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Original Article

Effect of Yogic exercise on static Spirometry values in normal healthy individuals

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Introduction: Yogic practices can be a very good exercise for maintaining proper health and has a profound effect on the lung functions of an individual. They are also used as psycho-physiological stimuli to increase the physiological functions and human performance. **Materials & Methods:** The present study was conducted on 60 male medical students in first year M.B.B.S, who came voluntarily as subjects for the project with written consent. Their age ranged between 18-24 years. All the participants were given training for 15 days by a certified yoga teacher and were allowed to practice pranayama and suryanamaskar exercise for one hour every day in the evening for a duration of six months. Five types of pranayama namely; Bhastrika pranayama, Anulomavilom pranayama, Bhramari pranayama and Pranava pranayama were chosen for this study. Various static spirometry tests were done to measure the Tidal volume (TV), Slow vital capacity (SVC), Inspiratory reserve volume (IRV), Expiratory reserve volume (ERV). Pulmonary function test was performed in all the participants using computerized pulmonary testing machine (Helios- 401, RMS). **Results:** The obtained data was analyzed for statistical significance using SPSS software of 22.0 version followed by student's t test and $p < 0.005$ was considered the level of significance. There was significant increase in all these variables ($p < 0.001$) in the study group after six months of yoga. **Conclusion:** From this study we concluded that, the practice of yoga can be advocated to improve respiratory efficiency for healthy individuals as well as an alternative therapy or as adjunct to conventional therapy in respiratory diseases and improve the anesthetic fitness for cardiothoracic surgery.

ABSTRACT:

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INTRODUCTION

The cases of stress-related diseases are increasing day by day throughout the world, GBD (Global Burden of Disease) estimates that mental disease, including stress related disorders will be the first leading cause of disability by the year 2020 [1]. Modern man has become a victim of daily stress and stress related disturbances like essential hypertension, angina, insomnia and impotency, yogic techniques are ideal for once ability to withstand stressful stimuli [2].

Yoga is an ancient system of self development through which union occurring between the mind, body and spirit. Yoga is a science and is immensely useful for promoting total health, which may assist in achieving recommended levels of physical activity for some individuals [3]. Yoga refers to the practice of physical postures or poses. Asana is only one of the eight limbs of yoga. Yoga breathing or pranayama is the science of breath control. Pranayama means control of "prana" in Indian Philosophy, refers to all forms of energy in universe.

The process of breathing is the essence of being, the main goal of these breathing techniques is to relax and to improve the respiratory efficiency [4]. Yoga refers to the practice of physical postures or poses. Asana is only one of the eight limbs of yoga. Suryanamaskar is the combination of few yogasana postures. This is well balanced set of movements that will stretch all the muscles in the body and keep the body and mind healthy [5]. Several studies had been undertaken to prove the role of pranayama and suryanamaskar for improvement of pulmonary functions in healthy individuals. It improves respiratory functions and has beneficial effect on respiratory diseases like bronchial asthma, COPD disorders. The combined effects of pranayama and suryanamaskar plays an important role as preventive measure in many cardiovascular and nervous system disorders [6]. The purpose of this study was to determine the effects of pranayama and suryanamaskar on static pulmonary function test in healthy young volunteers.

MATERIALS & METHODS

The study was conducted in Department of Physiology, MNR medical college, Sangareddy, Telangana. After approval of institutional ethical committee, sixty I year MBBS medical students between the age group of 18-24 yrs recruited in the study. After taking informed consent from each subject and explained the procedure of the study, a detailed history was recorded keeping in mind following inclusion and exclusion criteria. Inclusion criteria: Healthy non smoker volunteers with no cardio respiratory disorders. Subjects do not have previous experience of yoga and other type of exercises. Exclusion Criteria: History of Previous experience of yoga training and active sports training. Physically challenged persons.

History of major medical illness in the past e.g., Tuberculosis, Hypertension, Diabetes mellitus, Bronchial asthma etc, and history of major surgery in the recent past. **Methods:** All the participants were subjected to the six months of pranayama and suryanamaskar training by a certified yoga teacher in Department of Physiology. The participants were divided into four groups namely; control, pranayama, suryanamaskar and combined group of pranayama and suryanamaskar. All the subjects were asked to practice daily for about one hour. Yoga classes started with a brief prayer. The duration of the study was six months; the yoga training was performed for 30 min, daily for 5 days a week. This was followed by 30 minutes of either pranayama (Group-II) or suryanamaskar(Group-III) or combined Group

(pranayamaandsuryanamaskar).Atthe end of yoga training exercise, attendance was taken and the subjects were motivated to practice regularly. The parameters for dynamic lung functions (Tidal volume (TV), Slow vital capacity (SVC), Inspiratory reserve volume (IRV), Expiratory reserve volume (ERV), was performed on the students before and after six months specific pranayama, suryanamaskar and combined yoga training.

Pulmonary function tests (pft): The PFT was measured by a computerized spirometer (Helios- 401, RMS). To measure the flow and volume parameters such as Tidal volume (TV), slow vital capacity (SVC), Inspiratory reserve volume (IRV), expiratory reserve volume (ERV). The subject was asked to take three or four quiet breaths and then instructed to breathe in fully and then breathe out as forcefully and completely as possible while standing. This was followed by an equally rapid and complete inspiration. The data obtained was analyzed through the Helios- 401, RMS software and the printouts of the above given values were taken.The yogic exercises allotted to the group were as follows: Bhastika Pranayama, KapalBhati Pranayama, Bramhari Pranayama, Nadisuddi Pranayama / AnulomVilompranayamas, Pranava Pranayama and Suryanamaskar (sun salutation pose) for group-III subjects.

