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RESEARCH ARTICLE

Sahaja yoga meditation as a tool to enhance aging pulmonary functions

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ABSTRACT

Background: Aging is of recent origin. It is not a disease. Most of the age-related functional changes in the respiratory system result from three physiologic events-progressive decreases in the compliance of the chest wall, in the static elastic recoil of the lung, and in the strength of respiratory muscles. Meditation by the Sahaja yoga technique is, according to tradition, an innately therapeutic process, which is beneficial for all chronic diseases, mental or physical, including asthma. **Aims and Objectives:** To evaluate and compare the effect of Sahaja yoga meditation on pulmonary functions in subjects aged older than 40 years before and after the practice of Sahaja yoga meditation and to correlate pulmonary function test (PFT) parameters with age. **Materials and Methods:** The study included 100 subjects (50 male and 50 female subjects) aged older than 40 years who were selected from Jawaharlal Nehru Medical College campus and Wardha city. PFTs were carried out on all subjects, and Sahaja yoga meditation training was given, and all of them were advised to practice Sahaja yoga for 6 months. Statistical analysis was done using Wilcoxon signed-rank test and Pearson's correlation coefficient. **Results:** The mean FEV1% predicted increased from 65.55% ± 26.76% to 82.30% ± 29.81%. The forced vital capacity (FVC) % predicted increased from 75.76% ± 30.78% to 85.90% ± 30.49% at the posttest. The mean FEV1/FVC ratio was 0.93 ± 0.40 and 0.94 ± 0.11 at the pre- and posttest, respectively. All the parameters except peak expiratory flow rate were significantly negatively correlated with age. All the PFT parameters significantly increased at the posttest. **Conclusion:** Sahaja yoga meditation aims to promote the experience of "thoughtless awareness." Age-related decline in respiratory functions can be modified by the daily practice of Sahaja yoga meditation, which is specifically convenient in elderly individuals to prevent the risk of pulmonary diseases related to age.

KEY WORDS: Aging; Sahaja Yoga Meditation; Pulmonary Functions

INTRODUCTION

India is witnessing a demographic transition, leading to a rapid increase in the number of geriatric population. A child born 60 years ago in India had an average life expectancy at birth of 32 years, whereas a child born in 2007 is expected to live 64 years, and longevity is expected to enhance further. India had the second largest number of elderly in the world.[1,2] Aging is a recent origin.[3-5] It is not a disease. It is a slow and natural process through which an adult individual passes after a certain age.[6,7]

Most of the age-related functional changes in the respiratory system result from three physiologic events: Progressive decrease in compliance of the chest wall, in the static elastic recoil of the lung, and in the strength of respiratory muscles.[8]

Meditation is designed to help the individual develop a state of mind which is positive or benevolent toward oneself and others. The ideal state of mind has been described as

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"Sahaja," meaning spontaneous or effortless. The experience of meditation is essentially the Sahaja state. The yogic tradition encourages aspirants to pursue the awakening of energy, traditionally known as "kundalini," that facilitates the achievement of the Sahaja state. The key experience of Sahaja yoga meditation is a state called "thoughtless awareness" or "mental silence" in which the meditator is fully alert and aware but is free of any unnecessary mental activity.[9]

Sahaja yoga has shown a beneficial effect in the management of hypertension, bronchial asthma[10] and epilepsy.[11] Previous scientific studies on Sahaja yoga have also demonstrated its role in better autonomic control[12] in stress disorders. But studies demonstrating the effect of Sahaja yoga on healthy population are lacking. Therefore, the present study was undertaken to evaluate the effect of Sahaja yoga in persons >40 years of age who are at risk of development of cardiorespiratory dysfunctions related to aging.

