International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: SJIF: 5.995
Available Online at www.journalijcar.org
Volume 7; Issue 2(B); February 2018; Page No. 9703-9705
DOI: http://dx.doi.org/10.24327/ijcar.2018.9705.1616

Research Article

CHANGES IN PULMONARY FUNCTION TEST IN HEALTHY MEDICAL STUDENTS AFTER SHORT TERM PRACTICE OF SDB

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A R T I C L E I N F O

Article History:
Received 27th November, 2017
Received in revised form 5th December, 2017
Accepted 3rd January, 2018
Published online 28th February, 2018

Key words:
Slow deep breathing, SDB, Pranayam, PFT, Lung function

A B S T R A C T

The beneficial effects of Yoga besides its spiritual achievements are now well known in medical fraternity. "Pranayama" i.e. is the conscious voluntary regulation of breathing is the fourth stage of the 'Patanjali's Ashthanga Yoga' by which a balance between Sympathetic and Parasympathetic activity can be achieved. Object of this study was to find out whether the Slow Deep Breathing exercise for short duration can have any effect on Pulmonary function test or not.The study was conducted among 31 male and female medical students in the department. All had undergone slow breathing exercise for 20 minutes each day for a month and pulmonary function test was done by computerized spirometer in the beginning of the study and after one month. The recorded data were statistically interpreted by SPSS which showed a Significant increase ($p \leq 0.05$) in FVC, PEFR, FEF25-75% and FEV1/FVC ratio after breathing exercise. The study shows the significant increase in almost all of the Lung function parameter. If the exercise is performed for longer duration in regular way, it can improve the lung functions and can help in treating different lung diseases as a sole or adjunct therapy.

INTRODUCTION

Yoga has been practiced since thousands of years in India. Yoga reduces the stress, relaxes the mind, strengthens and tunes the body and brings them into harmony with each another[1]. Now a days it has been prescribed as one of the lifestyle modifications to reach the ultimate goal of healthy life and is becoming acceptable to the public as well as scientific community[2]. Pranayama, is the science of controlling breathing. The term "Pranayam" is derived from Sanskrit word "prana" means breathe and "ayama" means development or control. Pranayama consists of three phases: "Puraka" (inhalation); "kumbhaka" (retention) and "rechaka" (exhalation) that can be either fast or slow. The goal of breathing exercises is to relax quickly and to improve the respiratory efficiency. In deep breathing gaseous exchange occurs throughout the lungs, in contrast with shallow breathing which involves only the base[4]. Waste of ventilation at the dead space is reduced so also the work of breathing. Regular practice of pranayama improves cardiovascular and respiratory functions, improves autonomic tone toward the parasympathetic system, decreases the effect of stress and strain on the body and improves physical and mental health[3,5,6]. Pulmonary function parameters (PFT) provide important information to identify and quantify the functioning of the respiratory system.

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MATERIAL AND METHOD

This Cross sectional descriptive study was conducted at the Department of Physiology, RIMS Ranchi during the period of June, 2016 to August, 2016. 31 healthy Student volunteer (24 Male, 7 Female) of age group 18years to 25 years pursuing 1st Professional MBBS were included in the study after obtaining their consent and necessary permission from the institutional ethics committee. Volunteers having Hypertension, H/O Smoking, Respiratory diseases (Asthma, Nasal blockage, DNS), Chest wall injuries, Spinal/Chest wall deformities (Kyphoscoliosis), athletes and known practitioner of yoga/meditation were not included in the study. All the subjects were asked to perform the deep breathing exercise (6 breaths / minute) for 20 minutes each day for 30 days as stated by yoga instructor.

Pulmonary function test was carried out before the start of the study and at the end of study after performing the deep breathing exercise for a month.

The Pulmonary function of the subjects were assessed by computerized spirometer "SpiroExcel CT" and the following parameters were taken into the consideration (1) Forced Vital Capacity (FVC), (2) Forced expiratory volume in the first second (FEV1), (3) Peak expiratory flow rate (PEFR), (4) Forced expiratory flow 25-75% (FEF25-75%) and (5) FEV1/FVC ratio.

OBSERVATION AND THE RESULT

The data were interpreted by using the statistical software "SPSS v20" and values were expressed as "Mean ± Standard Deviation" along with the Probability value (p value) where p value ≤ 0.05 was accepted as "Statistically Significant". The Gaussian distribution of the data for each parameter was determined to check whether those are normally distributed or not. The Pre SDB and Post SDB values of the same parameter were analyzed by "Paired t-Test". The following result we got:

Table 1 Different parameters of Pulmonary Function Test before and after practicing Slow Deep Breathing exercise

Parameters	Mean ± SD		P value
	Before practicing SDB	After practicing SDB	
FVC (L)	3.39 ± 0.67	3.50± 0.67	0.001**
FEV1 (L)	3.14 ± 0.59	3.15± 0.57	0.217
PEFR (L/S)	7.39 ± 1.88	7.74± 1.67	0.001**
FEF 25%-75% (L/S)	2.51 ± 0.59	2.66 ± 0.52	0.024**
FEV1/FVC	92.58 ± 4.88	90.37± 4.78	.007**

FVC -Forced Vital Capacity, FEV1-Forced expiratory volume in the first second , PEFR -Peak expiratory flow rate , FEF25-75%-Forced expiratory flow 25-75% and FEV1/FVC ratio *p value ≤ 0.05 is considered to be significant.

