



**Research Article**

**EFFECT OF NADI SHODHANA PARANAYMA ON CARDIOVASCULAR PARAMETERS  
AMONG FIRST YEAR MBBS STUDENTS**

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**Abstract:** Yoga is the science of right living which includes asana, pranayama and kriyas. Yoga consists of five principles which include proper exercise, proper relaxation, proper breathing, proper diet, positive thinking and meditation. Pranayama means control of breathing. As a technique pranayama is the practice of slow and deep breathing. In this modern world right from the adult to old age, occurrence of cardiovascular complications are more. So in our study we conducted a session on Nadi shodhana paranayma (NSP). To assess the effect on cardiovascular parameters among sixty healthy volunteers. **Materials Methods:** Sixty first year M.B.B.S students of Sri Ramachandra University served as subjects. Age group of subjects was around 18 – 20 years of both genders participated in our study. Of these 60 subjects, 30 motivated students were selected to receive 10 weeks pranayama Group I and remaining 30 students will serve as controls Group II. The following cardiovascular parameters like the Heart Rate (HR), Systolic Blood Pressure (SBP), and Diastolic Blood Pressure (DBP). Pulse Pressure (PP), Mean Arterial Pressure (MAP) was recorded. All the above parameters were measured before and after 10 weeks of NSP. The results were analyzed accordingly. **Results:** Nadi shodhana paranayma significantly decreases the HR, SBP, DBP, PP, and MAP after 10 weeks of yoga training. Heart Rate responses of yoga group significantly reduced from  $79.43 \pm 3.12$  to  $65.49 \pm 2$ . Systolic Blood Pressure significantly reduced from  $118 \pm 3.30$  to  $101.74 \pm 5.46$ . Diastolic Blood Pressure significantly reduced from  $76 \pm 2.43$  to  $63.12 \pm 4.55$ . Pulse Pressure reduced from  $44.18 \pm 3.81$  to  $43.82 \pm 3.92$  in .Mean Arterial Pressure reduced from  $86.34 \pm 7.81$  to  $74.92 \pm 4.81$ . All these significant changes are observed in yoga group after 10 weeks of NSP. No significant changes were observed in the Group II (control) subjects. **Conclusion:** we concluded that Nadi shodhana paranayma, increases the cardiovascular performances among the age group of around 18 – 20 years of both genders. The mechanism underlying for this responses is fully focused on domination ruled by Para sympathetic nerve over sympathetic nerve. This in turn reduces the HR, SP, DP, PP, and MAP. **Keywords:** Nadi shodhana paranayma (NSP), Heart Rate (HR), Blood Pressure (BP).

**Introduction:**

Control of breath is done by a wonder technique called “Yoga”. Off that pranayama is one of the techniques developed by ancient yogis. The word paranayma has two subset meanings. “Parana” means source in the body. This obtains energy for life. “Ayama” means control of breath. A human being can control the rhythmic pattern changes in the breathing voluntarily. The final achievement goal for paranayma is to keep the source of happiness in both mind and the body<sup>1</sup>. As a technique pranayama can assume rather complex forms of breathing. But the essence of the practice is slow and deep breathing. Such breathing is economical because it reduces dead space ventilation. It also renews air throughout the lungs in contrast with shallow breath filling which renews air only at the base of the lungs. Slow and deep breathing is a part of shavasana. It may also be practiced sitting in the cross legged posture. Placing hand on the abdomen and the other on the chest. Breathing in slowly by diaphragm feeling the abdomen moving out. Then taking in some more air using the intercostals. Finally taking in some more air this would enter the uppermost part of the lungs. During this final effort at inspiration taking care that the abdomen does not move inwards and retain the breath for a while. Then breathing out slowly, first emptying the

lowest part of the lungs, then the middle, and finally the uppermost part of the lungs. Complex forms of pranayama require prior prolonged practice and mastery of asana, and meticulous instruction from a competent teacher.<sup>2</sup> A few varieties of pranayama are *Ujjayi pranayama* – Maximal inspiration making a sibilant sound followed by slow expiration. *Suryabhedana pranayama* - Inspiration through the right nostril, retention of breath and then expiration through the left nostril. *Nadisodhana pranayama* – Alternate nostril breathing the nostril is changed after each inspiration. *Bhastrika pranayama* – Forceful breathing simulating bellows. *Kapalabhati pranayama* – Resembles bhastrika but the inspiration is gentle, only the expiration is vigorous. *Bhramari pranayama* – Resembles ujjayi but a sound resembling the buzzing of a bee is produced during expiration. *Sitali pranayama* – The tongue is curled up and protruded, and characteristic sounds are produced during inspiration and expiration. *Sitkari pranayama* – A simpler version of sitali. *Murchhana pranayama* – Here there is a characteristic modification of the expiratory phase the neck remains bent while the glottis is opened<sup>2,3</sup>. In the previous years many studies have been done to assess the effect of paranayma on pulmonary function, cardiovascular function, and higher intellectual functions. In our study we planned to

assess only the effect of variations on cardiovascular function with the help of Naddi Shodhana Pranayama.

