
ORIGINAL RESEARCH ARTICLE

**Short Term Yogic Practices and its Effect on Respiratory Muscles
Endurance in Healthy Individuals**

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Abstract:

Introduction: Yoga an ancient practice which is known to affect cardio –respiratory efficiency of the people. The present study was designed to find the effects of the yoga on respiratory muscle endurance.

Material and method: respiratory muscle endurance is measured with pulmonary function test which were performed before and after the 8 week yoga training in the healthy individuals. The results of PFT before and after yoga training were compared.

Results: results of the study showed statistically significant elevation in the selected parameters like FVC, FEV1, FEV1/FVC, MVV.

Conclusion: From above results it can be concluded that short term yoga practices significantly increases the respiratory muscle endurance.

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Introduction:

When the breath wanders the mind also is unsteady. But when the breath is calmed the mind too will be still, and the yogi achieves long life. Therefore, one should learn to control the breath as written in Hatha Yoga Pradipika.

Yoga is a tool not only to maintain the physical but also the mental health. It is an ancient but perfect science. Yoga deals with the evolution of humanity. This evolution includes all aspects of one's self being, from bodily health to self realization. Yoga means union - the union of body with consciousness and consciousness with the soul. Yoga cultivates the ways of maintaining a balanced attitude in day to day life and endows skill in the performance of one's actions. B.K.S. Iyengar described the yoga perfectly.

Yoga has been cultivated in all the parts of India from past many years. A number of advantageous physiological effects occur in the body because of the practice of yoga. Sanskrit word prana means breathe and ayama means development or control¹ Pranayama is a fine skill of controlling respiration². It produces many systemic psychophysical effects in the body, improves respiratory functions and respiratory muscle endurance, readjusts the autonomic activity & corrects imbalance and also positively affects various physiological variables³.

Many previous studies says that yoga exercises improve various respiratory parameters such as forced vital capacity (FVC), peak expiratory flow rate (PEFR) and maximum voluntary ventilation (MVV)^{2,3,4,5,6,7}. Breathing exercises help to regulate respiratory movements during inhalation and exhalation.⁸

Pulmonary function tests are used to assess the functional status of the lungs. It has a diagnostic and therapeutic role and helps clinician to answer some general question about the patient and lung disease. The purpose of this study was to determine the effects of yogic exercises on pulmonary function tests in healthy individuals.

Material and methods:**Subject selection**

The study was conducted at a yoga centre. Forty normal volunteers (20 males, 20 females) between the age group of 25-35 yrs participated in the study. A written consent was taken from all the participants and before starting the study. The purpose of study of study was explained to subjects in detail to them. Before inclusion in the study a detailed history of the volunteers was taken and clinical examination was done.

Inclusion criteria:

Subjects who have not experienced yoga and respiratory muscle strengthening exercise in resent past.

No history of cardio respiratory diseases.

Nonsmokers

Exclusion criteria:

1. History of active sports training (Athletes), previous experience of practicing yoga.
2. 2. History of major medical illness such as Tuberculosis, Diabetes Mellitus, Bronchial Asthma.
3. 3. History of major surgery in the recent past.
4. 4. History of smoking

Methods:

Forty (n=40) healthy Volunteers were divided in to 20 males and 20 females with age range from 25-35 years were selected and a pulmonary function test was performed before introducing to the yoga and breathing exercise. After enrolment of subjects they were introduced to 8 week training by certified professional yoga instructor. The total 60 minute training was done 6 days in a week, one day was rest day. The training includes 5 minute prayer, 30 minute Asanas (Naukasana,

Matsyasana, Bhujangasana , Shalabhasana , Dhanurasana , Shavasana), 10 minutes of Breathing Exercises (Kapalbhati , Yogic Shwasan), 15 minutes of Pranayama (Nadi Shuddhi, Bhastrika, Bhramari). After the 8 week of training again the pulmonary functions test was performed on subjects.

