

## Effect of Meditation on Cardiovascular and Respiratory functions

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### Abstract

Stress and anxiety being the major contributors of morbidity, leads to many chronic diseases and is known to invariably decrease the quality of life and even life span. Autonomic Nervous System (ANS), a part of the peripheral nervous system that controls the visceral system, functioning largely under the level of consciousness, capable of being influenced by the psychological factors and influences the physiological processes happening in the body. Meditation practices mainly change functions through autonomous nervous systems, which links brain and body. Meditation is a technique of yoga practiced in India over thousands of years. Long term yogic practices have shown improvement in cardiovascular functions. Meditation is a concentrative type of meditation involving focusing of attention on breath. This was a cross sectional, comparative study. 50 subjects between 18-45 years were included for the study. 50 meditators and 50 non-meditators (control group). The meditators used to practice meditation every morning for at least 30 minutes, for 1 or more years. There was decrease in Heart rate, SBP and DBP, MAP, RR in meditation group. This difference between 2 groups is statistically highly significant ( $p < 0.001$ ).

**Key words :** Meditation, Blood Pressure, Heart Rate, Respiratory Rate.

### Introduction

The most common yoga practice today are different bodily postures (Asanas) and voluntarily regulated breathing (Pranayamas). [1] That aims at focusing the mind, achieve relaxation and increase wellness [2] Yoga has been reported to provide potential health benefits in anxiety, stress reduction and general well-being. [3-5] Bjorntop's hypothesis [6] postulates that psychosocial stress triggers the onset of visceral obesity, insulin resistance, and dyslipidemia. Globalization and technological innovations are bringing about new challenges to the study of mental health and stress management. It is important scientifically, practically, and financially to promote stress management programs for the

betterment of people.[7,8] The English meditation is derived from the Latin 'meditatio' from a verb 'meditari' meaning "to think, contemplate, devise, ponder". Meditation is a practice where one focuses his or her mind on a particular object, thought or activity to achieve emotionally calm state[9]. Meditation is a complex cognitive task. It is more than relaxation, concentration, or posturing. It is a state of altered consciousness with neurological manifestations, according to some neuroscientists. Goleman[10] stated that in every meditation system, the meditator needs to focus his attention, whether through concentration or mindfulness. Meditation has a number of positive effects on the physiology of the human body.[11] Meditative interventions have been found to be beneficial in treating various clinical conditions such as hypertension,[12] cardiovascular disorders,[13] pain syndromes, musculoskeletal diseases[14] and respiratory disorders such as asthma and chronic obstructive pulmonary disease;[15] dermatological problems such as psoriasis and allergies;[16] and immunological disorders.[17,18] Affirmations or autosuggestions are positive self-talk or talking to yourself in a positive manner. Continually making positive statements. Meditation practices mainly change body functions through Autonomic nervous system, which links brain and body. It is achieved by exercising the techniques like meditation, yoga, pranayam. Yoga is best lifestyle modification which aims to attain the unity of mind body and spirit.[19] Concentrative meditation focuses the attention on the breath. Breath is a dynamic bridge between the body and mind.[20] The present study design aims to find the effect of meditation on cardiac and respiratory functions as reflected in heart rate, respiratory rate, blood pressure. Long term meditation has been shown to affect the autonomic activity significantly creating a balance in favor of parasympathetic nervous system. Many studies have been conducted in past regarding effect of meditation on autonomic functions.

## **Material and Methods**

This was a cross sectional, comparative study. 50 subjects between 18-45 years were included for the study. The subjects belonged to two groups: 50 meditators and 50 non-meditators (control group). The meditators used to practice meditation every morning for at least 30 minutes, for 1 or more years at local meditation centre under supervision of meditation guru. Non-meditators included subjects who had never done any kind of meditation. All subjects included in the study were healthy and matched for age, gender.

### **Inclusion criteria:**

- Age 18-45 years
- Has given written consent.
- Have no acute or chronic illness.
- Are not on any medication at time of study.

### **Exclusion criteria:**

- Individuals with Known cardiorespiratory diseases
- Known allergic diathesis
- History of alcohol consumption, cigarette smoking.
- Known psychological disorders

Recording of physiological parameters.

