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Physiological Responses of Yogic Breathing Exercise in Young Females

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Abstract

Introduction: In present day, scenario stressful lifestyle, irregular eating habits and lack of exercise have led to emergence of cardio-vascular and respiratory diseases which were less common in older days when people had less stress and were physically more active as compared to present days. We have tried to study the possible beneficial effects of breathing exercises so as to prevent cardio-vascular and respiratory morbidity in young females.

Purpose: In the modern era, the interest of yogic practice of asanas and breathing exercises has increased in the general population for health benefits. The objective of the present study is to evaluate the effects of breathing yogic exercises of yoga on respiratory and cardio-vascular parameters in young females.

Materials and Methods: A study was conducted in the department of physiology LLRM Medical College, Meerut. Case material for the study comprises of 30 female students of age group between 17 and 22 years. The selections of these students were done on a voluntary basis, and written consent from each one of them was taken. These students were divided into two groups, each comprising of 15 students. Group 1: This consists of 15 students who were kept as a control group. Group 2: This consists of another 15 students who practiced respiratory yogic exercises daily for 20 min, for 3 weeks.

Result: There was a significant reduction in resting pulse rate, and there is no significant change seen in peak expiratory flow rate and systolic blood pressure in group 2 after 3 weeks of yogic exercises.

Conclusion: The above study showed beneficial effects of regular breathing exercises on cardio-vascular functions in normal healthy individuals.

Key words: Blood pressure, Breathing exercises, Heart rate, Peak expiratory flow rate, Yoga

INTRODUCTION

Stress and faulty life style are the major contributors to many diseases of modern civilization, such as obesity, hypertension, coronary artery disease, and diabetes mellitus.[1,2]

A carefully designed stress reduction program such as yoga has been shown to play a major role in recovery and contribute to improved general health. It has gained immense popularity as a form of recreational activity all over the world. Its possible contributions to healthy living have been studied and many interesting scientifically based revelations have been made. Regular yogic practice results in a reduction in intrinsic neurohormonal activity such as a decrease in fasting blood glucose level. A few months practice of yoga (asana, pranayamas, meditation, or various combinations of these) triggers neurohormonal mechanisms that bring about health benefits.[3]

Yoga is a tradition of health and spirituality that evolved over a period of some 5000 years. The principles of yoga practice involve, the adoption and maintenance of psychophysical posture along with controlled breathing techniques it forms the basis of yoga's mind-body integration work.

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Psychological and social stressful stimuli affect hypothalamic-pituitary-adrenal axis due to which there is imbalance of equilibrium of various hormones, such as glucocorticoids and aldosterone, which increases blood volume causing increase in blood pressure and impose strain on heart.[4]

By giving rest to body and mind yoga maintains equilibrium and can prevent many disorders of psychosocial origin.[5]

The present study is done to see the response of short term (3 weeks) practices of yogic respiratory exercises on various cardiac and respiratory parameters.

MATERIALS AND METHODS

This study was conducted in the department of physiology, LLRM Medical College, Meerut.

Case material for the study comprises of 30 female medical students of age group between 17 and 22 years. Thes selections of students was done on a voluntary basis, and written consent from each one of them was taken before the study was conducted (Figure 1).

Our subjects were divided into two groups, comprising of 15 students in each group.

Group 1: This consists of 15 students who were kept as a control group.

Group 2: This consists of another 15 students who practiced respiratory yogic exercises every day for 20 min and meditation for 10 min, for 3 consecutive weeks.

All subjects were under uniform dietary habits and received same yoga training for 3 weeks daily between 4 and 5 pm.

The different exercises practiced were: (a) Anulom - vilom, (b) kapal bhati, and (c) bhramari followed by 10 min meditation.

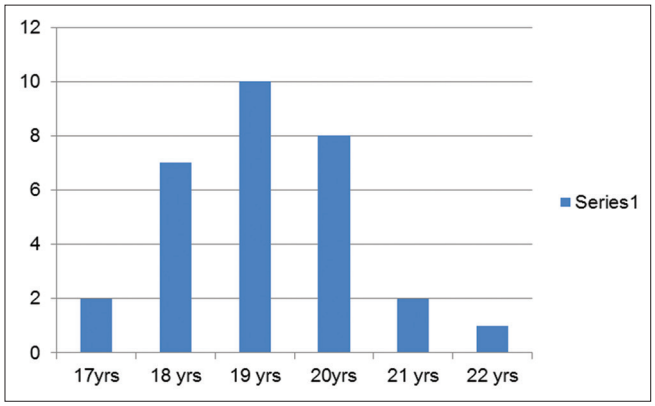

Figure 1: The age of subjects

Anulom vilom technique - Close right nostril with right thumb inhale slowly through left nostril remove right thumb from right nostril use ring and middle finger to close left nostril exhale slowly and completely inhale through right nostril with maximum inhalation close right nostril and open the left breath out slowly through left nostril continue for 15 min.

