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## ANULOMA VILOMA PRANAYAMA MODIFIES REACTION TIMES AND AUTONOMIC ACTIVITY OF HEART: A PILOT STUDY

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### ABSTRACT

Patanjali, foremost exponent of Yoga, described pranayama as the gradual unforced cessation of breathing. Pranayama is derived from two Sanskrit words-prana (life) or yama (control). Pranayam or control of prana or life force yields heart beat pulse and mind control. Yoga combines scientific technique of right behavior (Yama-Niyama), proper posture (asana), life force control (pranayama), interiorisation of the mind (pratyahara), concentration (dhyana), developing intuition (dharna) and Samadhi (ultimate realization). Anuloma Viloma pranayama starts with closing the right nostril with the thumb of the right hand, inhaling through the left nostril, holding the breath, followed by exhalation through right nostril while closing the left nostril with the index finger of right hand and then reversing the process. This forms one round of Anuloma Viloma pranayama or Nadishuddhi pranayama. Pulse rate and reaction times were recorded before and after twelve cycles of alternate nostril breathing. The pulse rate dropped from  $81.5 \pm 5.3$  to  $72.9 \pm 8.7$ . Reaction times dropped from  $0.47 \pm 0.15$  seconds to  $0.38 \pm 0.09$  seconds. The changes are statistically significant at  $p < 0.001$ . The subjects felt joy, peace and were calm.

Alternate nostril breathing is a process of continuous, regularity of inhalation, holding of breath and exhalation. It charges the body with an increased supply of oxygen through the lungs, this oxygen "burns" or oxidizes the waste impurities, chiefly carbon, in the venous blood. This process of purification is enhanced by an accompanying large increase in expulsion of waste carbon dioxide from the lungs during exhalation. As a consequence, very little of the tissue remains in the blood as waste material. There is less need for the breath, as the flow to the lungs of blood for purification slows down. The heart and lungs are given extraordinary rest.

**Keywords:** Pranayam, Anuloma Viloma, Yoga, Venous blood

### INTRODUCTION

Patanjali, foremost exponent of Yoga, described pranayama as the gradual unforced cessation of breathing. Pranayama is derived from two Sanskrit words-prana (life) or yama (control). Pranayam or control of prana or life force yields heart beat pulse and mind control. Yoga combines scientific technique of right behavior (Yama-Niyama), proper posture (asana), life force control (pranayama), interiorisation of the mind (pratyahara), concentration (dhyana), developing

intuition (dharna) and Samadhi (ultimate realization).

The ancient Indian science of Yoga makes use of voluntary regulation of the breathing to make respiration rhythmic and to calm the mind (1). This practice is called Pranayama. Nadisuddhi pranayama means "purification of subtle energy paths", inhalation and exhalation are through alternative nostrils for successive respiratory cycles. Surya Anuloma Viloma Pranayama means "heat generating breathing particle" when the

respiratory cycle of inhalation and exhalation is completed through the right nostril exclusively. When completed through the left nostril alone the practice is called "Chandra Anuloma Viloma Pranayama" which means a heat dissipating or cooling liberating practice. (2,3,4,5)

The study is designed to study the scientific basis of effect of pranayama on the heart and mind.

### **MATERIAL AND METHODS**

The Pranayama was performed before meals. The subjects were advised not to hold the breath for uncomfortably long periods, as this causes harmful pressure on the heart, lung, diaphragm and arteries. Subjects who were hyperthyroid have been excluded from the study. The subject was seated in a comfortable sitting posture with back straight (1, 15). Anuloma Viloma pranayama starts with closing the right nostril with the thumb of the right hand, inhaling through the left nostril, holding the breath, followed by exhalation through right nostril while closing the left nostril with the index finger of right hand and then reversing the process. This forms one round of Anuloma Viloma pranayama.

#### **Reaction time**

Reaction time test was taken online (17). It consists of a traffic light signal of red, yellow and green. The subject is instructed to click on a button to begin when ready, to wait for the stoplight to turn green, and click the button when it turns green quickly! The average of five responses in seconds is taken as a reading.

Pulse rate and reaction times was recorded before and after twelve cycles of left nostril breathing.

### **RESULTS**

Sixty six readings were taken for pulse and thirty subjects took the online reaction time test. The pulse rate dropped from  $81.5 \pm 5.3$  to  $72.9 \pm 8.7$ . The change is significant at  $p < 0.001$ . Reaction times dropped from  $0.47 \pm 0.15$  seconds to  $0.38 \pm 0.09$  seconds. The change is statistically significant at  $p < 0.001$ . The subjects felt joy, peace and were

calm. The subjects served as their own controls as baseline pulse rate was taken before the maneuver.

### **DISCUSSION**

Nostril breathing is a process of continuous, regularity of inhalation, holding of breath and exhalation. It charges the body with an increased supply of oxygen through the lungs, this oxygen "burns" or oxidizes the waste impurities, chiefly carbon, in the venous blood. This process of purification is enhanced by an accompanying large increase in expulsion of waste carbon dioxide from the lungs during exhalation. As a consequence, very little of the tissue remains in the blood as waste material. There is less need for the breath, as the flow to the lungs of blood for purification slows down. The heart and lungs are given extraordinary rest. (1) The inactivity of the muscles and limbs during meditation lessens bodily carbon production, and is conducive to the restful state of heart and lungs. Rest given to the heart helps in increasing longevity. (1)

The nasal cycle is a ultradian rhythm characterized by altering patency of the left and right nares, with a periodicity of eight hours. (6,7,8) Wertz correlated right nostril dominance with the activity phase of the basic rest activity cycle (13). A decrease in pulse rate may be related to an increase in vagal tone, a decrease in cardiac sympathetic activity. (3) Following Nasisuddhi pranayama, both the components of the autonomic nervous system viz parasympathetic and sympathetic are activated. While alternating to explain the mechanisms underlying the changes, the respiratory sinus arrhythmia has to be taken into account. The heart rate increases with inspiration and decrease with expiration. (7)

Breathing exclusively through the right nostrils several times a day, for a month can significantly increase baseline oxygen consumption by 37% where as breathing through left nostril alone produces smaller increase. Right nostril breathing increases metabolism perhaps by increasing the output of adrenaline from the adrenal medulla

(increasing basal oxygen consumption and heart rate) (10). Reduced mental stress or arousal cause increase in galvanic skin resistance reduced sympathetic tone to palmar sweat glands and cutaneous blood vessels. Nadisuddhi Pranayama practiced for four weeks causes decrease of the heart rate, as well as systolic and diastolic blood pressure levels. (11) Event related potential P300 decreased from  $391.16 \pm 49.7$  to  $331.0 \pm 22.0$  msec at  $p < 0.001$  in a study after 40 days of yoga asanas in diabetes (18).

Anand *et al* (19) 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. (20)

## CONCLUSION

The exact mechanism by which nostril breathing influences the function of the autonomic nervous system is not known, though it has been speculated that this is through a neural reflex mechanism in the superior nasal meatus. Further work is necessary to understand the mechanism as well as to record the changes during actual practice. However, the effect of pranayama practices can be used for therapeutic advantage. Several rounds Surya Anuloma Viloma Pranayama could be used to increase metabolism in overnight persons, while the effects of Chandra Nadi to decrease blood pressure in hypertensive's. Nadisuddhi pranayam helps calm the restless mind. (12, 14, 21-25)

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