Effect of Yogic Controlled Breathing Exercises on Cardiovascular Parameters

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Abstract

The study was conducted to evaluate the effect of pranayam (yogic controlled breathing exercises) & meditation on cardiovascular parameters in 1st year male medical students of GSVM Medical College, Kanpur. All the 60 students selected for the study were randomized into 3 groups of 20 students each: Group I–Anulom Vilom Pranayam, Group II–Kapalbhati Pranayam, Group III–Bhastrika Pranayam. Blood pressure (systolic & diastolic) & pulse rate of all the students in each group were recorded at baseline & after 3 months of training. Training programme included 10 min. meditation in padmasana followed by 5 min. practice of pranayam twice a day for 3 months. A significant ($p < .001$) decrease in pulse rate, systolic BP and diastolic BP were observed after 3 months of training.. The relaxation & flexibility induced by meditation & pranayam help to stabilize the autonomic nervous system with a tendency towards parasympathetic dominance. So the meditation & pranayam should be encouraged to improve the performance of cardiovascular system. Controlled pranayam breathing is also effective in improving the strength & tone of muscles involved in respiration.

Keywords: *Pranayam, Blood Pressure, Pulse Rate, Meditation*

Introduction

Modern man is the victim of stress and stress related disorders which threaten to disrupt his life totally. Being holistic in its approach, yoga offers the best way out of this 'whirlpool of stress'

Pranayama is a scientific method, being a part of "yoga" as preached and propounded by accomplished yogis of yore and systematized by Maharashi Patanjali

The state of the mind and that of the body are intimately related. If the mind is relaxed, the muscles in the body will also be relaxed. Stress produces a state of physical and mental tension. Yoga developed thousands of years ago, is recognized as a form of mind body medicine. In yoga physical postures and breathing exercises improve muscle strength, flexibility, blood circulation and oxygen uptake as well as hormone functions. In addition relaxation induced by meditation helps to stabilize the autonomic nervous system with a tendency towards parasympathetic dominance. Physiologic benefits which follow help yoga practitioners become more resilient to stressful conditions and reduce a variety of important risk factors for various diseases, especially cardiorespiratory diseases. (Parshad O, 2004).[1]

According to Bharshankar R (2003)[2] environmental conditions and variety of behavioral factors such as stress, anxiety, affective and attitudinal disposition of the individuals influence the cardiovascular responses. Yogic exercises involve physical, mental and spiritual task in a comprehensive manner. It brings about the behavioral changes. Yoga in long duration affects hypothalamus and brings about decrease in the Systolic BP and Diastolic BP through its influence on vasomotor

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centre, which leads to reduction in sympathetic tone and peripheral resistance.

The present study was undertaken to investigate the effects of training (for 3 months) in meditation and different types of pranayams viz. Anulomvilom, Kapalbhati and Bhastrika on cardiovascular parameters

Materials and Method

The present study was conducted on 60 1st year male MBBS students of GSVM Medical College, Kanpur. Students with a history of active sports training, previous experience of yoga training, major medical illness in the past such as tuberculosis, hypertension, diabetes mellitus, bronchial asthma etc., were excluded from the study. Written consent was obtained and formalities of ethical committee were completed.

Student were randomized into the following 3 groups of 20 students each.

Group I: Meditation in Padmasana then Anulom-vilom Pranayam.

Group II: Meditation in Padmasana then Kapalbhati Pranayam.

Group III: Meditation in Padmasana then Bhastrika Pranayam.

The following parameters were recorded:

Anthropometric Measurements: Height, Weight, Body Mass Index.

Cardiovascular Parameters:

Pulse rate (per minute)

Systolic Blood pressure (mmHg)

Diastolic Blood pressure (mmHg)

BP was recorded using conventional mercury type of sphygmomanometer.

Trainging Programme:

The subjects of group I were trained in Anulom Vilom Pranayam: Deep inhalation through left nostril, then deep exhalation through right nostril, then again inhalation through right nostril and exhalation through left. Subjects were instructed to repeat mentally the mantra 'AUM' while practicing this pranayam.

