

CLINICAL STUDY ON EFFECT OF NADISHUDDHI PRANAYAMA ON IMPROVING CARDIO-RESPIRATORY FUNCTIONS

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ABSTRACT

Pranayama (breathing exercise), one of the yogic techniques can produce different physiological responses in healthy individuals. The responses of *Nadisudhi Pranayama* on some cardio-respiratory functions were investigated in healthy young adults. The subjects performed Nadishuddhi Pranayama (15 minutes every day in the morning) for four weeks. Cardio-respiratory parameters were recorded before and after 4-weeks training period. A significant increment in Peak expiratory flow rate (PEFR L/min) and Pulse pressure (PP) was noted. Although Systolic blood pressure (SBP) was decreased insignificantly, the decrease in pulse rate (PR), respiratory rate (RR),

diastolic blood pressure (DBP) was significant. Results indicate that regular practice of Nadishuddhi Pranayama increases parasympathetic activity.

KEYWORDS: Nadishuddhi Pranayama, *Pranayama*, Breathing exercise.

INTRODUCTION

Yogic techniques are known to improve one's overall performance. *Pranayama* (breathing exercise) is known to be a part of yogic techniques. Patanjali in his Yoga Sutra describes- *Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana and Samadhi* as eight *angas* (parts) of yoga.^[1] Amongst them, in the present materialistic world, the third and fourth part, *Pranayama* and *Asana* (Postures) are considered as very important part and prescribed by modern medicine too. Yogic breathing techniques are termed as 'Pranayama'.

'Prana' can be explained as the vital life force that regulates all activities in the universe. 'Ayama' means control or regulation. According to Yoga, pranayama consists of various ways of inhaling, exhaling and retention of Prana. Different types of Pranayama (breathing exercises) produce different physiological responses in normal young volunteers. Many physicians now recommend yoga to patients at risk for heart diseases, as well as those with back pain, arthritis, depression and other chronic diseases.^[2] The beneficial effects of different *Pranayama* are well reported and has sound scientific basis.^[3-5] Different types of *Pranayama* (breathing exercises) produces different physiological responses in normal young volunteers.^[4,6] *Savitri Pranayama*, *Kapalbhati*, *Bhastrika Pranayama*, *Nadi suddhi Pranayama* (Alternate nostril breathing), are well known among them. These breathing exercises are reported to influence cardio-respiratory and autonomic functions.^[6-9] and also help in reducing the scores of anxiety^[10] and stress.^[5] In the present study an attempt has been made to investigate the effect of Nadishuddhi Pranayama on different cardio-respiratory parameters on healthy young volunteers.

SUBJECTS AND METHODS

Thirty six volunteers (32 males and 4 females) took part in the present study. Their age, height, weight, age were recorded and BMI calculated. All the subjects were healthy and did not have any cardio-respiratory diseases and were not under any medications. All were nonsmokers and were of same socioeconomic status. They all were sedentary. The aim and objective of the study were explained to each of them and verbal consent was taken. A baseline record (which served as control) of respiratory rate (RR/min), Pulse rate (PR/min), SBP (mmHg), DBP (mmHg), PEFr (L/min) were recorded and pulse pressure (mmHg) was calculated on first day before starting Nadishuddhi Pranayama session. They carry out Nadishuddhi Pranayama practice for four weeks. By end of four weeks, all parameters were recorded again (following Nadishuddhi Pranayama session). RR/min was recorded by observing abdominal wall movement in supine position. PR/min and blood pressure (SBP and DBP in mmHg) was also measured in supine position. Pulse Pressure was calculated as SBP minus DBP. Each Nadishuddhi Pranayama session consist of 15 minutes in the morning in an empty stomach. They were directed to sit in an easy and steady posture (either in a lotus posture i.e. *Padmasana* or a comfortable sitting posture i.e. *Sukhasana*) with the head, neck and trunk erect and in a straight line and keep the body still during practice of Nadishuddhi Pranayama in a calm and quiet room. Practice of Nadishuddhi Pranayama was performed in following steps (Steps used by Raghuraj *et al* and Srivastav *et al* with some modification)^[4,7]

1. The volunteer was asked to close one of his/her nostril (say right nostril) by his thumb and slowly breathe in upto maximum, through left nostril.
2. He/she was asked to close his other nostril (left) by his/her ring finger and open the right nostril to exhale slowly upto maximum.
3. Now, he/she was instructed to inhale through same right nostril (with left nostril closed) and then to open left nostril and exhale as stated above.

