EFFECT OF MIND SOUND RESONANCE TECHNIQUE ON AUTONOMIC VARIABLES IN OCCUPATIONAL STRESS INDIVIDUALS – A RANDOMIZED CONTROLLED TRIAL

[1]Dr. Vandana A Nikkam,[2] Dr. Shivaprasad Shetty, [3] Dr. Prashanth Shetty

[1] PG Scholar, [2] Professor and Dean, [3] Principal

[1]MD in Yoga Clinicals

SDM College of Naturopathy and Yogic sciences, Ujire, Karnataka, India.

ABSTRACT: *Occupational stress is a significant and a main problem, which challenge the organizations to manage work stress in order to reduce health-care costs and improve the productivity. Stress is man's adaptive reaction to an outward situation which would lead to physical, mental and behavioral changes. Yoga will lower physiological stress and reduced risk of chronic diseases and early mortality. The present study is to determine if a relaxation technique called Mind Sound Resonance Technique can improve the autonomic variables in the employees of the stress individuals. A total of 80 employees from the nature cure hospital, were recruited for the study, the experimental group comprised of intervention of Mind Sound Resonance Technique a relaxation technique for 10 days while the control group carried supine rest. Both the group was assessed for autonomic variables before and after 10 days of the intervention in both the groups. There was a significant change seen in the percentage of change in pre and posttest in SDNN, RMSSD, NN50 and PNN5O. There was no significant changes seen in mean RR, HR, SBP and DBP but there are some changes.*

INTRODUCTION:

Stress in today's world is increased which is owing to urbanization and globalization that results into cut-throat competition. Stress is inescapable part of the modern life, work place is becoming a volatile stress factory for the employees.[1] Stress is defined as a physical, chemical or emotional factor that causes physical or mental tension which is the factor for disease causation. It is a normal reaction when the brain recognizes a threat. When the threat is perceived, the human body releases hormones that activate its "fight or flight" response.[2] Occupational stress is a significant and a main problem, which challenge the organizations to manage work stress in order to reduce health-care costs and improve the productivity (Lawrence,1995).[3] Yoga has become popular throughout the Western world as a means of reducing the harmful physical and psychological effects of stress.[4] In the yogic tradition mantras are used as a sacred sounds and intentions to transform the energy of the mind in a positive direction. Mantras are the powerful sounds that will alter one's life experience and are being used all around the world since thousands of years. These sounds have the power to stimulate specific portions of the frontal cortex in the brain.[5] MSRT is one of the advanced mindful relaxation yoga techniques that use mantra to generate resonance. This technique is based on a powerful Mantra called *Mahamrutyunjaya Mantra* that helps one to realize their true state of being and at the same time removes fear of death. This Mantra is addressed to Lord Shiva and is mentioned in the RigVeda (7 mandala59 Chapter) as well as the Yajur Veda (3-60) showing that it is a words which has been received by Maharishi Vasishta, the Kula Guru of Bhagavan Sri Ramachandra. The vibrations and the meaning of this Mantra are known to pervade through all the koshas harmonizing the balance and functioning by channelizing the flow of prana at all levels.

OM. Tryambakam yajamahe
Sugandhim pushti-vardhanam
Urvarukamiva bandhana
Mrityor mukshiya mamrita

Meaning

"OM We worship and adore you, O three eyed one, O Shiva. You are sweet gladness, the fragrance of life, which nourishes us, restores our health, and causes us to thrive. As, in due time, the stem of the cucumber weakens, and the gourd is freed from the vine, so free us from attachment and death, and do not withhold immortality.[6]

MATERIALS AND METHODS

Participants

The study subjects were recruited from the SDM yoga and nature cure hospital Shantivana, Dakshina Kannada District, Karnataka, India. The Subjects were selected from the above mentioned hospital through screening based on Subjects scoring more than 20 in the Cohen Perceived Stress scale, inclusion and exclusion criteria.

Inclusion Criteria: Subjects who have scored more than 20 on Cohen Perceived Stress scale, Age between 25 to 55 years, Both the genders and subjects given consent for the study.

