



## TO STUDY THE EFFECT OF BHASTRIKA PRANAYAMA ON PULMONARY FUNCTION IN HEALTHY VOLUNTEERS

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### ABSTRACT:

Yoga is the science of right living and as such, is intended to be incorporated in daily life. It works on all aspects of the person, the physical, vital, emotional, psychic and spiritual. The science of yoga applies itself to all aspects of life, on a more practical level yoga is balancing and harmonizing the body, mind and emotions .This is done through the practice of *Asanas, Pranayama, Mudra, Bandha, Shatkarma* and Meditation and must be achieved before union can take place with higher reality. In present era of competition, everyone is trying to survive the fittest and facing various stressful experiences in life. Breath is the life force that sustains life. Nobody can survive more than a few minutes without air. When the breath stops, life ends. The Forefathers of Yoga developed a special system '*Pranayama*' to increase, develop and control this life force. To achieve the above success human being life style is changing. Until recently, this art and science of yogic breathing was almost completely unknown to the common man like many other ancient Indian arts. Those who knew it used to be very reluctant to share their knowledge and experience with anyone, unless a student proved by tests that he was ready to receive it.

**Keywords:** Yoga, *Pranayama, Ayurveda, Bhastrika Pranayama*

**INTRODUCTION:**Yoga is the science of right living and as such, is intended to be incorporated in daily life. It works on all aspects of the person, the physical, vital, emotional, psychic and spiritual <sup>(1)</sup> .The science of yoga applies itself to all aspects of life, on a more practical level yoga is balancing and harmonizing the body, mind

and emotions .This is done through the practice of *Asanas, Pranayama, Mudra, Bandha, Shatkarma* and Meditation and must be achieved before union can take place with higher reality.In today's life, the availability or versatile drugs for infectious diseases has lead to significant decrease in its mortality rate, thus the non-infectious

diseases or modified life style diseases are overtaking the mortality rate due to their insufficient preventive and curative measures sedentary lifestyle is also associated with higher incidence in obesity, diabetes mellitus and development of restrictive lung functions and cardiovascular morbidity. The Forefathers of Yoga developed a special system 'Pranayama' to increase, develop and control this life force. Normal breathing uses only a fraction of our potential respiratory capacity. Pranayama, one of the yogic techniques can produce different physiological responses in healthy individuals.<sup>2</sup>The chief purpose of pranayama is to increase the consumption of O<sub>2</sub> with the minimum of physical exertion, under condition probably favorable to storage oxygen. The purpose is definitely served by pranayama by increases in vital capacity, by increase in breath holding time and by reducing the basal metabolism providing conditions favorable for oxygen storage.<sup>3</sup>

Pranayama has considerable effect on respiratory functioning and proper Pranayama increases immunity and decreases the risk of respiratory diseases. Indian culture has always laid great emphasis on Prana and Pranayama and ancient texts say, "God is breath" as well as "Breath is life and life is breath". Atharva Veda even states, "Prana is the fundamental basis of whatever is, was and will be". In the Prasnopanishad we can find the following statement. "All that exists in all the three worlds is under the governance of Prana". If pranayama practiced in a proper way, it is capable of curing all the diseases<sup>(4)</sup>Pranayama means control over natural

process of inspiration and expiration of respiration<sup>(5)</sup>. Pranayama also denotes cosmic power, or the power of the entire universe, which manifests itself as conscious living being in us through the phenomenon of breathing.

The word Pranayama consists of two parts; prana and ayama. Ayama means stretch, extension, regulation, prolongation, restraint and control, and describes the action of Pranayama. Prana is energy, when the self energizing force embraces the body with extension and expansion and control; it is Pranayama.

In Hath-yog-pradipika while describing the provision of Pranayama, it is given that when pranavayu is in active state chitta is also in active state, when pranavayu is in inactive state chitta is also in inactive state. When both pranavayu and chitta are in inactive state the yogi enjoys longevity of life (i.e. sthanutvam)<sup>(6)</sup>. Nadishuddhi Pranayama is a breathing technique in which you inhale from one nostril at one time and release the breath from other nostril.<sup>(7)</sup>

## MATERIALS AND METHOD

**MATERIALS:** During the study of effect of Bhastrika on Pulmonary function following materials were used 60 healthy volunteers, irrespective of sex, age between 20 to 40 years were taken.

**Written consent:** First of all written consent was obtained from volunteer.

**Institutional ethics comitee approval and regulatory compliance:** Before the institution of the study, the protocol and related documents were reviewed and approved by Institutional ethical committee at Govt. Ayurved College & Hospital,

Nanded, Maharashtra. The study was conducted in accordance with schedule Y of drug and cosmetics act, India amended 2005 and ICMR ethical guidelines for biomedical research on human participants 2006.

