

Effect of 12 weeks of yoga training on respiratory pressures and 40 mm Hg test in healthy individuals

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Abstract

Background: Yogic exercises have been found to be beneficial for better maintenance of bodily functions even in normal healthy subjects. In view of this, present study was planned to evaluate the effect of Yoga on respiratory pressures and 40 mm Hg test in healthy individuals. **Method:** The present study included 80 healthy subjects (40 males, 40 females) of 30-40 years age group. Subjects fulfilling the inclusion and exclusion criteria attended a minimum of five Yoga classes per week for a period of twelve weeks. Age, height, weight & BMI of the subjects were recorded. The maximum expiratory pressure, maximum inspiratory pressure and 40 mm Hg test were analysed before & after twelve weeks of Yoga practice. The same subjects were chosen as both study as well as control group to minimize the confounding factors and make the study more reproducible. Student's paired 't' test was used to compare the changes in parameters before and after Yoga training. **Results:** On analysis of results, there was highly significant ($p < 0.001$) increase in maximum expiratory pressure, maximum inspiratory pressure, and 40 mm Hg test after twelve weeks of Yoga practise. The response was similar in both the genders. **Conclusion:** Present study proved that regular practice of Yoga for minimum of 12 weeks is beneficial in improving respiratory pressures and 40 mm Hg test in normal healthy individuals and this improvement is appreciable in both genders. Results of the study would justify the incorporation of Yoga as part of our lifestyle in promoting health. Also, Yoga can make an appreciable contribution to primary prevention and management of lifestyle diseases.

Keywords: Yoga; Maximum expiratory pressure; Maximum inspiratory pressure; 40 mm Hg test.

Introduction

Ventilation plays an important in the adequacy of external gas exchange. Ventilatory pump response in comparison to the given metabolic load depends upon the strength of the force generator units which are the respiratory muscles. Respiratory muscles strength can be directly measured using static pressures i.e. Maximum expiratory pressure (MEP), Maximum inspiratory pressure (MIP) and 40 mmHg test [1]. Respiratory pressures are easily measured, objective and sensitive indices of respiratory muscle strength and can be altered in disease states even when other commonly measured pulmonary function tests show little abnormality [2].

Maximum inspiratory pressure can be generated during inspiration and MEP can be generated during forceful expiratory, both against an occluded airway. The highest MIP is obtained near residual volume while the highest MEP is obtained near total lung capacity [3]. Endurance in the 40 mm Hg test is influenced by strength and endurance of respiratory muscles. Alternative medicine is being accepted as an adjunct to standard therapies in the practice of western medicine [4]. Currently four in ten Americans use at least one alternative therapy as compared with three in ten in 1990 [5]. Yoga has become increasingly popular in western cultures as a means of exercise and fitness training [6]. Yoga postures involve isometric contraction which is known to increase the skeletal muscle strength. Even in healthy individuals, yogic exercises have showed beneficial effects in the

previous studies. In view of this, present study was planned to evaluate the effect of Yoga on respiratory pressures and 40 mm Hg test in healthy individuals.

(PEMF) therapy is effective in reducing osteoarthritis pain by evaluation of quadriceps function by Electromyography (EMG) before and after administration of Pulsed Electro Magnetic Field Therapy.

Materials and Methods

This comparative study included 80 healthy subjects, 40 males and 40 females of age group 30-40 years. Subjects were selected randomly from a group of participants visiting the Yoga centre in Davangere who were not practicing Yoga but keen on learning. Ethical clearance for the study protocol was obtained from institutional ethical committee and informed consent obtained from each subject prior to inclusion in the study.

Subjects were required to attend a minimum of five Yoga classes per week with duration of 1 hour for a total of twelve weeks. The same subjects were chosen as both study as well as control group to minimize the confounding factors and make the study more reproducible.

