

Role of Meditation in Prevention of Cardiovascular Diseases: An Analytical Study in Hyper-Reactors of Cold Pressor Test

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Abstract

Living a happy and healthy life on all planes is possible through the unified practice of yoga, pranayama's, exercise, and meditation (dhyana) especially when performed consciously and with awareness. Such mindful meditation when performed on regular basis it helps to relieve stress from body and mind. Hence we undertook the present study to observe the effects of regular Meditation on the hyper reactors of cold pressure test (CPT) to find out their future outcomes in improving the modernized stressful life.

After getting ethical approval to the study subjects willing to participate in the study were selected and after performing cold pressor test (CPT) 383 hyper reactors were considered for the guided meditation sessions for 3 month. The sessions were conducted for 10 min both in morning and evening. After completing the session successfully it was observed that nearly 241 (62.83%) previous hyper reactors were turned into hypo reactors. Hence we conclude that non pharmacological method like meditation should be encouraged to enhance significant improvements in cardiovascular parameters like systolic and diastolic BP in population having high risk of cardiovascular disease.

Keywords: Cold pressor test (CPT), hyper reactors, hypo reactors, meditation, cardiovascular risk.

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 stresses'. Living a happy and healthy life on all planes is possible through the unified practice of yoga, pranayama's, exercise, and meditation (dhyana) especially when performed consciously and with awareness.¹

Meditation and exercise help us to develop strength, flexibility, will power, good health, and stability. Meditation helps us to control our emotions & stabilize the mind which are linked to breathing. Rhythmic breathing is ideal for controlling stress and overcoming emotional

hang-ups. Meditation is nothing but a spiritual tradition that is the inborn knowledge of close connection between mind and the body, which may possibly be achieved by the regular meditation sessions.²

Emotional stress causes excess of adrenaline secretion from adrenal medulla leading to tachycardia, high blood pressure etc. Later it was found that all these manifestations occur not only from adrenaline secretion but also from over activity of the sympathetic nervous system which liberates nor-adrenaline at its nerve endings.³

Such constantly increasing emotional stresses and changes in physiological specification of hormones causes increasing threat for cardiovascular diseases impairing the normal life of an individual. To find out these future threats autonomic function testing could be the best investigation emphasizing on impending outcomes.⁴

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Hines & Brown devised a method to test the reactivity of the body to cold stress. They observed the effect of pain caused cold stress in the form of rise in blood pressure and on this basis subjects could be classified as hypo-reactors or hyper-reactors. The hyper-reactors to

cold stress are likely to develop cardiac disorders later on in any phase of life. These hyper-reactive subjects should be properly dealt with to lower the incidence of such disorders.⁵

Hence we undertook the present study to observe the effects of regular Meditation on the hyper reactors of cold pressure test (CPT) to find out their future outcomes in improving the modernized stressful life.

Material and Method

The present study was carried out in Department of Physiology Gandhi Medical College, Bhopal. (M. P.) in collaboration with Brahmakumari center for yoga and Meditation, Bhopal. A sample size of 383 participants was calculated using SampSize online stats calculator with prevalence of hypertension in Bhopal city to 53.3%,⁶ confidence interval of 95% and precision to be 5 %.⁷

Young adults from Bhopal city aging 18-30 years participated in the study. After taking institutional ethics approval written and informed consent was taken from the participants. Then baseline parameters like Height, weight, systolic blood pressure (SBP), diastolic blood pressure (DBP), systemic blood pressure (BP) and heart rate (HR) was taken. For measuring BP traditional mercury sphygmomanometer was used and BP was recorded by both palpation and auscultation method by a two different investigators to reduce chance of errors.

Then cold pressor test was performed on the participants (details of which given below) and the hyper-reactors of CPT were separated for further study. On the selected hyper-reactors we trained them to perform mindful meditation for 10 minutes daily in morning session from 6 a. m. to 7 a. m. and in evening session from 6.30 p. m. to 7.30 p. m. The scientific training for mindful meditation was given by trained professional trainers at Brahmakumari center for Raj yoga and Meditation, Bhopal.

This training we implemented for a minimum of three months before taking the second session of recording SBP, DBP, BP and HR. The cold pressor test we performed was as follows:

Cold Pressor Test⁸: The reactivity of all the subjects to cold stress was studied by the cold pressor test of Hines & Brown. The technique is as follows:

The subject is allowed to rest in supine position in a quiet room with maintained temperature from 27 to 30 degree centigrade for 20-30 minutes. Readings of blood pressure were taken until basal level had been approximated.

