Evaluation of the effect of yoga training on respiratory muscle efficiency among healthy students

Celine D¹, Subharevathi K², Chandini G³

¹ Professor and Head ,² AssistantProfessor, ³ Postgraduate, Department of Physiology, Chengalpattu Medical College, Chengalpattu -603 001, Tamilnadu

Abstract

Background: Respiratory efficiency is a long-term predictor of overall survival and can be used as a tool inevaluation of general health. Yoga practice has proved to have beneficial effect in prevention, control and rehabilitation in respiratory disorders. Various studies, have shown that regular practice of yoga causes significant improvement in the respiratory muscle strength and endurance, and also quality of health. Medical students joining have a stressful life style and most of them don't do regular exercise. Hence, to sensitize and motivate medical students towards a healthy lifestyle, this study was pertinently designed to study the effects of 6 weeks yoga practice on the respiratory efficiency of medical students. Aim: To evaluate the effect of yoga training on Respiratory Muscle strength & endurance among healthy students. Methodology: Undergraduate first year students, were randomly selected, after obtaining written informed consent. Detailed historywas taken and clinical examinations were carried out to rule out any acute or chronic illness. The tests for assessing respiratory efficiency with static maneuvers like expiratory blast test, 40mmHg tests, BHT (breath holding time), and dynamic maneuver like PEFR, MVV (Maximal Voluntary Ventilation) were recorded. Yoga training was given for six weeks following which tests were repeated again. Parameters were analyzed using SPSS21.0 version. Results: Following yoga practice, BHT, PEFR, MVV, 40mmHg test and Expiratory blast test values increased, showing improvement in respiratory efficiency. **Conclusion**: Practicing yoga, improves respiratory efficiency and in return will improve the quality of life.

Keywords: BHT, MVV, PEFR, respiratory efficiency

Corresponding Author

Dr. G. Chandini, Postgraduate, Department of Physiology, Chengalpattu Medical College, Chengalpattu -603 001, Tamil Nadu Telephone: +91 8015727164 E-mail: chandinig90@gmail.com

Introduction

Yoga is a type of exercise which is being practiced in India and an established ideology since many years.¹ It includes physical activities like asanas and breathing practices, like pranayamas and dhyanas, thereby creating consonancy between human body and mind.²Breathing sustains life, clears the mind, calms emotions and releases flow of energy in us. It is claimed that yoga practice helps in prevention, control and rehabilitation of respiratory disorders.It is also found to improve physiological and emotional health of an individual.³ Yoga have apotent scientific foundation andis influential in bringing uphomogenous physiological changes in respiratory system.⁴Yogic exercises are gaining attention nowadays, because of its benefits on healthy lifestyle. Innumerable studies and researches are being carried out to explain the scientific basis of its welfare to people.

Respiratory efficiency is a predictor of an individual's prolonged healthy life. Hence can be used as a parameter for assessing general health and well-being.⁵Studies have proven that the practice of yoga improves cardiorespiratory performance by having a subsidiary effect on Pulmonary Function Tests (PFTs) and respiratory pressures.

Medical students lead a stressful life because of educational workload and communal presumptions.This ungoverned stress will ultimately lead to various psychological disorders in future for them.³ The quality time they spend on exercise is very less. This study was constructed, so that the students are sensitized to the benefits of yoga practices, with refinement in their mental and physical health.The aim of this study is to evaluate the effect of yoga training on Respiratory Muscle strength & endurance among healthy students

Materials and methods

After obtaining ethical approval for this study from the Institutional Ethics Committee, a total of 60 students (male -30, female-30) volunteered for this study.Healthy students of age group 18 to 25 years, who agreed to sign a written informed consent were included as participants in the study.

Exclusion criteria

- Students with (BMI >24.99),
- Students practicing Yoga, Exercise
- With History of respiratory, cardiovascular, musculoskeletal and other disorders

- On treatment with drugs
- Alcoholics and smokers

The subjects were described about the beneficial effects of yoga practices and hence were motivated to take part in this study. Therespiratory parameters were taken prior to yoga practice and follow up data collection for the same parameters was done after 6 weeks of yoga practice. Maximum voluntary ventilation [MVV], Peak expiratory flow rate [PEFR], Breath holding time after normal and forceful inspiration and expiration, expiratory blast test and 40mmHg test were the parameters collected.

The tests were carried out during a fixed time, in morning hours, to avoid diurnal variation.The results of pulmonary function tests before & after yoga practice were compared & statistically analyzed using student's Paired 't'-test

Subjects did yogasana for one hour daily. The session consistent of prayer, starting with chanting 'om', pranayama, meditation & different asanas (different physical postures). Various asanas done were as follows -Sukhasana, Padmasana, Chakrasana, Shavasana, Matsyasana, Makarasana, Bhujangasana

Height and weight were recorded;BMI was derived using quetelets formula. They were given detailed description about instruments, {Spirometer Easy on PC Spirometry (nddmedizintechnikAG,Zurich, Switzerland), wrights mini peak expiratory flowmeter} and were made proficient with the same. After giving a demonstration on how to perform the tests, they were asked to carry out it by themselves as rehearsal.3 to 4 trials of maximal inspiratory and expiratory efforts were made and only the best value was considered. Subjects performed the tests in a quiet room, so that they were not affected by external factors and was alleviated from any stress

Results

Data were expressed as Mean± SD. Paired 't' test was used to compare respiratory efficiency tests before and after yoga practice for a period of 6

weeks. participants showed a significant rise in pulmonary capacities.