Exclusion criteria: Subjects scoring less than 20 in Cohen perceived stress scale, Subjects who are already exposed to yoga practices, Female subjects during their menstrual cycle were not included in the experiment as menstrual cycle is known to

influence the circulatory and humoral dynamics, Female therapist who have missed the first intervention will be considered in the next intervention if required and Pregnant females.
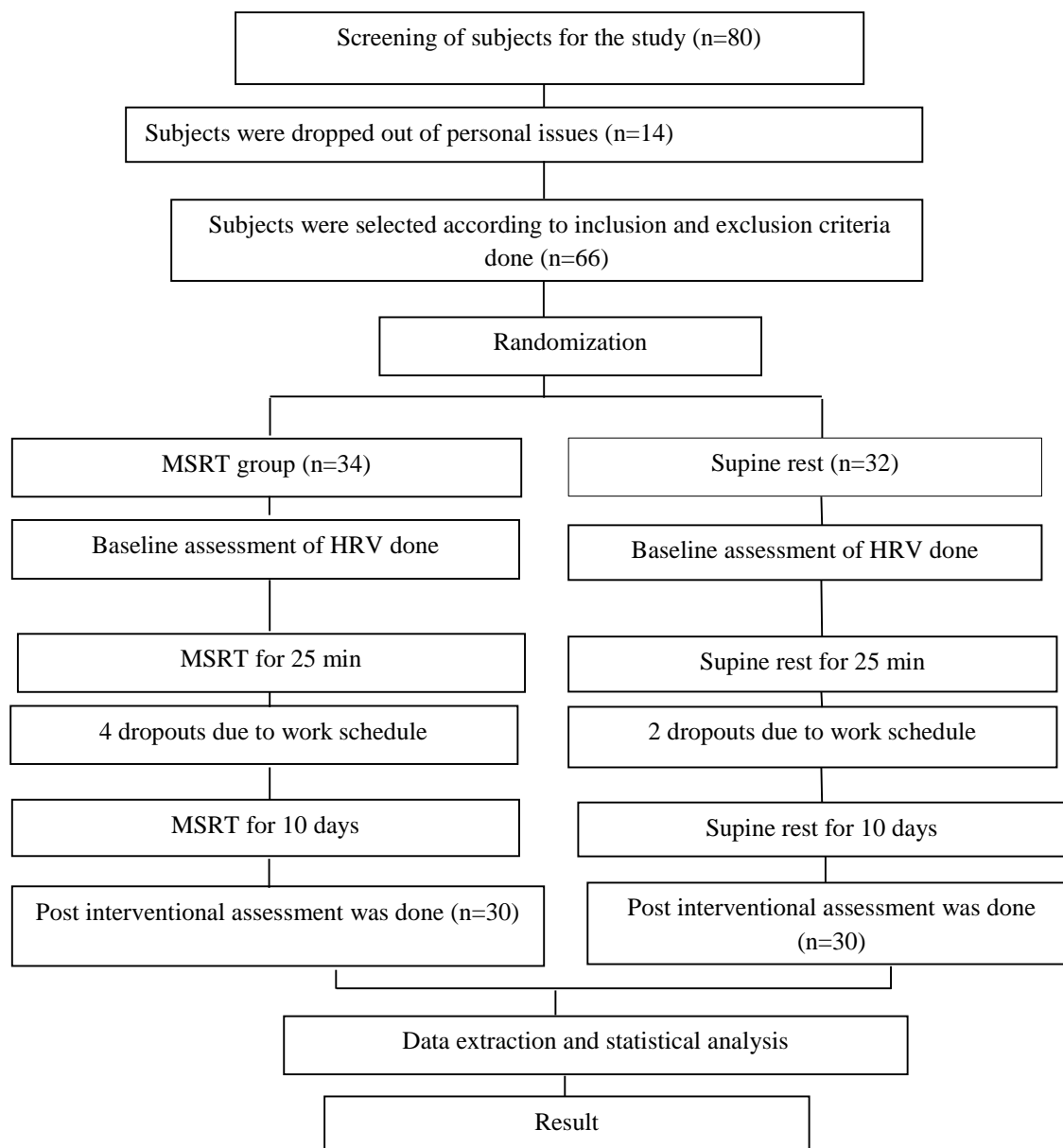