Recording of pulmonary function tests

Pulmonary function test (PFT) was performed by using computerized spirometer. The subject was asked to sit comfortably in a chair. The complete procedure was explained, all doubts were cleared. Subject was instructed to take deep and slow inhalation through the nose pause for a moment and Then exhale forcefully through mouth as fast as possible with lips sealed around the sterile mouth piece of spirometer. Best of three readings were recorded and interpreted. The parameters recorded were FVC, FEV1, FEV1/FVC, MVV.

Statistical analysis:

The result of study were statistically compared manually by statistician. As sample size is 40, the degrees of freedom for the particular research is $(n-1)$ i.e. $40-1=39$ and the table value of 39 degrees of freedom, for 5% level of significance or 95% confidence interval is 1.6849. Now we compare the T value (Calculated) to the table value, if $T_{\text{Calculated Value}} \geq T_{\text{Table Value}}$, we reject our Null Hypothesis otherwise accept it.

Result and Analysis:**Table 1: Observation table for males**

PARAMETER		GROUP 1		GROUP 2		T Value Calculated
		Mean	SD	Mean	SD	
FVC	Predicted	3	0.35	3.02	0.54	0.197
	Observed	2.02	0.54	2.25	0.69	1.660
FEV1	Predicted	2.89	0.24	3.02	0.45	1.612
	Observed	2.12	0.45	2.23	0.85	0.88
FEV1/FVC	Predicted	87.14	2.2	88.68	6.8	1.363
	Observed	92.75	6.52	93.67	7.69	0.577
MVV		46.89	75.89	7.43	77.6	7.02

The results in above table, we found that when the pulmonary parameters predicted and Observed values FVC, FEV1, FEV1/FVC ratio, MVV were significantly elevated in the male subjects after undergoing the 8 week yoga training .

Table 2: Observation table for females

PARAMETER		GROUP 1		GROUP 2		T VALUE calculated
		Mean	SD	Mean	SD	
FVC	Predicted	3.5	0.042	3.55	0.66	0.478
	Observed	2.84	0.76	3.01	0.5	1.182
FEV1	Predicted	2.96	0.52	3.08	0.58	0.974
	Observed	2.47	0.44	2.59	0.78	0.847
FEV1/FVC	Predicted	83.11	2.31	82.35	5.39	0.820
	Observed	97.02	4.03	97.65	3.36	0.759
MVV		46.89	55.89	7.12	57.6	6.89

The results in above table, we found that when the pulmonary parameters predicted and Observed values FVC, FEV1, FEV1/FVC ratio, MVV were significantly elevated in the female subjects after undergoing the 8 week yoga training .

Discussion:

From the results it is evident that there is significant improvement in FVC, FEV1/FVC, MVV after practicing yoga for a period of 8 week in normal individuals. These findings were supported by various studies^{2,3,4,5,6}. The probable cause of the observation is that yoga could have increased the respiratory muscle strength as well as the breathing exercise would have increased the diaphragmatic strength which is the main muscle of inspiration.² Increase in the forced vital capacity could be also due to the increase in the expiratory flow during Pranayama and may have cleared the airway which would have reduced the airway resistance.⁹

The stretching of the lung alveolar membrane also increase the production of surfactant as well as prostaglandins which again helps in improving the respiratory compliance and the airway resistance.² The training of yoga and the Pranayama is also associated with the decrease in the

sympathetic activity which would again reduce the airway resistance and helps in improving the respiratory function performance.¹⁰

Conclusion:

The pulmonary function tests were performed by using computerized spirometer in 20 male and 20 female healthy individuals. The present study reveals the effect of yoga on pulmonary functions in normal healthy individuals. Significant increase in PFT that is FVC, FEV1/FVC, MVV by paired t-test was found after a 8 week training of yoga exercise. The study suggest that yoga exercises are equally beneficial for both males and females. The cause for this could be strengthening of the respiratory muscles, decrease in the airway resistance and increase in the lung compliance due to short term yoga exercises practiced. It can be stated that yoga exercises are beneficial particularly to pulmonary functions, even in normal healthy individuals.

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Conflicts of interest

Author has no conflicts of interest.

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