

# BHASTRIKA PRANAYAMA: A LONGITUDINAL STUDY OF ITS EFFECT ON BLOOD PRESSURE, HEART RATE, MEP & PEFR OF HEALTHY YOUNG STUDENTS

Mullur Lata M.<sup>1</sup>, Khodnapur Jyothi P<sup>2</sup>, Aithala Manjunatha.<sup>3</sup>, Patil Satish G<sup>4</sup>

**Background:** Pranayama has a very important role in the yogic system of exercises for keeping sound health. Bhastrika Pranayama imitates the action of the 'Bhastika' or 'bellows' & fans the internal fire, heating the physical & subtle bodies. The most important physiological effects of Bhastrika is on the brain & heart. It stimulates the circulation of cerebral fluid & increases the compression & decompression upon brain, creating a rhythmic massage. There is a lack of study on particular discipline and hence the present study has been undertaken to examine the effects of bhastrika pranayama on the HR, BP, MEP & PEFR.

**Aim:** To determine the effects of Bhastrika pranayama on Blood Pressure, Heart Rate, MEP & PEFR.

**Materials & Methods:** The study was conducted on 50 medical students (age: 18-25 yrs). BP, HR, MEP & PEFR were recorded using standard instrument before & after the pranayama. Paired 't' test was applied to obtain the statistical significance.

**Results:** Significant decrease in SBP [before:  $117.84 \pm 6.86$  after:  $111.34 \pm 4.54$  mmHg, ( $p \leq 0.000$ )] and DBP [before:  $80.32 \pm 7.97$ , after:  $77 \pm 3.98$  mmHg, ( $p \leq 0.000$ )] and significant increase in Mean HR [before:  $70.38 \pm 7.39$ , after:  $79.08 \pm 5.59$  bpm, ( $p \leq 0.000$ )], MEP [before:  $33.22 \pm 15.63$  after:  $43.2 \pm 17.46$ , ( $p \leq 0.000$ )] and PEFR [before:  $223.2 \pm 64.56$ , after:  $280 \pm 67.35$  ( $p \leq 0.000$ )] observed as an immediate effect of bhastrika pranayama.

**Conclusion:** Bhastrika pranayama is found effective in decreasing BP and increasing HR immediately. Significant increase in pulmonary parameters like MEP and PEFR was found. It suggests that practice of pranayama helps in improvement of cardiopulmonary functions.

**Key words:** Bhastrika pranayama, Blood pressure, Heart rate, MEP, PEFR.

List of abbreviations: SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, HR: Heart Rate, PEFR: Peak Expiratory Flow Rate, MEP: Maximal Expiratory Pressure.

## INTRODUCTION

Imbalance or improper functioning of the physical or mental bodies results in serious repercussion on well being of a person, which would necessitate medical attention.<sup>[1]</sup>

A wide variety of common diseases such as coronary heart disease, hypertension & diabetes mellitus are now being attributed to a faulty lifestyle. Yoga is probably the best life style ever devised in the history of mankind.<sup>[2]</sup>

Yoga includes practice of physical postures (asanas), regulated breathing (pranayama) meditation.<sup>[3]</sup> *Pranayama* has been assigned a very important role in yogic system of exercises and is said to be much more important than *yogasanas* for keeping a sound health.<sup>[4]</sup> With increased awareness and interest in health and natural remedies, yogic techniques including *pranayamas* are gaining importance and are becoming acceptable to scientific community.<sup>[5]</sup>

A deep inspiration followed by a very slow expiration is a simple form of pranayama (In Sanskrit, prana-breath, ayama-restrain) which is an exercise of controlling the respiration voluntarily which is otherwise involuntary.<sup>[6]</sup>

Bhastrika Pranayama imitates the action of the 'Bhastika' or 'bellows' & fans the internal fire, heating the physical & subtle bodies.

The most important physiological effect of Bhastrika is on the brain & heart. It stimulates the circulation of cerebral fluid & increases the compression and decompression upon brain, creating a rhythmic massage. The rhythmic pumping of diaphragm & lungs stimulates the heart & blood circulation. Accelerated blood circulation and rate

<sup>1</sup>Associate Professor, <sup>2</sup>Assistant Professor, <sup>3</sup>Professor & HOD, <sup>4</sup>Lecturer, Department of Physiology, B.L.D.E.University's Shri.B.M.Patil Medical College, Bijapur, Karnataka.

of gas exchange in each cell produces heat and washout of waste gases. Therefore, Bhastrika is the most important pranayama.

