



## Evaluation on effect of pranayama and meditation on Pulmonary functions in healthy young adults

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### ABSTRACT

*Pranayama is a technique of controlling and modulating breath and meditation, a process through which one attains a state of deep rest yet active state of mind. Recent studies on long-term yogic practices have shown improvements in respiratory functions. The present study was done to evaluate the effects of pranayama and meditation on respiratory parameters. This study showed beneficial effects of regular pranayama and meditation practice on respiratory functions irrespective of age, gender and BMI in normal healthy individuals.*

**KEYWORDS :** Yoga, meditation and Pranayama.

### Introduction:

The term "yoga" and the English word "yoke" are derived from Sanskrit root "yuj" which means union. Yoga is a psycho-somatic-spiritual discipline for achieving union & harmony between our mind, body and soul and the ultimate union of our individual consciousness with the Universal consciousness (Madanmohan, 2008).<sup>1</sup> Yoga, an ancient Indian science, aims to bring about functional harmony between body and mind through three main practices: asanas, pranayama and meditation. Pranayama means control of 'prana'. "Prana" in Indian philosophy, refers to all forms of energy in the universe. Life force in an individual is symbolized by breathing. Breath is a dynamic bridge between the body and mind.<sup>2</sup> Medical science tries to achieve an optimum physical and mental health of the individual through preventive, curative, and promotive means. However, for a long time medical professionals have laid much emphasis on the curative aspect and only relatively recently the preventive aspect is also being emphasized whereas in yogic practice the stress is mainly on the promotive aspect, although some yogic methods are prescribed for curative purposes as well. A number of studies have been done to assess the effect of yogic practice on FVC FEV-1 PEFR pulmonary functions. Udupa et al studied the effects of some breathing exercises (Pranayam) in normal persons.<sup>3</sup> Nayar et al documented the effects of yogic exercises on human physical efficiency.<sup>4</sup> In another study, oxygen consumption during three yoga-breathing patterns was shown by Miles Wales.<sup>5</sup> In a related work, Makwana et al studied the effects of shortterm yoga practice on ventilatory function tests.<sup>6</sup> Since Pranayama and meditation have proven to have beneficial and therapeutic effects, in normal and diseased states alike, this study has been done exclusively on healthy young adults to add more data in the field of yoga and pulmonary functions. This study has been designed to explain and ascertain the promotive aspects of pranayama and meditation in influencing respiratory status in healthy individuals of 20-65 yrs.

### Material and methods:

This present study was conducted in the Department of Physiology, M L N Medical College Allahabad during the period from May, 2009 to September, 2010. A 30 healthy subjects, an age match group 20-65 years were selected randomly from a group of participants visiting the yoga center who had not yet started practicing yoga but were keen on learning. The same subjects were chosen as both study as well as control group. All the data was collected from 5am to 6am. Data on physical characteristics such as age, height, weight and body mass index (BMI) was obtained. BMI was calculated as weight (kg) / height (m)<sup>2</sup>. Pranayam schedule included the deep breathing, inhalation-retention-exhalation at fixed intervals, abdominal (diaphragmatic) breathing and alternate nostril breathing.

All the subjects used to do yoga practice daily for about one hour. The yogic schedule consisted of a prayer, asanas, pranayam and meditation. The exercise regimen included different yogic asanas like,

Padmasana, Yoga Mudra, Matsyasana, Kukkudasan, Uthana Padhasana, Pavanmuktasana, Paschimotasana; Dhanurasana, Supta Vajrasana, Gomukhasana, Viparita Karani, Sarvangasana, Halasan, Karna Peedhasana, Bhujangasana, Bakasana, Mandukasana, Parvathasana, Nauli and Shavasana. Optionally the subjects could do cleansing procedures (kriya) also.

Subjects who were trained in yoga before, subjects with history of respiratory diseases, cardiovascular diseases and diabetes were excluded from the study. We also excluded subjects with neurological disorders and those who were not able to perform respiratory function tests. Subjects who smoked, consumed alcohol, or any drugs were excluded after taking their history.

Pulmonary Function Tests (PFT) were recorded by Medspiror - made in India (Chandigarh) a computerized dry type spiro meter. The parameters of PFT included in the study were - FVC (Forced vital capacity), FEV1 (Forced expiratory volume in 1<sup>st</sup> second) and PEFR (Peak expiratory flow rate). Recordings were done on day-1, after 6 weeks, after 12 weeks and after 18 weeks of yogic practice. Data were analyzed by SPSS student t-test and one way ANOVA. A P-value <0.05 was considered statistically significant.