Kapalbhati technique - Inhale maximum air through the nostril and exhale through both nostrils forcefully repeat for 15 min take 1 min rest after every 5 min.

Bhastrika technique - Breath in deeply through nostrils and then breath out quickly through nostrils repeat the process, continue for 5 min.

Parameters studied were:

1. Systolic blood pressure (SBP) in mm Hg, measured by using mercury sphygmomanometer
2. Heart rate per minute, measured by palpatory method, in right radial artery
3. Peak expiratory flow rate (PEFR) recorded by wright's mini peak flow meter.

RESULT

The result was calculated as mean standard deviation. Student *t*-test was used to find the significance of study $P < 0.05$ was considered statistically significant.

SBP

The mean SBP at the beginning of our study was 125 ± 7.8 mm Hg, it reduced to 120 ± 7.4 which apparently shows a decline in the values but the *P* value is more than 0.05 thus the change being insignificant.

Heart Rate

Mean resting heart rate at the beginning of our study was 96.10 ± 7.6. It reduced to 94.00 ± 7.19 at the end of our study with a $P < 0.05$ thus the change being significant.

PEFR

The mean PEFR at the beginning of our study was 402.4 ± 59.8. It increased to 418 ± 67.7 at the end of our study with a *P* value of more than 0.05 thus the change

Table 1: Average parameters before and after pranayam

Parameters	Before exercise	After exercise	*P* value
SBP	125±7.8	120±7.4	>0.05
HR	96.10±7.6	94.00±7.19	<0.05
PEFR	402.4±59.8	418±67.7	>0.05

P>0.05 - insignificant, *P*<0.05 - significant, SBP: Systolic blood pressure, HR: Heart rate, PEFR: Peak expiratory flow rate

being insignificant although there is a definite increase in the mean PEFR (Table 1).

DISSCUSSION

Prayanamas are effective in reducing heart rate immediately, but there is no significant change in PEFR and SBP. Respiratory exercises cause contractions of respiratory muscles and abdominal muscles.

The decrease in heart rate suggests an increase in parasympathetic activity.

Decrease in heart rate and blood pressure shifts towards parasympathetic activation reported by Joseph *et al.*[1] and Anand.[2]

The effect on autonomic nervous system is brought by yogic exercises by influencing limbic system and higher centers of central nervous system as reported by Sevamurthy *et al.*[3]

Long term and regular practice of these yogic exercises causes an increase in baroreceptors activity and decreases sympathetic tone of blood vessels thereby maintain blood pressure to normal levels. In patient of hypertension by Vijayalakshmi *et al.*[4] Bhargava *et al.*[5] reported better peripheral circulation and blood flow to tissue by Gopal *et al.*[6]

Raghuras *et al.*[7] have reported kapalbhati produces sympathetic stimulation.

In our study, there is no significant changes are seen in PEFR and SBP as time period taken for the study is short.

Prayanamas may increase frequency and duration of inhibitory impulses by activation of pulmonary stretch receptors, which bring about withdrawal of sympathetic tone in blood vessels of skeletal muscles, leading to widespread vasodilation, thus causes decrease in peripheral resistance and thus decreases blood pressure.[8]

Similar result observed in a study conducted by Madanmohan *et al.*[9]

While practicing prayanama one concentrate on the act of breathing which removes attention from worries and distresses him. This stress free state of mind evokes relaxed responses in which parasympathetic nerve activity overrides sympathetic activity.[10]

These might be a few possible reasons for the significant improvement in cardiac functions. Blood pressure and pulse rate related with cardio-vascular system in the controlled autonomic nervous system.

Prayanam increases cardiac output, decreases hepatic blood flow, and increases peripheral vessel blood flow.[11]

Nadishuddi prayanam brings balance in autonomic nervous system.[12]

A practice of yoga bring decline in respiratory rate by increasing sympathetic activity[13] and PEFR improves due to increase in respiratory muscle activity.[14]

The effect can be explained on:

He following basis that increase power of respiratory muscles that is due to hypertrophy of muscles during prayanamas.[13]

Stimulation of pulmonary stretch receptors by inflation of lungs reflexly relaxes smooth muscles of larynx and tracheobronchial tree.[12]

Yogic breathing descent diaphragm and increases the vertical diameter of thoracic cavity.

