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Original article

26 COMPARATIVE STUDY OF EFFECT OF MEDITATION ON RESTING CARDIOVASCULAR PARAMETERS IN HEALTHY MEDITATORS AND NON-MEDITATORS.

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Abstract:

Background: Meditation has been practiced all over the world, to increase calmness and physical relaxation, to improve psychological balance, to cope with illness, or to enhance overall health and well-being. Meditation is a practice where one focuses his or her mind on a particular object, thought or activity to achieve a mentally clear and emotionally calm state. It has been shown by previous studies that meditation influences autonomic

nervous system (ANS). ANS plays a vital role in regulation of various cardiovascular parameters like pulse and blood pressure. The present study was designed to observe the effect of meditation, on cardiovascular parameters like pulse and blood pressure. **Aims and objectives:** To study the effect of meditation on resting pulse and blood pressure in normal subjects. **Methodology:** Permission of institutional ethical committee was taken before study. Subjects included 100 healthy meditators and 100 healthy non meditators. Resting cardiovascular parameters like pulse and blood pressure was measured in both groups and compared. The data was analysed using demo version of SPSS 20.0 to obtain the arithmetic mean for age, height, weight, BMI, systolic and diastolic BP, heart rate. **Results:** 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. **Conclusion:** Regular meditation increases parasympathetic dominance in our body and reduces the sympathetic drive. This result in better cardiac reserve in meditators compared to non-meditators. Also, regular meditation helps meditators to combat anxiety and stress effectively.

Key words: meditation, pulse, blood pressure.

Introduction:

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 a mentally clear and emotionally calm state (1). Meditation refers to “A family of self-regulation practices that focus on training attention and awareness in order to bring mental processes under greater voluntary control and thereby foster general mental well-being and

development and/or specific capacities such as calm, clarity, and concentration" Shapiro and Walsh (2). Goleman stated that "the need for the meditator to retrain his attention, whether through concentration or mindfulness, is the single invariant ingredient in... every meditation system" (3). Meditation techniques have also been used for counselling and psychotherapy, as it has been proved that it reduces stress and anxiety. Meditation produces mental and physical relaxation. From physiological point of view, meditation can induce an altered state of consciousness, corresponding to altered neuro-physiologic states. Meditation has been practiced all over the world, to increase calmness and physical relaxation, to improve psychological balance, to cope with illness, or to enhance overall health and well-being.

There are several techniques of meditation. Basically, all methods & practices of meditation come from following basic techniques: One can focus on breathing,one can focus on an object (e.g. light), focus on a sound,focus on a thought, focus on sensory perceptions. Based on these techniques, different methods of meditation have been described like Patanjali Rajyoga, Anapan Sati, Smriti Upasthan, Vipashyana, Prekshadhyan, Jaindhyan, Transcendental. Amongst others are Mantra dhyan, Zen meditation, Yoganindra, Nyas, Dynamic meditation, Sahajdhyan, Tratak, Kayotsarga, Atitdhyana, Bhavidhyana, Swapnadhyana, Tahata, Spanddhyan etc. Real meditation can restore physical, mental & emotional health. It can be helpful in controlling several lifestyle disorders, psychosomatic disorders including high BP, coronary artery disease, diabetes, asthma, rheumatism etc. In this stressful life, it is a powerful weapon for acute as well as chronic stress. Meditation produces a specific positive physiological response pattern in our body. Meditation has effects on metabolic, autonomic, endocrine,

neurological & psychological systems of the body. Some studies have proved that mindfulness practices are beneficial for the brain's self-regulation and control by increasing activity in the anterior cingulate cortex. Meditation is associated with bringing relief in depression and anxiety, and guiding us towards happiness, relaxation, and emotional balance (4). Various studies have shown that mindfulness has resulted in increased antibody titers to the influenza vaccine (5).

Examination of brain waves suggest during meditation has shown that mental activity during meditation is wakeful and relaxed (6). Long term meditation has been shown to change brain anatomical structure like grey matter concentrations and the precuneus (7). Changes in gray matter improves learning and memory processes, emotion regulation, self-referential processing, and perspective taking in meditators. Several researches have shown that meditation serves as a neuro protective factor that slows age-related brain atrophy (8).

The autonomic nervous system is a part of nervous system which control subconsciously and regulates bodily functions such as the heart, digestion, blood vessels, respiratory rate, pupillary reflexes, urinary bladder and all internal viscera. The sympathetic nervous system is considered to be ‘fight or flight’ system, while the parasympathetic nervous system is considered the "rest and digest" system. ANS plays a vital role in regulation of various cardiovascular parameters like pulse and blood pressure. The present study was designed to observe the effect of meditation, on cardiovascular parameters like pulse and blood pressure.

