

TO STUDY THE EFFECT OF FOUR WEEKS OF PRANAYAMA TECHNIQUE ON LUNG FUNCTION TEST OF NORMAL VOLUNTEERS

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ABSTRACT

In today's era of industrialization due to air pollution, sedentary lifestyles respiratory strength of individual is affected. So in our society there is increase in demand for special Technique which will look after respiratory health. *Pranayama* a part of *Yoga* has ability to improve respiratory function. FVC, FEV₁, PEFR etc. are parameters which indicate functional ability of respiratory system. The study is conducted to evaluate whether *Pranayama* plays any role in improving lung capacity.

Keywords: *Pranayama*, FVC, FEV₁, PEFR

INTRODUCTION

Today's era of Industrialization the air pollution is emerging fast & directly affects mostly the respiratory function of human beings, so many persons are prone to respiratory diseases. The new respiratory diseases are emerging like swine flu, put dangers in front of society. So it becomes important to prevent such diseases & to maintain normal lung function by any possible way.

Pranayama is important part of *Yoga* which has been practiced for centuries by students of *Yoga* in remote Ashrams & has been preserved for us through many genera-

tions both in practice and in handwritten books. Until science of Yogic breathing was almost unknown to common man like many other ancient Indian Arts. Those who knew it used to be very reluctant to share their knowledge and experiences with any one, unless students prove this by different tests world can't accept its importance.

Animals having lesser respiratory rate seems to live longer duration vice versa animals having greater respiratory rate live for short period ^{[1][2]}.

Table No: 1

Species	Respiratory rate	Longevity of life
Human	16-18/min	Around 100 yrs
Snake	8/min	Around 120 yrs
Tortoise	5/min	Around 140 yrs

In contrast **Table No: 2**

Species	Respiratory rate	Longevity of life
Dogs	30/min	12 yrs
Hares	40/min	8 yrs

It indicates definite relationship between respiratory habits & life expectancy. So, better respiratory functions will help to improve the life.

Pranayama has considerable effect on respiratory function. *Pranayama* includes the control over the natural process of inspiration & expiration. The word *Pranayama* is made up of *Prana*- Energy & *Ayama*-Stretch, Extension and Regulation^[3].

Pranayama is accepted as best breathing Technique. So it is important to explain *Pranayama* using objective parameters in today's world of science & technology.

AIMS & OBJECTIVES:

- To study the effect of four weeks of *Pranayama* Technique on Lung Function Test of normal volunteers
- To study the mode of action of *Pranayama* on Lung Function Test.

MATERIALS & METHODS:

During the study effect of *Pranayama* on respiratory system of randomly selected 30 healthy volunteers were studied. The following materials were used,

Thermometer, Weighing Machine, Stop watch, BP apparatus, Stethoscope, Measuring tape, Spirometer

Inclusion criteria: - Normal healthy volunteers aged between 20 to 50 yrs.

Exclusion Criteria:- 1) Pregnancy 2) Volunteers having habit of tobacco chewing, smoking & alcoholics were avoided 3) Volunteers having diseases of respiratory system e.g., Bronchial Asthma, URTI etc. were avoided 4) Volunteers performing *Pranayama* regularly, sports persons, athletes were not included in study.

Lung function test (LFT) was recorded by breeze suite 6.3 a computerized

spirometer. The parameters of PFT included in the study were

- 1) FVC- Forced Vital Capacity
- 2) FEV₁- Forced Expiratory Volume in 1 Second
- 3) PEFR- Peak Expiratory Flow Rate

Methods of Pranayama:-

30 Volunteers were randomly selected and all volunteers were considered as experimental group. Volunteers were first explained the whole *Pranayama* procedure as explained in *Hathayogpradipika* & demonstrated the same.

Pranayama is an art & has techniques to make the respiratory organs to move & expand intentionally, **rhythmically** & intensively. It consists of long, sustained subtle flow of inhalation (*Puraka*), exhalation (*Rechaka*) & retention of breath (*Kumbhaka*). *Puraka* stimulates the system, *Rechaka* throws out vitiated air and toxins, & *Kumbhaka* distributes the energy throughout the body^[4].