MATERIALS AND METHODS

The present study was conducted in the department of physiology in the postgraduate Research Laboratory, Jawaharlal Nehru Medical College, Sawangi (Meghe) Wardha in association with Lokmahavidyalaya school building, Bachelor Road Wardha, one of the centers for "Sahaja Yoga Meditation" under the guidance of an experienced instructor.100 subjects >40 years (range 40-75 years) of age (50 males and 50 females) were selected and subjected to Sahaja yoga meditation for 6 months.

The selection and screening of the subjects were done at the Department of Physiology in a postgraduate research laboratory, Jawaharlal Nehru Medical College, Sawangi (Meghe) Wardha. Clearance of Institutional Ethical Committee, Jawaharlal Nehru Medical College, Sawangi (Meghe) Wardha was obtained. Subjects were the local residents of Wardha district including the Non-teaching staff of JNMC Sawangi. There were 50 males and 50 females having age more than 40 years. The subject with the highest age was of 75 years. They had been explained the procedure and proper history for inclusion and exclusion criteria, sex and other parameters and a written informed consent was taken.

Pulmonary function tests (PFTs) were recorded as pretest parameters. All the 100 subjects underwent Sahaja yoga meditation training at the Sahaja yoga center for 6 months. Regular follow-up was done weekly to assure the attendance of subjects. The subjects were motivated by showing videos and speeches which conveyed various benefits of Sahaja yoga meditation. The subject practiced meditation for 6 months after which they were again evaluated for the post-test parameters.

The Sahaja yoga session was conducted by an experienced instructor who taught subjects how to achieve this state by the use of silent psychological affirmations. The weekly sessions involved meditation, instructional videos, personalized instruction, and discussion of problems in relation to improving the experience of meditation. Subjects were encouraged to achieve this state of mental silence for 10-20 min twice each day.[10]

It was suggested that a candle or oil lamp be lit in front of a photograph of Shri Mataji, which is believed to emit a constant stream of "positive, cool vibrations (energy)." The practitioner generally begins by raising the kundalini in a physical exercise with their hands and attention and puts on "bandhan." He or she then sits comfortably, breathes normally and holds the hands out, palm upward, as if receiving something precious.[13]

During meditation, the attention was focused on the Sahasrara chakra. Sahaja yoga can be practiced while listening to music or in silence.[14]

All the tests were conducted in the morning hours in a quiet room with a temperature of 25°C. Resting parameters were measured after ensuring a rest period of 15 min to the subjects. The blood pressure was recorded from the right arm using a standard mercury sphygmomanometer. The heart rate and respiration monitoring were done from the electrocardiogram recordings.[19]

The baseline parameters measured are as follows:
1. Age: Age was rounded to its nearest date of birth
2. Height: For the measurement of height, feet were approximated together with heels, buttocks and occiput touching the wall firmly. Head was held erect, and the subject was asked to look straight in front without tilt. The highest point on the head was marked on the wall with a plastic ruler, and then height was measured up to nearest centimeter
3. Weight: It was recorded using electronic weighing machine.

Measurement of PFTs

Pulmonary functions of all the subjects were recorded both before and after the period of Sahaja yoga meditation as baseline parameters and posttest parameters respectively. All the subjects were instructed about the test procedure which is as follows.

Test procedure

Helios (Recorders and Medicare Systems Pvt. Ltd., Chandigarh, India), a computerized electronic type of PFT machine was used for spirometry. It is a dry type of spirometer with an internal correction of volumes. Demonstrations were given to each subject separately before beginning the tests.