RESULTS

All the values obtained before and after performing Pranayama, Suryanamaskar and combined pranayama, suryanamaskar yogic exercises were expressed as mean ± SD. The data were analyzed by SPSS 22. 0 version one way ANOVA followed by student’s t test which was used to compare pre and post training results. P values of less than 0.05 were accepted as significant difference between the compared values. This study was conducted with the purpose of finding out the outcomes of pranayama training, suryanamaskar training and combined training on static spirometry functions in healthy students. All volunteers completed the study. There was no dropout. Comparison of spirometry values during pranayama, suryanamaskar and combined pranayama &suryanamaskar yogic procedures. The SVC, ERV, IRV and TV were significantly increased (p<0.05) in the combined (Group-IV) and suryanamaskar group (Group-III). But there was no significant change (p<0.05) (in SVC & TV in the pranayama group when compared with control group. All the above mentioned values were highly significant in the combined group (Group- IV) than the other groups (Table1).

Table 1: Comparison of static spirometry values before and after yoga practice

S.No	Parameters	Before Yoga (Group-I) (n=20)(Control)	After Pranayama (Group-II)(n=20)	After Surya namaskar (Group-III)(n=20)	Combined (Group-IV)(n=20)
1.	SVC (L)	3.51 ± 0.21	4.00 ± 0.23	4.20 ± 1.02**	4.58 ± 1.01**
2.	ERV (L)	1.12 ± 0.12	1.75 ± 1.02*	1.65 ± 1.12*	1.81 ± 0.01**
3	IRV (L)	2.07 ± 0.10	2.75 ± 0.04*	2.79 ± 0.05*	2.94 ± 1.01**
4	TV (L)	0.91 ± 0.03	0.98 ± 0.12	1.01 ± 0.56*	1.09 ± 0.08**

Values are expressed as mean \pm SD; *p<0.05 significant, **p<0.001 highly significant

DISCUSSION

From the results, it is evident that the six months of combined effects of pranayama and suryanamaskar showed a significant improvement in all the static lung spirometric values. The findings were supported by the study study conducted by ShravyaKeerthi et al., [7]. Nostril breathing is the process of continues, regularity of inhalation, holding of breath and exhalation. It charges body with an increased supply of oxygen through the lungs, this burns oxidizes the waste impurities, mainly CO₂, in the venous blood. This process of purification accompanying large increase in expulsion of waste CO₂ from the lungs during exhalation.

As a result, very little of the tissue remains in the blood as waste material. There is a less need for the breath, as the flow to the lungs of blood for purification slows down. The heart and lungs are given extraordinary rest [8]. The study also implies a significant increase in SVC, ERV, IRV and TV. Lung inflation near to tidal lung capacity is a major physiological stimulus for the release of lung surfactant and prostaglandins into alveolar spaces which increases compliance and decreases bronchial smooth muscle tone, respectively [9]. Our findings were consistent with the results of Sivapriya et al., immediate increase in TV, IRV, ERV and SVC [10].

By regular practice of yoga respiratory centre in medulla oblongata is brought under volition. In combined effects of yoga individual continuous the phase of inhalation with his strong voluntary control so that lungs are expanded considerably and the wall of the alveoli are stretched to the maximum thus the chest continuous to expanded under cortical control. The stretch receptors are trained to withstand more and more stretching this helps us to hold the breath for a longer period. The duration is gradually increased so that respiratory centre is gradually acclimatized to withstand higher Pco₂ and lower Po₂. The CO₂ stimulates the chemoreceptors located in the medulla oblongata which are sensitive to the amount of CO₂ concentration in the blood, which in turn send the impulses to respiratory centre. The respiratory centre which could have otherwise started exhalation is now helpless against the strong voluntary control from the cortex, so in many ways the individual practicing yoga training, the chemoreceptor's to tolerate more and more tension [11].

In our study, after six months of combined yoga practice, there was a significant increase in SVC, IRV, ERV and TV. The probable reason for the observation could be during pranayama, the compliance of the lung thoracic system increases and the airway resistance decreases, hence forceful expiration becomes more efficient. Also in pranayama and suryanamaskar combined exercise the efficient movement of the diaphragm leads to improvement in forced expiratory volumes and capacities.

CONCLUSION

Summing up, the six months yoga training including pranayama and suryanamaskar had significant effect on SVC, IRV, ERV and TV. Thus, such training may be recommended to improve physical and physiological fitness-based performance. The positive results found in the present study might apply to sports persons to improve physiological efficiency. A few minutes practice daily may help in maintain healthy life. The daily practice could also be parts of physical fitness and lifestyle modification programmes in maintain better physical and mental health. It is evident from the above results that, the combined practice of pranayama and suryanamaskar develops many wonderful qualities, and makes the students healthy for their future life. It also sharpens the ability to focus, self-confidence, and helps to develop self-discipline. We there for conclude that pranayama and suryanamaskar should be practices by any student's particularly medical students these who are under stress constantly every day to get these beneficial effects.

Conflict of Interest: Nil

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