### Materials and Methods

Sixty healthy medical student volunteers aged between 17-20 years of both genders studying in the first year MBBS at Sri Ramachandra University, Porur, Chennai were recruited for the study. Thirty motivated students were selected to receive paranyama training (group I) and remaining 30 students were controls (group II).

**Exclusion criteria** – Athletes, Previous experience of yoga training, History of major medical illness, History of major surgery in the recent days are excluded.

**Study Protocol**-General characteristics age, dietary habits body mass index (BMI), BP, HR, MAP, and PP were collected from all students and matched between the groups. All students were assigned to learn the whole protocol and explained in detail by the investigators. Thirty students of Group I (pranayama group) underwent Nadi shodhana paranyama for six days in a week for 10 weeks in the early mornings between 6am -7am with strict rule of empty stomach and with comfort clothing for to be more enthusiastic session. The session includes relaxation, stretching, padmasana postures were practiced by volunteers for the comfort of effective Nadi Soddhi Pranayama which was conducted around for 1 hour in a pleasant atmosphere without noise pollution with good air ventilation. Padmasana postures were maintained to perform shodhana paranyama. The following steps are performed in correct range to make the paranyama effectively

1. Spine erect with head and neck straight with eyes closed.
2. Thumb to be placed on one nostrils and tip of the ring finger against the other nostril.
3. The thumb and the ring finger will be used to close alternate nostrils as we breathe
4. By blocking the left side nostril, they should breathe out with right nostrils.
5. Alternate breath by both the nostrils completes one cycle. Volunteers were instructed to follow specific breathing patterns during each cycle. At the end of 10 weeks period all studied parameters were measured as post-test data with the same method. Informed written consent was obtained by explaining the study protocol .Ethical committee approval was obtained. The yoga practice sessions were conducted by a qualified yoga teacher. The purpose and view path of the study was explained to the volunteers.

### Method of recording the variables for the study

All the subjects are made to relax with comfortable seating .The whole protocol was explained. Informed written consent was obtained .the purpose and positive role of the study was explained. Blood pressure was recorded in supine position, from right brachial artery using calibrated sphygmomanometer. Three readings were taken from each subject at the interval of 5 minutes and the lowest of these values was taken for consideration. Common human errors were avoided by repeating the trails. Pulse pressure was

calculated by SBP minus DBP. The Mean Arterial Pressure was calculated by  $DBP + PP/3$ . Heart rate was done by palpating the radial artery. The heart rate was calculated for full one minute by making the subjects to be in a comfortable couch. Three trails were taken from all subjects at the interval of 5 minutes; the lowest of these values was taken for consideration. Common human error was avoided by repeating the trails.

**Statistical analyses:** Student paired “t” test was applied to compare the parameters within the groups. P Value <0.05 indicates significant differences among the groups.

### Results

The Mean, Standard Deviation and Comparative “t” test analysis were done. Heart rate responses of yoga group significantly reduced from  $79.43 \pm 3.12$  to  $65.49 \pm 2.10$ . Systolic blood pressure reduced from  $118 \pm 3.30$  to  $101.74 \pm 5.46$  .Diastolic blood pressure reduced from  $76 \pm 2.43$  to  $63.12 \pm 4.55$  in yoga group No significant changes were observed in control group (II) control group. Pulse pressure responses reduced from  $44.18 \pm 3.81$  to  $43.82 \pm 3.92$ . Mean arterial pressure  $86.34 \pm 7.81$  to  $74.92 \pm 4.81$  .No significant changes were observed in control group (II).

**Table1: Ten weeks of Nadi Shodhana (I yoga group n=30)**

Parameters	Before	After	P value
HR ( minutes)	$79.43 \pm 3.12$	$65.49 \pm 2.10$	<0.0001**
SBP( mm/Hg)	$118 \pm 3.30$	$101.74 \pm 5.46$	<0.0001**
DBP( mm/Hg)	$76 \pm 2.43$	$63.12 \pm 4.55$	<0.0001**
PP (mm/Hg)	$44.18 \pm 3.81$	$33.90 \pm 2.86$	<0.0001**
MAP(mm/Hg)	$86.34 \pm 7.81$	$74.92 \pm 4.81$	<0.0001**

**TABLE 1 Legend:** Data Expressed as Mean  $\pm$  SD P Value <0.0001 Considering the values of yoga group I n=30 the cardio vascular parameters values before and after the Nadhi sodhi paranyama showed a significant decreased level in. HR – Heart rate, SBP – Systolic blood pressure, DBP – Diastolic blood pressure, PP – Pulse pressure, MAP - Mean arterial pressure.

