

EFFECT OF YOGA AND MEDITATION ON DIFFERENT PHYSIOLOGICAL PARAMETERS (RESPIRATORY & CARDIAC) IN CHRONIC TOBACCO SMOKERS

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Abstracts: Background & objectives: This study was undertaken to study the effect of yoga and meditation on cardio-respiratory parameters in chronic tobacco smokers. **Methods:** The subjects were divided in to two major groups of 150 each in control (nonsmokers) and study (smokers) of 20-60 years of age. **Results:** Pulmonary function test was done before and after three months of yoga and meditation. In our study mean value of FVC and FEV1 are increased in all age groups of control and study ($P < 0.05$) after the intervention of yoga and meditation. FEF25-75% is increased and statistically significant ($P < 0.05$) in study group. But no significant changes were observed in blood pressure and heart rate. **Interpretation & Conclusion:** We concluded that yoga and meditation enhances pulmonary functions. Lung capacity of a yogic is far greater than that of ordinary man.

Key Words: Pulmonary function test, Yoga, Meditation.

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Introduction:

Yoga is an ancient Indian cult and a way of life which is claimed to endow one who practices it with perfect physical, mental and spiritual health. Yoga is a complete way of life and some 'asanas' have potential to provide 'user friendly' stress management techniques. Whereas, meditation is a mental exercise in which we direct our mind to think inwardly by shutting our sense organs to external stimulations. It is a Vedic exercise which can be used as a powerful instrument to restrain sense organs, control autonomic nervous system and also to attain superconsciousness.

Meditation and yoga provide deeper rest than dreamless sleep. Modern research has proved that during meditation, rate of metabolic processes slows down even more than during deep sleep. It is the realization of the state of mind which is different from waking state and deep sleep where a person feels bliss and contentment. A person coming out of deep meditation is free from all tensions. Regular meditation for many years leads to 'Self Realization'. By meditation a person not only dissolves his tension, but also his body and organs are charged with new energy and vitality.¹

After knowing these facts, about yoga & meditation that they help in healthy living by strengthening cardiovascular and respiratory

system. We thought to apply these two stress relaxation – techniques to quit bad habit of smoking as this is number one enemy of human health. It is also evident that yoga is popular fashionable exercise that is used for health promotion in all ages around the globe.²

The Present research work was done to evaluate the influence of yoga & meditation on the variables of cardio- Pulmonary function tests, specially the FVC, FEV1, FEV1/FVC, FEF25-75% and PEFr, Systolic, Diastolic blood pressure and pulse rate.

Material and Methods:

In this study, 300 male subjects were studied in morning hours between the age group of 20-60 years, among them 150 tobacco smokers were included as study group, while 150 non-smokers volunteers were included as control group. Institutional ethical clearance was obtained before commencement of the study. The study was conducted in the department of physiology, S.P. medical college, Bikaner with informed consent of the subjects. We observed pulmonary function tests on before and after three months of intervention of yoga and meditation. Patients suffering from asthma, chronic bronchitis, tuberculosis, myocardial infarction, congenital heart diseases and heart block diseases were excluded from the study.

Subjects included in the study came daily for one hour continuously for three months duration for Yoga. Before entering in to program patients were instructed about the yogic exercise. It included Health rejuvenating exercises for 3 minutes, Pranayama for 15 minutes and different Body Postures (Asanas) for 30 minutes and Relaxation exercises for 12 minutes

Pulmonary function tests were measured with the help of Helios RMS computerized spirometer, blood pressure by sphygmomanometer and pulse by three finger method in sitting posture, at day 0 and after 3 months of post intervention of yoga and meditation. Conditions were same for both study (smokers) and control (nonsmokers).

Research work was carried out in police men. Yoga and meditation practices were given 1 hour per day for three months regularly in the early morning by trained yoga teacher. The computer prints out of the following reports with graphic curves were Forced vital capacity (FVC), Forced expiratory volume in 1 second (FEV1), FEV1/FVC ratio, Forced expiratory flow between 25% and 75% of vital capacity (FEF25-75%) and Peak Expiratory Flow rate (PEFR).

Statistical analysis was performed according to an intention to treat strategy. Quantitative data were presented as mean \pm SD and the student's 't' test was used to compare the differences.

Result:

There were total 150 males among them 75 each were from age group 21-40 and 41-60 years in control as well as in study group. Body weight & BMI were measured in all subjects. The mean value of weight and BMI decreased in both groups but these changes were statistically non-significant after intervention of yoga and meditation for three months.