These three steps completed one cycles of *Nadisuddhi Pranayama*

Subjects of the present study formed their own control, so separate control was not taken into account. Data were all entered in statistical software (SPSS version 10).

Mean and standard deviation (\pm SD) of all parameters

RESULTS

The physical characteristics of the subjects are shown in table-1 and the comparison of different cardio respiratory variables before and after the four weeks of Nadishuddhi Pranayama exercises are presented in table-2. The mean respiratory rate dropped from 19.14 ± 1.57 per min to 16.85 ± 1.36 per min, pulse rate from 81.28 ± 4.18 per min to 74.01 ± 3.26 per min, systolic pressure from 118.78 ± 4.59 mm Hg to 114.38 ± 4.28 mm Hg and diastolic pressure from 76.44 ± 5.25 mm Hg to 73.48 ± 5.04 mm Hg, pulse pressure increased from 35.69 ± 2.32 mm Hg to 41.27 ± 3.55 mm Hg and PEFr from 455.28 ± 48.84 l/min to 511.50 ± 44.29 l/min.

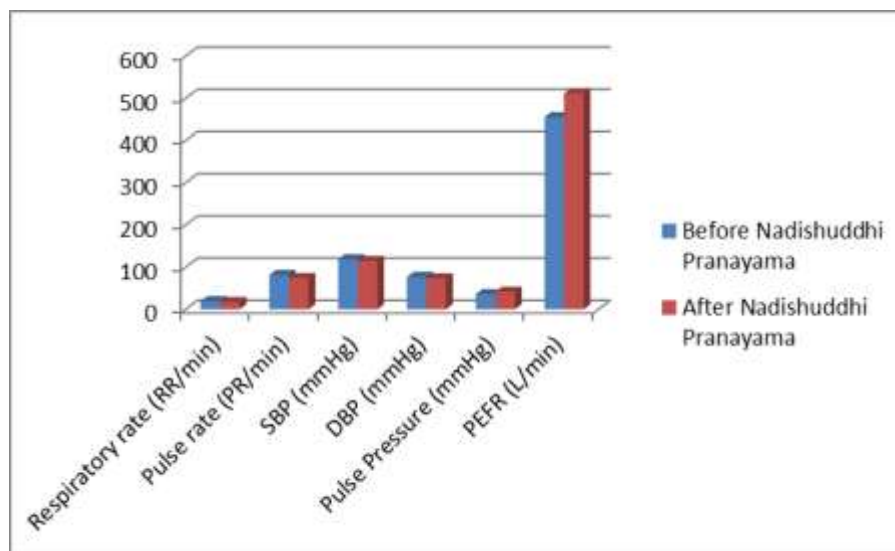
Table-1: Physical characteristics of the subjects.

Variables	Mean \pm SD
Age (year)	24.67 ± 2.35
Height (cm)	167.05 ± 3.89
Weight (Kg)	61.14 ± 5.49
BMI	21.89 ± 1.64

Table-2: Comparison of different cardio respiratory variables before and after the four weeks of Nadishuddhi Pranayama exercises.

Variables	Before (mean \pm SD)	After (mean \pm SD)
Respiratory rate (RR/min)	19.14 ± 1.57	$16.85 \pm 1.36^*$
Pulse rate (PR/min)	81.28 ± 4.18	$74.01 \pm 3.26^*$
SBP (mmHg)	118.78 ± 4.59	114.38 ± 4.28
DBP (mmHg)	76.44 ± 5.25	$73.48 \pm 5.04^*$
Pulse Pressure (mmHg)	35.69 ± 2.32	$41.27 \pm 3.55^*$
PEFR (L/min)	455.28 ± 48.84	$511.50 \pm 44.29^*$