Subjects with history of previous experience of Yoga training, history of asthma, COPD, tuberculosis and other respiratory diseases, musculoskeletal disorders, neurological disorders, cardiovascular diseases, smokers, alcoholics & involved in any sports activity which might affect the respiratory pressures were excluded from the study.

The health of the subject was assessed by noting the present, family, and personal history and by general and systemic examination. The subjects were explained about

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the importance and procedure of the study. The subjects were instructed not to perform any other physical exercises if they were not doing the same regularly. The study involved non-invasive procedures with no financial burden on the subjects. Enough time was given for the subjects to relax before recording the parameters mentally & physically.

Age, height, weight & BMI of the subjects were recorded. The subject was asked to sit on a chair comfortably. Maximum expiratory pressure was determined by asking the subjects to blow against a mercury column after taking in a full breath. (i.e. to Total Lung Capacity) and to maintain to column at the maximum level for about 3 seconds. Maximum inspiratory pressure was determined by asking the subject to perform maximal inspiratory effort against the mercury column after breathing out fully (i.e. to Residual Volume). The maximum inspiratory pressure that could be maintained for about 3 seconds was noted. 40 mmHg test was conducted by asking the subjects to take in a full breath and blow against a mercury column to the pressure of 40 mm, maintaining it if possible. MEP, MIP and 40 mmHg test were recorded three times for each subject. The values were taken from the best of three similar readings. As the highest MEP is obtained at lung volumes of more than 70% of total lung capacity and the highest MIP is obtained at lung volumes of less than 50% of total lung capacity [7], in our study MEP was measured after full inspiration and MIP after full expiration.

Precautions:

While recording MEP, MIP & 40 mm Hg test following precautions were taken:

- ⇒ Lips were secured tightly around the mouthpiece with the help of fingers to ensure that there was no leak
- ⇒ Care was taken to see that the subject did not use oral muscles or tongue to develop pressure or to block the tubing

All the subjects were given yoga training by a qualified instructor for a period of twelve weeks, minimum of five Yoga classes per week for one hour daily between 5.30 am to 6.30 a.m.

After 12 weeks of Yoga training once again parameters were assessed.

Statistical analysis: This study is pre-post study; where in the effect of 12 weeks of Yoga training on, MEP, MIP and 40 mm Hg test was evaluated. Data was presented as Mean ± SD. Significance is assessed at 5 % level of significance. Student ‘t’ test (two tailed, dependent) has been used to find the significance of study parameters before & after Yoga practice. The Statistical software namely SPSS 20th version were used for the analysis of the data and Microsoft Word and Excel have been used to generate graphs, tables etc.

Results

80 healthy subjects, 40 males and 40 females of age group 30-40 years who practiced Yoga for 12 weeks were analysed for the results. Both the genders were age matched without any significant variation in height, weight and BMI (Table 1).

Table 1. Age, weight, height, and BMI of the participants

Variable	Male	Female
Age (years)	36.24±3.42	35.34±3.59
Weight (Kg)	59.32±4.29	57.53±5.24
Height (m)	1.7 ±0.05	1.6 ±0.06
BMI (kg/m ²)	23.16±1.34	23.42±1.29

The mean MEP (mm Hg) before Yoga practice was 84.93±14.1 and it increased significantly to 112.55±7.75 (p<0.001) after 12 weeks of Yoga practice (Table 2). The increase in the mean MEP was significant both in males and females. In males, mean MEP increased from 87.15±5.51 to 116.25±8.14 and in females, it increased from 82.7±5.16 to 108.85±5.22 (p<0.001). The Mean±SD of MIP (mm Hg) of the participants before the Yoga practice was 63.61±6.39. It was found that the mean MIP significantly increased to 87.23±7.27 (p<0.001) at end of 12 weeks Yoga practice (Table 2). In males there was a significant increase in mean MIP from 66.53±6.69 to 89.6±8.37 (p<0.001) and in females the mean MIP increased significantly from 60.7±4.52 to 84.85±5.06 (p<0.001) (Graph 2). Before the Yoga practice, 40 mmHg test (mm Hg) was 31.96±4.10. At the end of 12 weeks regular Yoga practice, the 40 mmHg test increased significantly to 44.51±6.89 (p<0.001). In both the genders there was a significant increase in the 40 mmHg test In males the 40 mmHg test increased significantly from 34.7±2.66 to 49.4±5.83 (p<0.001) and in females, it increased from 29.23±3.39 to 39.63±3.64 (p<0.001) (Table 2).

