STUDY OF RESPIRATORY PARAMETERS FOLLOWING PRANAVA PRANAYAMA PRACTICE IN HEALTHY YOUNG ADULTS

Mamatha

ABSTRACT

Background and Objectives: Pranayama is a yogic technique in which breathing is controlled voluntarily. There are various types of pranayama. Previous studies have been conducted on the effects of certain combined practice of yoga.

The present study however is undertaken to ascertain whether pranava pranayama alone has any effect on the ventilatory lung functions, which depends on strength of respiratory muscles and compliance of lungs.

The study was done to know whether there is any change in pulmonary functions in subjects practicing pranava pranayama, and in subjects not practicing pranava pranayama.

Materials and Methods: Test group consisted of 40 student volunteers of Rama Krishna institute of moral and spiritual education, Mysore of aged between 18 to 28 years. They practiced pranava pranayama for 30 minutes daily for 16 weeks. The control group consisted of 40 students of JSS medical college aged 18-28 years. Pulmonary Function Tests (PFT) was determined after 16 weeks of practice by using medspiror. Appropriate statistical test were applied and results were analysed.

Results: The test group showed significant increase in values of parameters considered in present study as compared to values in control group after 16 weeks of practice. But there was no change in the same parameters in control group after 16 week.

Interpretation and Conclusion: While performing pranava pranayama the subject breaths deeply during which the lungs inflate & deflate to fullest possible extent and there is strengthening of respiratory muscles. Hence there is increase in Pulmonary functions.

Key Words: Pranava Pranayama, PFT.

INTRODUCTION

Yoga is the best lifestyle ever devised in the history of mankind. Besides spiritual achievements, the practice of yoga is accompanied by a number of beneficial physiological effects in the body.

Pranayama is a type of yogic practice, which produces many systemic psychophysical effects in the body. Prana means breath or respiration or vitality or energy. Ayama means expansion or stretching.

Pulmonary functions have been studied in yoga & pranayama practicing persons of different categories. Studies on the effect of yoga and pranayama on pulmonary functions, cardiovascular functions, on breath holding time, endocrine and metabolic response, and on nervous system, have shown significant changes.

There is a need to know the effect of this particular pranayama training on respiratory system, so that benefits, if any could be obtained in similar age group if they practice pranayama voluntarily.

MATERIALS & METHODS

Study was carried out in Rama Krishna Institute of Moral & Spiritual Education (RIMSE), Mysore and at department of physiology JSS Medical College, Mysore. Informed and written consent was taken from the subjects. Our study did not involve any invasive procedure. Ethical clearance was taken from Institutional Ethical Clearance Committee.

In the present study, 40 student volunteers were selected randomly from RIMSE, Mysore of aged 18-28 years as the test group.

Age and sex matched 40 student volunteers were selected randomly from JSS Medical College as control group. They did not practice any pranayama in the past or during the study.

The subjects in the test and control group had no history of allergic disorders, respiratory disorders, and systemic diseases in the past and during the study.

Test group practiced pranava pranayama for 30 mins in the early morning 6:00 to 6:30 am, 6 days per week for 16 weeks. They performed initial stretching exercise for 10 mins before starting pranayama. The details of Pranayama practicing schedule is as follows,

Subjects in test group practiced pranava pranayama sitting in padmasana. 'Tasya vachakah pranavah', the sacred sound of the Divine is the pranava, says Maharishi.
Patanjali. This practice expands the abdominal, thoracic and clavicular regions of the lungs to their maximum capacity. Adham Pranayama, the abdominal or lower chest breathing. The fingers are kept in the Chin Mudra with the index and thumb fingers touching each other at the tips and other fingers straight and united. After taking a deep breath into the lower chest and abdominal regions...1...2...3...4. then the breath is let out with the sound AAA......

To perform thoracic or mid-chest breathing, the Madhyam Pranayama, the fingers curled inwards to form Chinmaya Mudra. A deep breath is taken into the mid chest and thoracic regions 1...2...3...4. then breathed out with the sound OOO...

Adhyam pranayama is the clavicular or upper chest breathing and utilizes Adhi mudra. The fists are clenched with the thumb in the centre. With the Adhi mudra on thighs and breathe is taken deeply into the upper chest and clavicular regions 1...2...3...4. then exhaled with the sound MMM...

Joining earlier three parts of the breath in a complete Yogic Breath and utilizes fourth stage, known was Mahat Yoga Pranayama. With the Adhi mudra with knuckles of right and left hands touching in front of navel, which is now known as the Brahma Mudra. Deep breath is taken into the low 1...2... mid 3...4 and upper chest 5...6... regions. Then the breath is let out with the sounds AAA...OOO...MMM.

