

Impact of Pranayama on Pulmonary Functions in Young Healthy Adults

Dheeraj Jeph¹, Tanu Atreya², Rinki Hada³, Chhaya Gupta⁴

¹Professor, Department of Physiology, SMS Medical College, Jaipur

^{2,3}Assistant Professor, Department of Physiology, SMS Medical College, Jaipur

⁴Senior Demonstrator, Department of Physiology, SMS Medical College, Jaipur

Received: 15-01-2022 / Revised: 20-02-2022 / Accepted: 30-03-2022

Corresponding author: Dr. Chhaya Gupta

Conflict of interest: Nil

Abstract

Introduction: During recent years, a lot of research work has been done to show the beneficial effects of yoga as combined impact of Asanas, Pranayama and Meditation. The present study was undertaken to assess the impact of Pranayama excluding other yogic exercise on Pulmonary Functions.

Methods: A groups of 30 volunteers (age group 18-25 yrs.) were selected from the undergraduate male medical students were asked to practice Pranayama. They had to do pranayama practice daily for about 20 minutes. The observations were recorded by MEDSPIROR, in the form of FVC, FEV1, PEFR, FEV1/ FVC and MVV on day -1, after 4 weeks and 8 weeks of planned intervention (pranayama).

Results: There were significant increases in PFT parameters in Pranayama group at the end of 8 weeks. Results were significantly high with P value (< 0.001) in the Mean change + SD was observed in the Pranayama group.

Conclusion: Pranayama can act as a physiologically viable method for improving and maintaining lung functions in normal adults.

Keywords: Pranayama, FVC, FEV1, PEFR, FEV1/FVC, MVV

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Medical science tries to achieve an optimum physical and mental health of the individual through preventive, curative and promotive means. However, for a long-time medical professional have laid much emphasis on the curative aspect and only relatively recently the preventive aspect is also being emphasized whereas in yogic practice the stress is mainly on the promotive aspect, although some yogic methods are prescribed for curative purposes as well [1-5]. A wide variety of common diseases such as coronary heart

disease, hypertension and diabetes mellitus are now being attributed to a faulty lifestyle. Yoga is probably the best lifestyle ever devised in the history of mankind. [6-8] It is a simple, loving, giving, non-judgmental way and view of life upon which people across culture and across countries have stumbled from time to time for centuries. This peace of universal wisdom, which has been discovered and rediscovered several times in history as the 'Ultimate Prescription for Health' peace and joy has been organized

into a systematic process in yoga. After the favourable effects of a yogic lifestyle on coronary heart disease demonstrated by Dean Ornish[1990] and his colleagues, yoga is finding increasing acceptance as a non-pharmacological intervention for the prevention and treatment of several diseases[9]. The study was undertaken to assess the effect of Pranayama excluding other yogic exercises on pulmonary functions after 4 and 8 weeks of Pranayama practice.

Methods

The present study was conducted in the Department of Physiology, SMS Medical College, Jaipur. A groups of 30 volunteers were selected from the undergraduate medical students of the college and their physical characteristics like height (cms), weight (kgs) and age (years) which have a role in determining the lung volumes, were measured. Healthy young compliant adults in the age range of 18 – 25 years after having taken written informed consent were included in the study. Alcoholics and smokers and subjects with a history of acute and chronic cardiopulmonary disease were excluded from the study. The study group was asked to practice pranayama. The schedule of pranayama was explained to all participants and after three days practice session, the actual practice of pranayama was introduced.

