

## EFFECT OF YOGA ON RESPIRATION IN WOMEN

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**Abstracts: Background:** Women are very anxious and constantly under stress to carry out responsibilities at home as well as at workplace. Yoga is considered to be one of the most important, effective and valuable tool available to overcome various physiological and psychological problems. **Aims:** The study was aimed to find out the effect of yoga training on Respiratory Rate, Breath Holding Time and Expiratory Pressure seen in women. **Material & Methods:** The study was conducted at Yoga Institute of the Gujarat Ayurveda University, Jamnagar after prior approval from Ethical Committee. Total 50 women working/non-working, aged 25-50 years, non-smoker, non-pregnant, having stress related symptoms but never undergone yogic training were enrolled and informed consent were obtained. Women doing daily exercises and having major medical/surgical illnesses were excluded. History, general and physical examinations, anthropometric data, vital data and stress assessment of women were noted before & after 16 weeks of yoga training. Statistical analysis was done by paired-t test and values shown in mean  $\pm$  SD. **Results:** Out of total 50 women, 18 were working and 32 were non-working but doing household works. Pulse Rate before and after yoga training was found  $74.04 \pm 3.307$  and  $67.78 \pm 2.950$  respectively, Respiratory Rate before and after yoga training was found  $17.34 \pm 1.153$  and  $15.26 \pm 1.121$  respectively. Breathe Holding Time before and after yoga training was found  $25.82 \pm 4.972$  and  $31.56 \pm 5.555$  respectively. The difference observed in PR, RR and BHT was statistically significant ( $p < 0.0001$ ). **Conclusion:** Regular Yoga practice improves various physiological variables i.e. Decrease Respiratory Rate and Increase BHT and in working as well as non-working women. Practicing yoga daily improves the Respiratory functions significantly even in the absence of any other form of physical exercise.

**Key Words:** Breath Holding Time, Expiratory pressure, Respiratory rate, Working women, Yoga

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### Introduction

Yoga is considered to be one of the most important, effective and valuable tools available to overcome various physical and psychological problems<sup>1</sup>. Pranayama is an important component of yoga training. Pranayama (controlled breathing exercise) improves the air way reactivity in the asthmatic individuals<sup>2</sup>. Yogic asana and pranayama have been shown to reduce the resting respiratory rate, breath holding time, and blood pressure, stress condition and anxiety level. Pranayama is derived from two Sanskrit words, namely, prana, which means vital force or life energy, ayama means to prolong<sup>3</sup>. Pranayama (controlled breathing exercise) improves the air way reactivity in the asthmatic individuals<sup>4</sup>. By the practice of asana, pranayama, mudra, bandha, shuddhi kriyas and meditation yoga help in balancing and harmonizing the body, mind and emotions<sup>5,6</sup>. Yoga techniques may improve physical and mental health through down-regulation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS)<sup>7</sup>. The main

aspects of pranayama are inhalation, exhalation and retention. This strengthens the lungs and balances the nervous system, preparing the body to hold the breath [retention]. Practising pranayama on a regular basis regulates energy flow to the 72 thousand nadis [channels through which consciousness flows] in our body, helping us improve our wellbeing. Function of lung exhibit seasonal and diurnal variations which have complex origin, function also relate to the pattern of sleep, posture, meals and ambient temperature<sup>3,8</sup>.

### Material and Methods

The present study was conducted at Yoga Institute Gujarat Ayurved University campus, Jamnagar, Gujarat during the period of May – August 2015 after obtaining ethical committee approval. Total 50 healthy female subjects aged between 25-50 years were enrolled for study. All the subjects had never undergone any kind of yoga training earlier. The women involved in professions like doctors, teachers, bank managers, clerk and also doing household work were selected. The

informed consent was obtained from all the participants.

Exclusion and Inclusion criteria were based upon apparently normal health status as per following criteria

**Inclusion Criteria:**

1. Healthy non-smoker female.
2. Age: 25-50 years
3. Never undergone yoga training before joining this study
4. Subject is ready to perform and practices yoga.

**Exclusion criteria:**

1. History of daily exercise or physical training.
2. History of major medical illness such as tuberculosis, thyroid disorders, bronchial asthma, neuromuscular disorders
3. History of major surgery in the recent past, smoking, alcohol consumption.
4. Pregnant females.
5. Age < 25 years and >50 years.

All the data were collected at a fixed time of the day esp. between 5 p.m. -7p.m and 7 a.m. - 9 a.m. to minimize any diurnal variation in Physiology department, M. P. Shah Govt. Medical College, Jamnagar. 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>). All the subjects were received yoga training under the guidance of well-trained Yoga instructor for a period of 16 weeks for 1hour daily, 6 days a week between7:00 am to9:00 am and 4:00 pm to 7:00 pm at Yoga Institute. The subjects were informed about the procedures in brief and were asked to relax physically and mentally for 10 minutes. The yoga practice (1 hour-60 minutes) schedule consisted of Pranayama and Asana, which was concluded by meditation and prayer as follows:

Prayer	1 minute
Mild worm up exercise (Stretching exercise)	4 minutes
Surya Namaskar	15 minutes
Asanas: Shavasana, Naukasana,	15

Halasana, Dhanurasana, Bhujangasana, Pavanmuktasana,	minutes
Pranayama:Nadi-sodhan, Bhastrika, Kapalbhathi, BahyaPranayamAnulomVilom, Bhramari pranayama	20 minutes
Meditation on Omkar / laughing exercise	5 minutes