1) *Suryabhedana Pranayama*: - Firstly Volunteers (*Sadhakas*) were requested to sit in *Padmasaana* or *Sukhasana* (Special sitting position). They were asked to close their eyes, block the left nostril completely with the tips of the ring & little fingers. Partially close the right nostril with right thumb and then inhale slowly carefully & deeply through the partially closed right nostril up to maximum capacity. Hold the air as long as possible then slowly exhale through partially opened left nostril. This procedure was performed for 7 minutes.^[5]

2) *Ujjayi Pranayama*: - First all Volunteers (*Sadhakas*) were requested to Sit in *Padmasaana* or *Sukhasana* (Special sitting position). They were asked to close their eyes & mouth. Slowly inhale with both nostrils deeply. Then the air should be exhaled in

such a way that it should make noise while passing. Listen to the sibilant sound of the breath. The flow is controlled by resonance of the sound & the tone by the flow.^[6] This procedure was performed for 7 minutes.

3) *Bhastrika Pranayama*: - All Volunteers (*Sadhakas*) were requested to sit in *Padmasana* or *Sukhasana* (Special sitting position) in such a way that head, neck & vertebral column would be in straight line. Then ask them to take a short, strong breath and expel it with a quick strong blast. Repeat the second in breath quicker and more forceful than the first one. One quick in & out breath, taken together, completes one blast of *bhastrika*. Do 4-8 such blasts at a stretch to complete one cycle, ending with an out breath.^[7]

DATA COLLECTION

All volunteers were examined on 1st day & lung function test was done. Then daily early in morning 6:00 am to 6:30 am *Pranayama* practice done. After 4 weeks of *Pranayama* procedure above all volunteers were again examined. Case record form was prepared to note observations of volunteers at specific interval.

Observations obtained on day 1st & on 4th week were analyzed by paired 't' test.

Examination of Volunteers:-

A) General Examination – Weight, Pulse, B.P., Temperature are examined

B) Examination regarding Respiratory system –

Lung Function Test

Lung function test (LFT) was recorded by Breeze Suite 6.3 a computerized spirometer. The Parameters included in this study,

1. FVC – Forced vital capacity

2. FEV₁- Forced expiratory volume in 1 second

3. PEFR – Peak expiratory flow rate

For LFT the subjects were explained the whole procedure & were demonstrated the same. Before starting procedure, make sure that the volunteer is comfortable & fully understood the maneuvers necessary to complete the test.

FVC – FVC measures the maximum volume of gas that can be expired as forcefully & rapidly as possible after a maximal inspiration to lung capacity.

First, switch on the instrument. By clicking FVC tab initiate the procedure. After clicking space bar to begin the test, instruct the volunteers to make normal relaxed breaths. Instruct the patients to inhale fully, then exhale as rapidly, forcefully & completely as possible (Try to have volunteer exhale until the yellow indicator box turns green, indicating end of test criteria). Then inhale fully. After stopping the test by pressing space bar, the completed test results appear in Data table. Breeze software automatically performs the calculations.

FEV₁ - The volume exhaled during 1st second of forced expiratory maneuver started from the level of total lung capacity.

PEFR – (Peak expiratory flow rate) the maximum rate at which the air can be expired after a deep inspiration is known as peak expiratory flow rate^[8]

PEFR was determined by computerized Breeze suite spirometer while determining FVC test.

Table No: 3

Sr No	FVC (Litre)		FEV ₁ (Litre)		PEFR (ML)	
	Day 1	4 wks	Day 1	4 wks	Day 1	4 wks
1	1.43	1.51	1.4	1.49	247.3	262.9
2	2.12	2.34	2.09	2.31	311.3	326.8
3	1.28	1.63	1.25	1.59	231.8	248.3
4	1.8	2.05	1.72	2.01	295.1	322.8
5	1.57	1.64	1.54	1.62	264.2	288.1
6	1.87	2.11	1.83	2.1	312.8	344.6
7	1.3	1.67	1.23	1.52	164.5	148.1
8	1.78	1.84	1.76	1.8	236.4	254.9
9	2.96	3.12	2.89	3.08	582.6	585.4
10	3.07	3.45	2.76	2.94	456.1	477.3
11	2.53	2.68	2.53	2.66	356.4	362.4
12	1.38	1.43	1.38	1.43	225.8	234.2
13	2.32	2.51	2.28	2.48	364.3	371.9
14	3.11	3.42	2.79	3.18	380.5	397.2
15	2.04	2.58	1.9	2.43	163.3	189.2
16	2.96	3.15	2.36	2.4	430.9	441.1
17	2.65	2.71	2.53	2.6	362.1	377.8
18	3.4	3.65	3.03	3.34	503.2	516.7
19	2.14	2.67	2.11	2.64	352.4	367.9
20	1.98	2.22	1.95	2.18	248.6	263.2
21	3.65	3.82	3.16	3.31	542.9	554.1
22	2.08	2.23	3.08	2.2	363.7	381.2
23	2.42	2.51	2.2	2.41	234.4	248.1
24	3.9	4.08	3.27	3.62	358.9	371.3
25	3.7	3.62	3.24	3.34	511.8	535.3
26	2.19	2.28	2.19	2.28	296.5	305.2
27	3.19	3.27	2.92	3.11	567.9	578.2
28	3.38	3.41	2.33	2.59	398.5	412.1
29	3.33	3.41	3.23	3.37	522.3	541.1
30	1.77	1.85	1.77	1.83	341.9	356.2