*, Significant at $p < 0.001$



DISCUSSION

Patanjali, first exponent of yoga, described *Pranayama* as the gradual unforced cessation of breathing.^[1] The ancient science of yoga makes use of voluntary regulation of the breathing to make respiration rhythmic and to calm the mind to reach the ultimate goal.^[11] This practice of *Pranayama* is an art of controlling the breath. A practitioner of *Pranayama* not only tries to breathe but at the same time tries to keep his attention on the act of breathing, leading to concentration. This act of concentration removes his attention from worldly worries and “de-stress” him. This may decrease release adrenaline i.e. decrease sympathetic activity and hence decrease in heart rate, respiratory rate, blood pressure etc.^[5] It is well known that both the nostril does not take part equally in breathing at a time. One nostril predominate the other and follows a definite cycle. In the yogic system of breathing, the right nostril dominance corresponds to activation of ‘*Pingala*’ subtle energy channel; related to sympathetic arousal and left nostril to ‘*Ida*’ subtle energy channel, corresponding to parasympathetic activation.^[8,12] *Pranayama* effects the proper balance between ‘*Ida*’ and ‘*Pingala*’ i.e. Sympathetic and parasympathetic activity and gain spiritual upliftment.^[13-16] Leaving the yoga-philosophy aside and being more confined to the modern medical physiology only, it can be said that various central and autonomic mechanism as well as mechanical (heart) and hemodynamic adjustments are triggered in response to variation of breathing patterns, thereby causing both tonic and phasic changes in cardiovascular functioning.⁴

In the present study the fall in PR, RR, SBP, DBP and rise in PP and PEFr after four weeks of practice of Nadishuddhi Pranayama among our study subjects were noted. The decrease in PR, RR, DBP were significant ($P < 0.01$) although the decrease in SBP was insignificant. Change in different parameters by exposure to Nadishuddhi Pranayama could be attributed to a balance between sympathetic and parasympathetic activation. DBP depends upon peripheral resistance and lung inflation has been known to decrease systemic vascular resistance.^[17] This response is initiated by pulmonary stretch receptors which bring about withdrawal of sympathetic tone in skeletal muscle blood vessels leading to wide spread vasodilation thus bringing up decrease in peripheral resistance^[18] and thus decrease in DBP. Increase in PEFr among our volunteers may be due to rise in thoracic-pulmonary compliances and bronchodilation by training in Nadishuddhi Pranayama. Stimulation of pulmonary stretch receptors by inflation of the lung reflexely relaxes smooth muscles of larynx and tracheobronchial tree; probably this modulates the airways caliber and reduces airway resistance.^[19] The work of Yadav and Das attributed the increase in PEFr by yogic exercise due to following changes in respiratory dynamics: increased respiratory muscle strength by the exercises of these muscles, cleansing of airways secretions and efficient use of diaphragmatic and abdominal muscles, thereby emptying and filling the respiratory apparatus more efficiently and completely.^[20] Previous investigators also demonstrated the effect of *Pranayama* on enhancement of the respiratory muscle efficiency and lung compliance by reducing elastic and viscous resistance of lung present during inspiration.⁷ *Pranayama* acts as a physiological stimuli for release of lung surfactant and prostaglandins into alveolar spaces which increase the lung compliances.³ Considering the facts, it can be opined that regular practice of ANB type of *Pranayama* causes parasympathetic predominance as other slow breathing type *Pranayama* does (viz. sabitri *Pranayama*).⁶ The major effects of Nadishuddhi Pranayama were fall in DBP and rise in PEFr. Therefore, this simple exercise can be prescribed to hypertensive patients (with proper monitoring) along with the medical therapy. The increase in PEFr by Nadishuddhi Pranayama practice obviously offers an increment in cardiorespiratory efficiency and it can be advocated to the patients of early bronchitis and as a preventive measure for COPD.

CONCLUSION

Considering the facts, it can be opined that regular practice of alternate nostril breathing, type of Pranayama causes parasympathetic predominance as other slow breathing type Pranayama does (viz. Savitri Pranayama). The major effects of alternate nostril breathing were fall in

DBP and rise in PEFR. Therefore, this simple exercise can be prescribed to hypertensive patients (with proper monitoring) along with the medical therapy. The increase in PEFR by alternate nostril breathing practice obviously offers an increment in cardiorespiratory efficiency and it can be advocated for the patients of early bronchitis and as a preventive measure for COPD.