Aims and objectives:

To study the effect of meditation on various cardiovascular parameters in normal healthy subjects.

Materials and Methods:

Permission of the institutional ethical committee was taken before the commencement of the study. Ours was a cross sectional, comparative study. 200 subjects between 18-45 years were included for the study. The subjects belonged to two groups: 100 meditators and 100 non-meditators. The meditators used to practice meditation every morning for at least 45 minutes, for 3 or more years at local meditation center 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. Exclusion criteria were smokers, on any medication, any known disease, those having any type of addiction. Before testing, the subjects were laid down or seated for about 30 minutes in a quiet room with neutral temperature and humidity. Written informed consent of all the participants was taken before the start of the study. Detailed clinical history, anthropometric measurement and examination of subjects was done.

Sample size was calculated using the formula for difference of means. The data was analysed using demo version of SPSS 20.0 to obtain the arithmetic mean for age, height, weight, BMI, systolic and diastolic BP, heart rate, Difference in the mean values was subjected to Mann-Whitney U test. Power of the study was 80% and significance level was set as $p<0.05$.

Results:

Table 1 shows anthropological characteristics of meditators and non-meditators.

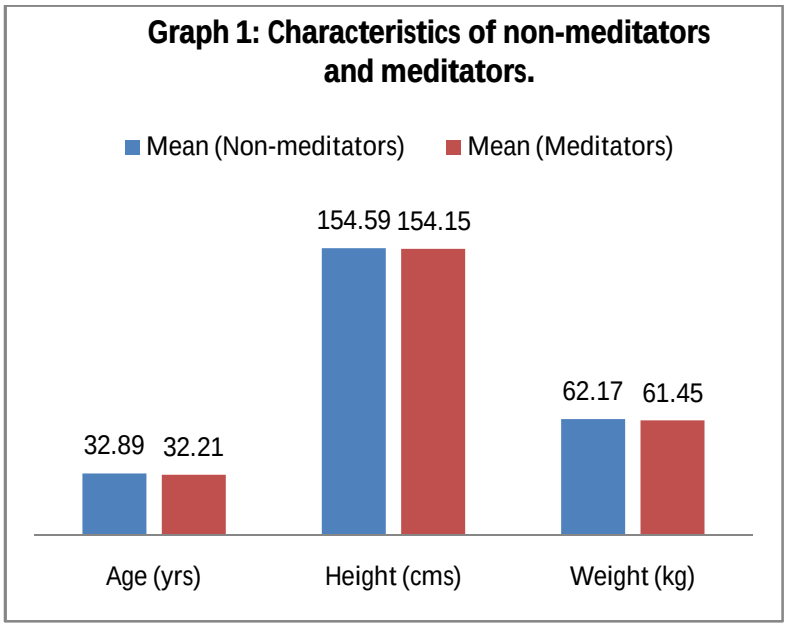
Table 1: Characteristics of non-meditators and meditators.

Anthropometric variables	Non-meditators n=100 Mean (SD)	Meditators n=100 Mean (SD)	p-value
Age	32.89 (6.28)	32.21 (5.71)	>0.05
Height (cms)	154.59 (2.74)	154.15 (3.67)	>0.05
Weight (kg)	62.17 (6.33)	61.45 (6.97)	>0.05

(p>0.05 Not significant)

* There was no statistical difference in mean values of age, height and weight as shown in Table 1.

Graph 1: Characteristics of non-meditators and meditators



* Table 2 shows results (mean and SD) of resting cardiovascular parameters inmeditators and non-meditators:

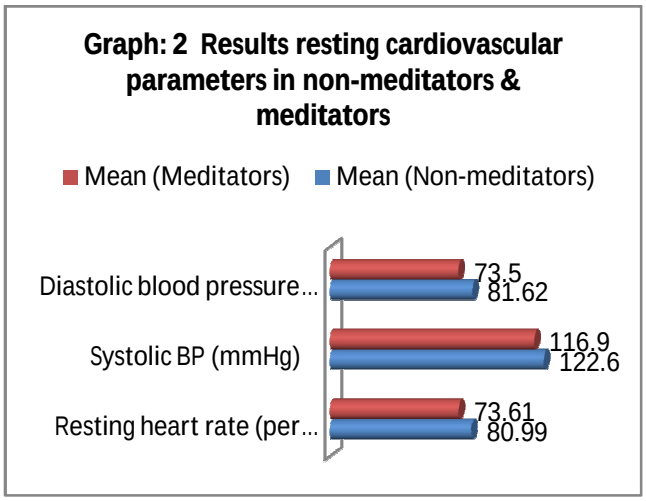
Table 2: Mean values of resting cardiovascular parameters in meditators and non-meditators.

