

**Original article**

## **Assessment of Pulmonary functions after Sudarshan Kriya Yoga practice in First Year Medical Students**

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### **Abstract**

**Introduction:** Sudarshan Kriya Yoga (SKY) is one form of yogic breathing exercise. SKY is a type of cyclical controlled breathing practice which has four distinct components. Studies had been done to prove the role of Yoga for the improvement of pulmonary functions in individuals with respiratory diseases. This study is done to determine the effect of Sudarshan Kriya Yoga on Pulmonary Function Test (PFT) in healthy young volunteers.

**Material and Methods:** The study conducted in the department of physiology, LLRM Medical College, Meerut over a period of three months on 30 Medical students of both genders. The pulmonary functions parameters were measured with Spirometer and recorded on 7<sup>th</sup>, 30<sup>th</sup> and 90<sup>th</sup> day of beginning of SKY.

**Statistical analysis:** The probability value  $p < 0.05$  was considered as significant while  $p < 0.01$  and above were considered as highly significant.

**Result:** A short duration (7 days) SKY practice is quite beneficial in improving one's Pulmonary Ventilatory Function. All the Pulmonary Function Tests improved but PEFR and MVV were significantly increased after 30 days of SKY training. After 90 days SKY practices, there is significantly increase in pulmonary parameters viz. FVC, FEV<sub>1</sub>, PEFR, VC and MVV.

**Conclusion:** Regular practice of Yoga (SKY) for 90 days is beneficial in improving the respiratory functions in healthy individuals irrespective of age and gender. Further research with large sample size and for varied age groups is needed for applying these results to population in general.

**Key words :** Sudarshan Kriya Yoga, Pulmonary Function Test, Peak Expiratory Flow Rate, Forced Vital Capacity, Maximum Voluntary Ventilation.

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### **Introduction**

The tradition of yoga was born in India several thousand years ago. "Yoga" means union of our individual consciousness with the Universal Divine Consciousness in a super-conscious state known as Samadhi<sup>[1]</sup>. Yoga is popular all over the world nowadays. It increases longevity and has therapeutic and rehabilitative effects<sup>[2]</sup>.

Yogic breathing or SKY is the science of breath control. Sudarshan Kriya Yoga (SKY) is one form of these breathing exercises. SKY has a sound scientific basis and is an ideal tool for improving the health. The goal of these breathing techniques is to relax quickly and to improve the respiratory

efficiency. SKY is a type of cyclical controlled breathing practice which has four distinct components<sup>[3]</sup>. SKY breathing techniques are mainly described as 'Ujjayi' or Victorious Breath (2-4 breaths/min), Bhastrika or "Bellows Breath" (rapidly inhaled and forcefully exhaled air @ 20-30 breaths/minute), 'Om' chanting (three times with very prolonged expiration) and Sudarshan Kriya. Ujjayi involves experiencing the conscious sensation of the breath touching the throat. This slow breath technique increases airway resistance during inspiration and expiration and controls airflow so that each phase of the breath cycle can be prolonged to an exact count. In Bhastrika air is

rapidly inhaled and forcefully exhaled. It causes excitation followed by calmness. “Om” is chanted three times with very prolonged expiration while Sudarshan Kriya is an advanced form of rhythmic, cyclical breathing with slow, medium, and fast cycles. Living a happy and healthy life on all planes is possible through the unified practice of Sudarshan Kriya Yoga (SKY) along with asana and pranayama [4]. Several studies had been undertaken to prove the role of pranayama for the improvement of pulmonary functions in healthy individuals [5, 6, 7, and 8]. It Improves respiratory functions and has a beneficial effect on respiratory diseases.

**Aims and Objectives**

The aim of this study is to determine the effect of Sudarshan Kriya Yoga on Pulmonary Function Test (PFT) in healthy young volunteers.

