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Research article

CONSOLIDATE EFFECT OF VIBHAGHA PRANAYAMA, NADISHUDDI PRANAYAMA, SAVITHIRI PRANAYAMA AND KAPALABHATI PRANAYAMA ON THE PULMONARY FUNCTIONAL STATUS OF YOUNG HEALTHY MALE SUBJECTS

Senthil Kumar K[1], Jeneth Berlin Raj T[2], Prema Sembulingam[1], Tripathi PC[3]

[1]Department of Physiology, Madha Medical College & Research Institute, Chennai
[2] Department of Physiology, Kapaga Vinayagar Institute of Medical Science & Research Center
[3]Department of Physiology, Rajah Muthiah Medical College, Annamalai University, Chidambaram.

*Corresponding author **e**mail: drksk.cool@gmail.com

ABSTRACT

Introduction: Pranayama is believed to increase the respiratory stamina, relax the chest muscles, expand the lungs, raise energy levels, calm the body and cause over-all improvement in lung functions. In the present study an attempt had been made to assess the authenticity of such changes.
Methods: 60 male medical students in first year MBBS in the age group of 18 to 20 were recruited for this study. Thirty were in the control group who did not practice pranayama and the other thirty were in the study group who underwent the regular practice of pranayama daily for 30 minutes in the morning. Four types of pranayama namely Vibhagha pranayama, Kapalabhati pranayama, Nadi suddhi pranayama and Savithri pranayama were chosen for this study. Pulmonary function test was done to measure vital capacity, forced vital capacity, forced expiratory volume in first second, peak expiratory flow rate and maximum ventilatory volume before and after six weeks. **Results:** There was significant increase in all these variables ($p < 0.001$) in the study group after 6 weeks of pranayama, whereas, control group did not show any significant change in these variables. **Conclusion:** The results of this study show the combined effect of different types of pranayama in improving the lung functions within the short period of six weeks.

Keywords: Yoga, Pranayama, Pulmonary function tests, Autonomic nervous system,

INTRODUCTION

Pranayama is a type of breathing technique in Yoga. Yoga is an age-old Indian Science but was not very popular until recent periods because it was practiced in some remote ashrams by selected group of people known as 'yogis' and 'sadhus'. However, in last two decades, it has become popular among common men and the importance, techniques and application of pranayama and its validity in maintaining overall health of an individual have been understood and accepted by public, thanks to the research documentation in the literature[1-5].

The 'yogis' claim that secret of normal health is the harmony between mind and body. Yoga

brings this harmony through three main practices, viz., asanas, pranayama and meditation. As per Indian philosophy, the word 'Pranayama' refers to 'prana' and prana is considered to be the core of energy in the universe. 'Prana' refers to breathing which is the vital link between the body and the mind. Disruption of this vital link creates chaos in the harmony of physical, physiological, psychological, emotional and spiritual aspects of life[2].

There are different methods of practicing Pranayama. Some are on slow and soft rhythm and some are on fast and forceful rhythm. Whatever may the type of pranayama, the beneficiary effects of it are well documented both in normal healthy conditions[6-10]. and in diseased conditions[11-14]. Its positive effects on respiratory system are amazing. It increases the respiratory stamina, relaxes the chest muscles, expands the lungs, raises energy levels, calms the body and causes over-all improvement in lung functions[15, 16]. Lung functions are assessed by pulmonary function tests (PFT) which help in physiological and clinical assessment of the respiratory status of a person.

However, acceptance of Pranayama as a natural health process by the young college going students is still a query. In the present study, an attempt had been made to see the willingness of the young healthy medical students in practicing pranayama and the outcome of the practice on some vital respiratory parameters, viz., vital capacity (VC), forced vital capacity (FVC), forced expiratory volume in first second (FEV1), Peak expiratory flow rate (PEFR), and maximum ventilatory volume (MVV)

MATERIALS & METHODS

60 male medical students in the age group of 18-20 years were recruited from Rajah Muthiah Medical College for the present study. All were normal healthy students without any history of allergic disorders, respiratory disorders, systemic diseases, cardiovascular diseases and neurological disorders. None of them were smokers or drug abusers. They were not athletes or sports persons and they were not involved in any sort of routine exercise like regular walking. Ethical clearance was obtained from the Institutional Ethical committee. Written informed consent was obtained from all the subjects after explaining the procedure and giving the assurance that they could withdraw from the study whenever they want.

Anthropometric measurements were taken to ensure that there was no significant difference in the age, height and weight of the subjects. They were divided into two groups viz., control group and study group with 30 subjects in each. The control group did not undergo pranayama practice. The study group practiced pranayama for six weeks. The PFT was done for all the students on the first day and one day after the end of six weeks. The respiratory parameters were recorded by using 'Medikro windows spirometer (Model-M9831-1.8-04).

