

ORIGINAL RESEARCH

EFFECT OF NADISUDDHI PRANAYAM ON REACTION TIME AND AUTONOMIC ACTIVITY OF THE HEART

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ABSTRACT

Yoga is a group of disciplines which includes physical, mental, and spiritual practices, originated in ancient India and aim to control and calm the mind and body. Pranayama is the yogic practice of focusing on breath. In Sanskrit, *prana* means "vital life force", and *yama* means to gain control. In yoga, breath is associated with the prana, thus, pranayama is a means to elevate the *prana shakti*, or life energies. Pranayama is described in Hindu texts like the Bhagavad Gita and the Yoga Sutras. In ancient literatures 8 different types of pranayam are described out of which nadi shuddhi or nadi shodhan pranayama is one. Anuloma Viloma is known as the level 3 of nadi shodhana pranayama. Nadi Shuddhi pranayama aasana is closing the right nostril with the right hand's thumb, inhaling fresh air through the left nostril (puraka) and holding the breath for some time (kumbhaka), followed by exhalation through right nostril (rechaka) while closing the left nostril with the right hand's index finger and then reversing the process. This is one complete cycle of Nadishuddi pranayama. Pulse rate and reaction times were examined and recorded before and after twelve cycles of Nadi Shuddhi pranayam. The pulse rate dropped from 80.9 ± 6.4 to 71.6 ± 8.1 . Reaction time dropped from 0.44 ± 0.13 seconds to 0.39 ± 0.07 seconds. The changes are statistically significant at $p < 0.001$. The subjects were very comfortable to this aasana. They felt deep mental peace and were calmer. Alternate nostril breathing is a process of continuous deep inhalation, holding the breath and exhalation. Every cycle of pranayama gives an increased supply of oxygen through the lungs and this oxygen oxidizes the waste products like carbon dioxide, in the venous blood. During exhalation, large expulsion of CO₂ from the lungs enhances this process of purification. As a result

very little waste material of the body tissue remains in the blood. After 2 or 3 cycles a large proportion of impurities is cleared and there is less need for the breath, as purification process in the lungs for the purification of blood slows down. Many organs of body are given maximum rest including lungs and heart.

Keywords: Nadi Shuddhi pranayama, Yoga, Reaction Time, Aasana

INTRODUCTION

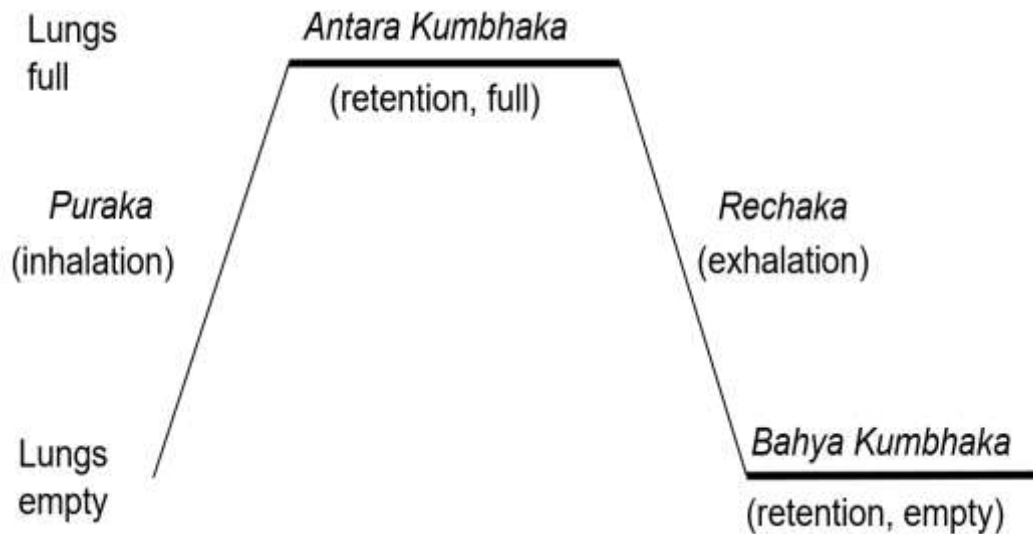
Yoga is a group of physical, mental, and spiritual practices or disciplines which originated in ancient India and aim to control (yoke) and still the mind, recognizing a detached witness-consciousness untouched by the mind (*Chitta*) and mundane suffering (*Duḥkha*). Pranayama is the yogic practice of focusing on breath. The ancient Indian science of Yoga teaches us voluntary regulation of the breathing to make respiration rhythmic and to calm the mind (1). In Sanskrit, prana means "vital life force", and yama means to gain control. In yoga, breath is associated with the prana, thus, pranayama is a means to elevate the prana shakti, or life energies. Pranayama is described in Hindu texts like the Bhagavad Gita and the Yoga Sutras of Patanjali. In ancient literatures 8 different types of pranayam are described out of which Nadi shuddhi or nadi shodhan pranayama is one. Nadi Shuddhi is a pranayama technique used to cleanse and replenish the vital energy in the body. *Nadi* is a Sanskrit word referring to "channels" or "flow" and refers to the flow of energy that is constantly moving through you. *Shuddhi* means "to purify" or "to cleanse." Practicing this breath is known to bring strong feelings of openness, clarity, and peace.