**Material and Methods**

The present study conducted in the department of physiology at LLRM Medical College, Meerut, U.P (India) over a period of three months on 30 Medical students of both sexes. The age range was 18-21 years. The students volunteered themselves after an

orientation session in the campus. The protocol for this study was approved by the Institutional Ethical committee. The participants gave informed consent after the study design was fully explained.

**Inclusion criteria-** Subjects are healthy, non-smoker and with no cardio respiratory diseases were included. Subjects not performing any other type of exercises were also included.

**Exclusion Criteria-** Subjects having history of allergy, any chest deformity, cigarette smoking was excluded. Subjects having history of major medical illness like tuberculosis, hypertension, diabetes mellitus and Bronchial asthma were also excluded for this study. Baseline vitals were measured before the beginning of Sudarshan Kriya Yoga (SKY) practice. The students did not have any exams or any academic burden during baseline investigations. The pulmonary functions parameters were measured with Spirometer and recorded on 7<sup>th</sup>, 30<sup>th</sup> and 90<sup>th</sup> day of beginning of SKY. The data collected was subjected to standard statistical analysis.

**Observations and Results**

**Table-1**

**Changes in Pulmonary parameters following SKY in subjects (n=30) after 7days**

Parameters	Basal Mean ± SD	After 7 days of SKY		p value
		Mean ± SD	Confidence Interval	
FVC(Lit )	3.42±0.61	3.41±0.61	3.18 to 3.64	NS
FEV <sub>1</sub> (Lt/min)	3.03±0.42	3.09±0.47	2.91 to 3.26	NS
FEV <sub>1</sub> /FVC ratio	91.2±5.73	90.9±5.61	88.81 to 93.30	NS
PFER (Lt/min)	7.25±1.34	7.29±1.54	6.71 to 7.86	NS
MEF <sup>50-75%</sup>	4.34±0.98	4.37±0.97	4.009 to 4.733	NS
VC (Lt)	3.10±0.603	3.11±0.589	2.89 to 3.32	NS
MVV (Lt/min)	135±29.8	136±29.6	124.7 to 146.8	NS

NS- Non Significant

**Table-2**

**Changes in Pulmonary parameters following SKY in subjects (n=30) after 30 days**

Parameters	Basal Mean ± SD	After 30 days of SKY		p value
		Mean ± SD	Confidence Interval	
FVC(Lit)	3.42±0.61	3.48±0.60	3.25 to 3.70	NS
FEV <sub>1</sub> (Lt/min)	3.03±0.42	3.10±0.42	2.94 to 3.25	NS
FEV <sub>1</sub> / FVC ratio	91.2±5.73	91.2±6.17	88.87 to 93.48	NS
PFER (Lt/min)	7.25±1.34	7.93±1.36	7.41 to 8.43	<0.001**
MEF <sup>50-75%</sup>	4.34±0.98	4.38±0.87	4.057 to 4.709	NS
VC (Lt)	3.10±0.603	3.29±0.722	3.01 to 3.55	NS
MVV (Lt/min)	135±29.8	144±27.7	134 to 154.7	<0.004*

\*Significance

\*\*Highly significance

**Table-3**

**Changes in Pulmonary parameters following SKY in subjects (n=30) after 90 days**

Parameters	Basal Mean ± SD	After 90 days of SKY		p value
		Mean ± SD	Confidence Interval	
FVC(Lit)	3.42±0.61	3.61±0.65	3.36 to 3.85	<0.005*
FEV <sub>1</sub> (Lt/min)	3.03±0.42	3.15±0.45	2.97 to 3.32	<0.03 <sup>#</sup>
FEV <sub>1</sub> /FVC ratio	91.2±5.73	89.9±5.64	87.77 to 91.99	NS
PFER (Lt/min)	7.25±1.34	8.32±1.36	7.80 to 8.82	<0.001*
MEF <sup>50-75%</sup>	4.34±0.98	4.56±0.85	4.238 to 4.874	NS
VC (Lt)	3.10±0.603	3.47±0.717	3.20 to 3.74	<0.003*
MVV (Lt/min)	135±29.8	152±27.6	141.8 to 162.4	<0.001*

