Immediate Effect of "Nadi-Shodhana Pranayam" on Some Selected Parameters of Cardiorespiratory and Mental Efficiency

Varsha Gupta*, Yogesh Singh, Bibhavavikramaditya, Harpreet Singh

ABSTRACT

In recent times, everyone is much attracted towards yoga. It is claimed that yoga practices improve general health and fitness. This study is designed to determine whether Nadi-shodhana pranayama practice for 20 minutes has any immediate effect on heart rate, systolic and diastolic blood pressure, peak expiratory flow and simple problem solving ability. To compare, heart rate, systolic and diastolic blood pressure, peak expiratory flow rate and simple problem solving ability before and after Nadi-shodhana pranayama practice for 20 minutes. To measure cardio-respiratory fitness and reaction time to show higher function of brain parameters before and after Nadi-shodhana pranayama. Study was designed to evaluate the effects of a 20 minutes Nadi-shodhana pranayama practice on heart rate, systolic and diastolic blood pressure, reaction time and peak expiratory flow rate in medical students of both sexes. 30 students aged 17-20 years studying in SMS Medical College, Jaipur were recruited for the study. Apparently healthy student with no history of present and past illness were selected. The participants were trained to perform Nadi-shodhana pranayama. All the parameters like heart rate, systolic and diastolic blood pressure, peak expiratory flow rate, to explain the cardiopulmonary function and simple problem solving ability to explain mental efficiency were measured before and after practice of Nadi-shodhana pranayama for 20 minutes. Nadi-shodhana pranayama practice for 20 minutes showed statistically significant difference (p<0.05) in Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Reaction Time (RT) and Peak Expiratory Flow Rate (PEFR). From this study we concluded that Nadi-shodhana pranayama practice for 20 minutes can be advocated to improve cardio-respiratory efficiency as well as higher functions of brain of healthy individuals.

KEY WORDS : Yoga, Nadi-Shodhana Pranayama, Cardiorespiratory Fitness

Introduction

Yoga is the best lifestyle modification, which aims to attain the unity of mind, body and spirit through asana (exercise), pranayama (breathing) and meditation [1]. Breath is a dynamic bridge between the body and mind [2]. Hence, life experiences can distort breathing pattern. Pranayama is the art of prolongation and control of breath helps in bringing conscious awareness to breathing and the reshaping of breathing habits and patterns [3]. Practice of pranayama has been known to modulate cardiac autonomic status with an Improvement in cardio-respiratory functions and higher function of brain. The practice of pranayama and meditation bring about

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changes in cardio respiratory and metabolic intensity [4]. Yogic exercises have been found to be beneficial for better maintenance of bodily functions, even in normal healthy subjects. Taking this view of this study was planned to observe effects of yoga training on various cardio-respiratory fitness parameters and higher brain function.

Materials and Methods

This study was carried out in Human Physiology Laboratory, Department of Physiology, S.M.S. Medical College, Jaipur. Thirty apparently healthy volunteers, all of whom were medical students, were recruited and separated into study group. Studies parameters included heart rate, systolic and diastolic blood pressure, peak expiratory flow rate, simple problem solving ability to explain the cardiopulmonary function and mental efficiency. Written consent was taken from all subjects after explaining the procedure.

STUDY PROTOCOL

In the study group, a recording was done before and immediately after performing ‘Nadi-shodhana Pranayama’ for 20 minutes.

Following Are The Steps Of Nadi Shodhan Pranayama:

Open the right hand and bend index and middle fingers against the palm. The thumb was used for closing the right nostril whiles the fourth and fifth fingers were used for the left nostril.

Place the right thumb against the ala at the end of the nostril to close it and similarly press the fourth and fifth fingertips against the left nostril.

Start the exercise in the ‘Sukhasana posture’, with relaxed attitude and concentration as below:-

Exhale slowly and deeply without closing the nostrils but being ready to do so.

Inhale slowly and quietly through the left nostril while closing the right.

At the end of the inhalation close both nostrils and hold the breath for a while (not more than 1–2 seconds).

Keep the left nostril closed and exhale through the right as quietly as possible.

After exhaling completely, inhale slowly and quietly through the right nostril.

Close both nostril and wait for a while, then open the left nostril and exhale slowly and silently.

Inhale through the same nostril and continue.

Parameter measurements

Heart rate was measured by counting radial pulse for a minute. Three readings were taken and their average was calculated.

Three readings of both systolic and diastolic blood pressures were measured with the auscultatory method by using sphygmomanometer and stethoscope and take their average.

Peak expiratory flow rate was measured. The subjects were asked to take a deep breath and then to blow hard into the mouthpiece of the flow meter with a sharp blast. The movement of the needle on the dial was indicated the peak expiratory flow rate in liters per minute. Four recordings at one-minute intervals were taken and the average of the three highest readings was noted down.