STATISTICAL ANALYSIS

Paired ‘t’ Test is applied to pair data of independent observations from one sample only when each individual gives a pair of observations, so Paired ‘t’ Test is applied for

statistical analysis. For testing the significance of difference Mean & SD of data is calculated^[9].

Table No: 4

	FVC (Litre)		FEV ₁ (Litre)		PEFR (ML)	
	Day 1	4 wks	Day 1	4 wks	Day 1	4 wks

Mean	2.44	2.59	2.26	2.46	346.2	370.62
SD	0.60	0.76	0.63	0.62	15.17	16.48

Effect of *Pranayama* on FVC:-

By using the paired 't' test, 't' value is found to be 7.05. Expected value at 29 degree of freedom at 5% significant level 2.05, which is less than the value found so the effect is significant.

Effect of *Pranayama* on FEV₁:-

By using the paired 't' test, 't' value is found to be 7.1. 't' value according to UND table at 29 degree of freedom at 5% significant level 2.05 which is less than the value found. So the effect is significant.

Effect of *Pranayama* on PEFr:-

By using the paired 't' test, 't' value is found to be 13.13. Expected value at 29 degree of freedom at 5% significant level 2.05, which is less than the value found so the effect is significant.

RESULT

The present study has demonstrated a significant (paired 't' test) improvement in the FVC, FEV₁, PEFr with 4 wks of half hour daily *Pranayama* Technique.

DISCUSSION

The improvement in the lung function test may be due to increased in development of respiratory musculature incidental to regular practice of *Pranayama*. By the practice the respiratory apparatus emptied & filled more completely & efficiently which is recorded in terms of FVC. During the normal inspiration or expiration volume of Air is Tidal volume & it is about 500ml. We directly try to stretch our basic respiratory unit i.e. Alveoli with the *Pranayama*.

The increase in FEV₁ might be due to increase in FVC.

Emptying & filling of respiratory apparatus more efficiently may be due to efficient use of diaphragmatic & abdominal muscles.

Along with that it is found that

1. Calming effect on mind
2. Decrease in pulse rate
3. Decrease in respiratory rate

The effect may be due to decrease in sympathetic activity. *Pranayama* may be working on Autonomic nervous system.

CONCLUSION

In today's fast life most persons are suffering from lack of enthusiasm & lack of concentration in their work, which is mostly due to inappropriate oxygen supply to body. Proper breathing can bring more oxygen to blood & ultimately to body parts. *Pranayama* is the best breathing Technique. Therefore the "To study the effect of four weeks of *Pranayama* Technique on lung function test of normal volunteers" is the subject taken for the study.

In this study 30 healthy volunteers, irrespective of sex between 20 to 50 years were randomly selected. All volunteers are considered as experimental group. First all volunteers were explained & demonstrated the procedure of *Pranayama* which includes *Suryabhedana*, *Ujjayi*, *Bhastrika* as explained in literature of *Hathayogpradipika*. Daily 30 minutes *Pranayama* is been advised between 6:00-6:30 am.

All volunteers examined on day 1 before starting *Pranayama* & the Lung Function Test is performed. Again after 4 wks of *Pranayama* LFT done & the observations are noted which further analyzed using paired 't' test. Parameters included in

the Lung Function Test are – FVC, FEV₁ and PEFr.

The Lung Function Test was performed with the help of Breeze suite spirometer 6.3 a computerized unit.

After 4 wks of *Pranayama* following effects are found,

All 3 parameters (FVC, FEV₁, and PEFr) show the significant improvement. The observations found are analyzed by ‘t’ test & ‘t’ value for

FVC - 7.1

FEV₁ -7.05 &

PEFr -13.13

Which is much greater than the ‘t’ value at 5% significant level at 29 degree of freedom. It shows that the effect found is not within the natural limit but due to *Pranayama* Technique.

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