**Heart rate:** Before the test was performed subjects were allowed to lie down for 5 minutes in supine position on couch. ECG leads were connected from subjects to the polygraph (8 channel) for recording of lead ECG (using leads provided in the polyrite connected to hardware). The basal lying down heart rate of subjects was noted. This was repeated 3 times at interval of 5 minutes and mean of 3 readings was taken.

**Blood pressure:** It was recorded using mercuric sphygmomanometer provided along with polyrite connected to hardware, which converts analogue signal to digital and records same in digital form. Pulse pressure = systolic – diastolic blood pressure. Mean arterial pressure = diastolic + 1/3 pulse pressure were calculated for each reading. 3 blood pressure reading with 1 minute interval were performed and lowest of them was expressed as resting SBP, DBP, MAP, PP (mm of Hg).

**Respiratory rate:** RR was counted as breaths per minute.

**Statistical Analysis:** Clinical parameters were compared in study and control group by performing paired t test. SPSS software is used for data analysis. The interpretation of P value are as follow P > 0.05 - not significant P < 0.01 - significant P < 0.001 - highly significant.

## Results

**Table 1: Age , height, weight in Subjects**

	<b>Control group n=50 Mean±SD</b>	<b>Meditation group n=50 Mean±SD</b>	<b>p</b>
Age (years)	31.64±7.4	33.42±6.2	>0.05
Height (cm)	156.4±3.1	152.28±4.2	>0.05
Weight (kg)	64.24±5.2	61.36±6.8	>0.05

p > 0.05 not significant

**Table 2: Cardiovascular parameters in Subjects**

<b>Parameters</b>	<b>Control n=50 Mean±SD</b>	<b>Meditation group n=50 Mean±SD</b>	<b>p</b>
Heart Rate (bpm)	80.46±3.4	72.6±2.2	<0.001
Systolic BP (mmHg)	124.8±5.1	114.8±4.2	<0.001
Diastolic BP (mmHg)	82.48±2.2	74.6±4.2	<0.001
MAP (mmHg)	91.48±6.2	86.9±3.8	<0.001
Respiratory Rate	19.6±2.1	15.82±2.4	<0.001

p < 0.001 Highly significant

**Figure 1 : Systolic and Diastolic Blood Pressure in Control and Meditation Group.**

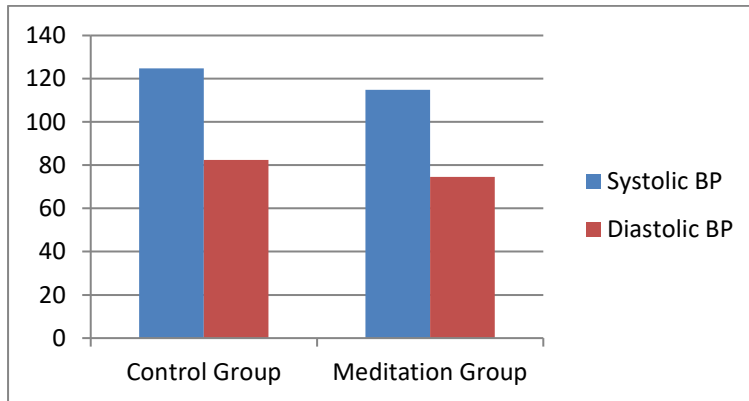


Table 2 shows heart rate in study and control groups . HR decreased in meditation group . The difference in HR was statistically highly significant in between 2 groups( $p < 0.001$ ). Respiratory rate is decreased in meditation group . This difference between 2 groups is statistically highly significant( $p < 0.001$ ). Systolic and Diastolic blood pressure: There was decrease in SBP and DBP in meditation group. Mean arterial pressure decreased in meditation group . This difference between 2 groups is statistically highly significant( $p < 0.001$ ).