Yoga with its calming effect on mind can reduce and release emotional stress thereby withdrawing bronchoconstrictor effect[13] Madanmohan *et al.*[9] have reported that yoga training of 6 weeks duration attenuates the sweating response to step test and produces a marked increase in respiratory pressures and endurance in 40 mm Hg test in both male and female subjects. In another study, they reported that 12 weeks of yoga practice results in a significant increase in maximum expiratory pressure, maximum inspiratory pressure, breath holding time after expiration, breath holding time after inspiration, and hand grip strength. Joshi[13] have also demonstrated that 6 weeks of pranayama breathing course resulted in improved ventilatory functions in the form of lowered respiratory rate, and increases in the forced vital capacity, forced expiratory volume at the end of first second, maximum voluntary ventilation, PEFR, and prolongation of breath holding time. Similar beneficial effects were observed by Makwana *et al.*[14] after 10 weeks of yoga practice. An increase in inspiratory and expiratory pressures suggests that yoga training improves the strength of expiratory and as well as inspiratory muscles. Respiratory muscles are like skeletal muscles. Yogic techniques involve isometric contraction which is known to increase skeletal muscle strength. Breath-holding time depends on initial lung volume. Greater lung volume decreases the frequency and amplitude of involuntary contractions of respiratory muscles, thereby lessening the discomfort of breath holding. During yoga practice, one consistently and consciously over-rides the stimuli to respiratory centers, thus acquiring control over the respiration. This, along

with improved cardio-respiratory performance, may explain the prolongation of breath holding time in yoga-trained subjects.

The technique of Kapalabhati pranayama involves short and strong forceful exhalations, and inhalation happens automatically. Very few references are available on the effect of Kapalabhati pranayama training on cardio-respiratory parameters in individuals. Our results are in agreement with that of Raghuraj *et al.*[7] who found that practicing fast pranayamas such as Kapalabhati for 6 weeks lead to decrease in sympathetic activity and is not in agreement with observations of few other studies. Madanmohan *et al.*[9] evaluated the short term effect of 3 weeks of Bhastrika pranayama practice on cardio-respiratory variables and reported an increase in sympathetic activity.

CONCLUSION

The present study suggests that regular practice of yogic breathing exercises improves cardio-vascular and respiratory functions, but the time period in this study is short, and thus the results were not significant for all the parameters except heart rate.

These findings, suggests incorporation of yogic breathing exercises can enhance efficiency by improving lung function capacity, reducing the resting heart rate, and SBP.

It is thus concluded that these results and their explanations would justify the incorporation of yogic breathing exercises as a part of our lifestyle in the prevention of age-related cardio-vascular complications.

REFERENCES

1. Joseph S, Sridharan K, Patil SK, Kumaria ML, Selvamurthy W, Joseph NT, *et al.* Study of some physiological and biochemical parameters in subjects undergoing yogic training. Indian J Med Res 1981;74:120-4.
2. Anand BK. Yoga and medical sciences. Indian J Physiol Pharmacol 1991;35:84-7.
3. Sevamurthy W, Nayer HS, Joseph NT. Physiological effects of yogic practice. NIMHANS J 1983;1:71-80.
4. Vijayalakshmi P, Madanmohan M, Bhavanani AB, Patil A, Babu K. Modulation of stress induced by isometric handgrip test in hypertensive patients following yogic relaxation training. Indian J Physiol Pharmacol 2004;48:59-64.
5. Bhargava R, Gogate MG, Mascarenhas JF. Autonomic responses to breath holding and its variations following pranayama. Indian J Physiol Pharmacol 1988;32:257-64.
6. Gopal KS, Bhatnagar OP, Subramanian N, Nishith SD. Effect of yogasanas and pranayamas on blood pressure, pulse rate and some respiratory functions. Indian J Physiol Pharmacol 1973;17:273-6.
7. Raghuraj P, Ramakrishnan AG, Nagendra HR, Telles S. Effect of two selected yogic breathing techniques of heart rate variability. Indian J Physiol Pharmacol 1998;42:467-72.
8. Udupa KN, Singh RH. The scientific basis of yoga. JAMA 1972;220:1365.
9. Madanmohan M, Thombre DP, Balakumar B, Nambinarayanan TK, Thakur S, Krishnamurthy N, *et al.* Effect of yoga training on reaction time, respiratory endurance and muscle strength. Indian J Physiol Pharmacol 1992;36:229-33.
10. Deepak DP. Impact of short term training of anulom vilom pranayama on blood pressure and pulse rate in healthy volunteers. Int J Res Ayurveda Pharm 2013;4:253-6.
11. Upadhyay Dhungel K, Malhotra V, Sarkar D, Prajapati R. Effect of alternate nostril breathing exercise on cardiorespiratory functions. Nepal Med Coll J 2008;10:25-7.
12. Rastogi D, Saxena J, Anumela B, Mishra SB. Effects of pranayama on pulmonary function tests and breath holding time in male medical students. IJCH 2007;19910:39-41.
13. Joshi LN. Effect of deep breathing on respiratory parameters in healthy young individuals. J Postgrad Med 1998;44:67-9.
14. Makwana K, Khirwadkar N, Gupta HC. Effect of short term yoga practice on ventilatory function tests. Indian J Physiol Pharmacol 1988;32:202-8.

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