



## PHYSIOLOGICAL RESPONSES OF SHORT TERM PRANAYAMA AND MEDITATION ON RESPIRATORY PARAMETERS IN HEALTHY INDIVIDUALS.

### Physiology

**Dr. Satyanath Reddy Kodidala\***

Assistant Professor, Department of Physiology, K.D. Medical College Hospital and Research Centre, 24 KM Milestone, Mathura-Delhi Road, NH-2, P.O. Akbarpur, Tehsil Chhata, Mathura (U.P.)-281406, India. \*Corresponding Author

### ABSTRACT

In present day, scenario stressful lifestyle, irregular eating habits and lack of exercise have led to emergence of cardio-vascular and respiratory diseases which were less common in older days when people had less stress and were physically more active as compared to present days. Pranayama, a stage of yoga practice, is an ancient science which makes use of voluntary regulation of breathing and calm the mind. We have tried to study the possible beneficial effects of breathing exercises so as to prevent respiratory morbidity in young adults. Keeping this in view, the present study is designed to evaluate the effects of short term practice of Pranayama and meditation on respiratory parameter (chest expansion, breath holding time, FVC, FEV1, PEFR and MVV). Sixty normal healthy subjects of first year MBBS course volunteers for this study was selected. They were aged between 17-20 years who did not have any previous training in Pranayama. Participants underwent two hours daily yoga program for 30 days under trained person. They were highly motivated to participate in this study program. All the selected physiological parameters were measured before and after performing yoga programme. There was significant increase in chest expansion, breath holding time, FVC, FEV1, PEFR and MVV after the practice of pranayama compared to pre yoga practice.

### KEYWORDS

Pranayama, FVC, PEFR chest expansion, breath holding time, FEV1 and MVV.

#### Introduction:

Pranayama is a Yogic technique in which breathing is controlled voluntarily. Patanjali in his Yoga Sutra describes- Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana and Samadhi as eight angas (parts) of yoga. (1) Amongst them, the third part Pranayama and also meditation are considered as very important part and prescribed by modern medicine too. Pranayama means control of 'prana'. "Prana" in Indian philosophy, refers to all forms of energy in the universe. Meditation is a technique of extending our ordinary consciousness to reach higher states of consciousness and there by discovering more about ourselves. Different types of Pranayama (breathing exercises) produces different physiological responses in normal young volunteers (2). Yoga aims to bring about functional harmony between body and mind through three main practices: asanas, pranayama and meditation. Pranayama and meditation as a natural way of cleansing breath has been suggested as a route to healthy body and mind. Growing number of evidences have claimed that yoga practices increases longevity, has therapeutic and rehabilitative effects. (3,4,5) The beneficial effects of six weeks practice of different pranayamas are well reported and have sound scientific basis. (6) Different types of pranayama along with asanas produce different physiological responses in normal young individuals. Breathing exercises for three weeks are reported to influence cardiorespiratory and autonomic functions. (7) Numerous people all over the world have derived subjective benefits by practicing pranayama regularly. But to prove its efficacy as a health science it must be studied in the light of modern medicine. Hence, present study was undertaken to find out effects of Short Term Pranayama and Meditation on physiological Respiratory Parameters.

#### Materials and Methods

This study was conducted in Department of Physiology, K.D Medical College Hospital & Research centre, Mathura. The ethical clearance was taken for the study from the Ethical Committee of the Institute. 60 subjects in Age Group 17 to 23 years of both sex, from college Campus were selected for the study. The subjects were explained about the importance and procedure of the study. subjects were asked not to change their lifestyle during the study. Consent was taken from the subjects prior to involving in the study on a consent form.

#### Inclusion Criteria

Healthy subjects with no major illness and no prior practice of yoga from K.D Medical college campus were included in the study.

#### Exclusion Criteria

- Subject already practising Yoga.
- Smokers and alcoholics.

- Respiratory diseases and those who were not able to perform respiratory function tests.
- Subjects with history of respiratory diseases.

#### Methods

The subjects were informed about the procedures in brief and were asked to relax physically and mentally for 30 minutes in supine position. 1) Measurement of chest expansion during deep inspiration after deep expiration was done using a measuring tape at the level of the fourth intercostal space. 2) Breath holding time was measured in seconds from the time of holding breath after deep inspiration till the breaking point of the held breath by using a stop watch. 3) Dynamic lung function (Such as forced vital capacity, forced expiratory volume in 1 second, peak expiratory flow rate, and maximum voluntary ventilation) will carried out using computerised portable spirometer.

The maximum value of three similar trials was taken for all parameters before start of pranayama and meditation and after practice. All the subjects were under uniform dietary habits and received same yoga training for 2 hours daily for one month.

#### Sequence of Yogic Pranayama Practices

The yoga practice schedule consisted of:

- Prayer - 10 min.
- Pranayama - 45 min.
- Short break - 5 min.
- Lecture or film on fundamentals innutrition, stress management, meditation and yogic attitude in daily life - 30 min.
- Meditation - 20 min.
- Prayer - 10 min.

- The different types of Pranayama practiced were –

- Vibhagiya Pranayama (sectional breathing)

- Adama (Kanista) Vibhagiya Pranayama (diaphragmatic/ abdominal breathing)
- Madhyama Vibhagiya Pranayama (Thoracic/intercostals breathing)
- Aadya (Jesta) Vibhagiya Pranayama (upper lobar/ clavicular breathing)
- Poorna mudra Pranayama (Full yogic breathing)

- Nadishuddi Pranayama (Alternate nostril breathing)
- Kapalabathi Kriya (cleansing breath)
- Bahya Pranayama (the external breathing)
- Cooling Pranayama

- Sitali Pranayama
- Sitkari Pranayama

Results were presented as Mean  $\pm$  SD and analysed by using statistical software statistical package of social sciences (SPSS). Student t test has been used to find the significance. P value less than 0.05 was considered as significant.

