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Original Research Article

Comparative Effect of Fast and Slow Breathing Pranayama on Pulmonary Functions in Students

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ABSTRACT

Background: Pranayama the fourth limb of ashtanga yoga plays a significant role in modulation of pulmonary, cardiovascular and mental functions. Due to urbanization and industrialization, environment in which one breathes has become polluted. To cope up with the changed environment, yoga and pranayama are the only way with which one can live a healthy and disease free life. Various type of pranayama are there and also there effects are also known but very few studies are available that compares the effect of fast and slow breathing pranayama. So in this study we planned to compare the effect of nadi-shodhan pranayama and bhastrika on Pulmonary functions in healthy students

Aim: To Compare the effect of Fast and Slow breathing pranayama on pulmonary functions.

Material and Methods: The study included 60 students which were divided into two groups of 30 each. One group practiced nadi-shodhan pranayama and other group perform bhastrika pranayama for 12 weeks. Their pulmonary functions were recorded at basal, 6weeks and 12 weeks.

Result: There occurs a significant increase (p value <.05) in Peak Expiratory Flow Rate (PEFR) and Vital Capacity (VC) and an insignificant increase in Forced Expiratory Volume in first second (FEV1%) and Maximum Voluntary Ventilation (MVV) of slow breathing group.

Conclusion: Slow breathing pranayama is more effective in improving the PEFR and VC than fast breathing pranayama.

Keywords: VC, PEFR, FEV1%, MVV, BHASTRIKA, NADI-SHODHAN

INTRODUCTION

The word Pranayama is derived from two words i.e. “Prana” meaning vital force or life and “Ayama” meaning to control the vital force. Hence pranayama means control of the vital force by concentration and regulated breathing. [1] Pranayama is a part of the ancient Indian art of yoga, which is the fourth limb of ashtang yoga. It is a controlled and conscious breathing exercise which involves mental concentration. Pranayama is of vital importance to any sincere yoga practitioner. It is helpful in controlling the mind by regular, dedicated and determined practice of pranayama. [2]

As we live in the age of modern science and technology, our lifestyle has become hectic. It is also becoming very hard and difficult to live a natural and normal life because of the changing geo-political scenario of the world. The very air is becoming unfit for human consumption. Our cities are growing noisier, dirtier and congested. The mind is always under strain due to various social evils. Stress affects functioning of our body systems and result in some serious ailments such as peptic

ulcer disease, asthma, back pain, psychosomatic disorders etc. [3,4]

Regular practice of pranayama enhances the quantity and quality of prana, clears blocked nadis and chakras and results in the practitioner feeling energetic, enthusiastic and positive. Practiced correctly under the right supervision it brings harmony between the body, mind and spirit, making one physically, mentally and spiritually strong. [5]

Pranayama is of vital importance to any sincere yoga practitioner. It is helpful in controlling the mind by regular, dedicated and determined practice of pranayama. [2]

Pranayama also helps in reducing the Respiratory Rate (RR) and Heart Rate (HR) while increasing the quantum of oxygen drawn from the air. Yogis can decrease the RR upto 2 to 3 cycles/minutes with regular practice of pranayama. With a decrease in RR, the metabolic rate of the body also reduces. The body is brought to a state of temporary hibernation. All the cells are rested and relaxation ensues**.** The sympathetic overdrive is reduced, which also results in energy conservation. With regular practice, the mind becomes attentive and the rhythm of breathing is optimised. [6]

Pranayama via its numerous role in alteration of various body functions affects mainly the pulmonary and cardio-vascular functions. A number of pranayama were practiced in the past by various researchers. Studies available in literature on the effect of either fast breathing or slow breathing pranayama on Pulmonary functions or cardio-vascular functions. Very few studies are there that compares the effect of fast and slow breathing pranayama on pulmonary functions. So this study was planned to compare the effect of fast and slow breathing pranayama on pulmonary functions.

MATERIALS AND METHODS

The present study was conducted in the department of Physiology at Pt. B.D.Sharma PGIMS, Rohtak on medical and para-medical students. Sixty students both male and female of 17 to 21 years of age were enrolled in the study and were randomly divided into two groups.

