Original Research Article

Effect of Short-term Yoga Practice on Respiratory Efficiency

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Abstract:

Hath yoga, one of the many paths of yoga, focuses on the overall fitness through breath control exercises (pranayama), yoga poses (asana), and meditation. There is evidence that the practice of yoga improves respiratory efficiency. The practice of yoga emphasizes body awareness and involves focusing one's attention on breathing or specific muscles or parts of body, so it is possible that yoga may strengthen respiratory muscles and improve respiratory efficiency. **Aim**: To study the effect of short-term yoga practice on respiratory efficiency in healthy individuals. **Materials & Methods:** 35 Apparently healthy individuals in the age group 17 – 25 yrs of both genders who have not undergone yoga before at Govt. Yoga and Naturopathy College, were selected. Informed consent was obtained. Pulse rate, Blood pressure and Respiratory rate, Breath holding time (BHT) after normal inspiration and after deep inspiration, Peak expiratory flow rate (PEFR) were recorded. Yoga practices comprising of Surya namaskar, asanas, pranayama were taught and made to perform for 1 hour daily, 5 days a week for 3 months. All the above parameters were measured after 3 months of yoga practice. **Results:** Statistical analysis was done using paired t test. Systolic BP (114.17+13.01 vs 111.63+12.34), Diastolic BP (70.71+10.6 vs 66.14+9.5) were reduced significantly. BHT after normal inspiration (30.62+13.1vs 38.62+15.79), BHT after deep Inspiration (38.45+14.2 vs 45.89+16.54), PEFR (299.71+79.27VS 337.71+78.44) were increased significantly. Pulse rate and respiratory rate showed no significant variations. **Conclusion:** Short term yoga practice has a beneficial effect in improving respiratory efficiency.

Key words: BHT, PEFR, respiratory efficiency, yoga

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Introduction :

Yoga is an ancient Indian practice and gaining popularity all over the world recently. It is believed to increase longevity and has therapeutic and rehabilitative effects.[1] Hath yoga, one of the many paths of yoga, focuses on the overall fitness through breath control exercises (pranayama), yoga poses (asana), and meditation.

Yogic exercises have been found to be beneficial for better maintenance of bodily functions, even in normal healthy subjects.[2] The practice of yoga

emphasizes body awareness and involves focusing one's attention on breathing or specific muscles or parts of body[3], so it is possible that yoga may strengthen respiratory muscles and improve respiratory efficiency.

Many reports supported the beneficial effect of long-term Yoga training on pulmonary functions.[3,6] Pranayama (controlled breathing exercise) is an important component of Yoga training. Pranayama and high frequency breathing exercise improves the air way reactivity in the asthmatic individuals.

It has been reported that regular Yoga practice resulted in decrease in resting respiratory rate and improvement in BHT and MVV.[3] With this background this study aims to analyse the effect of short-term yoga practice (12 weeks) on respiratory efficiency.

Breath holding time (BHT) is an indicator of cardiopulmonary reserve. It depends on the initial lung volume, strength of respiratory muscles, chemical factors, and psychological factors.

Peak Expiratory Flow Rate (PEFR) is an inexpensive, accurate and simple test for measuring airway resistance and strength of expiratory muscles. Hence these parameters were used to measure respiratory efficiency.

Materials & Methods :

The study was conducted in department of Physiology Stanley Medical College after obtaining Institutional ethical committee approval. It was an Interventional study done over a period of 4 months. 35 healthy young adults of both gender in the age group of 17 to 25 years were recruited for the study after obtaining written informed consent.

Inclusion criteria:

Apparently healthy individuals in the age group 17 – 25 years of both genders who have not undergone yoga before.

Exclusion criteria:

- Any acute or chronic medical illness
- Subjects on any medication for chronic diseases.
- H/O any substance abuse
- Subjects who are irregular in yoga practice

The following parameters were recorded.

Pulse rate, Blood pressure, Respiratory rate, Breath holding time after normal inspiration and Deep inspiration, and Peak expiratory flow rate (PEFR). Blood pressure and pulse rate was measured with Omron digital BP apparatus. The subject was asked to sit comfortably and asked to hold breath voluntarily and the duration from onset and breaking point was measured in seconds. After rest the same was done after deep inspiration. Wright's peek flow meter was used to measure PEFR and the best value of three attempts was taken as final.

All the students were taught certain yogacomprising of Asanas like "Surya Namaskar, Tadasana, Vṛikṣasana, PadaHastasana, Ardha Çakrasan, Trikoṇasana, Bhadrasana, Ardha Uṣṭrasana, Sasankasana, Vakrasana, Salabhasana, Makarasana, Setubandhasana, Pavanamuktasana, Savasana and pranayamas like Kapalabhati Praṇayama, Nadi Sodhana / Anuloma Viloma Praṇayama, Bhramari Praṇayama." The students were made to perform the yoga for 1 hour daily, 5 days a week for a period of 12 weeks. All the above parameters were measured after 12 weeks of yoga practice and compared using paired 't' test.