They did this procedure for 20 rounds with brief interval between each round.

There were no drop outs in the test group.

METHODS

Anthropometric measurement was done. Pulmonary function tests were done using medspiror. It is a type of flow sensing spirometer. This is a low cost high performance instrument capable of giving highly accurate & reproducible test results and represents the major advancement in computerized pulmonary function testing. Its development has helped in routine screening of many subjects without calculation and to standardize testing procedures predictions. For screening applications, where speed, accuracy and reproducibility are of utmost importance, the equipments configuration is ideal.

PROCEDURES

The subjects were familiarized with the set up and detailed instructions and demonstrations were given to their satisfaction. The subjects were made to breathe out forcefully following deep inspiration into the mouthpiece attached to the pneumatachometer.

Expiration was maintained for a minimum period of 3-4 seconds. 3 to 4 trails of maximal inspiratory and expiratory efforts were made and only the highest reading was taken for data processing. The parameters considered were Forced Vital Capacity (FVC) expressed in liters, Forced Expiratory Volume in one second (FEV1) expressed in liters, Forced Expiratory Volume in three seconds (FEV3) expressed in liters, Peak Expiratory Flow Rate (PEFR) expressed in liters/sec, and Maximum Voluntary Ventilation (MVV) expressed in liters/min. All recordings were done at the basal temperature and pressure.

As recommended by snowybird workshop all the readings were taken in standing position. The tests were done in a quiet room in order to alleviate the emotional & psychological stresses. During the tests, maximum effort from the subjects was ensured by adequately motivating them to perform at their optimum level.

Nose clips were not used since there was no significant difference in FVC with the use of nose clips.11

For maximum voluntary ventilation mouth piece was placed into the subject's mouth and was instructed to breathe quietly. When the subjects settled, was asked to breathe in and out as rapidly & deeply as possible for 10 seconds. Three readings were taken for data processing.

In both the groups (test & control) subjects were highly motivated and co-operative. They performed the tests with care and maximum efforts.

All the tests were carried out at the same time of the day in both test and control groups because rhythmic changes in physiological functions have been found to be associated with changes in performance during this period.21 Readings were taken between 8:30am and 9:30am to avoid possible influence of circadian rhythm.

Two phases of reading were taken. In test group, first phase of reading was taken before commencement of pranayama practice and second phase of reading at the cessation of pranayama practice that is after 6 weeks. In same way, with same duration readings of two phases were taken in control group also.

Data analysis was done using Independent sample 't' test and paired 't' tests to find out the significance of difference between the groups selected. The statistical software namely SPSS 16.0 was used for the analysis of data.
RESULTS

I. COMPARISON OF FIRST PHASE OF READINGS OF PULMONARY FUNCTION TESTS (PFT’S) IN TEST & CONTROL GROUPS AND RESULTS OF INDEPENDENT SAMPLES ‘T’ TEST

<table>
<thead>
<tr>
<th></th>
<th>FVC(L)</th>
<th>FEV1(L)</th>
<th>FEV3(L)</th>
<th>PEFR(L/sec)</th>
<th>MVV(L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>2.598±0.512</td>
<td>2.188±0.39</td>
<td>2.562±0.48</td>
<td>4.227±1.24</td>
<td>92.425±26.69</td>
</tr>
<tr>
<td>Control</td>
<td>2.595±0.506</td>
<td>2.181±0.39</td>
<td>2.553±0.47</td>
<td>4.262±1.20</td>
<td>92.60±26.59</td>
</tr>
<tr>
<td>P value</td>
<td>0.981 (NS)</td>
<td>0.935 (NS)</td>
<td>0.935 (NS)</td>
<td>0.899 (NS)</td>
<td>0.977 (NS)</td>
</tr>
</tbody>
</table>

(NS) – Not significant

First phase recording showed no significant differences in any of the tested parameters between Test and Control groups.

II. COMPARISON OF SECOND PHASE OF READINGS OF PFT’S IN TEST & CONTROL GROUPS AND RESULTS OF INDEPENDENT SAMPLES ‘T’ TEST

<table>
<thead>
<tr>
<th></th>
<th>FVC(L)</th>
<th>FEV1(L)</th>
<th>FEV3(L)</th>
<th>PEFR(L/sec)</th>
<th>MVV(L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>3.635±0.73</td>
<td>3.076±0.55</td>
<td>3.562±0.71</td>
<td>5.892±1.74</td>
<td>118.87±28.22</td>
</tr>
<tr>
<td>Control</td>
<td>2.592±0.50</td>
<td>2.182±0.39</td>
<td>2.550±0.46</td>
<td>4.252±1.21</td>
<td>92.5±26.48</td>
</tr>
<tr>
<td>P value</td>
<td>0.000 (S)</td>
<td>0.000 (S)</td>
<td>0.000 (S)</td>
<td>0.000 (S)</td>
<td>0.000 (S)</td>
</tr>
</tbody>
</table>

(S) – significant - p value < 0.05

Second phase recordings showed significant differences in all the tested parameters between Test and Control groups.