Group I. Comprising of 30 students practiced nadi shodhan pranayama for 12 weeks.

Group II. Comprising of 30 students practiced bhastrika pranayama for 12 weeks.

INCLUSION CRITERIA

1. Healthy medical and paramedical students of either sex between 17 and 21 years of age.
2. Students who have not practiced pranayama before enrollment.
3. Students who were committed to practice pranayama as taught by the instructor regularly.

EXCLUSION CRITERIA

1. History of smoking and alcohol intake
2. Subjects on long term medications or suffering from any chronic disease including neuromuscular or skeletal disorder.
3. Subjects who do not practice pranayama regularly during the study.

Bhastrika and Nadi Shodhan pranayama were performed by subjects as instructed by a certified yoga teacher as detailed below.

BHASTRIKA PRANAYAMA

For performing bhastrika pranayama subjects were asked to sit in *vajrasana keeping* the back, neck and head straight. Arms were folded at the elbows and kept on either side of the body with medial side of each arm touching the chest; fists were closed and pointed upwards. Keeping the mouth closed a deep inhalation was taken through nose along with raising the arms parallel to each other above the head and opening the fist. After the inhalation the subjects were instructed to exhale fully and forcibly through nose along with pulling the arms down to the same initial position. One inhalation and exhalation completes one cycle of *bhastrika.* One set consist of twenty such cycles. The subjects performed two such sets with an interval of four minutes.

Between the sets the subjects were asked to sit in vajrasana with eyes closed and hands resting on thighs palms facing towards the sky. Completing both the sets took approximately 25 minutes. [5]

NADI SHODHAN PRANAYMA

Each subject performed nadi-shodhan pranayama as detailed below. The subject sat in sukhasana with eyes closed, neck and head straight. Wrists were kept on the knees on each side with palms facing upwards, elbows slightly bent and kept close to the chest. Middle and index finger of the right hand was placed on the brow of head, thumb was used to close the right nostril and little finger was used to close the left nostril alternately. Elbow of the right hand was kept close to the chest. To start with subjects inhaled slowly through the left nostril to a count of six while the right nostril was closed with thumb. After inhalation, the left nostril was closed with ring and little finger, breath was held for a count of three, subject then exhaled slowly through the right nostril again for a count of six. After completely exhaling, subjects inhaled again slowly through the right nostril for a count of six while right nostril was closed with thumb. Breath was held for a count of three and then left nostril was opened and exhalation was done to a count of six. Inhaling from the left nostril, exhaling from the right and then again inhaling from the right and exhaling from the left nostril completed one cycle. Ten such cycles comprised one set. Each subject performed three such sets with an interval of four minutes. Completing three sets took approximately 25 minutes. [5]

The pranayamic breathing was practiced early in the morning after a warm up for ten minutes by jumping and jogging on the spot. Subjects practiced pranayama with empty stomach or if required only a glass of water was allowed 30 minutes before starting pranayama. Subjects were required to wear light & comfortable clothing.

Pulmonary Function Tests

The following parameters were recorded on RMS MEDSPIROR Platform WIN 98 version- 1.0 supplied by RMS Chandigarh:

(1) Vital Capacity in liters.

(2) Forced Expiratory Volume in First Second in Percentage.

(3) Peak Expiratory Flow Rate in liters/min.

(4) Maximum Ventilatory Volume in liters/min.

Procedure for VC, FEV_1% and PEFR

The subject was asked to apply the mouthpiece and close the lips above it so that no air escapes. A nose clip was applied on the nose to close both the nostrils and then subject was instructed to breathe in and out normally through the mouth. After a few tidal breaths the subject was asked to inhale deeply and then exhale as fast and as completely as possible into the mouthpiece. The subject was asked to repeat it three times and the best attempt was selected for analysis.