Table: 1 Percentage predicted value of FVC

Table 1 shows comparison of mean values of forced vital capacity (FVC) in control and study groups according to their age and habit of smoking. In control group the mean values of FVC increased statistically highly significant in both age groups i.e. ≤ 40 years ($p=0.0001$) and >40 ($p=0.0001$). In study group, the values of FVC increased statistically significant in age group of ≤ 40 years ($p=0.02$),

Groups	Age (years)	Before intervention (Mean \pm SD)	After intervention (Mean \pm SD)	P
Control	≤ 40	79.88 ± 14.63	93.98 ± 13.46	0.00 01
	>40	75.20 ± 13.84	91.21 ± 15.56	0.00 01
Study	≤ 40	72.6 ± 18.86	78.93 ± 14.27	0.02
	>40	68.32 ± 16.53	74.58 ± 15.51	0.00 01

while increased statistically highly significant in age group of >40 years ($p=0.0001$).

Table:2 Percentage predicted value of FEV1

Groups	Age (years)	Before intervention (Mean \pm SD)	After intervention (Mean \pm SD)	p
Control	≤ 40	89.64 ± 17.77	102.51 ± 17.75	0.00 01
	>40	87.73 ± 16.62	102.60 ± 18.24	0.00 01
Study	≤ 40	84.68 ± 20.96	93.60 ± 17.77	0.00 5
	>40	81.61 ± 18.38	89.21 ± 18.38	0.01 2

Table 2 shows comparison of mean values of (FEV1) before and after three months of yoga and meditation intervention in control (nonsmokers) and study (smokers) groups, shows that in control group the mean values of (FEV1) increased statistically highly significant in both age groups ($p=0.0001$). In study group, the values of (FEV1) increased statistically highly significant in age group of ≤ 40 years ($p=0.005$), while increased statistically significant in age group of >40 years ($p=0.012$).

Table:3 Percentage predicted value of FEV1/FVC

Group s	Age (years)	Before intervention (Mean± SD)	After intervention (Mean± SD)	p
Control	≤40	113.28 ± 13.93	109.97 ± 14.25	0.01
	>40	116.81 ± 7.64	112.46 ± 9.30	0.002
Study	≤40	115.02 ± 8.63	118.34 ± 7.18	0.01
	>40	116.49 ± 11.03	119.77 ± 9.21	0.05

In this table 3 shows mean, Comparison of mean values of FEV1/FVC before and after three months of yoga and meditation intervention in control (nonsmokers) and study (smokers) groups, in control group the mean values of FEV1/FVC decreased statistically significant, in age groups of ≤ 40 years (p-0.01) and >40 (p-0.002). In study group, the values of FEV1/FVC increased statistically significant in both age group i.e. ≤40 years (p-0.01), while increased statistically significant in age group of >40 years (p-0.05).

Table:4 Percentage predicted value of FEF 25-75%

Group s	Age (years)	Before intervention (Mean± SD)	After intervention (Mean± SD)	P
Control	≤40	106.48 ± 26.24	99.70 ± 25.64	0.111
	>40	98.22 ± 33.22	99.52 ± 35.12	0.81
Study	≤40	93.84 ± 35.38	106.30 ± 29.33	0.02
	>40	83.58 ± 35.49	93.80 ± 29.32	0.05

This table 4, shows mean values of FEF 25-75% before and after three months of yoga and meditation intervention in control (nonsmokers) and study (smokers) groups. In control group the mean values of FEF 25-75% in both the age group have no statistically significant difference, In study group, the values of FEF 25-75% increased statistically significant in both age group i.e. ≤40 years (93.84± 35.38 to 106.30± 29.33, p-0.02), while raised statistically significant in age group of >40 years (83.58± 35.49 to 93.80± 29.32, p-0.05).

Table:5 Percentage predicted value of PEFR

Group s	Age (years)	Before intervention (Mean± SD)	After intervention (Mean± SD)	p
Control	≤40	89.06 ± 12.16	91.90 ± 11.15	0.14
	>40	87.18 ± 14.43	89.10 ± 16.58	0.43
Study	≤40	81.66 ± 19.92	85.90 ± 18.12	0.17
	>40	76.70 ± 19.15	80.42 ± 17.2	0.21

Table 5 shows comparison of mean values of PEFR before and after three months of yoga and meditation intervention in control (nonsmokers) and study (smokers) groups. Mean values of PEFR increased but statistically non-significant in both groups.