**Table 2: Parameters level in control group (II control group n=30)**

Parameters	Before	After	P value
HR ( minutes)	$76.43 \pm 0.81$	$77.36 \pm 2.03$	NS
SBP( mm/Hg)	$116 \pm 8.16$	$118 \pm 5.60$	NS
DBP( mm/Hg)	$78.00 \pm 7.93$	$79 \pm 6.84$	NS
PP (mm/Hg)	$42.81 \pm 3.50$	$43.82 \pm 3.92$	NS
MAP(mm/Hg)	$88.09 \pm 9.13$	$89.12 \pm 8.13$	NS

**TABLE 2- Legend:** Data Expressed as Mean  $\pm$ SD P Value<0.0001 Considering the values of control group II n=30 the cardio vascular parameters such as HR – Heart

rate, SBP – Systolic blood pressure, DBP – Diastolic blood pressure, PP – Pulse pressure, MAP - Mean arterial pressure did not showed any significant differences in values.

#### Discussion:

Paranayama is the technique in which one can voluntarily control the breathing. Breathing is an automatic process occurs by rhythmic discharge of motor neurons from the higher centre of brain that innervates the respiratory muscles and controls the respiratory activity<sup>1,3</sup>. Complex forms of pranayama require prior prolonged practice and mastery of asana and meticulous instruction from the teacher<sup>2,4</sup>. Pranayama technique is not only concerned with breathing it also involves in control, and concentration of source on mind and body. By practicing pranayama regularly it throws the worries, negative thoughts, stress, anxiety out of the body. The physiological mechanism lying behind this is by decreasing the sympathetic nerve activity which in turn limits the adrenaline release in the circulating blood stream. This mechanism rapidly reduces the heart rate blood pressure. This shows that paranayama has great therapeutic effects on nervous, endocrine, and cardiovascular system<sup>5</sup>. Pranayama increases inhibitory neural impulses by stimulating stretch receptors of lungs which decreases the sympathetic tone leads to vascular dilatation causing decrease in blood pressure by decreasing the peripheral resistance in the vessels. shavasana posture makes the less excitement of proprioceptive and exteroceptive impulses which makes a markedly reduce in heart rate and blood pressure<sup>9,14</sup>. Udupa et al.. In 1975 from his study he has shown paranayama training has a wide role in controlling the blood pressure and heart rate by controlling the sympathetic nerve activity which improves the quality of life in high cardiovascular risk patients<sup>6</sup>. Bhargava et al.. In 1988 conducted a study on effect of four weeks pranayama on cardiovascular functions in hypertensive males. From the study they revealed that there was a decreased in heart rate and blood pressure in yoga group volunteers after onset of four weeks<sup>7</sup>. Madhan Mohan et al.. In 2005 from their study they revealed that pranayama has a beneficial effect on reducing the blood pressure and heart rate in cardiovascular patients by decreasing the total volume of oxygen utilization in tissues which reduces the overload on heart muscles.<sup>5,13</sup> Raghuraj P et al.. Conducted a study on slow breathing technique among 30 cardiovascular patients they revealed that slow breathing technique increases the parasympathetic nerve dominance which gradually maintains and decreases the blood pressure and heart rate<sup>8</sup>. Brown RP et al.. From his study stated that pranayama increase the inhibitory neural impulses by stimulating stretch receptors of lungs which decreases the sympathetic tone leads to vascular dilatation causing decrease in blood pressure<sup>9</sup>. Jain et al.. In 2005 conducted a study on selected pranayama on hypertensive patients. The results of the study revealed that there was a reduction in the blood pressure is mainly by both hemodynamic flow adjustments of cardiovascular system causing tonic balance of nervous system<sup>10</sup>. Stupor A Et al.. In 1987 from his study proved that pranayama not only reduces the blood pressure and heart rate it has an role in clearing the anxiety scores among the hypertensive patients. anxiety and stress are directly proportional factors which

increases the blood pressure. Regular practice of paranayama and other forms of yoga reduces the blood pressure by increasing parasympathetic dominance<sup>11,12,14</sup>.

#### Conclusion

Our results showed that significant decreases in heart rate and blood pressure after 10 weeks of regular practice of Nadhi sodhhi pranayamas. The present study has shown that adding comprehensive yoga-based breathing exercises (pranayama) to the daily life improve the cardio vascular function. Apart from cardiovascular control mechanism it also reduces stress and anxiety scores in day to day life. This encourages a complete mental relaxation throughout the day if it is practiced regularly in the early mornings.

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