Table 2. Effect of yoga on respiration opressures and 40mmHg test

Variables	Before Yoga	After Yoga	Mean difference	Paired t df=79
Male (n=40)				
MEP	87.15±5.5	116.25±8.14	-29.10	-19.07*
MIP	66.53± 6.69	89.6 ± 8.37	-23.08	-32.49*
40mmHg-Test	34.7 ± 2.66	49.4 ± 5.83	-14.70	-23.38*
Female (n=40)				
MEP	82.7 ± 5.16	108.85±5.22	-26.15	-61.38*
MIP	60.7 ± 4.52	84.85 ± 5.06	-24.15	-61.17*
40mmHg-Test	29.23± 3.39	39.63 ± 3.64	-10.40	-44.39*
Mean values (n=80)				
MEP	84.93±14.1	112.55±7.75	-27.63	-34.34*
MIP	63.61±6.39	87.23±7.27	-23.61	-57.85*
40mmHg-Test	31.96±4.1	44.51±6.89	-12.55	-30.47*

Discussion

In the present study MEP, MIP and 40 mmHg test increased significantly following twelve weeks of Yoga training in healthy individuals. Chen and Kuo have reported that inspiratory muscle endurance is greater in physically active men than sedentary men [8]. Increase in MEP and MIP in Yoga group indicates that Yoga training improves the strength of the expiratory as well as inspiratory muscles. Results of our study matches with Madanmohan et al [9] which studied the effect of 6 weeks

of yoga training on respiratory pressures in the age group of 17–20 yrs and Madanmohan et al [10] studied the effect of 12 weeks of yoga training in medical student in the age group of 18 to 21 years. Similar study was done on school children in the age group of 12 to 15 years, underwent Yoga training for 6 months and statistically significant increase in MEP and MIP, FEV, FEV1 and PEFr were observed after the Yoga training [11]. Another study reported significant increase in MEP & MIP after 4 months of Yoga training in elderly population [12]. Chhibber R. et al (2006) [13] found significant increase in 40 mm Hg test after short term Yoga practice. Gopal et al have reported a lower MEP in Yoga trained subjects as compared to untrained ones [14].

It appears that regular practice of Yoga improves the efficiency of the higher centres and increases respiratory pressures and prolongs 40 mm Hg endurance time by decreased responsiveness of respiratory centre to CO₂. Pranayama produces a wakeful hypo metabolic state of the body characterized by decreased consumption of O₂ and decreased CO₂ production, increased development of respiratory musculature causes increased muscle endurance and delays the onset of their fatigue [10]. In some Yoga breathing, one uses extremely rapid, shallow breathing and in others, makes each successive breath nearly equal to his vital capacity. In these prolonged efforts at controlling the respiratory muscles, one is consciously and persistently overriding the usual excitatory stimuli to the respiratory centres, thus acquiring some degree of control over the respiration [15].

Conclusion

Present study proved that regular practice of Yoga for minimum of 12 weeks is beneficial in improving respiratory pressures and 40 mm Hg test in normal healthy individuals and this improvement is appreciable in both genders. Results of the study would justify the incorporation of Yoga as part of our lifestyle in promoting health. Also, Yoga can make an appreciable contribution to primary prevention and management of lifestyle diseases.

Study limitations: This study was limited by its sample size & the effects of Yoga practice for 12 weeks; it remains to be seen how long these changes persist after discontinuation of the Yoga practice.

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