The subjects were instructed to report in the Physiology laboratory between 6.30 – 8.00 AM. The first phase of recording of PFT was done before beginning the session of pranayama. The second phase of recording was done after six weeks: in study group with pranayama training and in control group without pranayama training. All recordings were done around the same time to avoid any time bias. Pranayama was taught by a yoga master and the daily practice was supervised by the same person.

Procedure for pranayama: Four types of pranayama, viz., Vibhagha Pranayama, Kapalabhati, Nadishuddi, and Savithiri Pranayama were chosen for the present study. Out of these four types, Vibhagha Pranayama, Nadishuddi pranayama and Savithiri Pranayama are on slow and soft rhythm and Kapalabhati pranayama is on fast and forceful rhythm. All procedures were carried out for half an hour daily. The subject was instructed to sit in normal sitting position with legs crossed on one another and both the arms stretched straight and placed

on respective knees (padmasana) or sitting erect in any comfortable position[17, 18, 19]

Vibhagha Pranayama: It is otherwise called as sectional breathing. It comprises of three sections: Abdominal breathing, thoracic breathing and clavicular breathing.

1. Abdominal breathing (Adhama): It is also known as diaphragmatic breathing. The subject was instructed to sit in an erect posture with his fingers on either side of the naval and elbows resting at the sides. He exhaled slowly, continuously and completely by drawing the abdomen inwards followed by inhalation into the naval area taking two seconds for each. Then he stopped the breath for a second and the cycle was repeated.
2. Thoracic breathing or chest breathing (Madhyama): In the same posture, the hands were kept on either side of the rib cage and three breaths were taken starting with inhalation followed by exhalation taking two seconds for each. Here the air was filled in the chest and not in the abdomen
3. Clavicular breathing (Adhya): In the same erect posture, the fingers were placed underneath the clavicles and the breathing was carried out by inhaling for 2 seconds, holding the breath for one second, exhaling for 2 seconds and holding the breath for one second. The whole procedure was repeated 10 times

Kapalabhati pranayama: In padmasana position, the subject was instructed to exhale with full force by squaring the stomach inwards after deep inspiration. This act throws the abdominal gas out with a jerk. The whole procedure should be completed in one second. It was repeated ten times

Nadisuddhipranayama: It is also known as alternative nostril breathing: In padmasana position, the subject was instructed to block the left nostril with the tip of the right hand ring finger and exhale and inhale through his right nostril. This was followed by blocking his right nostril and exhaling and inhaling through the left nostril. Exhalation was done in two seconds and inhalation was done in one second. This whole performance was considered as one cycle. During this process, the breathing was kept slow and rhythmic. This was repeated ten times.

Savitri pranayama: In this type of pranayama, Inhalation and exhalation were followed by retention of air also. Inhalation was done for six seconds; retention was done for 3 seconds followed and exhalation for 6 seconds and retention 3 seconds. This procedure was repeated for 10 times

Statistical Analysis: The data were analyzed in SPSS, version 17. As there were significant differences in the values of first phase reading between study group and control group, (except MVV), these two groups were randomized before analyzing the values by applying ANCOVA (Analysis of Co-variance).

Reason for selecting ANCOVA: In many experiments, the outcome of a variable depends on the magnitude of the variable before subjecting the experimental units for experimentation. As such, it may be necessary to analyse the outcome values in relation to initial values. In some other cases, the outcome of a particular variable may be dependent on the outcome of another variable. Analysis of Co-variance is a technique that enables such analysis. This technique combines features of analysis of variance and regression analysis.

RESULTS

Anthropometric parameters: There was no significant difference in the age, height and weight between the study group and control group (Table 1)

First Phase – VC, FVC, FEV1 and PEFR were significantly higher in control group than in the study group. MVV did not show any significant difference between the groups (Table 2).

Second phase – There was significant increase in VC, FVC, FEV1, PEFR and MVV ($p < 0.001$) in the study group after 6 weeks of pranayama, whereas, control group did not show any significant change in these variables after six weeks (Table 3)

Table. 1: Anthropometric parameters

Parameters	Study group	Control group	' 't' value	p value
	Mean ± SD	Mean ± SD		
Age (Years)	18.833 ± 0.747	18.600 ± 0.770	1.370	< 0.182
Height (cm)	174.200 ± 5.610	173.300 ± 4.340	0.606	< 0.527
Weight (kg)	70.167 ± 6.613	70.933 ± 7.172	0.430	< 0.670

Significant level fixed as $p < 0.05$

Table. 2: Comparison of first phase of readings of Respiratory parameters in study and Control groups

Parameters	Study group	Control group	' 't' value	p value
	Mean ± SD	Mean ± SD		
VC (L)	3.595 ± 0.697	4.138 ± 0.772	2.859	< 0.006
FVC (L)	3.432 ± 0.656	3.804 ± 0.627	2.247	< 0.028
FEV1 (L)	3.335 ± 0.639	3.736 ± 0.619	2.468	< 0.017
PEFR (L/sec)	7.540 ± 1.857	9.320 ± 2.053	3.520	< 0.001
MVV (L/min)	95.031 ± 19.089	96.927 ± 11.112	0.470	< 0.640