There have been many studies on yoga and its effects on physical function but with the phenomenal and ever increasing popularity of pranayama in the past few years but there is lack of study on immediate effects of Bhastrika Pranayama. Hence, present study has been undertaken to evaluate the immediate effects of Bhastrika pranayama on the blood pressure, heart rate, MEP and PEFR.

### MATERIALS AND METHODS

50 Healthy Medical students of Shri. B. M. Patil. Medical College Bijapur in the age group of 18-25 yrs. Stratified sampling technique<sup>[7]</sup> was used.

The students suffering from major cardio respiratory and metabolic disorders and from any other chronic and acute illnesses during recording were excluded from the study.

Ethical clearance for the study was obtained from institutional ethical committee. Informed consent from all the participants was obtained. The study was carried out between 6 to 8am.

Average age, height and weight of the subject were noted. Blood pressure & Heart rate of volunteers were recorded before & after the pranayama. Blood pressure was measured by using mercurial Sphygmomanometer. Heart rate was measured by recording R-R interval (lead II ECG) with computerized four channel polygraph. MEP was measured by using modified Black's Apparatus and PEFR by Wright's Mini Peak Flow Meter in each subject before pranayama.<sup>[8],[9],[10]</sup>

To perform Bhastrika Pranayama the subject was asked to sit comfortably in an easy and steady posture keeping head, neck & trunk erect, eyes closed and the other muscles reasonably loose. The subject was directed to inhale through both nostrils slowly up to the maximum for about 4 seconds and then exhale slowly up to the maximum through both nostrils for about 6 seconds. These steps completed one cycle of slow pace bhastrika pranayama (Respiratory rate- 6/min). During the practice the subject was asked not to think much about the inhalation and exhalation time.<sup>[11],[12]</sup> The technique was

performed for 5 minutes. After 5 minutes of this breathing practice, the blood pressure, heart rate, MEP and PEFR again were recorded in the aforesaid manner using the same instrument.

Results were expressed in terms of tables & diagrammatic representation. Paired 't' test was applied to obtain the statistical significance.<sup>[13]</sup>

### RESULTS

**Table 1:** Showing average SBP, DBP, HR, MEP and PEFR before and after Bhastrika Pranayama.

Parameters	Before		After		p value
	Mean	± SD	Mean	± SD	
SBP(mmHg)	117.84	6.86	111.34	4.54	0.0001***
DBP(mmHg)	80.32	7.7	77	3.98	0.0001***
HR(bpm)	70.38	7.39	79.08	5.59	0.0001***
MEP(mmHg)	33.22	15.63	43.2	17.46	0.0001***
PEFR(L/min)	223.2	64.56	280	67.35	0.0001***

\*p: <0.05: Significant, \*\* p: <0.01: Highly significant, \*\*\* p: <0.001: Very highly significant,

NS: Non Significant.

There was a decrease in mean systolic blood pressure from 117.84± 6.86 to 111.34±4.54 mmHg (p=0.000) and mean diastolic blood pressure from 80.32 ±7.7 to 77± 3.98 mmHg.

(p=0.000) both are statistically significant. (table: 1)

Mean Heart rate was increased from 70.38± 7.39 to 79.08± 5.59 beats per minute. (p=0.000) MEP before pranayama was 33.22±15.63 mmHg and significantly increased after pranayama to 43.2 ±17.46 mmHg. PEFR also showed significant change from 223.2 ±64.56 L/min before pranayama to 280 ±67.35 L/min. (table:1)

### DISCUSSION

Bhastrika pranayama is found effective in decreasing BP and increasing HR immediately.

Pranayama may increase frequency and duration of inhibitory neural impulses by activating pulmonary stretch receptors, which brings about withdrawal of sympathetic tone in blood vessels of skeletal muscle,

leading to widespread vasodilatation, thus causes decrease in peripheral resistance and thus DBP.