#### Results:

Result showed significant increase in Chest expansion (cm), BHT(sec),FVC, FEV1, PEFR and MVV

Variable	Before Yoga (Mean $\pm$ SD)	After yoga (Mean $\pm$ SD)
Chest expansion (cm)	3.17 $\pm$ 1.28	4.13 $\pm$ 1.36*
BHT (sec)	33.37 $\pm$ 0.41	33.71 $\pm$ 0.39*
FVC (L/min.)	2.56 $\pm$ 0.45	3.12 $\pm$ 0.46*
FVC1 (L/min.)	2.42 $\pm$ 0.40	2.99 $\pm$ 0.44*
PEFR (L/min.)	6.15 $\pm$ 1.06	7.23 $\pm$ 3.2*
MVV (litres)	103.4 $\pm$ 11.42	130.00 $\pm$ 15.49*

Physiological Responses of Short Term Pranayama and Meditation.  
\* Significant at p < 0.005

#### Discussion:

Significant increase in Chest expansion (cm), BHT(sec),FVC, FEV1, PEFR and MVV in the present study is in accordance with finding of other studies on Physiological Responses of Short Term Pranayama and Meditation(6,7,8,9). Pranayama is reported to improve breathing rate and ventilator functions of the lung.(10) This increase of various parameters in the study can be explained on the following basis.

#### Due to practice of pranayama there occurs :

a) Strengthening of muscles of respiration.Increased range of movement of diaphragm & Emptying & filling of respiratory apparatus is more efficient & complete (11).

b)Lung inflation near to total lung capacity is a major physiological stimulus for the release of surfactant into alveolar space which increases lung compliance. (11, 12)

c)In addition it is suggested that lung inflation near to total lung capacity is a physiological stimulus for the release of prostaglandins which decreases bronchial smooth muscle tone, which in turn decreases airway resistant with a subsequent increase in MVV & FEV1(6).

Practice of meditation along with pranayama produces a hypometabolic state [13] of the body characterized by decreased carbon dioxide production and decreased oxygen consumption, thus allowing breath holding for a longer time. [6]. There was significant increase in BHT which may be due to decreased responsiveness to carbon dioxide to respiratory centre or chemoreceptor. There may also be hypometabolic state of the body characterised by decreased CO<sub>2</sub> production and decreased oxygen consumption, thus allowing breath holding for a longer time.

In the present study, the responses to 30 days of regular combined practice of pranayama and meditation were also assessed with respect to age, gender. It revealed that both males and females responded similarly to the yoga practice. Similar observations in both genders in respiratory parameters were also reported by previous study. [6]

#### Conclusion:

Thus in a nutshell, with this study, it is proved beyond doubt, that regular practice of pranayama and meditation for minimum of one month is beneficial in improving the respiratory functions even in healthy individuals irrespective of age, gender. The results of this study and their explanations would justify the incorporation of yoga as part of our lifestyle in promoting health and thereby preventing age related respiratory diseases. Thus we conclude that daily practice of Pranayama and meditation could also be parts of physical fitness and life style modification programs in maintaining better physical and mental health. Although the present study suggests some applications, further studies with larger number of subjects from different lifestyles need to establish the beneficial effects of pranayama practice.

#### REFERENCES

1. Yoga-sutra of Patanjali. Translated by Saugata Bhaduri . D.K Printworld (P) Ltd. New Delhi.2000.

2. Bhattacharya S, Pandey US, Verma NS. Improvement in oxidative status with yogic breathing in young healthy males.Indian J Physiol Pharmacol 2002; 46: 349-54.
3. Bharshankar JR, Bharshanker RN, Deshpande VN, Kaore SB, Gosavi GB. Effect of yoga on cardiovascular system in subjects above 40 years. Indian J Physiol Pharmacol.2003;47(2):202-06.
4. Khanam AA, Sachdev V, Guleria R, Deepak KK. Study of pulmonary and autonomic functions of asthma patients after yoga training. Indian J Physiol Pharmacol, 1996; 40(4):318-24.
5. Katiyar SK, Bihari S. Role of pranayama in rehabilitation of COPD patients – a randomized controlled study. Indian J Allergy Asthma Immunol, 2006; 20(2):98-104.
6. Joshi LN, Joshi VD, Gokhale LV. Effect of short term pranayama on breathing rate and ventilatory functions of lungs. Indian J Physiol Pharmacol, 1992; 36(2):105-8.
7. Chanavirut R, Khaidjapho K, Jaree P, Pongnaratorn P. Yoga exercise increases chest wall expansion and lung volumes in young healthy Thais. Thai Journal Of Physiological Sciences, 2006; 19(1):1-7.
8. Mascarenhas JF. Autonomic responses to breath holding and its variations following pranayama. Indian J Physiol Pharmacol,1988;32(4):257-64.
9. Bhargava R, Gogate MG, Mascarenhas JF. Autonomic responses to breath holding and its variations following pranayama. Ind J Physiol Pharmacol 1988;32(4):257-64.
10. Yadav RK, Das S. Effects of yogic practice on pulmonary functions in young females. International Journal of Physiology 2001;45(4):493-6.
11. K. Makwana. Effect of short term yoga practice on ventilatory function tests IJPP-July - 1988, vol 32(3), 202
12. Rajkumar Yadav and Shobha Das: Effect of Yogic practices On pulmonary functions in young females, IJPP –2001, 45(4), 493-496.
13. Wallace RK, Benson H, Wilson AF. A wakeful hypometabolic physiologic state. Am. J.Physiol. 1971; 221(3):795-99.