Nadi Shuddhi pranayama (also known as Nadi Suddhi Pranayam or Nadi Shodhana), is a practice of alternate nostril breathing, in which you use your fingers to gently close your nostrils, alternating your hand position with each cycle of breath. In yoga, inhalation, exhalation and retention of breath is known as *poraka*, *rechaka* and *kumbhaka* respectively. Nadi Shuddhi pranayama aasana is closing the right nostril with the right hand's thumb, inhaling fresh air through the left nostril (*puraka*) and holding the breath for some time (*kumbhaka*), followed by exhalation through right nostril (*rechaka*) while closing the left nostril with the right hand's index finger and then reversing the process. This is one complete cycle of Nadishuddhi pranayama. The study is designed to study the scientific basis of effect of nadishuddhi pranayama on the heart and mind.

MATERIAL AND METHOD

The Nadishuddhi Pranayama was performed during morning hours. The subjects were advised not to hold the breath for very long periods. Subjects who had thyroid problems and cardiac diseases were excluded from the study. The subjects were seated in a comfortable sitting position (posture) with back straight (1, 2). NadiShuddhi Pranayama aasana starts with closing the right nostril with the right hand's thumb, inhaling fresh air through the left nostril (*puraka*) and holding the breath for some time (*kumbhaka*), followed by exhalation through right nostril (*rechaka*) while closing the left nostril with the right hand's index finger and then reversing the process. Nadishuddhi Pranayam was performed in front of subjects to teach them the right technique. Reaction time test was taken with the help of online test (3). It consists of traffic light signals of green, red and yellow. The subjects were instructed to click on a button to begin, to wait for the stoplight to turn green, and click the button when it turns

green. The responses were recorded and the average of five responses (in seconds) is taken as a reading. Pulse rate and reaction times were recorded before and after ten cycles of right nostril breathing.



RESULTS

60 subjects took the online reaction time test while 120 readings were taken for pulse. The pulse rate dropped from 80.9 ± 6.4 to 71.6 ± 8.1 . The change is significant at $p < 0.001$. Reaction time dropped from 0.44 ± 0.13 seconds to 0.39 ± 0.07 seconds. The change is statistically significant at $p < 0.001$. The baseline pulse rate of the subjects before the maneuver was taken as control reading. The subjects were very comfortable to this asana. They felt deep mental peace and were more calm than before.

DISCUSSION

Alternate nostril breathing is a process of continuous deep inhalation, holding the breath and exhalation. Every cycle of Nadishuddhi Pranayama gives an increased supply of oxygen through the lungs and this oxygen oxidizes the waste products like carbon dioxide, in the venous blood. During exhalation, large expulsion of CO₂ from the lungs enhances this process of purification. As a result very little waste material of the body tissue remains in the blood. After 2 or 3 cycles a large proportion of impurities are cleared and thus there is less need for the breath, as purification process in the lungs for the purification of blood slows down. Many organs of body are given maximum rest including lungs and heart. During pranayama asana limbs activity is minimum hence the production of CO₂ is also minimum. The O₂ requirement is lessens and our heart is given maximum rest. This increases the longevity of heart (1). Nadisuddhi Pranayama practiced for four weeks causes decrease of the heart rate, as well as systolic and diastolic blood pressure levels. (4) The nasal cycle is a ultradian rhythm with a periodicity of eight hours. (5,6,7). A decrease in pulse rate may be related to an increase in vagal tone, a decrease in cardiac sympathetic activity. (8) The heart rate increases with inspiration and decrease with expiration. (6) Event related potential P300 decreased from 391.16 ± 49.7 to 331.0 ± 22.0 msec at $p < 0.001$ in a study after 40 days of

yoga in diabetics(9). Anand et al (10) reported dominance of alpha rhythm in the EEG activity of persons trained in yoga. The subjects were more aware and restful. Yoga relaxes, relieves stress and makes the subject feel good, alert, active and exhilarated by releasing opioids and altering adrenocortical activity that gives pleasurable sensations and keeps body fit.(11)

CONCLUSION

Though the exact mechanism is not known by which Pranayam affects the function of the autonomic nervous system, it has been speculated that this is due to superior nasal meatus neural reflex. More research work is necessary to understand the mechanism of Pranayam on Autonomic Nervous System as well as to record the changes during actual practice. However, the effect of pranayama practices can be used for preventive and therapeutic advantages. The effects of Chandra Nadi could be used to decrease blood pressure in hypertensives, while several rounds of Surya Anuloma Viloma Pranayama could be used to increase metabolism overnight in persons. Nadisuddhi pranayam is very helpful for a restless mind as it relaxes the brain. (12, 13, 14-18).

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