The Preparation for Pranayama

Subjects were asked to come with empty stomach and empty bladder after taking a bath early in the morning before sunrise, as per the set protocol. Subjects did pranayama in Padmasana (The lotus posture) or Sukhasana (The comfortable posture) or Vajrasana (The thunder bolt posture) in a calm and quiet environment. After the subjects had assumed the proper posture, they were instructed to close their eyes and concentrate on the sound of breathing. They were then asked to inhale slowly and deeply followed by pronunciation of 'OM' (A-----U-----

M) during slow and gentle exhalation. Three such pronunciation of 'OM' was performed before starting pranayama. The Pranayama schedule included four types, namely, Kapalbhatai Pranayama, Bhastrika Pranayama, Anulom - Vilom Pranayama and Bhramari Pranayama. These 4 pranayamas took a total time of about 20 minutes; each of 5 minutes duration with inclusion of one minute interval for rest between subsequent Pranayama. After completing the Pranayama practice, three pronunciations of 'OM' were performed as on starting the practice. The following parameters of the pulmonary functions, Pulmonary Function Tests (PFT), were recorded using automated dry spirometer (MEDSPIROR), namely, Forced Vital Capacity (FVC), Forced Expiratory Volume in First Second (FEV1), Peak Expiratory Flow Rate (PEFR), Forced Expiratory Volume (Timed) to Forced Vital Capacity Ratio (FEV1/FVC) and Maximum Voluntary Ventilation (MVV).

Subjects were divided in 3 groups of 10 each. The study for each group was performed on consecutive days to restrict the evaluation load to 10 persons per day. Recording was done in study group on Day-1, after 4 and 8 weeks of the planned intervention (Pranayama). PFT were performed 10 minutes before starting the Pranayama on Day-1, these initial readings served as baseline for an individual. PFT were performed again after 4 weeks and after 8 weeks, 10 minutes after completion of Pranayama. Pulmonary function tests were performed in rested, relaxed and sitting position in the morning hours.

Statistical Analysis

The results of PFT are presented as Mean \pm S.D. The data was analyzed by using student's paired 't' test and 'z' test. P values of < 0.05 were considered significant.

Results

The results have been summarized in the given Table. The FVC, FEV1, PEFR,

FEV1/FVC and MVV of pranayama group on Day1, 4th week and 8th week has been given in table. These results exhibit Mean Change ± S.D. in PFT values from Day-

1,4th week and 8th week of Pranayama group wherein significant increase (P<0.001) were observed in all the variables.

Table 1: Mean ± SD of parameters of PFT on various Day of Pranayama group

PFT	Day 1 st	At 4 weeks	At 8 weeks	Intra group comparison day I to 4 th week	Intra group comparison day I to 8 th week
	Pranayama group	Pranayama group	Pranayama group	P1-value	P2-value
FVC (Lit)	3.44± 0.71	3.88± 0.53	4.05± 0.51	< .001	< .001
FEV ₁ (Lit)	3.07± 0.64	3.60± 0.47	3.82± 0.47	< .001	< .001
PEFR (Lit/Sec)	8.78± 1.29	9.84± 1.08	10.23± 1.01	< .001	< .001
FEV ₁ /FVC (%)	88.93± 7.12	92.47± 5.40	93.97± 5.37	< .001	< .001
MVV (Lit/Min)	153.10± 24.95	167.47± 25.96	179.10± 21.87	< .001	< .001

Table exhibits Mean ±SD of PFT parameters at Day-1, at 4th Week and at 8th Week of intervention (pranayama).