Significant level fixed as $p < 0.05$

Table 3: Comparison of first and second phase of readings of Respiratory parameters in study group and Control groups

Para meters	Study group		Control group		ANCOVA	p value
	Before	After	Before	After		
VC (L)	3.595±0.697	4.095 ±0.79	4.14 ± 0.772	4.004 ±0.575	Group – 9.017 Pretest – 45.394	G – < 0.004 p – < 0.001
FVC (L)	3.432±0.66	3.978±0.66	3.80 ± 0.627	3.781 ± 0.622	Group – 38.219 Pretest – 184.827	G – < 0.001 p – < 0.001
FEV_1 (L)	3.335±0.64	3.901 ±0.62	3.74 ±0.619	3.638 ±0.563	Group – 49.486 Pretest – 158.250	G – < 0.001 p – < 0.001
PEFR (L/sec)	7.54±1.86	8.683±1.80	9.32 ± 2.053	9.127 ±2.035	Group – 14.916 Pretest – 169.831	G – < 0.001 p – < 0.001
MVV (L/min)	95.03±19.09	113.257±1.80	96.93 ± 11.11	94.492±9.989	Group – 134.644 Pretest – 80.163	G – < 0.001 P – < 0.001

Significant level fixed as $p < 0.05$

DISCUSSION

The results of the present study confirms the claim of the previous studies that pranayama is beneficial in improving the lung volumes and capacities[6, 7, 10, 12, 19, 20]. Literature also throws light on the improvement of respiratory efficiency after pranayama by observing the increase in chest expansion, breath holding time and PEFR[10, 21]. The unique feature of the present

study is that only breathing technique (pranayama) was used here without the involvement of physical movements (yogasanas) and mental control (meditation) whereas most of the previous studies employed all the three parts of Yoga to show their positive effects. So our results reflect exclusively the effect of pranayama alone on the betterment of respiratory functions.

Kapalbhati pranayama is the only physical and breathing technique useful for mind detoxification and purification. In all of the cleansing routines of yoga, kapalbhati is the only one which can cleanse both the mind and the body using only breath. As a de-stressing tool, kapalbhati breathing has shown remarkable results. Some of the more prominent yoga gurus have worked hard to popularize this technique all over the world. It is this reason that the technique is often also known as baba Ramdev kapalbhati.

It is interesting to know how practice of any type of pranayama improves the respiratory efficiency. It is speculated that pranayama influences the functional status of the autonomic nervous system through a neural reflex mechanism in the superior nasal meatus[7, 8]. Basically breathing is an automatic process regulated by the respiratory centers in the brain stem. This center, in turn, is controlled by the higher centers in the cerebral cortex. Normally, dorsal group of neurons in the medulla oblongata maintains the rhythmicity of respiration and the pneumotaxic center in the pons controls the duration of inspiration by transmitting the suprapontine impulses that are responsible for voluntary inspiration and expiration[22, 23]. According to Ankad RB etal[6] and Makwana K et al[24], daily practice of pranayama slows down the rhythmicity of respiration by prolonging the phases of inspiration and expiration voluntarily resulting full stretching and strengthening of respiratory muscles. This enables the maximum working capacity of the respiratory apparatus which is reflected in the increased lung volumes and capacities as seen in the present study also and more expansion of the chest wall and increased breath holding time [7, 10].

Another interesting factor is that, in normal course of breathing, inspiration is an active process and expiration is a passive process. But practice of pranayama, especially kapalabhati, reverses the episode; expiration becomes active process and inspiration becomes a passive process. It is believed to induce the reverse flow of nerve impulses to and from the brain facilitating the stimulation and awakening of the centers[20].

In the present study, only young boys with the narrow age group of 18 to 20 years participated. This is important because it eliminates the gender influence and age bias. And also the results of our study proves the beneficial effects of pranayama alone which otherwise called as breathing exercise. So anybody can do it without religious stigma. Fortunately the young medical students willingly participated in this study and the feed-back was very encouraging: even after research study period was over, they were willing to continue pranayama and some more students joined them also.

However, there are limitations in the present study like less number of subjects, non-inclusion of female subjects and omission of noting heart rate, blood pressure, body mass index and body fat percentage. Further study is underway to rectify these drawbacks and to understand the exact mechanism by which any type of pranayama influences the betterment of the over-all health.

CONCLUSION

In summary, all types of pranayama or breathing techniques are beneficiary in improving the respiratory functions in normal young healthy college going male students. As the results are encouraging, this can be popularized among the students of both genders for improving not only respiratory efficiency but also general health.

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