Figure 1: Trial Profile

Assessments:

Condition of recordings: The subjects were seated on a chair recording leads were connected to the four-channel polygraph equipment (BIOPAC, Montana, USA; model No: BSL 4.0 MP 36) and monitored on a closed circuit TV. Instructions were given to the subjects to remain relatively undisturbed during the session.

Data Extraction: From the digitized ECG data, the R waves are detected to obtain a point event series of successive R-R intervals, from which beat to beat heart series were computed. The data recorded was visually inspected off –line and only noise free data was included for analysis.

1. **Heart rate and heart rate variability (HRV):** The heart rate in beats per minute was calculated by counting the R waves of the QRS complex in the EKG in successive epochs of 60 seconds and averaged for each 5- minute block period. The HRV power spectrum was obtained using fast Fourier transform analysis (FFT). The energy in the HRV series of the following specific bands was studied, viz., the very low frequency component (0.0-0.05 Hz), low frequency component (0.05-0.15 Hz), and high frequency component (0.15-0.50 Hz). 45 The low frequency and high frequency values were expressed as normalized units, which represent the relative of each power component in proportion to the total power minus VLF component [LF norm = LF / (total power-VLF) × 100; HF norm + HF / (total power – VLF) ×100)] for a typical trace of HRV spectrum.

2. **Blood pressure:** The blood pressure was recorded with a sphygmomanometer by auscultation over the right brachial artery.

Intervention

The practice of *Mahamruthyunjaya mantra* and *Pranav(AUM* or *OM)* and its components(A,U,M) is used in MSRT [91]

Briefly the steps involved in MSRT are elucidated below:
Prayer
a) Loud chanting of A, U, M and AUM (3 rounds). Feel complete body resonance.
        b) *Āhata – Anāhata* of A,U,M and AUM next time A-,U-,M –AUM (3 Rounds). Feel the resonance even with *anāhata* (mental) phase.
a) Loud chanting of *Mrtyunjaya Mantra* (MM)
b) *Āhata – Anāhata of Mrtyunjaya Mantra* MM-,MM-,MM-(3 rounds)
Anāhata AUM (9 rounds)
Ajapājapa AUM to silence (9 rounds).
Stay in silence
Resolve, Closing Prayer.[6]

RESULTS
The data obtained following the study were found to be normally distributed across groups (p<0.00, Kolomogorov Simonov test). Hence the parametric test (Independent t test) was performed to assess the significant difference between the two groups.

Table 1: Comparison of pretest and posttest between the groups of mean RR

Variables	Group	Mean	SD	t value	*p* value
Pre	Exp	787.58	123.44	0.3602	0.7200
	Con	776.12	122.90		
Post	Exp	819.84	217.24	0.2182	0.8281
	Con	809.66	134.78		
% of change from pretest to post test					0.9764

The mean pretest and posttest values were higher in experimental group however the results of independent t test in mean RR scores reveal no significant difference between the groups in both pre and posttest, as shown in table 1.

Table 2: Comparison of pretest and posttest between the groups of SDNN

VARIABLES	Group	Mean	SD	t Value	P value
Pre	Exp	68.44	30.09	1.4366	0.1562
	Con	57.54	28.68		
Post	Exp	97.97	50.83	2.7683	0.0076
	Con	67.07	33.96		
% of change from pretest to post test					0.0623

The mean pretest and posttest values were higher in experimental group however the results of independent t test in mean SDNN scores reveal significant difference between the groups in both pre and posttest. The percentage of change from pretest and posttest, within the groups showed significant difference as shown in table-2.