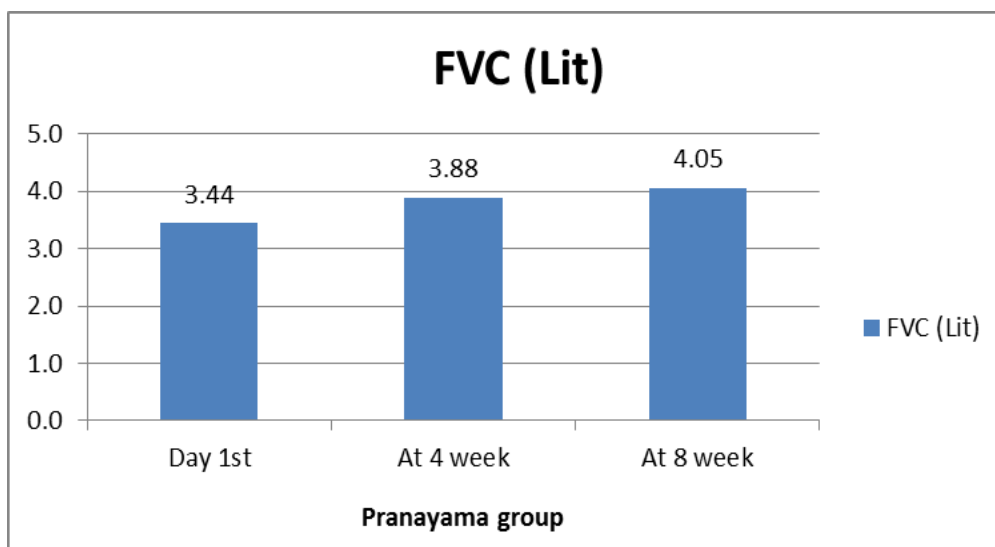


Figure 1: Graph showing the mean value of FVC at different point of time.

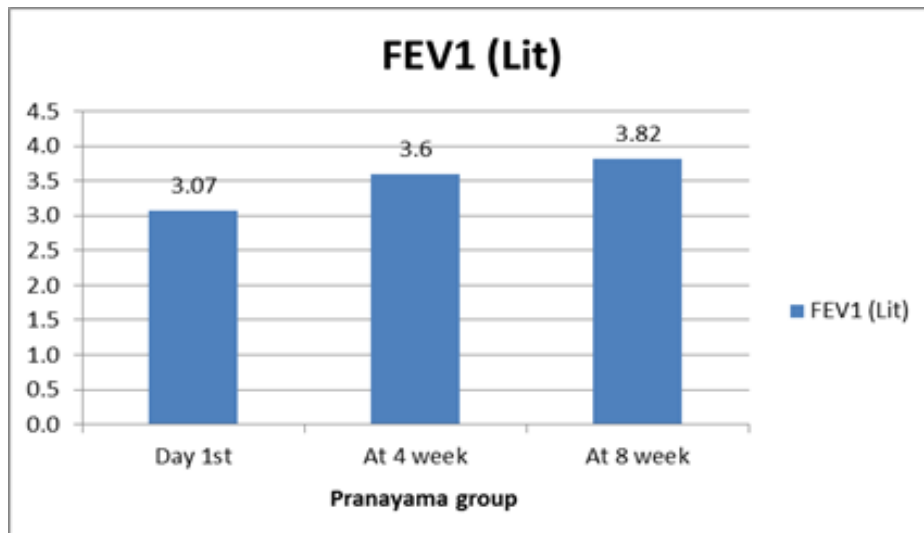


Figure 2: Graph showing the mean value of FEV1 at different point of time.

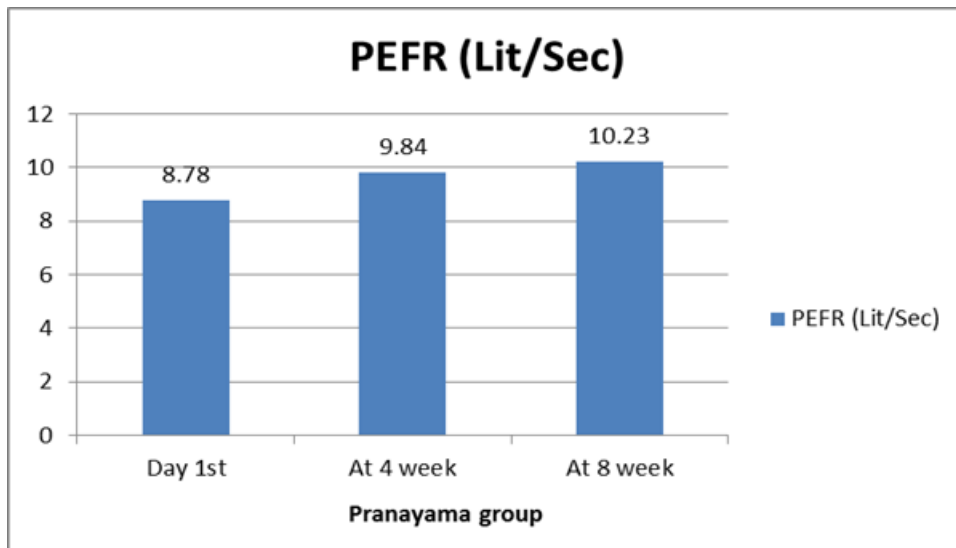


Figure 3: Graph showing the mean value of PEFR at different point of time.

