International Journal of Basic and Applied Medical Sciences ISSN: 2277-2103 (Online)
An Online International Journal Available at http://www.cibtech.org/jms.htm
2011 Vol. 1 (1) September-December, pp. 139-143/Kiran et al.
Research Article

INFLUENCE OF RAJYOGA MEDITATION ON COLD PRESSOR RESPONSE

Kiran[1] and Kawalinder K. Girgla[1], Richa Ghay[1] and *Anterpreet K Arora[2]
[1]Department of Physiology, Sri Guru Ram Das Institute of Medical Sciences and Research Amritsar, India
[2]Department of Anatomy, Sri Guru Ram Das institute of Medical Sciences and Research Amritsar, India
**Author for Correspondence*

ABSTRACT
Cold Pressor Test (CPT) is a simple & well documented laboratory test to evaluate the sympathetic autonomic functions. Stress is often associated with unmanaged emotions and occurrence of increased sympathetic autonomic activity. Long term meditation cultivates mindfulness and has long been used to reduce overwhelming stress. The purpose of this study was to compare the rise in the mean value of Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) in acute stressful condition in meditators of Rajyoga meditation and non-meditators, by performing CPT. The test was carried out in 50 meditators & 50 non-meditators. The mean age of meditators was 35.80±7.69 years & that of non–meditators was36.76±6.38 years. Meditators showed a rise in mean value of SBP and DBP to be 6.32±2.41 mmHg and 6.0±2.65 mmHg respectively during CPT. Non-meditators showed rise in SBP and DBP of 13.88±3.95 mmHg and 13.66±3.35 mmHg respectively during CPT. The meditators showed lesser rise in the mean value of both SBP and DBP as compared to non-meditators; changes in both being highly significant statistically ($p<0.001$). It thus implies that the meditators have a lower sympathetic activity compared to non meditators during acute stress, suggesting that Rajyoga meditation has a relaxing effect on sympathetic autonomic nervous system (ANS). The regular practice of Rajyoga Meditation has been observed to maintain optimal level of autonomic equilibrium at rest and during exposure to stressful conditions.

Key Words: *Autonomic Changes, Rajyoga Meditation, Cold Pressor Test (CPT), Sympathetic Activity, Blood Pressure (BP)*

INTRODUCTION
Everyday stress is taking a heavy toll on human health in modern times. Rising incidence of stress related disorders like essential hypertension, angina, insomnia and impotency are just a few to name. Stress causes a variety of physiological changes in the body, including increased cortisol levels, increased anaerobic cellular activity, increased heart rate and blood pressure (BP) (Connor et al., 2000).The association of meditation and health is also a deep one. Meditation is a technique of autogenic relaxation. It claims to deal with the inner world. Published scientific and medical evidence has proved its benefits, but it still needs to be much understood. Spiritual and religious meditation may have an impact on stress reactivity, pain perception, and pain tolerance through several possible pathways (Wachholtz et al., 2005). Being holistic in their approach, yogic techniques are ideal for improving one's ability to withstand stressful stimuli and produce long lasting changes in BP and heart rate if practiced regularly (Vijayalakshmi et al., 2005).

Meditation
Rajyoga (yoga of meditation) of the Brahmakumaris has spread from the organization's headquarters at Mount Abu (Rajasthan, India) throughout India, and to other countries as well. Rajyoga meditation is a behavioral intervention, which is simple to practice. Rajyoga is so-called because it is primarily concerned with the mind. In this form of meditation the individual sits in a relaxed & comfortable position with their eyes open, and with gaze fixed on a meaningful symbol (a light) & then uses visual or auditory images for concentration. Whenever the mind wanders away, it is brought back to the visual or

