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IMPACT OF MEDITATION ON AUTONOMIC NERVOUS SYSTEM- A RESEARCH STUDY

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ABSTRACT
Meditation is a complex physiological process which affects neural, psychological, behavioral, and autonomic functions, and is considered as an altered state of consciousness, differing from wakefulness, relaxation at rest, and sleep. Health professionals are also enthusiastic about meditation. There is much of clinical evidence to suggest that the activity of autonomic nervous system is affected by meditation. The present study was initiated and an attempt was made to bring out the association of autonomic functions with meditation. Autonomic Nervous System (ANS) function tests were conducted using Polyrite, medicare system. One hundred subjects were divided into two groups (meditators and non meditators in the age group of 25-60 years. The autonomic insufficiency was ruled out in all. The sympathetic activity of ANS was compared by Galvanic skin resistance (GSR), Cold pressor response (CPR) and Hand grip test and the parasympathetic activity was compared by standing to lying ratio (30:15) , valsalva ratio and tachycardia ratio. The results were statistically analyzed in each group and valid conclusions were drawn. The result on comparison of various autonomic function tests amongst meditators and non-meditators of same age group suggested that the parasympathetic activity was more in meditators males & females while sympathetic activity was less.

Key Words: *Autonomic Function Tests, Meditators, Non-Meditators, Parasympathetic, Sympathetic*

INTRODUCTION
It is thought that some types of meditation might work by reducing activity in the sympathetic nervous system and increasing activity in the parasympathetic nervous system.
In one area of research, scientists are using sophisticated tools to determine whether meditation is associated with significant changes in brain function. A number of researchers believe that these changes account for many of meditation's effects NCCAM (2010).
It is also possible that practicing meditation may work by improving the mind's ability to pay attention. Since attention is involved in performing everyday tasks and regulating mood, meditation might lead to other benefits NCCAM (2010).
Meditation is a technique of autogenic relaxation. It claims to deal with the inner world. It is a technique of self-exploration. 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 (Selvamurthi, 1984). Meditative practices diminish sympathetic dominance resulting in letter balance between sympathetic and parasympathetic system (Anand, 1991). Most of the meditation techniques work by affecting the ANS, in turn regulating many organs and muscles, controlling functions such as the heart beat, sweating, breathing, and digestion. One possible way for meditation to act on autonomic activity is through respiration control (Raghavendra, 2011). Both the parasympathetic and sympathetic nervous system which constitute the autonomic nervous system (ANS) are affected by meditation. A number of tests have been evolved over a period of time which have been made it possible to assess the functional status of ANS. The parasympathetic nervous system tests include beat to beat variation, valsalva ratio and the baroreflexsensivity and sympathetic nervous system tests include the hand grip test, the galvanic skin resistance and the cold pressor response (Ghai, 2007). Work done over the past few years gives us an

indication of effect of meditation on the autonomic nervous system activity. Meditation is commonly thought to reduce stress by a combination of two pathways. First, by reducing somatic-arousal (physiological effects) thereby reducing reactivity of the individual to environmental stressors, and second, by altering the individual's cognitive appraisal of and perceived self-efficacy with regard to stressors Manocha (2011). So a formal study was planned to the carried out which involved a battery of autonomic tests to be done on meditators and non mediators of same age group. The changes were noticed in some parameter of both sympathetic and parasympathetic function tests amongst meditators and non meditators of same age group.

MATERIALS AND METHODS

The present study was conducted in the Department of Physiology, SGRDIMSAR, Amrtisar. It was conducted in 100 healthy subjects both males and females, selected from Brahma Kumari Ashram in the city and perform Raj Yoga meditation regularly. Out of 100 subjects fifty healthy persons in the age group of 25-60 years were mediators who regularly do meditation for one hour a day while rest fifty healthy persons in the same age group were non meditators who visit the same Ashram but do not perform meditation. The anthropometric measurements were carried out in all the groups. History taking and medical examination was carried out .The nature of the test was explained to the subjects. All the tests were performed at the same time of the day in all the subjects and at a comfortable environment.