With the subject still supine, and with the cuff of the sphygmomanometer on one arm, the opposite hand is immersed in ice water (2-4°C), to a point just above the wrist. With the hand still in water, readings of the blood pressure were taken at the end of 60 seconds. The hand is removed from ice water soon as the readings had been made and then the readings were taken every two minutes until the blood pressure returned to its previous basal level. Subject were allowed to remove their hands any point time if they feel unbearable pain as per convenience.

On the basis of observations, the subjects were divided into two groups depending on their responses to cold stress:

Hyper-reactors: Those subjects in whom the systolic blood pressure raised more than 20 mm Hg and/or diastolic blood pressure raised more than 15 mm Hg.

Hypo-reactors: Those subjects in whom the systolic blood pressure didn't exceed 20 mm Hg and/or diastolic blood pressure more than 15 mmHg.

In present study we considered hyper-reactors only as they are supposed to be the victims of hypertension and mortal cardiac vascular diseases in future affecting the disability adjusted life years (DALY).

Each subject underwent a detailed history and clinical examination with the following inclusion and exclusion criteria.

Inclusion Criteria:

1. Healthy, nonsmoker, with no cardiorespiratory disorders.
2. Subjects not doing any type of physical exercise.

Exclusion Criteria:

- I. Subjects who were taking other physical activity like gym, athletics etc.
- II. Subjects who were smokers, alcoholic, with respiratory disorders, jaundice, diabetes or any other disease related with cardiorespiratory system.

The main rules and regulations pertaining to meditation are balance of common sense with regard to inner and outer thinking and living. We followed the following general rules

- **Breathing:** subjects were made aware of nostrils throughout the technique. While inhaling the nostrils should dilate or expand outwards and while exhaling, they should relax back to their normal position.
- **Time of Practice:** we chose early morning timings from 6 a. m. to 7 a. m. as the best time to practice Meditation when the body is fresh and the mind has very few impressions. Another good time that we considered was just after sunset in evening time as 6.30 p. m. to 7.30 p. m.
- **Place of practice:** Preferred place of practice was quiet, clean and pleasant room with good ventilation but without draught. Practice in draught or wind, in air-condition, in direct sun-light was avoided.
- **Sitting Position:** Subjects were instructed to sit in a comfortable, sustainable meditation posture so as to enable the efficient breathing and body steadiness during the practice.
- **Bathing:** Instructions were given to take a bath or shower before commencing the practice or at least wash the hands, face and feet. Bath for at least half an hour was avoided after the practice to allow the body temp to normalize.
- **No Smoking:** all the subjects were given strict instructions to not to smoke tobacco or cannabis.

Method of Meditation:

The following are a few easy tips to remember while practicing Meditation: it in a comfortable posture with an erect spine, preferably in a specific yoga posture such as the-padmasana or the Lotus posture.

- Energize the breath through pranayama.
- Hold visualization for a few minutes to clear the sensory field and focus the mind internally. This may relate to peaceful colors, geometric designs (yantra), natural images or that of a deity or guru.
- Repeat an affirmation or prayer to increase positive thought power.

- Repeat a mantra such as ‘Aum’ or ‘M’ to still the mind.
- Silently observe the mind and let it empty itself out.
- Depending on one’s natural temperament, it would help to try and establish contact with either *Godor* a Higher Consciousness through the natural movement of one’s heart.

Such training was implemented over the hyper-reactors which we selected from a total population of 689 people visiting the Brahmakumari ashram out of which 383 hyper reactors willing to join the study were selected.

Results

Overall 689 Meditators were visiting the Mediation center out which 260 subjects were either hypo reactors or showing less fluctuations in BP than required to label them as hyper reactors. 46 subjects though were found hyper reactors denied to participate in the study. Hence a total of 383 subjects who were hyper reactors were considered for the study.

In the present study after performing the CP; hyper reactors were selected for the study and their demographic data was recorded which is tabulated in Table. 1 as:

Table. 1: Demographic data amongst the hyper-reactors of cold pressor test (CPT).

Sr. No	Gender	Number of subjects	Age	Height	Weight
1.	Male	264	26.4± 3.2	156±5.2	70 ± 8.8
2.	Female	119	25.8 ± 2.9	149 ± 4.8	61 ± 7.3

As the hyper reactors were showing no statistical significance ($p > 0.05$) amongst gender distribution, height, weight and age hence the parameters recorded in these before and after the meditation were comparable.

After performing the CPT basal values of blood pressure were recorded in the hyper-reactors. It has demarcated that out of total 383 hyper-reactors nearly 244 were systolic hyper actors and 105 subjects were diastolic hyper reactors while 64 subjects were both systolic as well as diastolic hyper reactors. Mean values of their rise in BP are illustrated in Table. 2.