Procedure for MVV

The subject was asked to apply the mouthpiece and close the lips above it so that no air escapes. A nose clip was applied on the nose to close both the nostrils. The subject was then instructed to inhale and exhale as quickly and as deeply as possible into the mouthpiece for a period of 15 seconds. The subject was advised to stop the maneuver if he/she feels uncomfortable during the procedure.

All the tests were done at 7:00 am on empty stomach, in the department of physiology. Three sets of recordings were done, one before the start of study, second after six week and third after twelve weeks of pranayamic practice.

Statistical analysis of data

For interpretation of the results the data set of each group was analysed statistically. To compare the effect of fast and slow breathing pranayama mixed model ANOVA was used Significance of results was predicted based on p value. p value >0.05 was taken as nonsignificant, p value <0.05 was taken as significant and p value <0.01 was taken as highly significant.

RESULT

The present study was conducted in the department of Physiology at Pt. B.D.Sharma PGIMS, Rohtak on medical and para-medical students. The study was carried out on 60 students of 17-21 years of age of either sex and divided into two groups of 30 each. Their PFT and HRV were recorded at basal, 6 weeks and 12 weeks. The observations and results of our study are presented in graphical and tabular forms in the following section:

TABLE 1: COMPARISON OF EFFECT OF NADI SHODHAN AND BHASTRIKA PRANAYAMA ON VC

VC	BASAL	6 WEEK	12 WEEK
NADI SHODHAN PRANAYAMA	3.791 ± .559	3.863 ± 0.550	3.999 ± 0.554
BHASTRIKA PRANAYAMA	3.489 ± .513	3.694 ± 0.516	3.957 ± 0.497

p value <.05, mixed model ANOVA

TABLE 2: COMPARISON OF EFFECT OF NADI SHODHAN AND BHASTRIKA PRANAYAMA ON FEV1%

FEV1%	BASAL	6 WEEK	12 WEEK
NADI SHODHAN PRANAYAMA	85.280 ± 1.693	86.393 ± 1.600	88.412 ± 1.765
BHASTRIKA PRANAYAMA	84.091 ± 1.173	85.583 ± 1.297	87.739 ± 1.237

p value <.05, mixed model ANOVA

TABLE 3: COMPARISON OF EFFECT OF NADI SHODHAN AND BHASTRIKA PRANAYAMA ON PEFR

PEFR	BASAL	6 WEEK	12 WEEK
NADI SHODHAN PRANAYAMA	450.740 ± 76.556	456.240 ± 77.061	463.140 ± 77.716
BHASTRIKA PRANAYAMA	389.520 ± 83.237	406.360 ± 84.270	422.880 ± 81.392

p value <.05, mixed model ANOVA

TABLE 4: COMPARISON OF EFFECT OF NADI SHODHAN AND BHASTRIKA PRANAYAMA ON MVV

MVV	BASAL	6 WEEK	12 WEEK
NADI SHODHAN PRANAYAMA	122.033 ± 33.533	125.933 ± 34.107	131.533 ±33.427
BHASTRIKA PRANAYAMA	130.533 ± 28.064	134.500 ± 28.319	139.600 ±28.390

p value <.05, mixed model ANOVA

Table 1 shows the effect of nadi shodhan and bhastrika pranayama on VC. When both groups were compared over the time, there was a significant increase in VC. Also when compared in relation to effectiveness in increasing the VC, it was seen statistically that nadi shodhan pranayama was more effective in increasing the VC than bhastrika pranayama.

Table 2 shows the effect of nadi shodhan and bhastrika pranayama on FEV1%. There was a significant increase in FEV1% in both the groups when compared along the time. It was seen statistically that there was not much difference in effectiveness of both the groups i.e. both the groups were equally effective in increasing FEV1% of the subjects practicing the pranayama.

Table 3 shows the effect of nadi shodhan and bhastrika pranayama on PEFR. When both the groups were compared in respect to time, it was seen that there was significant increase in PEFR in both the groups with time. Also it was seen statistically that subjects practicing the nadi shodhan pranayama shows more significant increase in PEFR than the subjects performing bhastrika pranayama.