auditory image, being used quietly & persistently. This helps one to proceed to "dhyana" or meditation (Vyas et al. 2008). At the same time they actively think positive thoughts about a Universal force pervading all over, as light and peace (Telles et al., 1993). This technique requires considerable commitment and involves concentrated thinking. Yogic processes have a tremendous influence on the CNS. The body is ultimately controlled by the central nervous system (CNS) through its relationship with the ANS and the neuroendocrine processes. It helps an individual to gain control over the ANS resulting in homeostatic functioning of the body. (Mahajan et al, 2003). Regular practice of meditation and various yogic exercises have been observed to maintain optimal level of autonomic equilibrium at rest and during exposure to stressful conditions. Meditation can reduce the arousal state and may ameliorate anxiety symptoms (Krisnaprakornkit et al., 2006).The rise in BP in response to localized cold exposure is reflexogenic; mediated through hypothalamus with augmented sympathetic activity, releasing non-epinephrine at vascular smooth muscle cells (Gomez et al 1997), (Triebler et al 2002), (Bedi et al 1998), (Verma et al 2005). Stress affects physiological equilibrium leading to many pathological conditions probably through disturbance in autonomic balance of sympathetic and parasympathetic activity (Selvamurthy et al 1998). He found that six months of yoga resulted in an autonomic shift towards the parasympathetic nervous system (Selvamurthy et al 1983).

This study was carried out to address the lack of research on Rajyoga meditation specifically. Few studies have been done on the CPT in subjects who are practicing Rajyoga meditation regularly. So in the present study we would like to assess rise in BP in response to CPT, which acts as a stressful condition, in long term meditators practicing Rajyoga meditation and compare it with that of non meditators.

MATERIALS AND METHODS

The present study was conducted in 100 healthy persons (72 males and 28 females). Fifty subjects (36 males and 14 males) were healthy meditators in the age group of 25-50 years; they were long term meditators who had been practicing Rajyoga meditation regularly for 1 hour a day, for more than 5 years. The control group also had fifty healthy persons (36 males and 14 females) of the same age group who did not perform any meditative techniques. Meditators were selected from the persons who visit the local Prajapita Brahma Kumari Ashram, Amritsar, Punjab, India.

Non meditators were selected from the persons who visited the same ashram but did not perform any meditation. All the volunteers were vegetarians, non- hypertensive, non-smokers, non alcoholic and did not suffer from any organic disease, neuropsychiatric disorder or any other illness known to affect the functioning of autonomic nervous system. They were not on any medication affecting heart or circulation.

Experimental Protocol: All the tests were performed in the months of September, October and November under thermo-neutral conditions and at the same time of the day in all subjects. The meditators had been practicing Rajyoga meditation for 1 hr every morning (6:00-7:00 AM) in the ashram for more than 5years.The nature of the test was explained to them and informed consent was obtained. The procedure was in accordance with ethical standards committee of the institute. Subjects were allowed to acclimatize themselves to the experimental and environmental conditions. Their height and weight were recorded and Body Surface Area was calculated (Table 1). The subjects were allowed to relax on a couch for 15 mins. Their basal SBP & DBP was recorded by mercury sphygmomanometer. CPT was commenced when the two consecutive readings taken 5minutes apart were identical. This means that in all probability they had reached their basal value. The subjects were asked to immerse their left hand in a bowl containing ice cubes & water (0-4°C.). SBP & DBP were again recorded in contra lateral hand at the end of 1min. Maximum increase in the systolic and diastolic pressure was determined. The results were recorded and data analyzed.

Standard statistical methods were used for calculation of mean ± SD. Statistical analysis was carried for the parameters using SPSF program version 10.0 (Microsoft Corp). 'P' value was determined. $P > 0.05$

was considered as non-significant. Statistical significance was accepted at $p<0.05$ levels and highly significant at $p<0.001$.

