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Transcendental meditation (tm) and stress management program on pulse rate and blood pressure: a comparative study

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Abstract

Background: Disorders of cardiovascular system especially hypertension and ischemic heart disease are leading causes of death all over the world. Stress is one of the important factors precipitating above diseases. In today's life stress is inevitable. Meditation and stress management are important to reduce the stress.

Aims, settings and design: In the present study effect of 6 weeks of meditation and stress management programme were studied on pulse and blood pressure.

Methods and materials: For present study 150 volunteers were selected in two groups each containing 75 volunteers. Group I volunteers were trained for TM. After training period they practiced TM every day 20 minutes for 6 weeks. Pulse rate and B.P. were recorded before and after the practicing session and results were statistically analysed.

Group II volunteers were subjected to stress management programme, they practiced various breathing exercises, some asana and relaxation technique each day 20 minutes for 6 weeks. Pulse and B.P. were recorded before and after the practicing session and results were statistically analysed.

Statistical analysis: Results obtained were compared with the control readings taken before the session. Student's 't' test was applied for the results.

Result: Comparison of results of TM and stress management programme was done by statistical analysis. Both the sessions were equally effective. There was significant reduction in pulse rate in both the groups. However there was no significant effect on blood pressure in both the groups.

Conclusion: In the present study Transcendental meditation and stress management programme caused significant reduction in pulse rate. There was however no significant reduction in systolic or diastolic blood pressure in the volunteers. This was probably due to short duration (6weeks) of TM and stress management programme. Long duration of such programme should prove more beneficial in order to reduce the blood pressure and should be employed widely in the society.

Keywords: TM, pulse rate, blood pressure, and stress management programme

Introduction

Nowadays stress is an absolutely inevitable part of life. Stress causes hormonal changes [1-3], biochemical changes [4], various illnesses and psychosomatic diseases [5, 6]. Linkage between body and mind are now well appreciated and therefore one can use yogic practices in preventing and treating such stress related illnesses. Several studies have been done on effect of various yogic practices on cardiovascular functions and its therapeutic effects in cardiovascular diseases [7- 19]

The present study examined the effects of TM and a stress management program on pulse rate and blood pressure.

Transcendental meditation (TM) is a common form of meditation that is easy to learn.

The stress management program followed in the present study composed of breathing exercises, some yogic asanas and mudras.

Goal of the present study was to compare the effects of TM and stress management and to find out which is better.

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Materials and methods

One hundred and fifty volunteers (75 males and 75 females) were selected. Following criteria were used for selecting the volunteers.

- 1) Age between 20 to 40 years
- 2) No history of heart attack, hypertension, diabetes, or any other chronic illness that required regular pharmacological treatment.
- 3) No history of major psychiatry disorders, current alcohol abuse/ dependency disorders.

Each volunteer was explained the whole programme. Interested and co-operative volunteers were selected. Written consent was obtained from volunteers. The volunteers were asked to discontinue if they felt giddy. An approval of institutional medical ethics committee was obtained before commencing the study.

Name, age, sex, height and weight of each volunteer were recorded. Then pulse rate and blood pressure was measured as given below in each volunteer and the readings were noted as controlled readings.

Pulse rate: Placing three fingers on the radial artery pulse rate for full one minute at complete rest of the volunteer was measured for three times and average was taken and noted.

Blood pressure: Volunteer was asked to lay on the bed for 15 minutes. Then with the help of sphygmomanometer his/her systolic and diastolic pressures were measured. Blood pressure was measured three times and average was noted as systolic and diastolic blood pressure.

Volunteers were divided in two main groups. Group I and Group II each of 75 volunteers. Group I was further subdivided into Group I (males) consisting of 37 male volunteers and Group I (females) consisting of 38 female volunteers. Group II was further subdivided into Group II (males) consisting of 38 male volunteers and Group II (females) consisting of 37 female volunteers. Group I

underwent session one and Group II underwent session two.

Session one and two were divided into

- 1) Training session for 6 weeks
- 2) Practicing session for 6 weeks

Session One

Training session: In this session volunteers were trained for Transcendental meditation (TM). This is a progressive relaxation technique. Technique was taught by giving individualised personal instructions. Technique of TM was taught as below ^[20- 23]

- 1) Meditator sits quietly in a comfortable position with his back erect, eyes closed, (lotus position) and takes slow and deep breaths.
- 2) Meditator silently repeats a mystical sound (mantra- OM) Repetition of mantra is supposed to be effortless. Meditator neither attempts to concentrate on sound nor attempts to prevent his/her attention from wavering. There is no need to prevent thoughts during TM. The meditator is instructed merely to concentrate on mantra. Gradually meditator learns to maintain awareness of mantra excluding the other thoughts, external influences and desires.