## Discussion

It has been established that physiological effects of meditation are mediated through autonomic nervous system. Our results show that the mean values of resting cardiovascular parameters like heart rate, systolic blood pressure, diastolic blood pressure were statistically significantly less in meditators than non-meditators. Our results are similar to results by Desh Deepak et al[21]. Regular long term meditation increases parasympathetic dominance resulting in increased vagal tone in meditators resulting in physiological bradycardia. Several studies by Cauthen and Pyrmk[22], Cuthbert, Kristeller, Simons[23] concluded that heart rate decreases by meditation. All these changes in meditators increases cardiac reserve in meditators compared to non-meditators. Jyotsana. R. Bharshankar[24], in their study also concluded that values for resting HR, SBP and DBP were significantly lower in Raja-yoga meditators. Stress is a condition where expectations are genetically programmed, established by prior learning or deduced from circumstances which do not match the current or anticipated perceptions of the internal or external environment.[25] Stress and anxiety, being the major contributors of morbidity, leads to many chronic diseases and is known to invariably decrease the quality of life and even life span. Perseverative cognition the series of processes mediating the prolongation of active cognitive representations thereby extending their physiological concomitants even after their removal, which can result in chronic over activity or under activity of allostatic systems, including the HPA axis, autonomic nervous system, metabolic[26] and immune systems carrying a potential role towards morbidity.[27] Socio-economic factors and industrialization along with pollution is a known factor towards causing stress and altered emotions, which carry a definite and well established role in precipitating cardio-vascular events.[28] Also, the worry intensity is known to prolong stress related physiologic activity and is proportionate to daily somatic complaints.[29] Non-pharmacological therapies play a major role to relieve stress and anxiety of

which yoga takes first place compared to pharmacological treatment.[30] Yoga is an ancient Indian science well known presently all over the world for its potential therapeutic benefits both physical and mental, which commonly includes the practice of physical postures (Asanas), breathing practices (Pranayama) and meditation (Dhyana) practices being practiced in India since thousands of years to attain functional harmony between body and mind. Having a vast evidence of the beneficial role of immediate and short term yoga practices over autonomic functions, anxiety, depression, hypertension and other morbidities of stress, a necessity to understand the regulatory role of yoga in long term practitioners is warranted. This autonomic modulation in yoga is mediated through modification of breathing which triggers central and autonomic mechanism and hemodynamic adjustments.[31] Meditation by modifying state of anxiety reduces stress induced sympathetic over activity, thereby decreasing arterial tone and peripheral resistance resulting in lowering of diastolic blood pressure and heart rate.[32] Meditation slowed respiration to almost 5 breaths/minute. In present study significant reduction in respiratory rate can be explained on basis of altered mental state, reduction in sympathetic activity or inhibition of neural activity. By practicing OM meditation for few weeks, the bulbopontine complex is adjusted to a new pattern of breathing which is slower than basal rhythm causing decrease in respiratory rate.[33] In our Study HR decreased in meditation group. The difference in HR was statistically highly significant in between 2 groups( $p<0.001$ ). Respiratory rate is decreased in meditation group. This difference between 2 groups is statistically highly significant( $p<0.001$ ). Systolic and Diastolic blood pressure: There was decrease in SBP and DBP in meditation group. Mean arterial pressure decreased in meditation group. This difference between 2 groups is statistically highly significant( $p<0.001$ ). Decrease in heart rate and diastolic BP was observed which indicates a shift in balancing components of autonomic nervous system towards parasympathetic state, reduced stress induced sympathetic overactivity resulting in a lowering of diastolic blood pressure and heart rate. It makes subject undergo relaxation and thereby decreases arterial tone and peripheral resistance. Some research shows an elevated Beta endorphin level in person doing regular meditation that may be responsible for relaxed and calm state of regular meditation and also boost immunity.[34] Overall, regular and long-term practice of yoga could be an ideal way for lifestyle modification, and family care physicians can advise adapting any kind of yoga practices on long-term basis for the effective management of lifestyle diseases in the future for high-risk patients. In addition, it can be recommended for the patient who seeks supports for psychosomatic disorders for an integrative approach. The affirmative findings of the yoga practice towards the betterment of physical and mental health make yoga complementary in medical practice for the prevention of lifestyle diseases.

## Conclusion

Regular meditation increases parasympathetic dominance in our body. Meditation helps to maintain normal homeostasis in our body. Hence, meditation should be practiced daily for overall well-being of the body. We concluded that regular practice of meditation for 30 minutes would be helpful in increasing cardiorespiratory efficiency. The results of study demonstrates reduction in blood pressure, heart rate indicating parasympathetic nervous system dominance after meditation. This would help in preventing or treating various psychosomatic and other respiratory diseases

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