Table 3: Comparison of pretest and posttest between the groups of HR

VARABLES	Groups	Mean	SD	t Value	P value
Pre	Exp	78.97	14.09	-0.2251	0.8277
	Con	79.77	13.30		
Post	Exp	75.98	17.74	-0.1882	0.8514
	Con	76.74	13.05		
% of change from pretest to post test					0.9908

The mean pretest and posttest values showed no changes in experimental group however the results of independent t test in mean HR scores reveal no much difference between the groups in both pre and posttest. As shown in the table-3

Table 4: Comparison of pretest and posttest between the groups of RMSSD

VARIABLES	Groups	Mean	SD	t value	P value
Pre	Exp	59.73	33.17	1.0795	0.2848
	Con	50.22	35.09		
Post	Exp	92.07	49.28	3.3458	0.0014
	Con	55.46	34.12		
% of change from pretest to post test					0.0039

The mean pretest and posttest values showed highly significant in experimental group however the results of independent t test in mean RMSSD scores reveal significant difference between the groups in both pre and posttest. There was also a significant difference seen in the post test within the experimental group. The percentage of change in pretest and posttest showed significant changes (p=0.0039). As shown in the table-4

Table 5: Comparison of pretest and posttest between the groups of NN50

VARIABLES	Groups	Mean	SD	t value	P value
Pre	Exp	95.33	62.87	0.9260	0.3583
	Con	79.40	64.82		
Post	Exp	123.53	70.21	2.3839	0.0204
	Con	84.77	61.09		

% of change from pretest to post test					0.0700

The mean pretest and posttest values showed significant in experimental group however the results of independent t test in mean NN50 scores reveal significant difference between the groups in both pre and posttest. There was also a significant difference seen in the post test within the experimental group. The percentage of change in pretest and posttest showed significant changes (p=0.0700). As shown in the table-5

Table 6: Comparison of pretest and posttest between the groups of PNN50

VARIABLES	Groups	Mean	SD	t value	P value
Pre	Exp	25.73	17.93	0.6506	0.5179
	Con	22.41	21.44		
Post	Exp	36.75	21.85	2.2513	0.0282
	Con	24.73	19.43		
% of change from pretest to post test					0.0593

The mean pretest and posttest values showed some changes in experimental group however the results of independent t test in mean PNN50 scores reveal significant difference between the groups in both pre and posttest. There was also a significant difference seen in the post test within the experimental group (p=0.0282). Also significant in the percentage of change from pretest to post test, as shown in the table-6

Table 7: Comparison of pretest and posttest between the groups of VLF

VARIABLES	Groups	Mean	SD	t value	P value
Pre	Exp	28.57	15.65	-1.2662	0.2105
	Con	32.71	18.11		
Post	Exp	34.03	17.65	-0.6669	0.5075
	Con	36.06	20.71		
% of change from pretest to post test					0.6675

The mean pretest and posttest values showed no changes in experimental group however the results of independent t test in mean VLF scores reveal no significant difference between the groups in both pre and posttest, as shown in table7

Table 8: Comparison of pretest and posttest between the groups of LF

VARIABLES	Groups	Mean	SD	t values	P values
Pre	Exp	58.90	18.28	1.1698	0.2469
	Con	52.66	22.81		
Post	Exp	55.68	19.04	0.6244	0.5348
	Con	52.92	15.00		
% of change from pretest to post test					0.4572

The mean pretest and posttest values showed no changes in experimental group however the results of independent t test in mean LF scores reveal no significant difference between the groups in both pre and posttest, as shown in table 8.

Table 9: Comparison of pretest and posttest between the groups of HF

VARIABLES	Group	Mean	SD	t values	P values
Pre	Exp	41.08	18.30	-1.1726	0.2458
	Con	47.34	22.81		
Post	Exp	43.15	19.62	-0.8715	0.3871
	Con	47.08	15.00		
% of change from pretest to post test					0.6051

The mean pretest and posttest values showed no changes in experimental group however the results of independent t test in mean HF scores reveal no significant difference between the groups in both pre and posttest, as shown in table 9.

