College, Madurai granted approval for the study. Fifty females in age group of 40-60yrs with a BMI of 18-24 kg/m², regularly practising pranayama (6days/week, 1hour/day) for more than 1year without any respiratory disorders were included in the study group. Fifty females without any respiratory disorders, age and BMI matched ,who are not practising yoga were included in the control group.

Pulmonary function test was carried out using a portable spirometer (spirobank-G). The procedure of pulmonary function test was explained in detail to all the subjects. All the subjects were healthy and medication free. Females with age less than 40yrs and more than 50yrs, thoracic cage and spine deformities, pulmonary tuberculosis, bronchial asthma, cor - pulmonale on clinical

examination and any respiratory illness and systemic diseases were excluded from the study.

After calibrating the spirometer and getting informed written consent from the subjects,using a disposable mouth piece the subjects were asked to make 3trials with in between rest of two minutes.The best of the three trials was included for the study.The parameters studied were FEV₁, FVC and FEV₁/FVC and PEFR.Matching for age, sex and BMI was necessary since these parameters are known to influence pulmonary function.

The body weight of the study and control group was recorded by weighing machine in kilogram scale Height of the study and control group in metres was recorded by metre scale. **Body Mass Index (BMI)** was calculated by **Quetelet index** (body weight in kilogram divided by height in meter square).

Pulmonary Function Tests:

The pulmonary function of the subjects were measured using portable computerised spirometer (spirobank_G) manufactured by MIR-Medical International Research-Roma -Italy. The instrument is based on a turbine sensor working on the infrared interruption principle. This is a small hand held instrument displaying the results and interpretation.

Indications for spirometry:

1. Evaluation of respiratory disorders.
2. Assessment of response to bronchodilator therapy.
3. Preoperative assessment.
4. Detection of pulmonary function abnormality in persons predisposed to lung diseases due to occupational exposure.

Contraindications:

1. Recent myocardial infarction.
2. Chest or abdominal diseases.
3. Oral or facial pain aggravated by mouth piece.
4. Stress incontinence.
5. Dementia or confused state.

Activities to be avoided prior to spirometry:

1. Smoking within one hour of testing.
2. Alcohol consumption within 4 hours of testing.
3. Exercise within 30 minutes of testing.
4. Clothing that restricts full chest and abdominal expansion.

- A large meal within two hours of testing. After calibrating the spirometer according to the procedure given in the manual, three trials of each ventilatory function of each subject was carried out.

Indian. J. Physiol. Pharmacol. 2004; 48(3). Subjects were in the standing position, head slightly elevated and nose clips applied. The mouth piece is held between the lips to create a good seal. After taking a deep breath the subjects were asked to expire as fast and forcibly as possible into the mouth piece. The readings with the highest value were included for the study.

Precautions undertaken:

- The turban sensor was sterilized before each spirometric test.
- Disposable mouth pieces were used for each subject.
- The subjects were well instructed and encouraged to make maximum possible effort.
- The time interval given between each trial was 3minutes.

STATISTICAL ANALYSIS:

The comparison between the study group and control group was done by **students t test** using **SPSS (Statistical Package for Social Sciences) software. Sigma stat version 3.5.** The **statistical significance** was drawn at 'p' value < 0.05.

Result:

The **mean ± SD** for **age** for study and control group were **46.04 ± 7.12** years and **45.40±7.74** years respectively. The **mean ±SD** for **BMI** for study and control group were **21.69±1.27kg/m²** and **21.93 ± 1.38 kg/m²** respectively. The **mean ±SD of FEV₁**, for study and control group were **3.006 ± 0.225** and **2.708 ± 0.147 L** respectively. The **mean ± SD of FVC** for study and control group were **3.410 ± 0.224L** and **3.173 ± 0.184L** respectively. The **mean ± SD of FEV₁,%** for study and control group were **88 ± 2.798** and **85.403 ± 3.127** respectively. The **mean ± SD for PEFR** for study and control group were **6.441± 0.546 L/S** and **6.017±0.334 L/S** respectively.

Results and observations:

Table-1:Results of the analysis are given.

S. No	Pulmonary function test	Study group(30)	Control group(30)	"P" Value
1	FEV ₁ (L)	3.006±0.225	2.708±0.147	<0.001
2	FVC(L)	3.410±0.224	3.173±0.184	<0.001
3	FEV ₁ /FVCX100(FEV ₁ ,%)	88±2.798	85.403±3.127	<0.001
4	PEFR(L/S)	6.441±0.546	6.017±0.334	<0.001

Discussion:

Pulmonary function parameters have a relationship with yogic practice, an ancient system of India. Yoga is the best lifestyle modification ever devised to improve health. Yoga is a practice involving body and mind. It is the art of living that provides perfect balance in all aspects of life – the physical, emotional, psychic and spiritual. It is a method of preservation of health and prevention of diseases. Yoga practice consists proper relaxation, exercise, breathing, diet modification and meditation.

The present study revealed significantly higher values of pulmonary functions among subjects practicing yoga as compared to controls who did not practice yoga. Study group exhibited better pulmonary function status. It was observed that the mean of %FVC for yoga practitioners was higher and statistically significant with 'p' value < 0.0001. This correlates with findings of Joshi et al. [16], Yadav and Das[2] in their study also observed that there was a significant increase in FVC among the subjects exposed to yogic exercises. The changes in the FVC values depend upon the duration of yoga training.

Yadav and Das[2] in their study observed that FEV₁ was significantly higher with 12 weeks of yoga training. The present study also showed highly significant values of FEV₁ among study group suggesting that the yoga practice does have an influence on FEV₁. Yoga training increases strength of respiratory muscles contributing to improvement in pulmonary functions.[19]

Present study revealed statistically significant higher PEFR values in yoga practitioners. Yadav and Das[2], Joshi et al.[16] also observed a significantly higher PEFR. In contrast Khanam et al.[18] did not report any significant change in other lung function tests but for PEFR. Repeated methodical respiratory exercises as done in yogic practice improves total lung capacity and breath holding during pranayam leads to maximal shortening of the inspiratory muscles which have been shown to improve the lung functions.

In the present study, the mean FEV₁/FVC% among yoga practitioners was higher than control group. Vital capacity is determined by the compliance, lung dimensions and respiratory muscle power, whereas PEFR is determined mainly by alveolar elastic recoil, airway caliber, and respiratory muscle effort. Pranayama is characterized by slow and deep inhalation and exhalations.. Udupa et al.[21] in their study stated that pranayama also trains the respiratory centers. The emphasis is more on prolonged expiration and efficient use of abdominal and diaphragmatic muscles. Similarly Chibber et al.[23] found significant increase in FVC, FEV₁ % and PEFR at 6th and 12th week of pranayama practice in healthy females.

Improvement in pulmonary function parameters among yoga practitioners in the present study may be attributed to better development of respiratory musculature incidental to regular practice of yoga, improved thoracic mobility and the balance between lung and chest elasticity. Increased respiratory muscle power is due to hypertrophy of the muscles during yoga.

We recommend the general population should adopt yogic exercises for improving their health. Hence regular practice of yoga should be promoted among the public especially those with sedentary life that may bring desirable physical, physiological, and psychological changes in the individual.

Conclusion:

Present study revealed that yoga practitioners had better pulmonary function. Regular yoga practice improves health, positive effect on the lung and improvement of pulmonary capacities. Effect of yoga on lung functions can be used as a tool to treat and prevent many lung diseases such as asthma, allergic bronchitis, tuberculosis and many occupational diseases.

Since respiratory disorders are one of the commonest causes of preventable morbidity, regular yoga practice improves pulmonary function and improves health and wellbeing.

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