Mental efficiency (simple problem solving ability) was estimated as follows: simple arithmetical problems of three-digit numbers involving addition, subtraction, multiplication and division were given. Two sets of questions
comprising of 10 problems. Each was prepared and students were asked to pick one set by ‘lottery system’. The time taken to solve all the questions was noted down.

**Statistical analysis**

All the values obtained before and after performing ‘Nadi-shodhana Pranayama’, all values were expressed as mean ± SD. The student’s paired ‘t’ test was used to compare pre and post training values.

**Results**

When compared, various parameters like Heart Rate, Systolic and Diastolic Blood Pressure, Reaction Time and Peak Expiratory Flow Rate before and after Nadi-shodhana pranayama practice for 20 minutes showed statistically significant difference (p<0.05).

**TABLE-1**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre (N=30) Mean ± SD</th>
<th>Post (N=30) Mean ± SD</th>
<th>‘p’ value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>79.47 ± 1.08</td>
<td>73.73 ± 2.392</td>
<td>0.000</td>
</tr>
<tr>
<td>Diastolic Blood Pressure</td>
<td>78.27 ± 3.473</td>
<td>72.8 ± 3.916</td>
<td>0.000</td>
</tr>
<tr>
<td>Systolic Blood Pressure</td>
<td>118.1 ± 3.748</td>
<td>110.1 ± 6.279</td>
<td>0.000</td>
</tr>
<tr>
<td>Peak Expiratory Flow Rate</td>
<td>3.673 ± .3331</td>
<td>3.973 ± .3173</td>
<td>0.000</td>
</tr>
<tr>
<td>Reaction time</td>
<td>70.13 ± 15.55</td>
<td>62.63 ±13.89</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*p <0.05 was considered significant

**Discussion**

In the present study it was observed that Nadi-shodhana pranayama practice for 20 minutes showed statistically significant difference (p<0.05) in heart rate, systolic blood pressure(SBP), diastolic blood pressure (DBP), reaction time and peak expiratory flow rate. Findings of present study were well supported by other authors also [5–23]. Udupa et al. (2002) and Bharashankar et al. (2003) observed that statistically significant reduction in heart rate after short term Yoga training [5, 6]. Present study also showed statistically significant reduction in pulse rate after Nadi-shodhana pranayama practice for 20 minutes and it is attributed to increased vagal tone and decreased sympathetic activity [7]. Decreased sympathetic activity in turn reduces catecholamine secretion and also leads to vasodilatation leading to improvement in peripheral circulation. Jyotsna Bharshankar et al (2003)[6] , Gandhi et al (2006)[8] found statistically significant decrease in both systolic and diastolic blood pressure after Yoga training. Kalwale PK, Shete AN et al (2006) [9] observed significant decrease in SBP after one month of pranayama training, but no change in DBP. Increased vagal tone decreases the work load on heart leading to decrease in cardiac output and hence systolic blood pressure.

Yogic practices alter the hypothalamic discharges leading to decrease in sympathetic tone and peripheral resistance and hence the diastolic blood pressure. In the present study, while performing breathing practice, subjects were also emphasized to concentrate on the act of breathing. This act of breathing removes his attention from worldly worries and de-stress. This stress free individual adapts better to the daily emotional, physical, and mental stresses. Therefore, the significantly less time taken to solve the mathematical problems could be due to better adaptability for mental stress induced by breathing act for 20 minutes.

Pranayama influences higher functions of the central nervous system like perception, planning, execution of task, learning and memory. It improves coherence between the two cerebral hemisphere signifying synchronization of logical and intuitive function. It increases alertness along with relaxation. Alertness decreases reaction time of brain. Breathing through a particular nostril also improve special memory score.
A significant improvement in peak expiratory flow rate was observed in the present study. It is an effort independent flow and is mainly dependent on lung volume. The ‘Nadi-shodhana Pranayama’ involves using of lung spaces, not used up in normal shallow breathing. Therefore, the increased peak expiratory flow rate might be a consequence of small airway opening in lungs.

Yoga practice have been proposed to, increase in PEFR (Udadhvay et al, 2008)[11]. In present study the significant difference was seen in PEFR after pranayama. The peak expiratory flow rate increased significantly when measured immediately followed by Nadi-shodhana Pranayama practice[12]. It improves coherence between the two cerebral hemispheres signifying synchronization of logical and intuitive function. It increases alertness, along with relaxation. Alertness decreases the reaction time of the brain. Twelve weeks of yoga is known to decrease the visual and auditory reaction times [13,14]. Pranayama have shown similar effects [15].

**Conclusion**

The short term Yogic training programmed like Nadi-shodhana pranayama practice for 20 minutes seems to improve cardio-respiratory efficiency and higher brain functions. By extending these results, we suggest that yoga practice may be applied as alternative therapy or as adjunct to conventional therapy in stress related diseases like essential hypertension, angina and coronary artery diseases.

**References**