Practicing session: Volunteers in GroupI practiced TM for 20 minutes in the morning everyday for 6 weeks.

Session Two

Training session: Volunteers underwent stress management programme ^[24] training for 6 weeks. In this programme volunteers were explained about what is stress, different kind of stressors, mechanism by which stress acts on the body. Volunteers were taught about importance of holistic health and its role in stress management. Volunteers were also informed about importance of sprouts, fruits and proteins in the diet. Additionally they were taught some breathing exercises, mudras, and asanas as shown in the table.

Steps	Program	Duration
1	Stress and stressors	2 Hours
2	Stress identification and construction of stressor hierarchy	1 Hour
3	Autonomic responses to stress	1 Hour
4	Effects of stressors on various systems of the body	1Hour
5	Importance of fruits, fluids, proteins in the diet. Training is given for the following ^[25] 1) Breathing exercises- 2) Anulom and vilom type of breathing 3) Mudras - Brahmamudra - Sinhmudra 4) Relaxation - Jaw relaxation - Makarasan - Nasikagra –drushti 5) Asanas - Bhujangasana - Vakrasana	10 mins

Session of Stress Management Programme

Practicing session: Volunteers of Group II practiced breathing exercises, mudras, asanas, and relaxation techniques given above everyday in the morning 20 minutes for 6 weeks.

At the end of practicing sessions pulse rate and blood pressure were recorded from all the volunteers of GroupI and Group II. The results obtained were compared with the control readings taken before the sessions.

Student’s “t” test was applied for statistical analysis of the results.

Results

- 1) There was highly significant fall in pulse rate in males and females of both the groups. (Table 1)
- 2) Comparison of results in GroupI and GroupII showed no statistically significant difference (Table 2) indicating

that both the sessions had almost equal effect on pulse rate.
 3) Comparison of results in males and females of each group did not show statistically significant difference (Table 3) indicating that in each Group males and females have almost equal responses.

4) There was no significant change in systolic pressure before and after the sessions in both the groups. (Table 4)
 5) There was no significant change in diastolic pressure before and after the sessions in both the groups (Table 5) indicating that both the sessions had no effect on systolic and diastolic pressure in males and females.

Table 1: Comparison of Pulse Rate per Minute– Before and After the Sessions in Males and Females of both Groups

Groups		No. of Observations	Mean (x)	S.D.	S.E.	t- value	p-value	Significance
Group-I (Males)	Before	37	77.41	3.07	0.309	24.48	<0.0004	Highly Significant
	After	37	69.84	1.42				
Group-I (Females)	Before	38	76.55	3.65	0.688	9.869	<0.0004	Highly Significant
	After	38	69.76	2.16				
Group-II (Males)	Before	38	77.97	2.16	0.467	16.927	<0.0004	Highly Significant
	After	38	70.05	1.90				
Group-II (Females)	Before	37	77.16	3.49	0.682	10.296	<0.0004	Highly Significant
	After	37	70.14	2.24				

Table 2: Comparison of Pulse Rate per Minute– in Group-I & Group-II

Groups		No. of Observations	Mean (x)	S.D.	S.E.	t- value	p-value	Significance
Group-I	Males	37	7.6	2.6	0.492	0.8133	0.418	Not Significant
Group-I	Females	38	6.8	2.5				
Group-II	Males	38	8.0	1.5	0.639	0.3122	0.7566	Not Significant
Group-II	Females	37	7.0	3.0				

Table 3: Comparison of Effect on Pulse Rate per Minute– Males & Females of each Group

Groups		No. of Observations	Mean (x)	S.D.	S.E.	t- value	p-value	Significance
Group-I	Males	37	6.8	2.5	0.589	1.3578	0.1738	Not Significant
Group-I	Females	38	7.6	2.6				
Group-II	Males	38	7.0	3.0	0.545	1.819	0.0688	Not Significant
Group-II	Females	37	8.0	1.5				

Table 4: Comparison of Systolic Pressure (mm of Hg)– Before & After the Session in Males & Females of both Groups

Groups		No. of Observations	Mean (x)	S.D.	S.E.	t- value	p-value	Significance
Group-I (Males)	Before	37	124.590	4.716	1.005	1.018	0.3076	Not Significant
	After	37	123.567	3.890				
Group-I (Females)	Before	38	123.790	6.530	1.450	0.724	0.4716	Not Significant
	After	38	122.740	6.090				
Group-II (Males)	Before	38	124.890	4.449	0.904	2.320	0.0200	Not Significant
	After	38	122.789	3.357				
Group-II (Females)	Before	37	122.900	6.630	1.446	1.0027	0.3174	Not Significant
	After	37	121.450	5.780				