Three distinct phases of the forced vital capacity (FVC) maneuver were used: (1) Maximal inspiration; (2) a "blast" of exhalation; and (3) continued complete exhalation to the end of test. The appropriate technique was first demonstrated to the subjects. The subject inhaled rapidly and completely from functional residual capacity, the breathing tube was inserted into the subject's mouth (if this has not already been done), making sure the lips are sealed around the mouthpiece and that the tongue does not occlude it, and then the FVC manoeuvre begun with minimal hesitation. Reductions in PEF and FEV1 have been shown when inspiration is slow, and/or there is a 4-6 s pause at total lung capacity (TLC) before beginning exhalation. It is, therefore, important that the preceding inspiration is fast and any pause at full inspiration be minimal (i.e., only for 1-2 s). The test assumed a full inhalation before beginning the forced exhalation, and it is imperative that the subject takes a complete inhalation before beginning the maneuver. The subject was prompted to "blast," not just "blow," the air from their lungs, and then he/she was encouraged to fully exhale. Throughout the maneuver, enthusiastic coaching of the subject using appropriate body language and phrases, such as "keep going," was required. The subject was observed particularly, with occasional glances for distress, and the tracing or computer display during the test which ensured maximal effort. If the patient felt "dizzy," the maneuver was stopped, since syncope could follow due to prolonged interruption of venous return to the thorax. This is more likely to occur in older subjects and those with airflow limitation.[15-17]

All the parameters were recorded in sitting position. Three consecutive readings were taken, and the best among these was selected. The parameters recorded were FVC, FEV1, FEV1/FVC ratio, peak expiratory flow rate (PEFR) and FEF 25-75%.

Statistical Analysis

All the results were analyzed and compared at the pre- and post-test. Statistical analysis was done by descriptive and inferential statistics using Wilcoxon signed-rank test for comparison of all pre- and post-test parameters. Pearson's correlation coefficient was used to correlate age with different parameters. Statistical software used in the analysis were GraphPad Prism 5.0 version and SPSS 17.0 version. All the results were tested at 5% level of significance. $P < 0.05$ was considered as statistically significant.

RESULTS

The mean age of the subjects was 54.81 ± 9.23, mean height 160.10 ± 5.83, mean weight was 62.40 ± 6.26 and mean body mass index was 24.41 ± 2.82. The data was composed of 50% male and 50% female. The FEV1 ($r = -0.07$, $P = 0.043$), FVC ($r = -0.07$, $P = 0.048$), PEFR ($r = -0.04$, $P = 0.68$) and FEV1/FVC ratio ($r = -0.05$, $P = 0.001$) were negatively correlated with age. All the parameters except PEFR were significantly negatively correlated with age. The mean FEV1% predicted at the pre-test was 65.55 ± 26.76 and at the post-test, it was 82.30 ± 29.81. The FVC % predicted was 75.76 ± 30.78 at the pre-test and 85.90 ± 30.49 at the post-test. The mean FEV1/FVC ratio was 0.93 ± 0.40 and 0.94 ± 0.11 at the pre- and post-test respectively. The mean PEFR at the pre-test was 79.15 ± 8.26, and at the post-test, it was 82.16 ± 11.17. FEF 25-75% was 81.51 ± 8.68 and 90.61 ±14.32 at the pre- and post-test respectively. Except for FEF 25-75% ($z = 1.09$, $P = 0.275$), statistically significant difference was found in all the PFT parameters *viz*. FEV1% ($z = 10.32$, $P = 0.000$), FVC% ($z = 5.13$, $P = 0.000$), FEV1/FVC ratio ($z = 0.307$, $P = 0.045$) and PEFR ($z = 3.89$, $P = 0.000$) at the pre- and post-test. All the PFT parameters were significantly increased at the post-test (Tables 1-3).

DISCUSSION

The ratio of FEV1/FVC is normally between 0.7 and 0.8. Values below 0.7 are a marker of airway obstruction, except in older adults where values 0.65-0.7 may be normal. Caution particularly needs to be taken in patients over 70 years, where the use of predicted values extrapolated from the younger population may result in over-diagnosing chronic obstructive pulmonary disease. In people over 70 years old, the FEV1/FVC ratio may need to be lowered to 0.65 as a lower limit of normal. Conversely, in people under 45, using a ratio of 0.7 may result in under-diagnosis of airway obstruction. To avoid both these problems, many experts recommend use of the lower limit of normal for each population.