The subject of group II were taught Kapalbhati: Normal tidal inspiration through both the nostril and then forceful expiration through both the nostril. While doing this pranayam subjects were instructed to think that while exhaling they are throwing out of their body all the negative and injurious elements with mental aberrations like anger, greed, self ego attachment etc. along with the air exhaled. Likewise while breathing in they were asked to think that they are taking into their body positive thoughts like compassion, love, detachment etc. and filling body and mind with them.

The subjects of group III were trained in Bhastrika Pranayam: Forceful inspiration with both the nostrils and then forceful expiration with both the nostrils. Subjects were asked to think at the time of breathing in, that the cosmic energy which enlivens the entire universe and which is the cause of happiness of mankind, enters their body with every inhalation and they experienced that they have become an integral part of that energy.

Subjects were instructed to practice meditation in Padmasana for 10 min. and then Pranayam for 5 min. twice daily for 3 months.

Statistical Analysis: Observations were tabulated and analysed using Students't' test.' p value of 0.05 was taken as cut off for the measure of significance.

Observations and Results

All subjects were male between 17-27 yrs of age with an average of 21.50+ 2.82 yrs in group I, 21.30+1.71 yrs in group II and 21.25+1.71 yrs in group III.

Table 1: Group I: Pre and Post Yogic Exercise Values (Anulom Vilom Pranayam)

Sl.No.	Parameters	Pre	Post	'p' value
1	Weight	57.7±7.39	57.7±7.39	-
2	BMI	20.32±2.46	20.32±2.46	-
3	Pulse rate	79.3±4.26	73.3±3.96	<0.001
4	Systolic BP	128.4±3.01	124.6±3.61	<0.001
5	Diastolic BP	76±5.91	72.1±5.40	<0.001

Table 2: Group II: Pre and Post Yogic Exercise Values (Kapal Bhati Pranayam)

Sl.No.	Parameters	Pre	Post	'p' value
1	Weight	61.55±7.85	61.55±7.85	-
2	BMI	22.01±1.98	22.01±1.98	-
3	Pulse rate	76.6±4.81	70.3±3.26	<0.001
4	Systolic BP	128.4±4.03	124.6±3.89	<0.001
5	Diastolic BP	75.6±4.66	71.5±3.99	<0.001

Table 3: Group III: Pre and Post Yogic Exercise Values (Bhastrika Pranayam)

Sl. No.	Parameters	Pre	Post	'p' value
1.	Weight	57.10±8.91	57.10±8.91	-
2.	BMI	20.47±3.00	20.47±3.00	-
3.	Pulse rate	77.2±3.91	71.3±3.79	<0.001
4.	Systolic BP	129.7±3.79	125.1±4.37	<0.001
5.	Diastolic BP	75.5±4.89	70.6±3.73	<0.001

A Comparison was made between Pre and Post values.

Physical Assessment – There was no effect of Yoga on weight and BMI.

Cardiovascular Assessment:

Pulse Rate: A highly significant decrease [P<0.001] in PR was observed in all three groups after 3 months of training in pranayam.

BP: A highly significant decrease [P<0.001] in Systolic BP and Diastolic BP was observed in all three groups after 3 months of training in pranayam.

Discussion

Our results are similar to most of the earlier studies done on yoga.

Srivastava RD et al (2005)[3] studied the effect of alternate nostril breathing on cardiorespiratory and autonomic functions in healthy young volunteers and observed decrease in RR, HR, SP, DP and increase in PEFR. They explained decrease in HR in the following way –

The individuals differ in relation to their parasympathetic (Vagal) tone and sympathetic activity levels as evident from great variation in resting HR from 60 -90/min. (Ganong WF 2001)[4]. The HR responses will therefore depend on the algebraic summation of sympathetic and parasympathetic activation further modulated by hypocapnoea and lung stretch receptor responses (Kontos HAet al, 1965)[5]. Both tachycardia (Hayashi KD, 1969)[6] and bradycardia (Glick G et al, 1969)[7] have been recorded following pulmoflation.