Table. 2: Basal blood pressure values in subjects and effect of cold pressor test (CPT)

S. No.	Subjects	Blood Pressure	Basal Blood Pressure		Rise in B. P. due to CPT	
			Mean Value	S. D.	Mean Value	S. D.
1.	Hyper-reactors (383)	Systolic	121.31	±7.36	21.45	±7.33
		Diastolic	78.59	±4.77	12.72	±4.79
2.	Systolic Hyper-reactors (244)	Systolic	119.21	±7.34	25	±2.20
		Diastolic	78.92	±5.17	9.85	±3.46
3.	Diastolic Hyper-reactors (105)	Systolic	122.16	±4.48	11.33	±4.64
		Diastolic	77.16	±4.38	18.0	±1.69
4.	Both Systolic & Diastolic Hyper-reactors (64)	Systolic	127	±7.27	27.0	-
		Diastolic	81	±1.61	17.0	-

As per the study protocol the hyper reactors under consideration were asked for 3 months of Meditation session. After successful completion of the session again the basal BP was recorded and the CPT was performed; again BP was recorded to observe the changes in BP. It was observed that nearly 241 (62.83%) previous hyper reactors were turned into hypo reactors. Significant

changes in systolic and diastolic hyper reactors were observed with $p < 0.05$ on application of paired t test. On the other hand statistically insignificant changes were observed in the hyper reactors to both systolic and diastolic BP after 3 months of Meditation. Changes in number of hyper reactors after completion of the 3 months of training is depicted in Table. 3.

Table. 3: Changes observed in Hyper-reactors after 3 months of meditation

S. No.			Hyper-Reactors to CPT Before Meditation	Hypo-reactors after Meditation	Subjects showing no change in their hyper-reactivity
1.	Hyper-reactors	No. of Subjects	383	241	141
		Percentage		62.83 %	37.17%
2.	Systolic Hyper-reactors	No. of Subjects	244	164	80
		Percentage		67.34%	32.66 %
3.	Diastolic Hyper-reactors	No. of Subjects	105	61	44
		Percentage		58.29%	41.71 %
4.	Hyperreactor to both	No. of Subjects	34	19	15
		Percentage		54.3%	45.7%

Discussion

In modernera due to disastrous modifications in life style and increasing burdens of official works stress has become an inevitable part of life. Because of increasing stress consistent increase in population affected by diseases like blood pressure, myocardial infarction, other cardiac diseases and mental illnesses like depression are growing chaotically. To avoid such superfluous events early detection of changes in systemic activities and preventive remedies like meditation are seeking attention.^{9, 10}

Cold pressor test is used to appraise the cardiac autonomic function test detecting possible future outcomes about cardiac abnormal functioning.¹¹

Also hyper reactors population are not only supposed to be affected with the disease but also their progeny will also be affected by the hypertensive disorders as suggested by Dan Wu. Hence for prevention of the hypertensive disorders stress relieving maneuvers like Meditation should be considered to reduce the risk in current and future generations by changing hyper reactors to hypo reactors the finding goes in accordance with the present study.¹²

U. S. Ray observed that there was improvement in performance at submaximal level of exercise and in anaerobic threshold in the meditation group. Along with improvement in inflexibility and various psychological parameters like reduction in anxiety and depression and a better mental function. The results were analogous to the present study.¹³

K. N. Udupa (1975) found significant decrease in systolic BP after 3 months of meditation. He found initial fall in systolic BP alike results were observed in the present study.¹⁴

The reduction in cold stress to systolic BP after 3 months of meditation session could be attributed to the reduction in sympathetic activity and increase in parasympathetic activity in cardiovascular tree due to increased vagal tone.^{15, 16}

The autonomic nervous system plays a major role in conveying adaptation of human body to environmental changes, by restraining the sensory, visceral, motor and neuro-endocrine functions. Also autonomic nervous system is one of the most important mediators to affect cold stress effects which may be responsible for the conversion of hyper reactors to hypo reactors supporting observation in present study.¹⁷

Conclusion

In the present study Hyper-reactivity to cold pressor test decreased after 3 months of meditation. Initially there were 383 hyper-reactors to cold pressor test and the number of hyper-reactors decreased to nearly 37% after 3 months meditation, so there is approximately 63% reduction in hyper-reactivity. Hence we conclude that non pharmacological method like meditation should be encouraged to enhance significant improvements in cardiovascular parameters like systolic and diastolic BP. These results would justify the incorporation of meditation as part of our life style in prevention of hyper-reactivity to stress related disorders. Hence we can say that in a rigid society meditation alone will bring quantum of solace from stress and hence they are now essentials for endeavouring life.

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