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Original Research Article

Which of the Two *Pranayamas*, *Anulom Vilom* or *Bhastrika* is better at Improving Maximal Oxygen Uptake in Normal Individuals?

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ABSTRACT

Background: Various breathing techniques including Pranayama are studied and proven their benefits on respiration, lung capacities as well as maximum oxygen uptake. The present study aims to compare effects of two types of pranayama i.e. Anulom Vilom and Bhastrika on maximum oxygen uptake (VO2max) in normal subjects.
Methods: Thirty healthy but relatively sedentary individuals in the age group of 18-24 years were recruited from community settings and randomly allocated into, Group A (performed bhastrika) and Group B (performed anulom vilom) and Group C (Control group received no intervention). Group A and B participants performed respective pranayamas for 10 mins once a day for 5 days per week for 6 weeks. Vo2max was assessed using incremental shuttle run test pre and post interventions
Results: It was observed that there was significant improvement in VO2max in all three groups ($p < 0.05$), but group A performing bhastrika pranayama showed higher increments in VO2max as compared to other groups. ($p<0.001$).
Conclusion: Anulom Vilom and Bhastrika both improve Vo2max in normal healthy individuals but *Bhastrika* was found to be more effective.

Keywords: cardiorespiratory fitness, breathing exercise,

INTRODUCTION

"Prana" is Breath or vital energy in the body. Pranic energy responsible for life or life force, and *"ayama"* means control. So Pranayama is "Control of Breath". Deep breathing, inhalation-retention-exhalation at fixed intervals, abdominal (diaphragmatic) breathing and alternate nostril breathing pranayama is known to improve FVC, FEV_1, and PEFR in normal population. [1]

Maximal oxygen uptake (VO2max) is defined as the oxygen uptake attained during maximal exercise intensity that could not be increased despite further increases in exercise workload, thereby defining the limits of the cardiorespiratory system. It is the best measure of cardiorespiratory fitness and is expressed as 'milliliters of oxygen used in one minute per kilogram of body weight'(ml/kg/min). Maximal oxygen uptake depends on oxygen absorption, transport and its utilization at peripheral (muscle) level. [2]

Bhastrika also known as bellows breathing strengthens the diaphragm and abdominal muscles, increases exchange of

O2 and CO2 in the bloodstream, alleviates inflammation in the throat, reduces accumulation of phlegm and balances and strengthens the nervous system. [3] Anulom vilom pranayama also called alternate nostril breathing has been shown to be effective in improving vital capacity of the lungs as well as cardio-pulmonary functioning. [4,5] It is also known to improve maximal oxygen uptake. [6]

Research has proven that both these pranayamaas improve lung function. [7] Since improved lung function helps in better utilization of oxygen and hence should increase maximal oxygen uptake by the lung.

MATERIALS AND METHODS

After obtaining ethical approval from the Institutional Review Board, samples of 30 normal healthy subjects (18-24yrs) were recruited for the study. People practicing yoga, having lower limb fractures in the past 3 months, practicing any aerobic exercise, having any cardiovascular, respiratory, neurological disorders were excluded from this study.

All participants were informed in detail about the study protocol and informed written consent was taken after which they were randomly allocated to 3 groups using Research Randomizer software - GROUP A, GROUP B, GROUP C. Group A practiced Bhastrika, Group B practiced anulom vilom and Group C control was given no intervention.

After allocation baseline measures of maximal oxygen uptake (VO2 max) were taken with 20m Incremental shuttle run test. [8] The participants practiced their respective pranayamas for 10 mins per day for 5 days a week for 6 weeks, out of which 3 sessions were supervised and 2 unsupervised.

After 6 weeks of intervention, reassessment of maximal oxygen uptake was done for which Incremental shuttle run test audio and calculator from Top end sports was used for calculation. [9]

Statistical analysis:-

Data was analyzed using SPSS (Statistical Package for The Social Sciences) software version 16.0. Wilcoxon signed ranks test was used for within group data analysis and Kruskal Wallis test was used for between groups data analysis for Maximal Oxygen Uptake. Level of significance was set at $p \leq 0.05$.

RESULTS

Table 1 shows results pre and post means. It was observed that there was significant improvement (p value = <0.001) in maximal oxygen uptake in group A and group B and group C. Table 2 shows results of within group test where it was observed that there was significant difference (p value = <0.001) between groups with the highest mean of Group A followed by Group B and Group C.

Table 1:- Pre and Post means comparision

Groups	Pre	Post	P-value
Bhastrika Group A	19.48±0.76	23.33±1.08	<0.001*
Anulom vilom Group B	19.70±0.48	20.37±0.57	<0.001*
Control Group C	19.88±0.79	20.09±0.74	<0.001*

Table 2:- Within group test results

Group	n	Mean rank	P VALUE
VO2 MAX 1	10	25.50	<0.001*
2	10	14.55	
3	10	6.45	

DISCUSSION

The results stated above clearly indicate that there is a statistically significant increase in both the groups but is much higher in group A (bhastrika) compared to group B (anulom vilom) and group C. Research has shown that Pranayama helps improve lung function in the following ways. There is the release of lung surfactant when lungs have been stretched near to total lung capacity and prostaglandins into alveolar spaces, which increase lung compliance and decreases bronchial smooth muscle tone, respectively. [10] The other possible mechanism for improved pulmonary functions might be: (i) Hypertrophy of respiratory muscles due to regular practice of pranayama (ii) cleansing

procedures cleans the infective nasal secretions; (iii) more efficient use of the diaphragmatic and abdominal muscles thereby emptying and filling the respiratory apparatus more efficiently and completely; and (iv) pranayama has calming effect on the mind which reduces emotional stresses, thereby withdrawing the broncho-constrictor effect. [11]

Anulom vilom and Bhastrika pranayama both are proven to increase tidal volume and maximum voluntary ventilation. [12] Both are known to help in improving diffusion of gases at alveolar level and hence enhance oxygenation. [13]

However Bhastrika involves forceful inhalation and exhalation, which strengthens the diaphragm and abdominal muscles. [14] Also anulom vilom pranayama is done at a slow pace whereas bhastrika pranayama involves inhalation and exhalation at a very fast pace which is very similar to the breathing pattern carried out while working out at a maximal intensity. And hence practicing bhastrika pranayama may train respiratory muscles better to increase air intake and hence maximal oxygen uptake while maximal intensity workout.

The control group mean also showed a statistically significant improvement which could be due to learning effect. A larger sample size could have given a better picture of the result.

CONCLUSION

From this it can be concluded that bhastrika pranayama is comparatively better than anulom vilom pranayama in improving maximal oxygen uptake in normal individuals. Thus practicing bhastrika regularly for 10 mins each day for 5 days a week for 6 weeks can help in improving cardiorespiratory fitness.

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