Parameters	Non-meditators n=100 Mean (SD)	Meditators N=100 Mean (SD)	P-value
Resting heart rate (per minute)	80.99 (3.83)	73.61 (1.47)	$p < 0.01$
Systolic blood pressure (mmHg)	122.6 (5.07)	116.9 (4.92)	$p < 0.01$
Diastolic blood pressure (mmHg)	81.62 (2.17)	73.5 (4.77)	$p < 0.01$

($p < 0.01$ highly significant)

* 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 as shown in Table 2.

Graph 2: Mean values of resting cardiovascular parameters in meditators and non-meditators.



Discussion:

It has been established that physiological effects of meditation are mediated through autonomic nervous system (9, 10).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 (11). In their study they concluded that regular

practice of meditation initially blunted the sympathetic drive and later on developed control over sympathetic function of meditators. This resulted in decrease in heart rate and blood pressure. Also, regular meditation over periods of years increases parasympathetic dominance resulting in increased vagal tone in meditators resulting in physiological bradycardia. A study by Desh Deepak et all concluded that hat in a person practicing meditation initially basal parasympathetic tone is increased and this increase is greater in meditators of long term in comparison to those who have been practicing medication for a shorter term. Several studies by Cauthen and Pyrmk (12), Cuthburt, Kristeller, Simons (13), Hodes and Lang (14) concluded that heart rate reduces by meditation. However, English and Baker (15) concluded that transcendental meditation reduced blood pressure but did not affect heart rate. Our findings are also similar to other researchers (16, 17). Meditation reduces stress and anxiety in meditators leading to decreased stimulation of sympathetic nervous system resulting in decreased stimulation of sinoatrial node causing decrease in heart rate. Also less stimulation of sympathetic nervous system leads to vasodilatation resulting in decreased in diastolic blood pressure. Decreased force of contraction of heart results in decreased systolic blood pressure in meditators. All these changes in meditators increases cardiac reserve in meditators compared to non-meditators. Jyotsana. R. Bharshankar (18), in their study also concluded that values for resting HR, SBP and DBP were significantly lower in Raja-yoga meditators. This could be because dominance of parasympathetic over sympathetic system in meditators. Meditation reduces stress and anxiety in meditators leading to decreased stimulation of sympathetic nervous system. The results by Vempati RP suggest that sympathetic activity decreased after guided relaxation based on yoga, depending on

the baseline levels (19). A study by Desh Deepak et all concluded that in a person practicing meditation initially basal parasympathetic tone is increased and this increase is greater in meditators of long term in comparison to those who have been practicing medication for a shorter term. In a study (20), the autonomic and respiratory variables were studied in seven experienced meditators (with experience ranging from 5 to 20 years). Each subject was studied in two types of sessions--meditation (with a period of mental chanting of "OM") and control (with a period of non-targeted thinking). The meditators showed a statistically significant reduction in heart rate during meditation compared to the control period (paired 't' test). During both types of sessions there was a comparable increase in the cutaneous peripheral vascular resistance. This was interpreted as a sign of increased mental alertness, even while being physiologically relaxed (as shown by the reduced heart rate). It has been seen that regular meditation over years helps the body to experience high levels of stress with less sympathetic activation. In their study, Solberg et al (21) had concluded that male runners who meditated regularly by repetition of soothing sound had lower levels of lactic acid after exercise, due to blunting of sympathetic activity leading to parasympathetic dominance. Hence, body is able to relax more and perform better after performing physical activity before meditation. Regular deep relaxation normalized the function and improved the ability to cope by parasympathetic dominance. Out of sympathetic and parasympathetic, only one system is usually active at a particular time. Both systems exhibit reciprocal inhibition ie. When sympathetic nervous system is active, it inhibits parasympathetic nervous system and vice versa. During emergency or stressful situations, sympathetic nervous system is active. And during normal day to day activities, to promote balance and healing,

parasympathetic nervous system is usually more active. However, due to modern stressful lifestyle, sympathetic system is used more often leading to literal 'burning out' of body nutrients. Meditation blunts sympathetic nervous system leading to parasympathetic dominance, helping body to heal and replenish.

Conclusion:

From our study, it can be concluded that regular meditation increases parasympathetic dominance in our body and reduces the sympathetic drive. This result in better cardiac reserve in meditators compared to non-meditators. Also, regular meditation helps meditators to combat anxiety and stress effectively. Meditation helps to maintain normal homeostasis in our body. Hence, meditation should be practiced daily for overall well-being of the body.

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