#### **INCLUSIVE CRITERIA:**

1. Volunteers aged between 20 to 40 years of either sex.
2. Non obese individuals

#### **EXCLUSION CRITERIA:**

1. Smokers, tobacco chewers and alcoholic
2. Athletes
3. Any Respiratory tract diseases, Cardiovascular Disorders
4. Pregnant and Lactating women
5. Sports person

**Instruments:** For examination following instruments were used -

1. Thermometer
2. Weighing machine
3. Stopwatch
4. BP apparatus
5. Stethoscope
6. Measuring tape
7. Breeze suite spirometer 6.4 (For FVC, FEV1, PEFR, SVC, and MVV).
8. Peak-flow Meter

**METHODOLOGY:** In this 60 healthy volunteers, irrespective of sex, between 20 to 40 years were taken for study. 60 volunteers were randomly selected and all volunteers were considered as experimental group. Firstly all volunteers were explained and demonstrated the procedure of *Asanas*, *Nadishuddhi Pranayama* and *Bhastrika Pranayama*. All volunteers were examined by Ayurved and Modern parameters on day 1st. Then daily early in the morning in between 6:00 am to 7:00 am the above all *Asanas*, *Nadishuddhi Pranayama* and *Bhastrika Pranayama* were done. After every 4 weeks of Pranayama procedure all volunteers were again examined by Ayurved

and Modern parameters. Case record forms were prepared for observations of volunteers at specific interval (day - 1st, after 4, 8 weeks and after 12 weeks). Specially in modern parameters - pulmonary function tests, viz - (FVC - forced vital capacity, FEV1 - forced expiratory volume in one second, PEFR - peak expiratory flow rate, SVC - slow vital capacity and MVV - maximum volume ventilation) were done with Breeze Suite Spiro meter 6.4 and observations were recorded in case record form.

#### **Padmasana<sup>(8)</sup> (Lotus Pose):**

Procedure: Place the right foot on the left thigh and the left foot on the right thigh, and grasp the toes with the hands crossed over the back. Press the chin against the chest and gaze on the tip of the nose. This is called the *Padmasana*, the destroyer of the diseases of the *Yamis*

#### **Siddhasanam<sup>(9)</sup>:**

Procedure: Press firmly the heel of the left foot against the perineum, and the right heel above the male organ. With the chin pressing on the chest, one should sit calmly, having restrained the senses, and gaze steadily the space between the eyebrows. This is called the *Siddhasana*, the opener of the door of salvation

#### **Bjujngasasna<sup>(10)</sup>**

Procedure: Lie flat on your stomach, let your legs be straight, feet together and toes should and toes should point out. Touch your forehead to the ground and rest it. Place the palms on the ground right beneath the shoulders. Breathe in and slowly raise your head and neck, chest and upper abdomen, supporting your-self lightly on the arms. Now bend backwards, so that the

spine bends and arch your back as far as possible and look upwards. Hold breath for a few seconds while maintaining the position. Breathe out and return back to the original position slowly.

#### **Pavanmuktasana**<sup>(11)</sup>

Procedure: Lie flat on your back with your hands placed by your side. Fold back the legs and let your feet are flat on the floor. Interlock fingers of your hands and place them a little below the knees. Bring the thighs up near the chest Breathe out, raise your hand and shoulders and bring your nose between your knees. Now the final position is attained. For few seconds maintain the same position. Reverse the position and get back to the original position.

#### **Nadishuddhi Pranayama**<sup>(12)</sup>

Procedure: Sitting in the *Padmasana* posture the Yogi should fill in the air through the left nostril (closing the right one), and, keeping it confined according to one's ability, it should be expelled slowly through the *sûrya* (right nostril). Then, drawing in the air through the *surya* (right nostril) slowly, the belly should be filled, and after performing *Kumbhaka* as before, it should be expelled slowly through the *chandra* (left nostril).

#### **Bhastrika Pranayama**<sup>(13)</sup>

Procedure: In this method of *Pranayama* first inspire and expire quickly like (bellow) at twenty times, let him perform *kumbhaka*, then let him expel the air through both the

nostrils. Let the wise one perform this *bhastrika kumbhaka* (bellows - like) thrice.

**STATISTICAL ANALYSIS:** Students paired 't' test was applied to determine the significance. The level of significance was set at 5%,  $P < 0.05$ ,  $t$  calculated  $> t$  table value indicates the significance and it reveals the effect was not usual but it was due to *pranayama*.