Table 5: Comparison of Diastolic Pressure (mm of Hg)–Before & After the Session in Males & Females of both Groups

Groups		No. of Observations	Mean (x)	S.D.	S.E.	t- value	p-value	Significance
Group-I (Males)	Before	37	84.596	4.716	1.005	1.018	0.3076	Not Significant
	After	37	84.567	3.890				
Group-I (Females)	Before	38	81.89	6.439	1.439	0.0	1.0	Not Significant
	After	38	81.89	6.103				
Group-II (Males)	Before	38	84.736	4.99	1.131	2.2388	0.81	Not Significant
	After	38	84.77	4.865				
Group-II (Females)	Before	37	82.43	6.74	1.462	0.9577	0.337	Not Significant
	After	37	81.03	5.8				

Discussion

In the present study there was significant decrease in pulse rate in males and females of both groups. There was no significant difference in pulse rate changes observed in Group I and Group II indicating that TM and stress management programme were equally effective in reducing the pulse rate. Similarly there was no significant difference in the effect caused in males and females. Many workers have studied effects of TM on resting pulse rate or heart rate. Shirely Tell *et al.* [26] reported decreased heart rate in subjects mentally repeating meaningful and non meaningful syllable. According

to her repeating non-meaningful syllable is equivalent to TM. Decreased heart rate reported is due to reduced sympathetic activity.

Ayesha A. Khanam *et al.* [27] also reported reduction in basal heart rate as an effect of yogic asanas, meditation and Anulom-violm breathing in asthmatic patients. Total period of yogic exercises in this study was of seven days. In such a small period there was significant decrease in heart rate due to reduced sympathetic activity. Shirely Tell *et al.* [26] found significant decrease in heart rate in subjects during OM meditation which she attributed to psycho physiological

relaxation. Robert K. Wallace ^[8] also reported significant reduction in heart rate during and after TM in his volunteers and concluded that TM reduces physical and mental tension. V.A. Barnes *et al.* ^[10] studied acute effects of TM and found reduction in temperature, pulse rate and respiratory rate during TM. According to him practice of TM affects the thinking process to a more settled state resulting in what is called as "Restful Alertness". However Putai Jin ^[17] studies effects of Taichi (a type of meditation) on heart rate and found significant increase in heart rate in volunteers having practice of Taichi after one year. These effects were similar to the effects of physical exercise. Ruth Michael *et al.* ^[29] found that after practice of TM for 2 years there was no effect on heart rate and therefore he does not support the hypothesis that TM is a state of reduced sympathetic activity.

Majority of workers have shown the significant reduction in resting pulse rate as an effect of meditation and the present study also agrees with them. In the present study TM Group (Group I) showed significant decrease in pulse rate after practicing TM for 6 weeks. The observed result is probably due to a physical and mental relaxation attained as an effect of TM, which also results in reduction of sympathetic activity and trend of autonomic equilibrium to gradually shift towards parasympathetic dominance.

Several workers have studied the effects of various types of asanas, relaxation techniques and breathing yogic exercises on heart rate or pulse rate. Paul Christophy *et al.* ^[30] observed significant reduction in heart rate during relaxation technique. D.D. Kulpati *et al.* ^[31] observed significant reduction in heart rate in volunteers suffering from chronic obstructive lung disease practicing different yogic asanas. Santha Joseph *et al.* ^[32] found significant decrease in heart rate in patients doing asanas and breathing exercises for three months.

K.N.Udupa *et al.* ^[33] studied the effects of different yogic asanas and physical exercises on heart rate and found that group doing particular asanas had significant decrease in heart rate after 6 months of practice whereas some asanas (other group) and physical exercises had not affected the heart rate. The group which showed reduction in heart rate practiced relaxation asanas such as Shavasana.

However M. Satyanarayan *et al.* ^[34] reported no change in heart rate after yogic exercises and relaxation. Similarly Dennis M. Davidson *et al.* ^[7] also reported that relaxation therapy did not change the heart rate in patients with organic heart disease. Shirley Tells *et al.* ^[35] studied effect of Anulom-vilom type of pranayama on pulse rate and reported that surya Anulom-vilom (right nostril breathing) causes significant increase in heart rate and Chandra Anulom-vilom (left nostril breathing) does not show any effect on heart rate.