According to Bhargava R et al (1988)[8] pranayam breathing exercise increases vagal tone and decreases sympathetic discharges and our findings are also showing the same effects.

SP is determined by venous return and sympathetic and parasympathetic drive. Lung inflation has been known to decrease systemic vascular resistance. (Hainsworth R, 1974)[9] This response is initiated by pulmonary stretch receptor which bring about withdrawal of sympathetic tone in blood vessels leading to wide spread vasodilatation thus decreasing peripheral resistance.

Noradrenergic fibres end on vessels in all part of the body. The noradrenergic fibres are vasoconstrictor in function. In addition to their vasoconstrictor innervation, the resistance vessels of the skeletal muscles are innervated by vasodilator fibres which although they travel with the sympathetic nerves are cholinergic (the sympathetic vasodilator system). There is no tonic discharge in the vasodilator fibres but the vasoconstrictor fibres to most vascular beds have some tonic activity.

So on sympathectomy the blood vessels dilate. In most tissues vasodilatation is produced by decreasing the rate of tonic discharge in the vasoconstrictor nerve, although in skeletal muscles it can also be produced by activating the sympathetic vasodilator system (Ganong WF, 2005)[10].

Wide spread vasodilatation leads to less venous return and SP falls. Vasodilatation also decreases total peripheral resistance resulting in decrease in DP.

In the present study subjects were instructed to think that while exhaling they are throwing out of their body the entire negative and injurious element. Likewise while breathing in they were instructed to think that they are taking into their body positive thoughts and filling their body and mind with them. So, peace and stability of mind is secured. Such a practice affects hypothalamus and brings about decrease in the systolic and diastolic BP through its influence on the vasomotor centre, which leads to reduction in sympathetic tone and peripheral resistance as was observed by Khanam AA et al (1996)[11].

Vijayalakshmi P et al (2004)[12] studied on hypertensive patients and reported decrease in BP and HR after yoga training (technique was not specified).

Jain N et al (2005)[13] reported decrease in PR, SP and DP after training in right nostril breathing and left nostril breathing in healthy student volunteers and suggested that there occurs a general parasympathetic dominance by both these breathing pattern.

Mc Caffrey R et al (2005) [14] reported decrease in BP and HR in hypertensive patients following yoga program (type of yoga not specified).

Conclusion

All the three pranayams (Anulomvilom, bhastrika & kapalbhati) seem to be equally effective in improving the efficiency of cardiovascular system in healthy individuals.

The students also gave the feedback of becoming more energetic both physically and mentally. They became more calm, peaceful and stable in handling stressful situations.

Environmental conditions and variety of behavioral factors such as stress, anxiety and affective disposition of the individuals influence the cardiovascular response. Regular practice of meditation and pranayam with positive thoughts has calming effects on mind. This decreases the sympathetic tone. In case of physical exercise or during the competitive sports events the mere thought of exercise causes increase in sympathetic tone, so that changes in PR & BP can be demonstrated before starting physical exercise.

Hence, practice of meditation and pranayam should be introduced in the daily activities of the students who face stress during their study periods especially during exams. It is also recommended to be introduced as a part of regular training program of professional sports player. It would be extremely helpful in easing out their stress before and during the .event and improve their overall performance.

So the results & their explanations justify that the regular practice of meditation & pranayam is beneficial for cardiovascular system in healthy individuals and retards age related cardiovascular pathological process.

The real meaning of Pranayama as expounded in the Yoga Shastras is control of the life force, prana that governs the heart, sensory motor nerves, breathing and all other functions of body. All body processes can be brought under our conscious direction if we learn the art of controlling the life force

Further studies are required to explore the potency of ancient Indian science and art of meditation and yoga for the overall welfare of human beings.

Conflict of Interest: Nil

Source of funding: Self

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