Table 1: Static Respiratory efficiency tests in Male student (paired students 't' test) (n=30)

Parameter	$\label{eq:pressed} \mbox{Pre yoga Mean} \pm SD$	Post yoga Mean \pm SD	P value
BHT after norma linspiration (seconds)	31.51 ± 7.3	41.06 ± 9.96	0.0003*
BHT after deep Inspiration (seconds)	56.58 ±14.59	69.22 ± 16.63	0.0005*
BHT after normal expiration (seconds)	29.54 ± 8.78	38.8 ± 10.44	0.0007*
BHT after deep expiration (seconds)	34.12 ± 9.21	41.54 ± 10.04	0.0008*
40mmHg test (seconds)	26 ± 8.28	34.21 ± 10.82	0.0001*

*P<0.05- statistically significant

Table 2: Dynamic Respiratory efficiency tests in Male students (paired students 't'test) (n=30)

Parameters	$\label{eq:pressed} \mbox{Pre yoga Mean} \pm SD$	Post yoga Mean \pm SD	P value
Expiratory blast test (mmHg)	61.45 ± 15.36	73.83± 17.71	0.0002 *
PEFR (L/min)	454.84 ± 81.5	515.32 ± 69.8	0.0006 *
MVV (Litres)	99.00 ±16.73	115.22 ± 14.3	0.0004 *

*P<0.05- statistically significant

Table 3 Static respiratory efficiency tests infemale students (Paired students 't' test) (n=30)

Parameter	Pre yoga Mean \pm SD	Post yoga Mean \pm SD	P value
BHT after normal inspiration(seconds)	24.65 ± 3.19	32.81± 5.59	0.0003*
BHT after deep Inspiration (seconds)	38.43 ± 6.17	48.46 ± 7.76	0.0005*
BHT after normal expiration(seconds)	27.06 ± 6.53	33.90 ± 6.43	0.0006*
BHT after deep expiration (seconds)	30.25 ± 4.65	37.78 ± 5.70	0.0008*
40mmHg test(seconds)	17.68 ± 5.54	22.5 ± 4.19	0.0001*

*P<0.05- statistically significant

Table 4 Dynamic respiratory efficiency tests tests infemale students(paired students 't' test) (n=30)

Parameters	Pre yoga Mean ± SD	Post yoga Mean ± SD	P value
Expiratory blast test(mmHg)	41.21 ± 10.37	49.34 ± 9.85	0.0002*
PEFR (L/min)	333.59 ± 58.4	373.75 ± 48.5	0.0004*
MVV (Litres)	66.5 ± 11.01	73.56 ± 10.2	0.0005*

*P<0.05- statistically significant

Discussion

The study was conducted to find out efficacy of yoga practice on respiratory muscle strength and endurance.⁷Many studies have been done showing effect of yoga on pulmonary function tests and also on effect of pranayama on respiratory endurance individually.⁸⁻¹⁰ This study was conducted to evaluate the effect of yoga sessions combined with breathing exercise on both static and dynamic maneuvers, signifying respiratory muscle endurance.

Breath holding time (BHT)

The results from our study showed that the breath holding time, both after normal and deep inspiration and expiration have improved significantly after yoga practice. Our findings are identical with Madanmohan*et al.* who found that BHT after expiration and inspiration significantly increased by 39% and 40%, respectively, after 12 weeks Yoga training. Similar findings were reported by Naya*ret al.* where BHT increased significantly from 54 s to 106 s.

BHT varies in accordance with individual's initial lung volume and their determination.Yoga practice aids them in overriding the stimulus to respiratory centers and thereby can control their respiration consciously.¹³ Forceful respiration and maintenance of respiratory muscles in sustained isometric contraction, improves cardiorespiratory endurance.Also,as a result of pranayama training the responsiveness of medullary and systemic arterial chemoreceptors gets altered. All these factors result in prolongation of BHT.

Peak expiratory flow rate (PEFR) and Maximum voluntary ventilation (MVV)

Our study showed that yoga practice resulted in improvement in values of PEFR and MVV significantly. Akhani et all reported similar findings, showing improvement in PEFR with yoga practice amongst young healthy students. Parikh et all reported a very significant increase in MVV (p value < 0.01) During yoga sessions lung inflates and deflates to their maximal ability, causing improved respiratory muscle strength and endurance. This maximum inflation and deflation work as a physiological stimulus causing release of surfactants and prostaglandins into the alveolar spaces, thereby increasing lung compliance. The stretch receptors reflexly decrease the tracheobronchial smooth muscle tone, resulting in decreased air flow resistance and increased airway caliber, ultimately leading to advancement in dynamic lung function tests like PEFR and MVV.¹⁴

40mmHg test and Respiratory blast test

Respiratory endurance is best measured by these tests, as it involves isometric contraction of respiratory muscles to hold the breath while maintaining a constant pressure. Our study found that these endurance tests improved significantly following yogic practices. Similar findings were reported by Balakrishnan et al. who found that 40 mmHg test results increased by approximately 46% indicating an improvement in cardiorespiratory endurance.⁹

Conclusion

This study findings show that six weeks of yoga training can significantly increase respiratory efficiency and pulmonary function tests. This study proposes that regular practice of yoga can improve health related aspects of physical fitness and general wellbeing. This resultant effect of yoga can be used as lung strengthening tool to bring about a balanced physical and mental wellness to newly joining medical students and to alleviate unnecessary stress.

Limitations

Efficacy of this study might have been better understood with involvement of more number of participants. If yoga sessions were practiced for more duration on daily basis, better improvement in respiratory efficiency might have been observed.

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Conflict of interest: Nil

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