From above discussion it is concluded that, in the present study significant decrease in pulse rate observed in group II (i.e. stress management programme) can be attributed mainly to some relaxation asanas such as makarasana, jaw relaxation. In the present study effect of TM and stress management programme on systolic and diastolic blood pressure was studied. It is found that there was no significant change in systolic or diastolic blood pressure in males and females of both the groups.

Several workers have studied the effects of different yogic exercises on systolic and diastolic blood pressure. Chandra Patel ^[19] reported significant fall in systolic and diastolic blood pressure of hypertensive patients. Barvy Backwell *et al.* ^[9] studied effect of 12 weeks of TM practice and found significant reduction in blood pressure and anxiety score. He has suggested that TM may be a therapeutic adjunct in

patients with hypertension.

Vernon A. Barnes *et al.* ^[10] studied acute effect of TM. He reported that there is significant decrease in systolic blood pressure, temperature pulse rate and respiratory rate during TM. In his opinion TM affects thinking process to a more settled state resulting in what is called as restful alertness. Many investigators have demonstrated enhanced neurophysiological function, decreased respiratory rate, decreased sympathetic tone and inhibition of hypothalamo-pituitary adrenocortical system. Such physiological changes are associated with concomitant fall in blood pressure. B.L. Agrawal and A. Kharbanda ^[11] studied effect of six months of TM practice and reported fall in systolic and diastolic blood pressure in patients with mild to moderate hypertension. R.K. Wallace *et al.* ^[13] have studied long term and short term effects of TM practice on blood pressure. Volunteers practicing TM for less than five years were considered to be having short term practice of TM whereas volunteers practicing TM for more than five years were in long term group. In both the groups there was significant decrease in blood pressure. But in the long term TM practitioners significant lowering occurred as compared to short term TM practitioners in males and females of all the different age groups. They proposed that TM should be widely employed.

Results seen in the TM group of the present study is contrary to the effect seen by above investigators. Six weeks of TM practice has not affected both systolic and diastolic pressure in both sexes. All the investigators stated above have reported reduction in blood pressure either during TM or in persons practicing TM for a long time. Probably long term practice of TM seems to affect vasomotor tone and blood pressure. In the present study TM was practiced only for 6 weeks and therefore no effect was seen on blood pressure.

Several investigators have studied effect of different relaxation techniques on blood pressure and reported varied effects. Paul Christoph *et al.* ^[30] reported that there is no significant change in blood pressure after single session of relaxation technique. M. Satyanarayan *et al.* ^[34] studied the effect of santhikriya which is combined breathing and relaxation technique. His volunteers practiced santhikriya for 30 days. There was no significant change in blood pressure in them. Rolt G. Jacob *et al.* ^[12] also demonstrated that there was effect of relaxation therapy in only white coat hypertension. His study was done in patients whose blood pressure remained high despite use of anti hypertensive drugs.

Bernold F. Frankel *et al.* ^[14] studied the effects of relaxation techniques practiced for sixteen weeks and found that such techniques are not effective in reducing blood pressure and therefore not much useful as primary therapy in most of the hypertensives. Iris B. Goldstain *et al.* ^[15] also reported that there is no effect of ten weeks relaxation therapy on blood pressure.

Angele MacGrady *et al.* ^[18] studied the racial difference in response to relaxation and found that in black races there was decrease in systolic as well as diastolic blood pressure in response to relaxation. In black races of America there is greater incidence of hypertension because of increase in peripheral resistance.

K.N. Udupa *et al.* ^[33] studied effects of different asanas and physical exercise and found only certain asanas (which included Shavasana) caused significant reduction in blood pressure. Santha Joseph *et al.* ^[32] reported significant reduction in blood pressure after three months of practice of certain asanas and concluded that yogic practice causes a gradual shift of autonomic equilibrium towards

parasympathetic dominance.

Thus only few investigators found significant effects of relaxation techniques and asanas on blood pressure, while majority have concluded that relaxation techniques, asanas or breathing exercises are ineffective in reducing blood pressure. In the present study group II practice stress management programme consisting of breathing exercises, certain asanas including makarasana, jaw relaxation. Present study agrees with majority of investigators and concludes that stress management programme did not reduce blood pressure in both males and females, so is not an effective therapeutic tool. Thus in this study TM and stress management programme were equally effective in reducing pulse rate and were ineffective in changing blood pressure.

Conclusion

In the present study Transcendental meditation and stress management programme caused significant reduction in pulse rate. There was however no significant reduction in systolic or diastolic blood pressure in the volunteers. This was probably due to short duration (6weeks) of TM and stress management programme. Long duration of such programme should prove more beneficial in order to reduce the blood pressure and should be employed widely in the society.

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