Bhastrika Pranayama involves forceful contraction of respiratory muscles and abdominal muscles. The increase in heart rate suggests an increase in sympathetic activity. Raghuraj et al<sup>[14]</sup> have reported that nadishuddi reduces sympathetic activity while Kapalabhati produces sympathetic stimulation. In our study there was significant increase MEP and PEFr immediately after Bhastrika pranayam. Similar results observed in a study titled as "Effect of Slow and Fast pranayams on reaction time and cardiovascular variables" conducted by Madanmohan et al<sup>[15]</sup>

It is known that regular practice of breathing exercises (pranayama) increases parasympathetic tone, decreases sympathetic activity, improves cardio-vascular and respiratory functions, decreases the effect of stress and strain on the body and improves physical and mental health.<sup>[16]</sup>

In yoga tradition, it is taught that different pranayams have different effects. Raghuraj et al have studied the acute effect of fast and slow pranayams on heart rate variability while Telles and Desiraju<sup>[17]</sup> have demonstrated the heart rate changes during the performance of different pranayams.

These findings suggests that incorporating pranayama can enhance the efficiency by improving lung function capacity. Such practices are not only beneficial for physical health but also helpful in increasing work efficiency as well as mental toughness of every individual.<sup>[18]</sup>

Further studies will be conducted on large population group to confirm the findings and to understand the mechanism of these kind of changes noticed.

## REFERENCES

1. <http://www.medindia.net/yoga-lifestyle/yogaHighBloodPressure-print.htm>
2. Bijalani. R. L. Understanding Medical Physiology. 3<sup>rd</sup> edn. New Dehli. Jaypee Brothers; 2004.pg902
3. Nagendra HR. Yoga its basis and application. Bangalore: Swami Vivekananda Yoga Prakashan; 2005.
4. Datta RS. Yogic Exercises – Physiologic and Psychic Process. New Delhi: Jaypee Brothers Medical Publishers; 1998.
5. Udupa K, Madanmohan, Bhavanani AB, Vijayalaxmi P, Krishnamurthy N. Effect of Pranayama training on cardiac function in normal young volunteers. Indian J Physiol Pharmacol 2003;47:27-33.
6. Iyengar BKS. Light on Yoga. 7<sup>th</sup> Ed. New Dehli: Herper Collins publishers; 2002.
7. Sidhu KS. Methodology of Research in Education. 1<sup>st</sup> Ed. New Delhi: Sterling's Publishers Pvt Ltd; p.262-272.
8. Mahajan. Methods in Biostatistics. 5<sup>th</sup> Ed. New Delhi: Jaypee Brothers; 1989. p.102, 114-119, 125-39.
9. Jain AK. Manual of Practical Physiology. 2<sup>nd</sup> Ed. Himachal Pradesh: Arya Publications Avichal Publishing Company; 2007. p.178-184, 223, 233, 148-151.
10. Evans SA, Watson L, Hawkins M, Cowly AJ, Johnston IDA, Kinnenar WJM. Respiratory muscle weakness in chronic heart failure. Thorax 1995; 50:625-628.
11. Boum GL. Text book of pulmonary diseases. 6<sup>th</sup> Ed. Lippincott Philidelphia: 1998. p.393 & 724.
12. Nagaratna R, Nagendra. HR. Yoga for hypertension and heart diseases. 1<sup>st</sup> Ed. Bangalore: Swami Vivekanand yoga prakashana; 2003.
13. Tapas Pramanik et al. Immediate effect of slow pace bhastrika pranayama on blood pressure and heart rate. The Journal of Alternate and Complimentary medicine 2009; 15(3): 293-295.
14. Raghuraj P, Ramakrishnan AG, Nagendra HR, Telies S. Effect of two selected yogic breathing techniques on heart rate variability. Indian J Physiol Pharmacol 1998; 42:467-472.
15. Madanmohan et al. Effect of slow and fast pranayams on reaction time and cardiorespiratory variables. Indian J Physiol Pharmacol 2005; 49 (3): 313-318.
16. Bhargava R, Gogate MG, Mascarenhas JF. Autonomic response to breath holding and its variations following Pranayama. Indian J Physiol Pharmacol 1994;38:133-7
17. Telles S, Desiraju T. Heart rate alterations in different types of pranayamas. Indian J Physiol Phrmacol 1992; 36: 287-288.
18. Budhi Bal R, Puskar Raj P, Kapil Dev P et al. Effect of Bhastrika Pranayama and Exercise on Lung Function Capacity of Athlete: A Pilot Study. J of Medicine and Science in Sports and Exercise 2011; 43(5):577.