Table 1 shows the comparison of different parameters of PFT before and after performing the Slow Deep Breathing exercise, and its statistical significance if any. Almost all the parameters (FVC p value=0.001, PEFR p value=0.001, FEF 25%-75% p value=0.24 and FEV1/FVC p value=0.007) shows statistically significant increase after performing SDB exercise even for a short term.

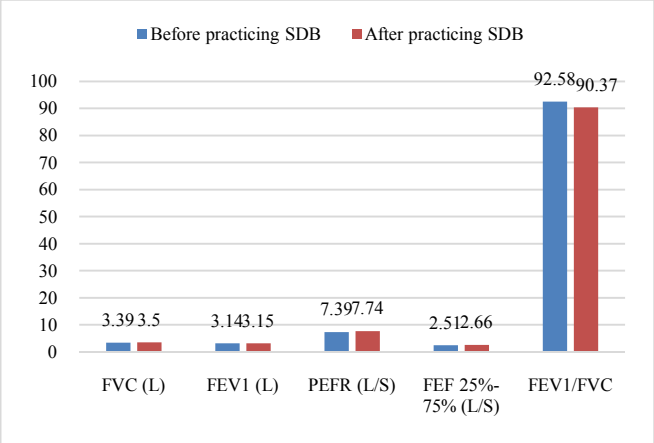

Chart 1 Comparison of mean values of different Lung function parameters after Spontaneous breathing and after performing Slow Deep Breathing for 20 minutes for a month.

DISCUSSION

Though the respiration is an autonomous procedure however in yoga practice there is conscious manipulation of the respiration and this makes an effect on the various parameters of the lung function test as in our study showed strong relationship between performing Slow deep breathing exercise (a type of pranayama) and improvement of lung function parameters. During normal inspiration the stretch receptors of the alveoli are stimulated which sends inhibitory impulses to the inspiratory center as a result inspiration stops and expiration starts as a reflex process. But in the deep breathing exercise the inspiration phase is prolonged, normal inhibitory stretch reflex is inhibited, and the stretch receptors are gradually trained to withstand more stretching. Thus the inspiratory capacity is more utilized, filling even the alveoli at the base of the lungs, improves the gaseous exchange process. In SDB the voluntary manipulation of expiration increases the duration of expiration, reduces the force of expiration as the alveoli are deflated gradually and the air escapes slowly. This causes the increment of the CO2 level in the blood that finally stimulates the central chemoreceptors in the medulla to stop the expiration and initiate inspiration.

Peripheral chemoreceptors also try to initiate inspiration in a reflex manner as they are sensitive to lower oxygen concentration in blood.

SDB also modulate the autonomic nervous system by

1. Increasing the duration of inhibitory neural impulses by activating the stretch receptors of the lungs while inhaling air above the tidal volume.
2. Increasing the generation of the hyperpolarization current by stretching the fibroblasts around the lungs.

During deep inspiration Slowly adapting receptors (SARs) play important role in controlling autonomic functions like breathing pattern, airway smooth muscle tone, Systemic vascular resistance and Heart rate.

Stretching of fibroblasts during prolonged breathing in SDB causes withdrawal of sympathetic tone in the skeletal muscle blood vessels, leading to widespread vasodilatation, causing decrease in peripheral resistance decrease in diastolic blood pressure[13].

Even the stretching of the fibroblast affect the membrane potential of the nervous tissue and is likely to be responsible for this autonomic shift towards the parasympathetic dominance as a result of synchronization between hypothalamus and brain stem [11,12]. A good cardiorespiratory coupling occurs when there is decreased breathing frequency that occurs in deep breathing exercise.

CONCLUSION

After performing SDB exercise, immediately there is an increase in almost all of the parameters of lung function which is consistent with the other studies showing improvement in lung functions after practicing Pranayama or breathing exercise for short period and long period. Present study has once again proved the relevance of Yogic exercise 'Pranayama' in improving lung functions. So, this breathing exercise can be prescribed as a sole or adjunct therapy.

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How to cite this article:

Rajesh Kr. Sinha, Bhaskar Saha, Poonam Singh and Sandeep Kumar (2018) 'Changes in Pulmonary Function Test in Healthy Medical Students after Short Term Practice of Sdb', *International Journal of Current Advanced Research,* 07(2), pp. 9703-9705. DOI: http://dx.doi.org/10.24327/ijcar.2018.9705.1616

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