History of the subjects was noted in brief as per Performa. The health of the subject was assessed by general and systemic examination after noting down the present, past, family and personal history. Vital parameters like radial pulse, blood pressure in right upper arm and respiratory rate were measured after 15 minutes rest in sitting position. A baseline record (which served as control) of respiratory rate (RR/min), pulse rate (PR/min), systolic blood pressure (SBP mmHg), diastolic blood pressure (DBP mmHg) were recorded within first 5 days of starting yoga in sitting position. SBP & DBP was measured by mercury sphygmomanometer (Diamond) on right upper arm and RR was recorded by observing abdominal wall movement in supine position after sufficient rest. Respiratory Rate (RR/min) was recorded by observing abdominal wall movement in supine position after sufficient rest. Breath holding time was measured in seconds from the time of holding breath after normal expiration till the breaking point of the held breath by using a stop watch in comfortable sitting position in which subjects were asked to hold breath by closing both nostrils voluntarily by pinching nose between his/her thumb and index finger and mouth[9,10].Expiratory pressure was measured by Mercury Sphygmomanometer (Diamond) after detaching cuff and hand pump from the tube joining mercury reservoir in which subjects were asked to expire deeply and forcefully in tube connected to mercury reservoir pushing the mercury column up with closed nostrils after deep inspiration taking care of not leaking of air from mouth outside the tube while expiring. The maximum level to which mercury column was reaching taken as expiratory pressure<sup>9</sup>.Three readings were taken for BHT and Expiratory pressure with gap of 1-2 minutes between each reading and best of three was taken as final

reading. Statistical analysis was done by using Graph Pad Prism 5 software. All the values were shown in Mean  $\pm$  SD. Paired t-test was used to see the effect of yoga training.  $p < 0.05$  was considered statistically significant,  $p < 0.01$  considered as highly significant.

**Result**

Out of total 50 participants, 18 were working women and 32 were non-working women. The baseline characteristic of study is shown in Table-1.

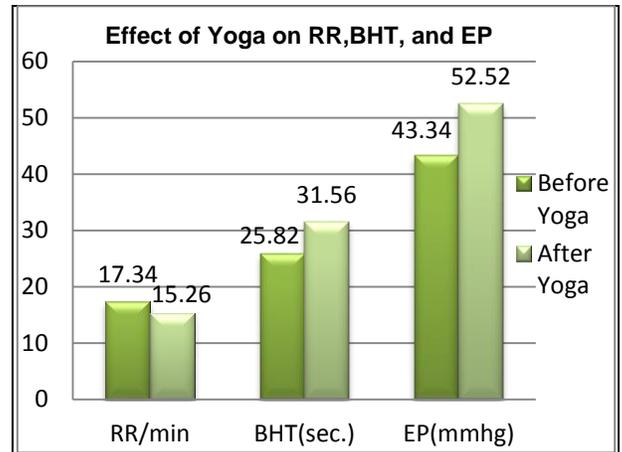
**Table-1. Baseline characteristic of study population**

Variables	Total(N=50)
Age (yrs.)	36.42 $\pm$ 8.666
Weight (Kg)	59.28 $\pm$ 7.948
Height (cm)	155.58 $\pm$ 5.834
BMI (Kg/m <sup>2</sup> )	24.45 $\pm$ 2.551

**Table-2 shows the comparison of RR, BHT and EP in women before and after yoga training.**

Parameters	Before Yoga	After Yoga	T value	P value
RR/Min	17.34 $\pm$ 1.1	15.26 $\pm$ 1.1	16.34	< 0.001
BHT (sec.)	25.82 $\pm$ 4.9	31.56 $\pm$ 5.5	19.62	< 0.001
EP(mm.Hg)	43.34 $\pm$ 7.2	52.52 $\pm$ 6.6	16.40	< 0.001

Our study clearly showed significant difference in anxiety scores before and after yoga training ( $p < 0.0001$ ) which is graphically presented in Figure-1.



**Discussion:** Yoga especially Pranayama provides the concentration and removes attention from worldly worries and “de-stress” the person. This may decrease release of adrenaline i.e. decrease sympathetic activity and hence decrease in heart rate, blood pressure etc. including respiratory rate. During daily practice of Pranayama the basic activity of bulbopontine complex is modified in such a way as to slow down it's rhythm by voluntarily prolonging the phases of inspiration and expiration by stretching to their fullest extent. Thus making the lungs to work to their maximal extent to take O<sub>2</sub> and expire CO<sub>2</sub> maximally<sup>11,12</sup>. Thus by practicing Pranayama for few weeks, the bulbopontine complex is adjusted to a new pattern of breathing which is slower than it's basal rhythm leading to decrease in respiratory rate. Improvement in BHT may be due to practice of yoga which makes stretch receptors to withstand more stretching. Also the sensitivity of the respiratory center to carbon dioxide is reduced. Hence respiratory center can withstand higher carbon dioxide concentrations in the alveoli and in the blood. With training subject can exercise voluntary control on respiratory muscles overriding the excitatory stimuli to respiratory centers. In addition there is gradual acclimatization of receptors to the concentration increased of carbon dioxide[13]. Pranayama like Kapalbhati and Nadi-sodhan included in our present yoga training schedule involves powerful strokes of exhalation, which trains the subject to make full use of diaphragm and abdominal muscles. Slow, deep and full inhalation and exhalation as in Anulom-vilom and Bhastrika pranayama also improves respiratory

muscle strength. Black and Hyaat<sup>11</sup> have demonstrated that their values are altered before there is alteration in other commonly used pulmonary function tests. Hence evaluation of respiratory muscle strength is important from physiological as well as clinical point of view. Since the highest EP is obtained at lung volumes of more than 70% of TLC, we measured EP after full inspiration.

#### Conclusion

Our study concludes that regular practicing yoga decreases RR Increases BHT and EP in working as well as in non-working women. It also helps to improve subjective feeling of wellbeing

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