After 4, 8 weeks and 12 weeks of *Pranayama* procedure following considerable effects were found –

Mean FVC at baseline study was  $3.12 \pm 0.70$  and was increased significantly to  $3.45 \pm 0.68$  (at 12th week). The mean FEV1 at baseline of study was  $2.84 \pm 0.7$  and it was increased significantly to  $3.10 \pm 0.7$  (at 12th week). The mean PEFr at baseline study was  $336 \pm 123.8$  and it was increased significantly growth  $396.32 \pm 123.34$  (at 12th week). SVC of these volunteers shows significant growth from  $3.26 \pm 1.22$  to  $4.52 \pm 1.4$  at the end of 12th week. The MVV of these volunteers was increased from  $109.13 \pm 15.16$  to  $117.58 \pm 23.74$  at the end of 12th week. At base line mean score of pulse rate was  $76.45 \pm 6.24$  and was decreased slightly to  $74.03 \pm 5.46$ . Respiratory rate of these volunteers at baseline was  $21.49 \pm 1.56$  and was decreased slightly to  $16.30 \pm 1.48$ . *Shwas nigrhana Kala* was increased from  $24.78 \pm 6.56$  to  $29.38 \pm 6.82$ . Mean weight of volunteers was also decreased slightly from  $62.89 \pm 9.36$  to  $57.8 \pm 7.82$  at the end of 12th week. (Table 1, 2)

**Table 1:**

Effect of <i>Bhastrika Pranayama</i> on PFT parameters					
Pulmonary Function Tests					
Interval	FVC (Lit)	FEV1(Lit/Sec)	PEFR(Lit/Sec)	SVC (Lit)	MVV(Lit/Min)
Day 1	3.12±0.70	2.84±0.7	336 ±123.8	3.26±1.22	109.13±15.16
After 4 Week	3.18±0.78	2.92±0.79	349.6 ±136.5	3.59±2.36	113.6±26.54
After 8 Week	3.32±0.86	3.07±0.85	378.2±189.4	3.86±3.6	116.4±27.63
After 12 Week	3.45±0.68	3.10 ±0.7	396.32±123.34	4.52±1.4	117.58±23.74

**Table 2:**

Effect of <i>Bhastrika Pranayama</i> on other parameters				
Interval	Pulse Rate (per min)	Respiratory Rate (per min)	Shwas Nigrahana Kala (per min)	Weight (per Kg)
Day 1	76.45±6.24	21.49±1.56	24.78±6.56	62.89±9.36
After 4 Week	76.23±6.1	20.55±2.35	26.58±5.89	60.34±6.54
After 8 Week	75.27±5.64	18.57±3.23	27.41±4.35	58.89±7.89
After 12 Week	74.03±5.46	16.30±1.48	29.38±6.82	57.8±7.82

**DISCUSSION:** The present study has confirmed a significant increase in FVC & FEV1. The improvement in vital capacity is due to increase development of respiratory musculature incidental to regular practice of *pranayama*. The increase in FEV1 is might be due to significant increase in vital capacity. The study also implies a significant increase in SVC. Lung inflation near to total lung capacity is a major physiological stimulant for the release of prostaglandins into alveolar spaces which increase compliances and decrease bronchial smooth muscle tone, respectively.

Significant increase in PEFR and MVV may be due to *pranayama* breathing exercises practitioners to use the diaphragmatic and abdominal smooth

muscles more efficiently. *Pranayama*, with its calming effect on the mind can reduce and release emotional stresses thereby withdrawing the broncho-constrictor effect.

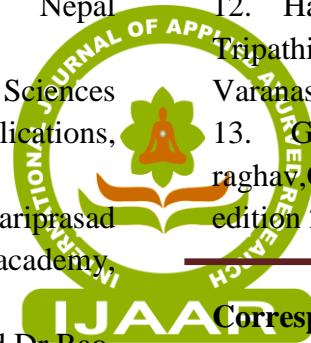
**CONCLUSION:** Inspiration is a main process in *Pranavahasrotasa* which is due to *pranavayu*. Significant increase in PFT i.e. FVC, FEV1, SVC, PEFR and MVV (by paired' test) was found in volunteers. It implies that increase in PFT (Pulmonary function test) is due to *Bhastrika Pranayama*. *Shwasa-nigrahana* is a main function of *Pranavayu*. Significant increase in *Shwasa nigrahana kala* (by paired't' test) was found after *Bhastrika pranayamic* procedures. From above it proves that due to *Bhastrika Pranayama* the functioning of *Pranavayu* is increased. Lung vital capacity

was found increased after *Bhastrika Pranayama*, it implies the increase in physiological strength of lungs is due to *Bhastrika Pranayama*. In conclusion, it can be stated that *Pranayama* exercises are beneficial for the better maintenance of *Pranavaha srotas* functions, particularly pulmonary functions, even in normal healthy volunteers.

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