Various tests used for the assessment of sympathetic and parasympathetic activity are as follows:

Standing to lying ratio S/L ratio:

Each subject stand quietly and then lie down without any support while continuous ECG was recorded from 20 beats before to 60 beats after lying down. The longest R-R interval during 10 beats after lying down was calculated.

Lying to standing 30:15 S/L ratio:

Each subject was made to lie quietly for 3 minutes then asked to stand up and a continuous ECG was recorded and 30:15 ratio was calculated by taking the ratio of R-R interval at beat 30 and beat 15 after standing.

Valsalva Ratio:

Subject was asked to perform the valsalva maneuver for 15 sec. Three trials were performed at interval of 5 min. Continuous ECG was recorded 1 min before to 1 min after the maneuver. The ratio was taken as maximum R-R interval after maneuver to that of shortest R-R interval during the strain.

Tachycardia Ratio:

Shortest R-R interval during the valsalva maneuver was divided by the longest R-R value before this.

The sympathetic activity was assessed by the

Galvanic skin Resistance (GSR):

The electrodes were applied over the two index fingers and a constant current of 5 micro ampere was passed through the electrodes. The level of skin resistance was calculated from the recording.

Hand grip test:

Diastolic blood pressure response to static exercise was done in form of this test for one minute and changes were observed.

Cold pressure Response:

The test was done at the end because of slight unpleasantness associated with the test. Blood pressure of the subject was recorded under resting condition. Then the subject was asked to immerse his hand in cold water at 1-4 degree centigrade. BP readings were made from the other arm at 30 Sec. intervals for a period of two min. The maximum increase in systolic and diastolic BP was determined and results recorded. For each variable group of autonomic function tests performed in the study mean and standard deviation of results were calculated.

RESULTS

The data revealed that mean values for the S/L, 30:15 and valsalva ratio are higher in meditators than in non meditators. The statistics also showed a highly significant value of S/L, 30:15 and valsalva ratio in meditators (P<0.001). The mean value for tachycardia ratio is higher in non-meditators and is also statistically highly significant. (P<0.001) This indicates that parasympathetic activity is more in meditators as compared to non meditators.

Table1. Comparative study of parasympathetic functions in meditators and non- meditators

Parameters	Meditators		Non Meditators		P value	Significance
	Mean	S.D.	Mean	S.D.		
S/L ratio	1.20	0.10	1.08	0.09	< 0.001	H.S.
30:15 ratio	1.15	0.09	1.09	0.07	< 0.001	H.S.
Valsalva ratio	1.60	0.20	1.33	0.13	< 0.001	H.S.
Tachycardia ratio	0.68	0.11	0.75	0.08	< 0.001	H.S.

S/L = Standing to lying ratio
30:15 = Lying to standing ratio
HS = Highly significant

Table 2. Comparative study of sympathetic functions in meditators and non meditators

Parameters	Mediators		Non Mediators		P value	Significance
	Mean	S.D.	Mean	S.D.		
Cold Pressor Response						
Systolic blood pressure	6.32	2.41	13.88	3.95	< 0.001	H.S.
Diastolic blood pressure	6.00	2.65	13.66	3.35	< 0.001	H.S.
Rise in mm Hg						
Hand Grip Test						
Systolic blood pressure Diastolic	13.12	3.57	20.24	4.83	< 0.001	H.S.
blood pressure	11.96	2.98	17.20	3.90	< 0.001	H.S.
(Rise in mm Hg)						
Galvanic Skin Resistance (Kohms)	162.52	6.41	155.80	5.70	< 0.001	H.S.

The data obtained on sympathetic function study in meditators and non-meditators revealed that mean values for rise in blood pressure due to cold pressor response and hand grip test are higher in non-meditators compared to meditators and the values are statistically highly significant (P<0.001). The mean value for GSR is higher in meditators than non- meditators and statistically highly significant (P<0.001). These values of cold pressure response, hand grip test and galvanic skin resistance in mediators showed that sympathetic activity is low in mediators as compared to non-mediators.