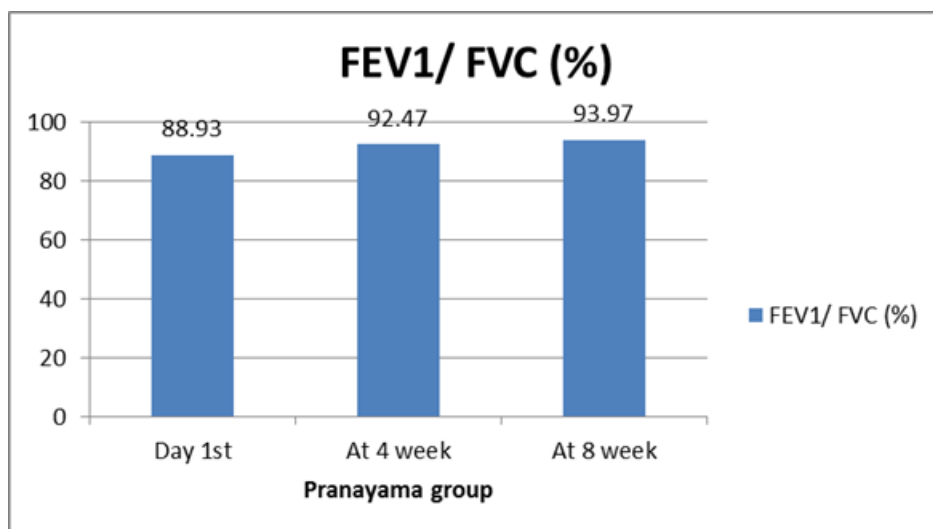


Figure 4: Graph showing the mean value of FEV₁/FVC at different point of time.

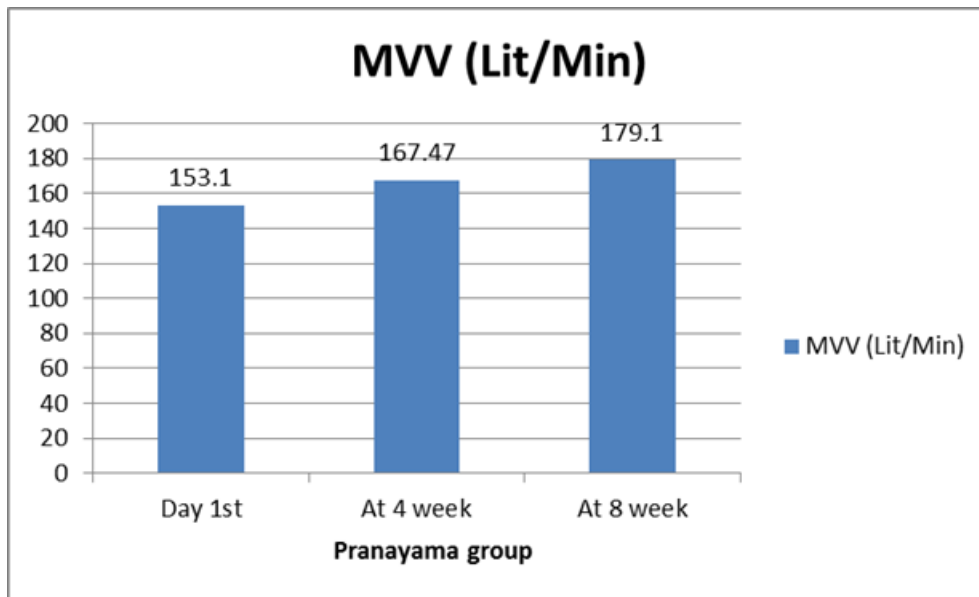


Figure 5: Graph showing the mean value of MVV (Lit/Min) at different point of time.

