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INFLUENCE OF PRANAYAMA PRACTICES ON RESPIRATORY ENDURANCE AMONG COLLEGE MEN STUDENTS

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Abstract:

The purpose of the study was undertaken to find out whether the practice of Pranayama regularly for a significant duration increases respiratory endurance. 45 subjects were selected from pondicherry university community college and their ages ranged between 18 to 21 years. The twelve weeks of pranayama practices were conducted for all the subjects. The dependent variables are Maximum expiratory pressures and maximum inspiratory pressure, breath holding time after expiration and after inspiration were recorded and 40 mmHg tests was completed before and after the period of practice. The collected data was analysed by using paired t-test. The study revealed that therespiratory muscles and respiratory endurance has significant improvement after the practices.

Key Words: Pranayama, Maximum Respiratory Pressure, Respiratory Endurance, Breath Holding Time

Introduction:

Yoga is the science of holistic living which promotes positive health and helps in disease management as well as rehabilitation. It works at physical, mental, emotional, psycological and spiritual planes of being. The Word Yoga is derived from the Sanskrit root “yuj”, which means 'to join' or ‘to unite’ (i.e. union of the individual consciousness with the universal consciousness. Yoga is one of the commonly used lifestyle modifications today. But, Yoga has originated in India 5000 years back as an ancient vedic science (Iyengar, 2002), which is being evaluated scientifically and applied in the field of health and disease (Ankad et al., 2011 & Singh et al., 2008). As a systematic discipline it consists of Purificatory techniques (shatkarma), Physical postures (asanas), Voluntarily regulated breathing practices (pranayama),Meditation and Relaxation techniques along with some specialized advanced practices such as yogic gestures (mudras), musculoskeletal locks (bandhas),(Saraswati, 2008).Breath is the dynamic bridge between body and mind and Pranayama (breathing techniques) provides various methods to maneuver the same (Muktibodhananda, 1984).

Pranayama is an integral part of Yoga. It is a Yogic technique in which breathing is controlled voluntarily. The word Pranayama is comprised of two roots: 'prana' and 'ayama'. Prana means 'vital energy' or 'life force'. Ayama is defined as 'extension' or 'expansion'. Thus, the word Pranayama means 'extension or expansion of the dimensions of prana'. The practice of Pranayama includes three important aspects of breathing viz., 1) Pooraka (inhalation), 2) Rechaka (exhalation), 3) sahitaKumbhaka (voluntary breath retention) which include AntarKumbhaka (internal breath retention) &BahirKumbhaka (external breath retention). An advanced stage of Pranayama which occurs during high states of meditation is called as kevalaKumbhaka (spontaneous breath retention). Hence, we used these tests in the present study to find out whether Pranayama improves respiratory endurance in young adults. The results of this study would help to emphasize the role of Pranayama in improving respiratory endurance and importance of regular

Pranayama practice.

Methodology:

Selection of Subjects:

The study was carried out in pondicherry university community college. For the present study, 53 healthy young volunteers in the age group of 18 - 21 years were selected randomly from the students of the college. 28 male and 25 female volunteers were selected.. The nature of the study was explained and written informed consent was taken from the subjects before the procedure. The subjects had similar dietary habits and physical and mental activities. Before the study, subjects were clinically examined and were not found to be having any significant abnormalities. None of the subjects had any Yoga training and did not involve in athletics or sports. Since the parameters were tested in the same subjects before and after the intervention, each subject acted as his or her own control. Before the start of the study, subjects were familiarized with the test procedures. For each test, practice trials were administered until we were satisfied that the subjects understood and performed the task correctly. Control readings were taken approximately 2 h after a light breakfast and 30 min of rest. It was ensured that the subjects were comfortable and relaxed during the procedure.

Selection of Variables:

Maximum expiratory pressure (MEP) and maximum inspiratory pressure (MIP), breath holding time at end-expiration (BHTe), and breath holding time at end-inspiration (BHTi) were recorded, and 40 mmHg test was performed for all thesubjects at rest which formed the control readings.MEP and MIP were measured using a handheld digital manometer specifically for respiratory pressure measurement - the micro respiratory pressure meter manufactured by MDSpiro. The MIP and MEP reflect the respiratory muscles' ability to generate force during a short quasi-static contraction. MIP and MEP measurements are conducted with a manometer that measures mouth pressure and these depend on the motivation and coordination of the subject.BHTe was determined by noting the maximum time (in seconds) for which the subject could hold his breath after breathing out fully, i.e. at residual volume. Similarly, BHTi was determined after taking in a full breath. It was ensured that there was no hyperventilation before breath holding. Care was taken to see that the subjects did not make any chest or abdominal movement during the breath holding. A noseclip was used to prevent nasal breathing. 40 mmHg test was conducted by asking the subjects to take in a full breath and blow against the mercury column to the pressure of 40 mmHg, maintaining it as long as possible. The time (in seconds) for which the subject could maintain the mercury level at 40 mmHg was noted.For each parameter, three readings were taken at intervals of 5 min and the best out of the three efforts were noted.After determining the control readings, the subjects were trained to perform seven Pranayamas by me as specialized in Yoga. Each session lasted for about 45 min. The sequence and the durations for the various Pranayamas are mentioned below

Sequence and duration of Pranayama's performed by the subjects	
Pranayama	**Duration (Min)**
Bhastrika	5
Kapalbhati	5
AnulomVilom	5
BahyaPranayam	5
Bhramari Pranayama	5
Udgeet Pranayama	5
Pranav Pranayama	5

The subjects were instructed to perform the above-mentioned Pranayamas daily for 12 weeks under my supervision and guidance.