RESULTS

Cold Pressor Test measures the changes in blood pressure in response to painful stimulus generated by placing hand in cold water (Leblance et al, 1975). Table 1 shows the anthropometric profile of 50 meditators and non-meditators. Mean age, height, weight and BSA of meditators were 35.80±7.69 yrs, 163.28±5.70 cms, 56.24±6.92 Kg and1.59±0.10 cm^2 respectively. The mean age, height, weight and BSA of non-meditators was 36.76±6.38 yrs, 162.80±6.95 cms, 58.30±8.39Kg and 1.61±0.12cm^2 respectively. Meditators showed a mean value for change in systolic and diastolic blood pressures to be 6.32±2.41 mmHg and 6.0±2.65 mmHg respectively (Table 2). On the other hand non-meditators showed change in SBP and DBP of 13.88±3.95 mmHg and 13.66±3.35 mmHg respectively. So the meditators showed lesser rise in mean systolic and diastolic blood pressure during CPT as compared to non-meditators, which is highly significant statistically ($p<0.001$) (Table 2). It thus implies that the meditators had a lower sympathetic activity during CPT as compared to non meditators.

Table 1: Anthropometric data of meditators and non-meditators

Group	Age (years)		Height (cms)		Weight (Kgs)		BSA (m^2)	
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD
Meditators	35.80	7.69	163.28	5.70	56.24	6.92	1.59	0.10
Non-meditators	36.76	6.38	162.80	6.95	58.30	8.39	1.61	0.12

SD: *Standard Deviation*
BSA: Body Surface Area

Table 2: **Comparative study of cold pressor test in meditators and non-meditators**

Sr. No.	Parameters	Rise of BP in Meditators (n=50)		Rise of BP in Non-meditators (n=50)		p-value	Significance
		Mean	±SD	Mean	±SD		
1.	CPT (SBP)	6.32	2.41	13.88	3.95	<0.001	H.S*
2	CPT (DBP) Rise in mmHg	6.00	2.65	13.66	3.35	<0.001	H.S*

**HS: Highly significant*

DISCUSSION

The present study was done to compare the changes in Mean SBP and DBP during CPT in regular practitioners of Rajyoga meditation and that in non-meditators. In the present study the mean values for changes in SBP and DBP in meditators were less as compared to change shown by non meditators during CPT. Meditation can reduce systolic and diastolic blood pressure especially during acute pain and stress. Our findings are in concordance with Blackwell et al (1976) who demonstrated a reduced BP and anxiety level with Transcendental Meditation(TM). The regular practice of Transcendental Meditation may have the potential to reduce systolic and diastolic blood pressure (Anderson et al 2008). Our results are similar to Barnes (2001) who recorded a decrease in SBP in adolescents with high normal BP and were on TM program, in acute laboratory stress. Practice of meditation produced a relaxation response and reduced the physiologic stress responses (Mahajan et al. 2011). In our study, subjective reactions on

immersion of hand in ice cold water were different in meditators and non-meditators. The non-meditators reported more pain and restlessness as compared to meditators. Similar findings were reported by Mills and Farrow (1981) that TM decreases the distress associated with experience of acute experimental pain. Wachholtz's study (2005) that spiritual meditators had decreased anxiety levels and tolerated pain better when their hand was immersed in ice cold water; is in concordance with our findings. Meditation is believed to gradually diminish sympathetic dominance, resulting in better balance between the sympathetic & the parasympathetic, resulting in greater autonomic stability (Orme-Johnson 1973). By modifying the state of anxiety, meditation reduces stress induced sympathetic over activity. It makes the subject undergo relaxation and thereby decrease arterial tone and peripheral resistance (Anand BK. 1991). It also brings about a hypo metabolic state (Young et al., 1998). Thus a decrease in sympathetic discharge and better ability to overcome stress can be cited as possible mechanisms, which cause fewer rises in mean Systolic and diastolic BP in meditators compared to non- meditators.

Conclusion

Regular practice of Rajyoga meditation does have a relaxing effect on the mind and body and decreases the blood pressure response to acute stress and pain. By modifying the state of anxiety, meditation reduces stress induced sympathetic over activity. This is an interesting finding concerning Rajyoga meditation. Since limited studies on the effect of Rajayoga meditation on ANS are available, further studies are recommended.

ACKNOWLEDGEMENT

The authors wish to thank the management of the Prajapita Brahmakumari Ashram, Amritsar and Rajyoga meditators and non-meditators who visited the ashram and lent us full support and cooperation in conducting this study.