Discussion

In the present study the selected Parameters of Lung functions improved significantly ($P < 0.001$) after 4th and 8th weeks of continuous Pranayama practice from the baseline values at Day- 1 of the study. Similar Increasing trend has also been reported by Yadav and Das (2001) [10].

The changes observed in Pranayama group in the lung functions under evaluation were significantly high after eight weeks, substantiating the claims of Pranayama on lung Physiology. The present study documents the beneficial effects of Pranayama on the Ventilatory functions. The claims of the present study further substantiate the results of earlier research done by Nayer et al (1975) [8].

Pranayama modulates and enhances Pulmonary functions by increasing Total Lung Capacity [3,4,10]. Lung inflation near to total lung capacity (as achieved through Pranayama) is a major Physiological stimulus for the release of Lung Surfactant[2] and Prostaglandins into alveolar spaces[11,12], which increases the Lung Compliance and decrease bronchial smooth muscle tone, respectively. Yoga,

with its calming effect on the mind can reduce and release emotional stresses, thereby withdrawing the broncho-constrictor effect [1].

Conclusion:

Hence, it can be concluded that Pranayama can act as a physiologically viable method for improving and maintaining lung functions in normal adults.

Acknowledgements

We are thankful to the Yoga teacher Shri Vishwajeetji and the undergraduate medical students for their cooperation and participation in the study. We also express our gratitude to the Principal and Department of Physiology, S.M.S. Medical College, Jaipur.

References

1. Bhattacharya S, Pandey US, Verma NS. Improvement in oxidative status with yogic breathing in young healthy males. *Indian J PhysiolPharmacol* 2002; 46(3): 349-354.
2. Hildebran J, Georke J, Clements JA. Surfactant release in exercised rat lungs stimulated by air inflation. *J ApplPhysiol* 1981; 51: 905-910.

3. Iyenger BKS. Light on pranayama. New Delhi: Harper Collins, 1993.
4. Madanmohan, Rai UC, Balavittal V, Thombre DP, Swami Gitananda. Cardiorespiratory changes during Savitri Pranayama and Shavasan. The Yoga Review 1983; 3: 25-34.
5. Mallick HN. Review of Prof. B.K. Anand's Scientific Study. Indian J Physiol Pharmacol 2001; 45(3): 269-295.
6. .Nayar HS, Mathur RM, Sampath Kumar R. Effects of Yogic exercises on human physical efficiency. Indian J Med Res 1975; 63: 1369-1376.
7. Ornish D, Brown SE, Scherwitz LW, Billings JH, Amrstrong WT, Ports TA, McLanahan SM, Kirkeeide RL, Brand RJ, Gould KL. Can lifestyle changes reverse coronary heart disease? Lancet 1990; 336: 129-133.
8. Shrivastav RD, Jain N, Singhal A. Influence of alternate nostril breathing on cardiorespiratory and autonomic functions in healthy young adults. Indian J PhysiolPharmacol 2005; 49(4) : 475-483.
9. Smith AP. Prostaglandins and respiratory system, prostaglandins: physiological, pharmacological and pathological aspects, edited by S.M.M Karim, 1976, 83-102.
10. Textbook of Medical physiology (3rd edition). Edited by RL Bijlani. Published by Jitender P VIJ Jaypee Brothers Medical Publishers (P) Ltd. 2004; page No. 871-906.
11. Yadav RK, Das S. Effect of yogic practice on pulmonary functions in young females. Indian J Physiol Pharmacol 2001; 45(4) : 493-496.
12. Darmal, D. I., Khan, A., Ahmad, D. S., & Gowani, A. Frequency of Type II Diabetes Mellitus in ST Segment Elevated MI patients presented to French Medical Institute for Mothers and Children: A Cross Section Study. Journal of Medical Research and Health Sciences, 2022:5(6), 2023–2038.