Table 1: Distribution of subjects according to their demographic characteristics

Characteristics	Mean±SD	Range
Age (years)	54.81 (9.23)	41-75
Height (cms)	160.10 (5.83)	146-172
Weight (kg)	62.40 (6.26)	45-78
BMI (kg/m^2)	24.41 (2.82)	17.57-31.11
Gender		
Male	50 (50%)	Male:Female ratio=1:1
Female	50 (50%)	

SD: Standard deviation, BMI: Body mass index

Table 2: Correlation of age with FVC%, FEV1%, PEFR and FEV1/FVC% pearson's correlation coefficient

Parameter	Mean	SD	N	Correlation 'r'	*P*-value
Age (years)	54.81	9.23	100	-	-
FEV1%	73.31	15.37	100	−0.07	0.043*
FVC%	84.74	17.39	100	−0.07	0.048*
PEFR	79.15	8.26	100	−0.04	0.68
FEV1/FVC ratio	0.93	0.042	100	−0.05	0.001*

*P<0.05 (significant). SD: Standard deviation

Table 3: Comparison of pulmonary function test parameters at pre- and post-test

Parameter	Mean	N	SD	SEM	Wilcoxan signed rank test *z* value	*P*-value
FEV1%	65.55	112	26.76	2.52	10.32	0.000*
Pre-test	82.30	112	29.81	2.81		
Post-test						
FVC%	75.76	112	30.78	2.90	5.13	0.000*
Pre-test	85.90	112	30.49	2.88		
Post-test						
FEV1/FVC ratio	0.93	112	0.40	0.03	0.307	0.045*
Pre-test	0.94	112	0.11	0.01		
Post-test						
PEFR	79.15	100	8.26	0.82	3.89	0.000*
Pre-test	82.16	100	11.17	1.11		
Post-test						
FEF 25-75%	81.51	100	8.68	0.86	1.09	0.275
Pre-test	90.61	100	14.32	1.43		
Post-test						

*P<0.05 (significant). SD: Standard deviation; SEM: Standard error of mean

The present study observed a negative correlation of age with FEV1, FVC, FEV1/FVC ratio and PEFR (Table 2). FEV1 is supposed to indicate the contractile power of respiratory muscles of an individual. FEV1 decrease is significant after 30 years more so in females PEFR suffers non-significant fall up to 45 years, but thereafter the fall becomes steep.[18]

A study of Memon et al. showed a negative correlation between pulmonary function and age in their study. FVC and PEFR showed a decline with advancing age. A decline in respiratory efficiency with advancing age was found by Kapoor and Tandon, Mungreiphy et al., Pruthi and Multani which favors the findings of our study.[19-21]

In the study of Ren et al., the pulmonary function parameters including, FVC, FEV1, FEV1/FVC, PEFR, FEF25, FEF50, decreased significantly with age in both male and female subjects. Non significant changes in FEV1/FVC ratio were found which is consistent with the finding of the present study.[22] The expansion of lungs is restricted as the elastic tissue in the lungs is replaced by fibrous tissue and a number of alveoli break down leading to emphysema. The ribs and vertebral joints are variable calcified. Over and above, the muscles of respiratory cage-diaphragm, intercostal, scalini contract poorly.[23] There is homogeneous degeneration of the elastic fibers around the alveolar duct starting around 50 years of age resulting in enlargement of airspaces. Reduction in supporting tissue results in premature closure of small airways during normal breathing and can potentially cause air trapping and hyperinflation, hence “senile emphysema.”[24]

The most important physiological changes associated with age are A decrease in the static elastic recoil of the lung, a decrease in compliance of the chest wall, and a decrease in the strength of respiratory muscles. In addition, the decline of pulmonary function in the elderly has something to do with environmental factors and lifestyle.[22]