Results :

Fig:1 Gender Distribution in the study group

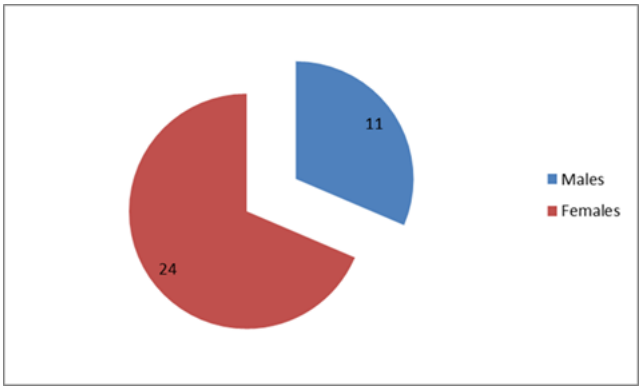

Table :1 Comparison of parameters before and after yoga practice
(** Highly significant)

PARAMETERS	BEFORE YOGA (MEAN± SD)	AFTER YOGA (MEAN± SD)	SIGNIFICANCE (P VALUE)
Pulse rate	93.63+ 17.13	85.89 +14.45	0.007**
Systolic BP (mm of Hg)	114.17±13.01	111.63±12.34	0.287
Diastolic BP (mm of Hg)	70.71±10.6	66.14±9.5	0.002**
Respiratory Rate	16.54 ±12.83	17.09 ±4.23	0.546
Breath holding (sec) (Normal inspiration)	30.62±13.1	38.62±15.79	0.006**
Breath holding (sec) (Deep inspiration)	38.45±14.2	45.89±16.54	0.000**
PEFR(L/min)	299.71±79.	337.71±78.44	0.003**

The statistical analysis of the data was done using the SPSS software version 17.

The Mean and Standard deviation of the variables (Pulse rate, Blood pressure, Respiratory rate, Breath holding time after normal inspiration and Deep inspiration, and Peak expiratory flow rate (PEFR) were determined for the two groups. Paired 't' test was employed as the Test of significance at 95% confidence interval. p value <0.05 was considered as significant. Among the study group 11 were male and 24 were female. As

the no of subjects were less gender difference was not analysed. Moreover, both genders were subjected to the same intervention and pre and post intervention the variables were analysed. Hence, we did not go for gender difference.

There was a significant reduction in pulse rate and diastolic blood pressure in the study group after yoga practice. Analysis of the respiratory parameter showed a significant increase in breath holding time both after normal inspiration and deep inspiration and PEFR was also significantly increased after yoga practice.

Discussion :

On analyzing the results of present study before and after 12 weeks of regular Yoga practice, it was found that there is highly significant improvement in almost all the pulmonary function parameters as shown in Table 1. In the present study there was a significant increase in BHT and MVV with decrease in respiratory rate after Yoga practice.

Pranayama, the breathing practice provides a deeper concentration in the process of inhalation and exhalation with a probable calming effect on the mind. This may decrease the sympathetic activity thereby by decreasing the release of adrenaline.[4] Decrease in heart rate, blood pressure and respiratory rate may be attributed to this mechanism. Voluntarily prolonging the phases of inspiration and expiration by stretching the lungs makes the bulbo-pontine complex to adjust to a new pattern of breathing which is slower than its basal rhythm leading to decrease in respiratory rate.

BHT is increased after yoga practice.

Table: 1 shows a significant increase in BHT.Ankad Roopa B et al. (2011) found similar improvement in BHT after practicing short term Pranayama and meditation in healthy individuals and study of Lata M. Mullur et al. (2012)[9] also found significant increase in BHT after short term Yoga practice. Repeated practice of breathing techniques tunes up the stretch receptors to withstand more stretching. Prolonged inspiration and expiration reduce the sensitivity of medullary and/or systemic arterial chemoreceptors to carbon dioxide with consequent prolongation of BHT. With training voluntary control on the respiratory muscles overrides the excitatory stimuli to the respiratory centres.[5]

PEFR is significantly increased after regular yoga practice.

Asanas strengthens the respiratory musculature due to which chest and lungs inflate and deflate to fullest possible extent and muscles are made to work to a maximal extent. Secretions are cleared and 'Dead space' due to bad posture, emotional tension and environmental factors gets reduced.

Regularly practicing a combination of well-balanced asana sequences and breath practices Improves the flexibility and strength of the respiratory muscles and fascia. Stretching of the diaphragm by yoga reportedly improves thoracic and abdominal cavity expansion, lumbar flexibility, body stability, balance, and expiratory muscle activity. Diaphragmatic breathing is facilitated by yoga, thereby influencing movement, stability and overall respiratory function. [6,7,8]

Pulse rate and Blood pressure are decreased after yoga practice.

Regular aerobic exercise puts the heart under stress to meet increased requirement for blood and oxygen. In asanas the requirement for blood and oxygen decreases as there are not strains and every muscle is relaxed. With conscious breathing asanas balance and stabilize autonomic nervous system resulting in reduced sympathetic activity and regulation of blood pressure and heart rate.[9,10]

Conclusion :

We conclude with this study, that regular practice of Yoga (Pranayama and Asanas) for a short period of 12 weeks is beneficial in improving the respiratory efficiency in healthy individuals irrespective of age and gender. Incorporating Yoga as part of our lifestyle and also as a part of our regular treatment regime may improve respiratory efficiency and may be beneficial for age related and occupational respiratory disorders. Regular breathing practice may suppress sympathetic system and alleviate its effects on many systemic disorders and can make an appreciable contribution to primary prevention as well as management of lifestyle diseases.

Further research with large sample size and for varied age groups and respiratory disorders is required for applying these results to population in general.

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Conflict of interest: Nil

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