Table:6 Systolic blood pressure (mm of hg)

Group s	Age (years)	Before intervention (Mean± SD)	After intervention (Mean± SD)	p
Control	≤40	122.00 ± 2.34	121.89 ± 2.36	0.62
	>40	128.48 ± 2.39	128.10 ± 2.60	0.1587
Study	≤40	128.61 ± 2.40	128.24 ± 2.45	0.089
	>40	130.02 ± 2.98	129.00 ± 3.03	0.08

Table:7 Diastolic blood pressure (mm of hg)

Group s	Age (years)	Before interventio n (Mean± SD)	After interventio n (Mean± SD)	p
Contr ol	≤40	69.68 ±4.95	68.77 ±4.89	0.12
	>40	73.50 ±6.77	72.166.8 ±9.00	0.09
Study	≤40	73.78 ±6.81	72.34 ± 6.30	0.06
	>40	73.57 ± 8.20	72.37 ± 6.23	0.17

Table:8 Heart rate (beat/minute)

Group s	Age (years)	Before interventi on (Mean± SD)	After interventio n (Mean± SD)	p
Contr ol	≤40	73.65 ± 7.08	72.85 ±7.43	0.18
	>40	76.32 ± 8.75	75.14 ± 9.11	0.07
Study	≤40	73.17 ± 7.32	72.50 ± 7.47	0.29
	>40	76.37 ± 8.66	75.2 ± 9.11	0.08

Above tables 6 -8, shows mean values of systolic blood pressure, diastolic blood pressure and heart rate before and after three months of yoga and meditation intervention in control (nonsmokers) and study (smokers) groups but changes were statistically non-significant.

Discussion:

Neurological changes & endocrinal secretions affect majority of our body function including physiological and biochemical changes .They so

affect our circulatory system and finally influence our cellular environment. Our yogis and rishis developed various physical and mental exercises that work through these mechanisms to keep our body healthy.

The Present research work was done to evaluate the influence of yoga & meditation on the variables of cardio- Pulmonary function tests, specially the FVC, FEV₁, FEV₁/FVC, FEF_{25-75%} and PEFR, Systolic, Diastolic blood pressure and Heart rate.

Research work was carried out in police men. Yoga and meditation practices were given 1 hour per day for three months regularly in the early morning by trained yoga teacher. The subjects were divided in to two major groups of 150 each in control (nonsmokers) and study (smokers).

In our study we found that the mean value of FVC and FEV₁ was increased statistically highly significant in all age group of control (nonsmoker) and study (smoker groups) after the intervention of yoga and meditation.

We also found that mean value of FEV₁/FVC ratio was increased statistically highly significant in control group of above the age group of 40 years, while in study group mean value of FEV₁/FVC ratio and FEF_{25-75%} were increased significantly. Whereas, PEFR values were not significant in both groups.

In our study the mean values of systolic, diastolic blood pressures and pulse rate decreased after intervention of yoga and meditation for three months but statistically the values were not significant in all age group of control (nonsmokers) and study (smokers). Indicating that a short exposure of yoga and meditation does not lead to significant cardiovascular improvement.

The probable mechanism by which yoga meditation improves pulmonary functions:-

1. During normal inhalation an average person inhales about 500cubic cm of air, during deep inhalation intake of air is about 6 times that is about 3000 cubic cm. The capacities of individuals vary according to their body constitution. The practice of Pranayama increases the lung capacity and allows it to achieve optimum ventilation.³

2. Persons who trained in yoga make the use of diaphragmatic and abdominal muscles more efficiently, there by emptying and filling of the respiratory apparatus is more efficient and complete.^{4,5}
3. Lung inflation near to level of total lung capacity is a major physiological stimulus for the release of lung surfactant⁶ and prostaglandins in to alveolar spaces,⁷ which increases lung compliance and decreases bronchial smooth muscle tone respectively.
4. Yoga with its calming effect on the mind can reduce and release emotional stresses, thereby withdrawing the broncho-constrictor effect.^{8,9}
5. Most of us assume that breathing is usually automatic & it is beyond our active control .But this is not true. In Pranayama by arduous training of the lungs and nervous system, breathing can be made more efficient by changing its rate, depth & quality.³ The lung capacity of athletes and yogis is far greater than that of ordinary men.⁸ Better breathing means a better healthier life.¹¹
6. Pranayama breathing exercises alters autonomic responses to breath holding probably by increasing vagal tone and by decreasing sympathetic discharge. Results suggest that breathing selectively through nostril could have a marked relaxing effect on the sympathetic nervous system. The therapeutic implications are because of its ability to alter metabolism by changing the breathing pattern.¹² Practice of such technique not only keeps the subject free from stress but also improve their response to further stressful stimulus.⁸
7. Pranayama produces a significant decrease in oxygen consumption.¹³⁻¹⁶ These studies show that pranayama training produces an overall reduction in oxygen consumption, metabolic rate and load on the heart.

Thus practice of Pranayama is beneficial for not only respiratory system but also for other systems of the body.

Conclusion:

By yoga and meditation pulmonary functions are enhanced .By yoga, bronchconstrictor effect (due to stress, smoking) is withdrawn. The lung capacity of athletes and yogic is far greater than that of ordinary man. 'pranayam' helps by keeping the lungs pure and by increasing the flow of fresh

blood. It also decreases oxygen consumption and metabolic rate. So it is useful in bronchial asthma.

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