DISCUSSION

Work done over the past few years gives us an indication of studies carried out on meditators for the autonomic nervous system activity. The data on this aspect was lacking in this part of the country, so the present study was conducted to measure the autonomic nervous system activity in meditators and compare it with that of non-meditators using S/L ; 30:15, valsalva ratio and tachycardia ratio for parasympathetic activity and cold pressor response, hand grip test and galvanic skin resistance for sympathetic activity. In the present study changes were noticed in some parameters of both sympathetic and parasympathetic function tests on comparison between meditators and non-meditators. Parasympathetic function tests revealed that mean value for S/L ratio is lower in non-meditator (1.08±0.09) compared to meditators (1.20 ± 1.10) and found to be statistically highly significant

(P<0.001). L/s ratio is higher in meditators which is again highly significant statistically (P<0.001)Valsalva ratio is highly significant (P<0.001) indicating greater parasympathetic activity in meditators. Tachycardia ratio on statistical analysis shows a highly significant change from non meditators to meditators (P<0.001). It indicates that parasympathetic activity is more in meditators as compared to non meditators. The sympathetic function tests revealed that during cold pressure response mean value for change in systolic and diastolic blood pressures to be 6.32 ± 2.41 and 6 ± 2.65 respectively in meditators as compared to non meditators (13.88 ± 3.95 and 13.66 ± 3.35 respectively). So, the meditators showed lesser rise of blood pressure as compared to non-meditators which is highly significant (P<0.001). In any condition where there is low sympathetic activity the cold pressor response will be expected to show a smaller rise.

During hand grip test the mean value of changes in systolic and diastolic blood pressures in meditators are 13.12 ± 3.57mmHg and 11.96 ± 2.98 resp while in non meditators20.24 ± 4.83 and 17.20 ± 3.90 resp. The values are highly significant (P<0.001). The mean value for galvanic skin resistance in meditators is 162.52 ± 6.41 while in non-meditators it is 155.80 ± 5.70 showing marked rise of GSR in meditators which is highly significant statistically (P<0.001). It thus implies that the mediators have a lower sympathetic activity compared to non mediators. Our study is consistent with those of Levander (1972), Kanchan (1973, 1984), Usha Panjwani (1994) . Levander (1972) reported an increase in forearm blood flow during the practice of transcendental meditation suggesting decreased sympathetic activity and deep relaxation. Kanchan(1973, 1984) studied changes in the EEG and autonomic parameters of practitioners of transcendental meditation and Brahma Kumaris Raj Yoga meditation, GSR tended to increase during meditation sessions. Panjwani (1995) performed a study on the effect of Sahaja Yoga practice on stress management in patients of epilepsy which showed reduction in stress who practiced Sahaja yoga. A study by (Goswami 2011) revealed definite and specific changes in the heart rate variability of the subjects during meditation. The study shows that meditative state has a completely different physiology and that it can be achieved by any meditation technique. A well-designed electroencephalographic (EEG) study reported that the experience is consistently associated with symmetrically distributed fronto-parietal midline alpha/theta activity. Perhaps most remarkable was the strong correlation between subjective quality of self-reported meditative experience and the strength of these electrical changes Manocha (2010).

Our study is consistent with Yi-Yuan et al. (2009), Manocha et al. (2010), Madhavi et al. (2010), Mohan. et al (2011) , Raghavendra et al (2011) , Goswami et al. (2011) , Manocha et al. (2011) , Shaoweia at al. (2011) . Practice of meditation produced a relaxation response even in the young adult subjects who had never practiced meditation before. The practice of meditation reduced the physiologic stress responses without taking away the beneficial effect of stress, namely, improved memory scores Mohan et al. (2011). From the above discussion we conclude that meditators have lower sympathetic activity and dominant parasympathetic activity as compared to their non-meditators counterparts.

CONCLUSION

To conclude, meditative lifestyle is specifically associated with better mental health scores. The autonomic nervous system activity is affected by meditation. While comparing ANS activity of meditators and non meditators of each group separately, we conclude that there is increase in parasympathetic activity, but the sympathetic activity was less in meditators.

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