Statistical Analysis

The data entry was done in MS-Excel, and the analysis was done by SPSS-IS software. The descriptive statistics were used, i.e. mean and standard deviation (SD) for describing the parameters. We used paired t-test to compare the MEP, MIP, BHTe, BHTi, and 40 mmHg test before and after study, i.e. before and after the practice of Pranayama daily for 12 weeks. $P < 0.05$ was considered

statistically significant.

Comparison of MEP, MIP, BHTe, BHTi, and 40 mmHg test before and after practice of Pranayama		
Parameter	**Before training**	**After training**
MEP	90.75±5.31*	124.26±6.74*
MIP	70.71±5.17*	89.58±5.01*
BHTe	32.48±1.55*	44.8±2.31*
BHTi	63.01±3.38*	91.87±5.55*
40 mmHg	36.32±1.89*	54.62±2.41*

Results

The results of the study are expressed as mean ± SD (n = 53) and depicted in Table. 2. In our study, we found that before the practice of Pranayama, the MEP and MIP were 90.75 ± 5.31 mmHg and 70.71 ± 5.17 mmHg, respectively. After the training program of 12 weeks, there was a highly significant increase in both MEP and MIP which increased to 124.26 ± 6.74 mmHg and 89.58 ± 5.01 mmHg, respectively (Z = 28.19, P < 0.001 for MEP and Z = 19.06, P < 0.001 for MIP). BHTe was 32.48 ± 1.55 s before training which increased significantly to 44.8 ± 2.31 s after training (Z = 32.24, P < 0.001). BHTi was 63.01 ± 3.38 s before training and 91.87 ± 5.55 s after training, the increase being statistically significant (Z = 32.33, P < 0.001). Results of 40 mmHg test showed a statistically significant increase from 36.32 ± 1.89 mmHg before training to 54.62 ± 2.41 mmHg after completion of training program (Z = 43.50, P < 0.001).

Discussion

The present study was of 12 weeks duration which was of sufficient intensity and duration to elicit significant changes in all the parameters. In the present study, the MEP and MIP were found to be considerably increased in the subjects after Pranayama training. We found that there was an approximate 37% increase in MEP posttraining (P < 0.001). Furthermore, MIP increased by approximately 26% after Pranayama training (P < 0.001). Respiratory pressures are specific and sensitive indices of respiratory muscle strength, and they are easy to measure and reproducible and do not produce any complications. In our study, various Pranayamas, especially Bhastrika, Kapalabhati, and Bahya Pranayama, are involved forceful respiratory efforts which increase the strength of the respiratory muscles. Kapalabhati Pranayama involves forceful expiration with passive inspiration which makes maximum use of diaphragm and abdominal muscles, thus strengthening them. Bahya Pranayama involves holding the breath at residual volume after forceful expiration. This requires isometric contraction of expiratory muscles which increases the endurance of these muscles. BHTe and BHTi both increased significantly after the training program. BHTe and BHTi increased by approximately 38% and 46%, respectively (P < 0.001). BHT depends on initial lung volume, training, and willpower of the subject. Our findings are consistent with Madanmohan et al. who found that BHTe and BHTi significantly increased by 39% and 40%, respectively, after 12 weeks Yoga training.Similar findings were reported by Nayar et al. where BHTi increased significantly from 54 s to 106 s.During Pranayama, a person consciously and consistently controls his respiration by overriding respiratory stimuli. This results in greater ability to control one's own respiration. Various Pranayamas involve forceful respiration as well as maintaining the respiratory muscles in sustained isometric contraction. Furthermore, practice of Pranayama may lead to alteration in responsiveness of medullary respiratory centers as well as central and peripheral chemoreceptors increasing respiratory endurance and BHT. Studies have shown that practice of AnulomVilom Pranayama (alternate nostril breathing) and Ujjayi Pranayama influences autonomic functions favorably.After Pranayama training, there was a significant improvement in 40 mmHg test results by approximately 50% (P < 0.001). This test measures the respiratory endurance as it involves isometric contraction of respiratory muscles to hold the breath while maintaining a constant pressure. Similar findings were reported by Madanmohan et al. who found that 40 mmHg test results increased by approximately 46% indicating an improvement in cardiorespiratory endurance.A number of studies have proved the beneficial effects of Pranayama on respiratory functions. Joshi et al. have reported that Pranayam training improves ventilatory functions in the form of increase in forced expiratory

volume (FEV), FEV in one second, and peak expiratory flow rates. Many investigators have found that Yoga training increases the vital capacity and improves lung functions in subjects. In this study, we closely monitored and supervised the Pranayama training program. Tests were carried out in a controlled setting with emphasis on accuracy and reproducibility. However, the application of the findings may be limited by the sample size. There is a scope for similar studies to be carried out with larger study groups.

Conclusion

In our study, we have found a significant improvement in all the respiratory parameters that were tested. We conclude that the practice of Pranayama significantly improves maximum respiratory pressures, BHT, and 40mmHg test results and is extremely useful in improving lung functions and respiratory endurance. The results of our study may be used to emphasize the role of Pranayama in strengthening respiratory muscles and improving respiratory endurance, and regular practice of Pranayama may prove to be a step in the direction of a healthy lifestyle

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