REFERENCES

Anand BK (1991). Yoga and medical sciences. *Indian journal of Physiology and Pharmacology* 35(2) 84-87.

Anderson JW, Liu C, Kryscio RJ (2008). Blood pressure response to transcendental meditation: a meta-analysis. *American Journal Hypertension.* 21(3):310-316.

Barnes VA, Treiber FA, Davis H (2001). Impact of Transcendental Meditation on cardiovascular function at rest and during acute stress in adolescents with high normal blood pressure. *Journal of Psychosomatic Research.* 51(4) 597-605.

Bedi Mona, Babbar R, Chakrabarty AS (1998). Cold pressor response in normal & malnourished children. *Indian Journal of Physiology and Pharmacology* 42 569-572.

Blackwell B, Bloomfield S, Gartside P et al (1976). Transcendental meditation in HT. Individual response patterns. *Lancet* 31(1) 223-226.

Connor TM, Halloran DJ, Shanahan F (2000). The stress response and hypothalamic-pituitary-adrenal axis: from molecular to melancholia. *Quarterly Journal of Medicine* 93(6) 323-333.

Gomez VM, Blanco M, Rodriguez I(1997). The cold pressor test: Pharmacological& therapeutical aspects. *American Journal of Therapeutics* 4 34-38.

Krisnaprakornkit T, Krisnaprakornkit W, Piyavhatkul N et al (2006). Meditation Therapy for anxiety disorders. *Cochrane Database of Systematic Reviews.25* (1) CD 004998.

Le-Blance, Dulac J and Scote J(1975). Autonomic nervous system and adaptation to cold in man. *Journal of Applied Physiology* 39(2) 181-86.

Mahajan AS and Babbar R (2003). Yoga: a scientific Lifestyle. *The Journal of Yoga* l2 (10)1-14.

Mills WW. Farrow JT (1981). The transcendental meditation technique and acute experimental pain. *Psychosomatic medicine* 43(2) 157-164.

Mohan A, Sharma R, Bijlani RL (2001). Effect of Meditation on Stress-Induced Changes in Cognitive Functions. *The Journal of Alternative and Complementary Medicine* 17(3) 207-212.

Orme-Johnson DW (1973): Autonomic stability and Transcendental Meditation. *Psychosomatic Medicine* 35 341-349.

SelvamurtyW, Nayar HS, Joseph NT et al (1983). Physiological effects of yogic practices. *National Institute of Mental Health and Neurosciences journal* 1(1) 71-80.

SelvamurtyW, Sridharan K, Ray US et al (1998). A new physiological approach to control essential hypertension. *Indian Journal of Physiology and Pharmacology* 42 205-213.

Telles S., Desiraju T (1993). Autonomic changes in Brahma Kumaries
Rajayoga meditation. *International journal of Psych Physiology* 15(2):147 52.

Triebler FA, Kapuku GK, Davis H et al (2002). Plasma endothelia- I release during acute stress: role of ethnicity & sex. *Psychosomatic Medicine* 64 707-713.

Verma V, Singh SK, Ghosh S (2005.) Identification of susceptibility to HT by the CPT. *Indian Journal of Physiology and Pharmacology 49119*-120.

Vyas R, Raval KV and Dixit N (2008). Effect of Rajyoga meditation on the lipid profile of post-menopausal women. *Indian Journal of Physiology and Pharmacology* 52(4) 420 424.

Vijayalakshmi P, Madanmohan, Bhavanani AB et al (2004). Modulation of stress induced by isometric hand grip test in hypertensive patients following yogic relaxation training. *Indian Journal of Physiology and Pharmacology* 48(1)59-64.

Wachholtz AB, Kenneth IP (2005). Is Spirituality a Critical Ingredient of Meditation? Comparing the Effects of Spiritual Meditation, Secular Meditation, and Relaxation on Spiritual, Psychological, Cardiac, and Pain Outcomes. *Journal of Behavioral Medicine* 28(4) 369-384.

Young JD, Taylor E (1998). Meditation as a voluntary hyometabolic state of biological estimation. *News Physiological Sciences.* 13 149-153.