# Significance

\*Highly significance

The ancient Indian yoga system emphasizes on controlled breathing (pranayama), body postures (asanas), relaxation of mind (Meditation)<sup>[9-10]</sup>. SKY is a unique breathing process not practiced as a single technique but is integrated with asanas, pranayama, meditation and attitude training. This type of yoga is said to heal and purify within, is a natural and non invasive stress relieving technique<sup>[10]</sup>. Studies on the ancient practice of Yoga have demonstrated an improvement in respiratory function. Long duration practice of SKY improves many body functions including pulmonary parameters. A short duration (7days) SKY practice is quite beneficial in improving one's Pulmonary Ventilatory Function [Table 1]. Our results are consistent with the earlier studies<sup>[11-12]</sup>. They had noticed increase in values of Pulmonary Function Tests. However in our study all the Pulmonary Function Tests improved but PEFR and MVV were significantly increased after 30 days SKY training [Table 2]. JS Bhuvaneshwaran (2005) study confirms the positive effects of SKY on certain cardio respiratory parameters. For long SKY, there is significant effect on Tidal Volume and oxygen saturation ( $P < 0.05$ )<sup>[13]</sup>. After 90 days SKY practices, there is significantly increase in pulmonary parameters viz.FVC, FEV<sub>1</sub>, PFER, VC and MVV.

### Discussion

Although clear cut evidence is lacking, the mechanisms by which changes in respiratory functions occur are greater relaxation of respiratory muscles induced by supraspinal mechanisms which increase expiratory reserve volume contributing to a rise in vital capacity<sup>[14]</sup>. Lung inflation to near total lung capacity is a major physiological stimulus for release of surfactant and prostaglandin into alveolar spaces. This causes increase in lung compliance and decrease in bronchiolar smooth muscle tone. Lung inflation to near total lung capacity as induced by

relaxation during meditation may thus lead to a better vital capacity. The increased breath holding time caused by greater control of respiratory musculature and the ability to consciously override the normal physiological stimuli of respiratory centres has been reported in the study on those doing yoga<sup>[14]</sup>.

By consistently performing a variety of asanas, muscles of the thoracic cavity are constantly being recruited. This recruitment may lead to greater musculature and thereby result in improved FVC<sup>[15]</sup>. Yoga postures (asanas) involve isometric contraction which is known to increase skeletal muscle strength. The stress is on more prolonged expiration and efficient use of abdominal and diaphragmatic muscles. This act trains the respiratory apparatus to get emptied and filled more completely and efficiently. Removal of undue tension from the skeletal muscles in yogasanas help the thorax to relax better than before<sup>[16]</sup>.

Yogic breathing raises the diaphragm at a higher level than its normal excursion. This helps in efficient movement of diaphragm<sup>[16]</sup>. Yoga strengthens the respiratory musculature due to which chest and lungs inflate and deflate to fullest possible extent and muscles are made to work to maximal extent. During pranayama, there is slow and prolonged inspiration as well as expiration. This stretches elastin and collagen fibres interwoven among the lung parenchyma. Hence, these fibres can elongate to a greater extent, thus, increasing the compliance of lungs.<sup>[17-18]</sup> Yoga with its calming effect on the mind can reduce and release emotional stresses thereby withdrawing the bronchoconstrictor effect<sup>[19]</sup>.

### Conclusion

With this study, it is proved beyond doubt that regular practice of Yoga (SKY) for 90days is beneficial in improving the respiratory functions in healthy individuals irrespective of age and gender.

The results of this study and their explanations would justify the incorporation of yoga as part of our lifestyle and as a part of course in the medical field in promoting health and thereby preventing age related respiratory diseases as well as other

systemic disorders. Research on particular set of Yogic exercises like only selected SKY is required and also further research with large sample size and for varied age groups is required for applying these results to population in general.

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