Table 4 shows the effect of nadi shodhan and bhastrika pranayama on MVV. There was a significant increase in both the groups when compared in relation with time but no significant change was seen in effectiveness of both the groups in increasing MVV. Results signifies that both fast and slow breathing pranayama were equally effective in increasing MVV i.e. no significant change was seen in either group.

DISCUSSION

Pranayama involves manipulation of the breath movements and breath is a dynamic bridge between the body and mind. It consists of three phases: “Puraka” (inhalation); “kumbhaka” (retention) and “rechaka” (exhalation) that can be either fast or slow. [7-8]

In our study we found that all the PFT parameters studied in bhastrika and nadi shodhan pranayama groups were found to be significantly raised over the time. There was no significant difference in effectiveness of both the pranayama on

FEV1% and MVV i.e. both the pranayama were equally effective in raising the MVV and FEV1% of the subjects that practiced pranayama regularly.

In case of PEFR and VC it was found that nadi shodhan pranayama was more effective than bhastrika pranayama in increasing these parameters i.e. group practicing nadi shodhan pranayama shows a greater increase in value of PEFR and VC than the bhastrika pranayama practicing group.

Improvement in Pulmonary functions parameters may be due to clearing of respiratory secretion and increased respiratory muscle strength. [9] Also lung inflation due to deep breathing lead to stimulation of pulmonary stretch receptors which causes modulation of airway caliber and decrease in airway resistance. [10]

CONCLUSION

When comparison was done on effect of fast and slow breathing pranayama over the time it was noticed that there was significant increase in VC of subjects. When compared in relation to effectiveness it was found that slow breathing pranayama i.e. nadi-shodhan pranayama was more effective in increasing than bhastrika pranayama.

There was a significant increase in mean MVV of subjects when both the bhastrika and nadi-shodhan pranayama were compared over the time. In terms of efficacy it was found that both type of pranayama i.e. fast and slow breathing pranayama were equally effective in increasing the MVV of the subjects.

When nadi-shodhan and bhastrika pranayama were compared it was found that mean PEFR increased significantly from basal to 12 weeks. It was also seen from the study that nadi-shodhan pranayama has more efficiently increased mean PEFR than bhastrika pranayama.

Mean FEV1% of both the groups were compared and it was found that FEV1% increases significantly over the time. Also it was concluded that both nadi-shodhan and bhastrika pranayama were equally effective in increasing the FEV1% of the subjects.

REFERENCES

1. Lathadevi GV, Maheswari TU, Nagashree R. Modulation of cardiovascular response after ujjayi pranayama and shavasana training in normal human volunteers. J Clin Diagn Res. 2012; 6(4):571-3
2. Swami NS. Prana and Pranayama. Yoga Publications Trust Bihar, India: Thomson press; 2009.
3. Daily GC, Ehrlich PR. Population, sustainability and earth's carry capacity: A framework for estimating population size and lifestyle that could be sustained without undermining future generation. BioScience, November 1992; 42:761-71.
4. Salleh MR. Life event, stress and illness. Malays J Med Sci. 2008; 15(4):9–18.
5. Swami GG. Pranayama: The fourth limb of ashtanga yoga. Pondicherry, India: Satya press; 2008.
6. Yadav SK. Effect of bhastrika and kapalbhati pranayama on selected physiological variables of sports men. International Education e-journal. 2015; 4(2):58-64.
7. Bijlani RL. 3rd ed. New Delhi: Jaypee Brothers; 2004. Understanding medical physiology; pp. 871–910.8.
8. Chodinzki JY. The effect of rhythmic breathing on blood pressure in hypertensive adults. J Undergrad Res. 2000:1–6.
9. Yadav RK, Das S.Effect of yogic practice on pulmonary functions in young females. Indian J Physiol Pharmacol. 2001 Oct; 45(4):493-6.
10. Mandanmohan, Jatiya L, Udupa K, Bhavanani AB. Effect of yoga training on handgrip, respiratory pressures and pulmonary function. Indian J Physiol Pharmacol. 2003 Oct;47(4): 387-92.

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