### Results and Discussion:

The age of the subjects ranged from 20-65 yrs, the mean age being 36.01±7.20 years. On analysis of the physical characters of the 30 subjects, the mean age (years) was 36.01±7.20, the mean height (cm) was 156.38±6.17, the mean weight (kg) was 60.21±5.21 and the mean BMI (kg/m<sup>2</sup>) was 26.41±2.09.

The results have been summarized in Table-II. The FVC, FEV-1 and PEFR of all the subjects on day-1, weeks-6, weeks-12 and weeks-18 has been given. It is evident that the PFT parameters have higher values at weeks-6, weeks-12 and weeks-18 in comparison to day-1 values. The p value has been calculated at weeks-6, weeks-12 and weeks-18 in comparison to values on day-1.

**Table 1: Comparison of pulmonary function tests.**

Parameter	FVC(lit.)	FEV-1(lit.)	PEFR (lit/sec)
time interval	mean±sd	mean±sd	mean±sd
Day-1	2.60 ± 1.32	1.989±0.289	4.33 ± 1.43
Weeks-6	2.90 ± 1.28*	2.40 ± 0.87*	5.10±1.12**
Weeks-12	3.20 ± 1.19*	2.60 ± 1.32*	5.34± 1.10**
Weeks-18	3.45 ± 1.45*	2.90 ± 1.28*	5.59±1.09***

\*P<0.0001 \*\*P =N.S. \*\*\*P<0.001

On analyzing the effect of regular practice of pranayama and meditation in the present study, it was found that there was a highly significant increase in chest expansion, breath holding time and PEFR after

yoga practice. Other studies have also reported significant increase in chest expansion<sup>7,8</sup> and PEFR after yoga practice.<sup>9,10,11</sup> The increased chest expansion and PEFR due to regular practice of pranayama and meditation.

In this study, FVC and FEV-1 were significantly higher at weeks-6, weeks-12 and weeks-18 from day-1 ( $P < 0.0001$ ). However, PEFR is not statistically significant at weeks-6 and weeks-12 but value of PEFR is higher at weeks-6 and weeks-12 in comparison to day-1. At weeks-18, PEFR is significantly higher than day-1 ( $P < 0.001$ ).

Makwana et al reported significant increase in FVC following 10 weeks of yoga training.<sup>6</sup> Others have recorded similar observations.<sup>4,12</sup> The improvement in vital capacity is due in part to increased development of respiratory musculature incidental to regular practice of yogic exercise.<sup>13</sup> By the practice the respiratory apparatus is emptied and filled more completely and efficiently which is recorded in terms of increased FVC. Similar ventilatory training even in elderly subjects (age 60 to 75 yrs) has been shown to improve lung volumes and capacities.<sup>14</sup> Makwana et al also showed increased FEV-1 after 10 weeks of yogic practice. The increase in FEV-1 might be due to significant increase in vital capacity. Joshi et al reported significant increase in FVC and PEFR following 6 weeks of pranayam practice.<sup>15</sup>

Lung inflation near to total lung capacity is a major physiological stimulus for the release of lung surfactant<sup>16</sup> and prostaglandins into alveolar spaces<sup>17</sup>, which increase lung compliance and decrease bronchial smooth muscle tone respectively. The other possible mechanism for improved PFT may be: Increased power of respiratory muscles that is due to the work hypertrophy of the muscles during pranayam and other exercises. Cleansing procedures clean the infective nasal secretions, Yogic breathing exercises train practitioners to use the diaphragmatic and abdominal muscles more efficiently thereby emptying and filling the respiratory apparatus more efficiently and completely.<sup>6</sup> Yoga, with its calming effect on the mind can reduce and release emotional stresses, thereby withdrawing the broncho-constrictor effect.

Thus, practice of yogic exercises seems to be beneficial for respiratory efficiency. A number of studies have been done to show the beneficial effects of yoga on asthmatic patients.<sup>18,19</sup> In recent studies, effect of yoga on ventilatory responses, respiratory endurance and muscle strength have been well documented.<sup>20,21</sup> Bera et al have studied 'recovery from stress by yogic relaxation posture' in their recent work.<sup>22</sup>

### Conclusion:

These findings suggest that, it can be stated that yogic exercises are beneficial for the better maintenance of body functions, particularly pulmonary functions, even in normal healthy subjects. In our study, there was significant increase in FVC, FEV-1 and PEFR at the end of 18 weeks of yogic practice in healthy young adult. However, it remains to be assessed whether these changes persist after resuming normal respiration and whether long term practice will lead to stable modifications of respiratory control.

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