



International Journal of Physical Education, Sports and Health

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 4.69
IJPESH 2016; 3(2): 184-185
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www.kheljournal.com
Received: 03-01-2016
Accepted: 05-02-2016

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Effects of pranayama on respiratory parameters among healthy athlete boys

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Abstract

While breathing is fundamental, our life experiences can alter the pattern of this natural process, distorting its rhythm and flow. When this happens, whether brought about by stress or simply how one comes to inhabit one's body/mind, breath's life-affirming, energizing, and nourishing capacities are disrupted. Lung parameters like Respiratory rate (R.R), Tidal volume (VT), Inspiratory reserve volume (I.R.V), Expiratory reserve volume (E.R.V), Vital capacity (VT), Forced expiratory volume in first second (FEV1) and Peak expiratory flow rate (P.E.F.R) were recorded. Peak expiratory flow rate (P.E.F.R) was also increased significantly. The mean value initially was 416.90+36.423 Litres min while the final mean value was 498.2+30.364 Litres/min The 't' value was found to be -33.609 and $p < 0.001$

Keywords: Pranayama, P.E.F.R. Respiratory parameters

Introduction

Pranayama is an art of controlling the life force of breath. It produces many systemic psycho-physical effects in the body, besides its specific effects on the respiratory functions. It is claimed that practice of 'pranayama' is one of the ways to achieve this goal of physical and mental health. 'Regular practice of pranayama has found to be helpful in developing a healthy body and a sound mind. Several studies have shown the beneficial effects of pranayama practice on respiratory parameters in patients with respiratory disorders, especially asthmatics. The present study was done to find out whether short-term practice of pranayama has any additive effects on respiratory parameters of normal healthy persons.

While breathing is fundamental, our life experiences can alter the pattern of this natural process, distorting its rhythm and flow. When this happens, whether brought about by stress or simply how one comes to inhabit one's body/mind, breath's life-affirming, energizing, and nourishing capacities are disrupted. This may result in physical, mental, emotional, and spiritual disharmonies. Unfortunately most people do not breathe in the right way. Shallow chest-restricted breathing is pandemic in our culture. Fast breathing or restricting the breath is a common and unhealthy response to physical or emotional pain or duress. We live in a time of tight bodies in tight clothes holding to tight schedules. The more we try to rigidly control, the more we constrict. The more we constrict, the less we breathe. ^[1]

Re-learning to breathe slowly and naturally can have tremendous benefit to overall health, energy, and outlook. The science of yoga speaks of "pranayama", which is a controlled breathing exercise. The word 'prana' in pranayama is translated as respiration which determines breath of life, vitality and energy. The word 'ayama' means stretch, expansion, prolongation, restrain or control ^[2]. Thus pranayama is the art of prolongation and control of breath.

Pranayama helps in bringing conscious awareness to breathing and the reshaping of breathing habits and patterns. This has been found to improve a variety of conditions, including migraine headaches, chronic pain, hypertension, epilepsy, asthma, panic attacks, hyperventilation syndrome, menopausal hot flushes, and coronary heart disease. ^[3] As a technique, pranayama can assume rather complex forms of breathing, but the essence of the practice is slow and deep breathing. Such breathing is economical because it reduces dead space ventilation.

Methodology

The present study was conducted among students fulfilling the inclusion criteria. In the beginning they were given training in practice of pranayama, after which all the subjects

practiced two types of pranayama for a total duration of 12 weeks. Lung parameters like Respiratory rate (R.R), Tidal volume (VT), Inspiratory reserve volume (I.R.V), Expiratory reserve volume (E.R.V), Vital capacity (VT), Forced expiratory volume in first second (FEV1) and Peak expiratory flow rate (P.E.F.R) were recorded at the beginning and at the end of the 12 weeks study period

The practice of the above mentioned breathing techniques was done by all the subjects under supervision for 30 minutes daily in the evening between 5:30 pm to 6:00.

Results

1. There was a significant reduction in the rate of respiration (R.R). The mean value decreased from 13.28+2.362 breaths per minute to 9.79+1.788 breaths per minute. The 't' value was calculated to be 17.00 and $p < 0.001$ (Statistically significant).
2. Tidal volume (VT) showed an increase with the initial mean value of 466.75+36.937 ml to a final mean value of 472.0+35.583 ml. The 't' value was found to be -3.778 and $p < 0.001$ (Statistically significant).
3. Inspiratory reserve volume (I.R.V) showed a significant increase. The mean value increased from 2620+140.75 ml to a final mean value of 2811+127.49 ml. The 't' value was -19.504 and $p < 0.001$ (Statistically significant).
4. Expiratory reserve volume (E.R.V) also showed an increase in the mean value. The mean value increased from 836.00+70.739 ml to 945.75+71.338 ml. The 't' value was calculated to be - 21.791 and $p < 0.001$ (Statistically significant).
5. There was a remarkable increase in vital capacity (V.C). The initial mean value was 3922.75+199.529 ml to a final mean value of 4228.75+165.65 ml. The 't' value was found to be - 28.703 and $p < 0.001$ (Statistically significant).
6. Forced expiratory volume in first second also showed significant increase, with the final mean value of 81.42+2.559 % of F.V.C as compared to the initial mean value of 76.67+2.446 % of F.V.C. The 't' value was found to be -45.743 and $p < 0.001$ (Statistically significant).
7. Peak expiratory flow rate (P.E.F.R) was also increased significantly. The mean value initially was 416.90+36.423 Litres/min while the final mean value was 498.2+30.364 Litres/min The 't' value was found to be - 33.609 and $p < 0.001$ (Statistically significant).

Discussion

There was significant decrease in rate of respiration among study subjects. Similar observations have been reported by other study [4]. Usually breathing is not a conscious event and is regulated automatically by the nervous system through the respiratory centers located in the medulla oblongata and pons. These are the dorsal and ventral group of neurons located in the medulla, the pneumotaxic center and the apneustic center located in the pons. The activity of these respiratory centers is in turn modified by supra-pontine influences, in a conscious human being. While the basic respiratory rhythm in normal situations is maintained by the impulses discharged by the dorsal group of neurons, the pneumotaxic center indirectly controls the duration of inspiration helps in relaying the supra-pontine impulses which promote voluntary inspiration and expiration. [5]

During daily practice of pranayamic breathing the basic activity of the bulbo-pontine complex is modified in such a

way as to slow down its rhythm. Also by voluntarily prolonging the phase of inspiration and expiration, the respiratory muscles are stretched to their full extent and the respiratory apparatus is able to work to their maximal capacity. Thus after continuous practice of pranayama for few weeks, the bulbo-pontine complex is adjusted to the new pattern of breathing which is slower than its basal rhythm. [6]

Also there was significant increase in lung volumes like tidal volume, inspiratory reserve volume and expiratory reserve volume. The improvement in these parameters can be explained on the following basis.

- a) There occurs strengthening of respiratory musculature after regular practice of pranayama, during which the lungs inflate and deflate to their fullest possible extent and the muscles are made to work to the maximal extent.
- b) Secondly lung inflation near to the total lung capacity is a major physiological stimulus for the release of lung surfactant and prostaglandins into the alveolar spaces. These increases lung compliance and decreases bronchiolar smooth muscle tone respectively. [5]

Conclusion

There was decrease in respiratory rate (R.R) and increase Vital capacity (VT). There was an increment in the lung volumes Tidal volume (VT), Inspiratory reserve volume (I.R.V), expiratory reserve volume (E.R.V). Also there was a significant increase in Forced expiratory volume in first second (FEV1%) and Peak expiratory flow rate (P.E.F.R).

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