Regardless of the exact rate of decline in FEV1 with age, the decline is likely due to a combination of age-related changes of the parenchyma, the chest wall, and the respiratory muscles, which may be difficult to separate using spirometry alone. The chest wall may change with aging due to reduced height of thoracic vertebrae, or stiffening or calcification of the costal joints of the rib cage. Direct measurements have confirmed decreased compliance of the chest wall with aging. Respiratory muscle function also changes with age.[25]

Griffith et al. identified several independent predictors of excessive decline in FEV1: Medium to heavy current cigarette smoking, occupational exposures, airway hyper-responsiveness, chronic phlegm, and malnutrition.[26] In the present study, the subjects were nonsmokers and non-hypertensives. Age-associated decline in the lung function in the present study is attributed to reduced elasticity of lung tissue and reduced contractility of the respiratory muscles as evidenced by negative correlation of age with FEV1.

The mean pulmonary function parameters increased significantly at the post-test except FEF 25-75% which increased non-significantly (Table 3). The results of the present study indicate improvement in all the pulmonary function parameters, i.e., FEV1, FVC, FEV1/FVC, PEFR, FEF 25-75% after Sahaja yoga practice which is in accordance with the study of Manocha et al., Chug in which there was a significant increase in the pulmonary function in asthma patients after the practice of Sahaja yoga meditation.[9,10] Significant improvement in pulmonary function parameters similar to present study were reported by Raichur et al., Sayyed et al. by incorporating yoga and meditation.[27,28] Ahmed et al., Bhutkar et al., Yadav and Das showed significant improvement in lung functions after yoga practice in healthy individuals including elderly which is consistent with the findings of the present study.[29-31]

The yogic tradition encourages aspirants to pursue the awakening of energy, traditionally known as "kundalini," that facilitates the achievement of the Sahaja state. The meditative experience is characterized by a sensation of normal or even heightened, alertness in conjunction with a state of complete mental silence. This is associated with a sense of relaxation and positive mood and a feeling of benevolence toward oneself and others.[9]

Effect of yogic practices on respiratory function has been an important area of research for decades. Practicing yoga, in addition to its contribution in the improvement of pulmonary ventilation and gas exchange, helps in the prevention, cure, and rehabilitation of many respiratory illnesses by improving ventilatory function.[29] Another researcher showed improvement in respiratory parameters by yogic breathing.[33] Obesity and hypertension are also associated with a reduction of pulmonary functions[34] but subjects in the present study are nonhypertensives and nonobese.

Yoga asanas and pranayamas have a vital role to play in the immediate management of bronchial asthma. There might be bronchodilatation by correcting their abnormal breathing patterns and reducing the muscle tone of inspiratory and expiratory muscles. Due to improved breathing pattern, respiratory bronchioles may be widened, and perfusion of a large number of alveoli can be carried out efficiently. Yoga along with Dhyana (meditation) appears to result in somatic musculature relaxation finally resulting in a reduction in airway resistance thus relieving the patients of asthma by giving them subjective well-being. Further, deep and controlled breathing desensitization of the sensory nerve endings may occur and this, in turn, might have helped to reduce the allergic condition to the environment.[32]

Lung inflation to near TLC is a major physiological stimulus for release of surfactant and prostaglandin into alveolar spaces. This causes an increase in lung compliance and a decrease in bronchiolar smooth muscle tone. Lung inflation to near TLC as induced by relaxation during meditation may thus lead to a better vital capacity. The increased breath holding time caused by greater control of respiratory musculature and the ability to consciously override the normal physiological stimuli of respiratory centers may contribute as a mechanism for improvement in pulmonary function by Sahaja yoga meditation.

CONCLUSION

Age is the important influencing factor for pulmonary function. The decline of pulmonary function is more associated with structural: A decrease in the static elastic recoil of the lung, a decrease in compliance of the chest wall, and a decrease in the strength of respiratory muscles. Lung inflation to near TLC as induced by relaxation during meditation contributes to improvement in pulmonary functions by Sahaja yoga meditation.

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