REFERENCES

1. Yoga-sutra of Patanjali. Translated by Saugata Bhaduri . D.K Printworld (P) Ltd. New Delhi., 2000.
2. Becky Richmond. The benefits of yoga. *JOY: The Journal of Yoga.*, 2003; 2: 1. <http://www.godconsciousness.com/joy/thebenefitsofyoga> as accessed on., 4th January 2007.
3. Joshi LN, Joshi VD, Gokhale LV. Effect of short term pranayam on ventilatory functions of lung. *Indian J Physiol Pharmacol.*, 1992; 36: 105-8.
4. Raghuraj P, Ramakrishnan AG, Nagendra HR, Shirely Telles. Effect of two selected yogic breathing techniques on heart rate variability. *Indian J Physiol Pharmacol.*, 1998; 42: 467-72.
5. Bhattacharya S, Pandey US, Verma NS. Improvement in oxidative status with yogic breathing in young healthy males. *Indian J Physiol Pharmacol.*, 2002; 46: 349-54.
6. Madanmohan, Udupa K, Bhavanani AB, Vijayalakshmi P, Surendiran A. Effect of slow and fast Pranayams on reaction time and Cardiorespiratory variables. *Indian J Physiol Pharmacol.*, 2005; 49: 313-8.
7. Srivastav RD, Jain N, Singhal A. Influence of alternate nostril breathing on cardiorespiratory and autonomic functions in healthy young adults. *Indian J Physiol Pharmacol.*, 2005; 49: 475-83.
8. Jain N, Srivastav RD, Singhal A. The effects of Right and Left nostril breathing on cardiorespiratory and autonomic parameters. *Indian J Physiol Pharmacol.*, 2005; 49: 469-74.
9. Pal GK, Velkumary S, Madanmohan. Effect of short-term breath exercises on autonomic functions in normal human volunteers. *Indian J Med Res.*, 2004; 120: 115-21.
10. Brown RP, Gerbarg PL. Sudarshan kriya yogic breathing in the treatment of stress, anxiety and depression: part 1- neurophysiological model. *J Alt Complement Med.*, 2005; 11: 189-201.

11. Sri Paramhansa Yogananda. God Talks with Arjuna. The Bhagavad Gita, Royal Science of God-Realization. The immortal dialogue between soul and spirit. A new translation and commentary, chapter IV verse., 2002; 29: 496-507.
12. Swami Ramdev. Chapter: Hatha yoga and Satkarma. In: Yoga sadhana and Yog chikitsa rahasya. Divya prakashan. Divya yog mandir (trust). Kanakhal. Haridwar., 2004; 114-20.
13. Joshi BC. Neurology in ancient India: Ajna cakra- A Physiological reality. *Indian J History Sci.*, 1987; 22: 292-315.
14. Bharkher DL. Chapter: The Astanga yoga. In: Yoga and Human Health. Deeptara Press; Kathmandu., 2004; 7: 48-9.
15. Swami Sacchidananda Visudhadev. “*Pranayama*: breathing control exercise” In: Character-Science [Charecterology]. Centre for stato-dynamic international movement. Kathmandu., 2005; 261-75.
16. <http://www.himalayaninstitute.org/ArticleRead.aspx?code=48> as accessed on 4th January 2007. “Awakening Kundalini” by Swami Rama.
17. Hainsworth R. Circulatory responses from lung inflation in anesthetized dogs. *Am J Physiol* 1974; 226-47.
18. Daly M, De B, Robinson BH. An analysis of the reflex systemic vaso-dilator response elicited by lung inflation in dog. *J Physiol London* 1968; 195-387.
19. Keele CA, Neil Erik, Joel Noman. The chemical regulation of Respiration. In: Samson and Wright’s Applied Physiology. 13th ed, Oxford University Press, New Delhi., 2003; 209: 170-1.
20. Yadav RK, Das S. Effect of yogic practice on pulmonary functions in young fem.