III. COMPARISON OF FIRST & SECOND PHASE OF READINGS OF PFT IN TEST GROUP AND RESULTS OF PAIRED SAMPLES ‘T’ TEST:

<table>
<thead>
<tr>
<th></th>
<th>FVC(L)</th>
<th>FEV1(L)</th>
<th>FEV3(L)</th>
<th>PEFR(L/sec)</th>
<th>MVV(L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>2.598±0.51</td>
<td>2.188±0.39</td>
<td>2.562±0.48</td>
<td>4.227±1.24</td>
<td>92.425±26.69</td>
</tr>
<tr>
<td>Second</td>
<td>3.635±0.73</td>
<td>3.076±0.55</td>
<td>3.562±0.71</td>
<td>5.892±1.74</td>
<td>118.87±28.22</td>
</tr>
<tr>
<td>p value</td>
<td>0.000(S)</td>
<td>0.000(S)</td>
<td>0.000(S)</td>
<td>0.000(S)</td>
<td>0.000(S)</td>
</tr>
</tbody>
</table>

(S) - significant – p value < 0.05

There was significant difference in all the tested parameters between first and second phase of reading.

DISCUSSION

The present study confirms that regular pranayama training increases pulmonary functions.

Possible explanation for this could be regular inspiration and expiration for prolonged period during pranayama training leads to strengthening of respiratory muscles.

This helps the lungs to inflate and deflate maximally. The maximum inflation and deflation is an important physiological stimulus for the release of surfactant and prostaglandins increasing the alveolar spaces thereby increasing lung compliance & decreasing bronchial smooth muscle tone activity.
In Pranava Pranayama, Adhyma pranayama practice causes better ventilation in the lower segments of lungs. Madhyam pranayama practice causes better ventilation in middle portion of lungs. Adhyma pranayama causes better ventilation in upper most portion of lungs. Therefore the whole lung is utilized during pranava pranayama. Due to the even expansion of all the alveoli a vast expanded alveolar membrane is available for exchange of gases. This surface is about 50 square meters in extent which is 20 times the entire surface of lungs. Thus a larger surface is available for the process of diffusion.

The advantage of yogic breathing lies in the fact that it is more a vertical breathing than horizontal. By this vertical all the alveoli of both lungs open out evenly. The diaphragmatic muscle between the chest & abdominal cavities plays a major role in the act of respiration. The diaphragm descents 1.5cm during quiet breathing, but during deep vertical breathing it descents 6 to 7 centimeters, increasing vertical diameter of thoracic cavity.

Total diaphragmatic surface is 270 Sq cm, every 1cm descent of diaphragm will increase the thoracic cage cavity by 270 cu cm with an intra pulmonary pressure of -3mmHg. During deep breathing diaphragm descends as a result intra pulmonary pressure will become about -6mmHg facilitating more air entry into the lungs improving vital capacity.

Thus by yoga total breathing is improved by 400ml of air per breath. This alone offers an even surface of 50 sqm for exchange of gases. This even expansion of alveoli keeps the lungs intact in structure & function. Thus pranayama can prevent diseases like Emphysema, and also gain relief in asthma & chronic bronchitis. The increased amplitude of the movements of the diaphragm improves the functions of stomach, liver, spleen, heart & circulation in the lymphatic thus improves digestion. Pranayama thus acts directly on various systems of the body and affords benefits to them all.

There occurs strengthening of respiratory musculature incidental to regular practice of pranayamic breathing during which the lungs & chest inflate & deflate to fullest possible extent & muscles are made to work to maximal extent. Hence there is improvement in lung volumes & capacities.

CONCLUSION

Present study is done to know effect of pranava pranayama on pulmonary functions in test groups. The test group showed significant increase in pulmonary functions as compared to control group after 16 weeks of practice. The cause for this could be regular, slow and forceful inspiration and expiration for prolonged period during pranayama practice leads to strengthening of respiratory muscles. Hence pranayama can be part of a doctor's prescription like drugs and the prescription is aimed at improving health, reducing disease risk or treating an illness.

REFERENCES