Table 10: Comparison of pretest and posttest between the groups of LF/HF

VARIABLES	Groups	Mean	SD	t value	P value
Pre	Exp	1.84	1.57	-0.1633	0.8708
	Con	1.81	1.46		
Post	Exp	1.92	2.04	1.2799	0.2057
	Con	1.40	0.97		
% of change from pretest to post test					0.2259

The mean pretest and posttest values showed no changes in experimental group however the results of independent t test in mean LF/HF scores reveal no significant difference between the groups in both pre and posttest, as shown in table 10.

Table 11: Comparison of pretest and posttest between the groups of SBP

VARIABLES	Groups	Mean	SD	t value	P value
Pre	Exp	112.24	6.69	-0.1506	0.8808
	Con	112.49	6.12		
Post	Exp	112.10	9.07	-0.1327	0.8949
	Con	112.40	8.43		

| % of change from pretest to post test	0.9691

The mean pretest and posttest values showed no changes in experimental group however the results of independent t test in mean SBP scores reveal no significant difference between the groups in both pre and posttest, as shown in table 11.

Table 12: Comparison of pretest and posttest between the groups of DBP

VALUES	Groups	Mean	SD	t value	P value
Pre	Exp	81.31	7.68	-0.0307	0.9756
	Con	81.37	7.32		
Post	Exp	75.33	6.18	-0.0423	0.9664
	Con	75.40	6.03		
% of change from pretest to post test					0.9965

The mean pretest and posttest values showed significant changes in experimental group however the results of independent t test in mean DBP scores reveal no much difference between the groups in both pre and posttest. As shown in the table-12

Independent t test showed that experimental group had significant higher percentage changes in the autonomic variables (SDNN, RMSSD, NN50, PNN50).Whereas HR, LF, LF/HF, HF, SBP, DBP and mean RR showed some changes but they are not significant.
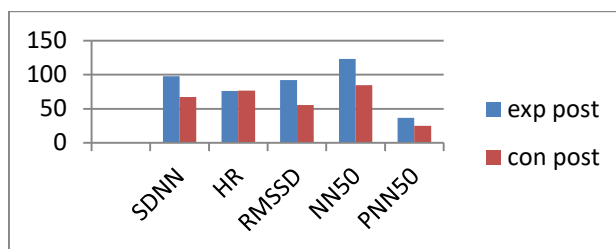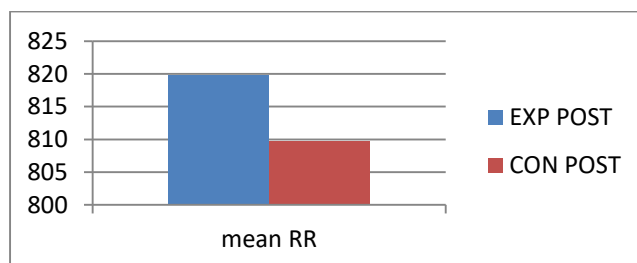

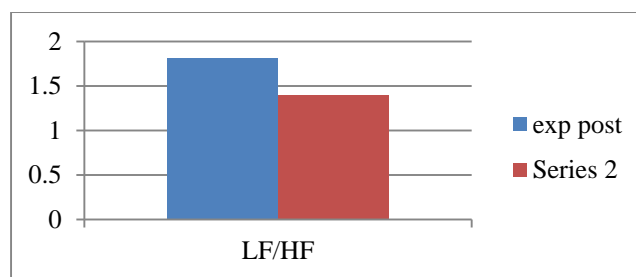Post frequency domain in experimental and control group
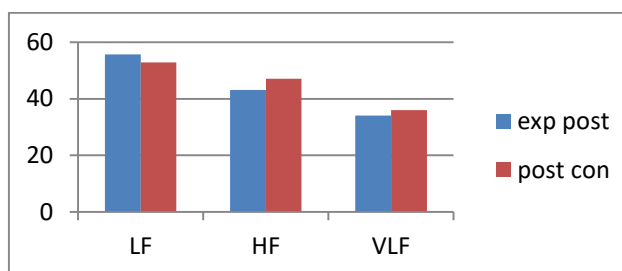
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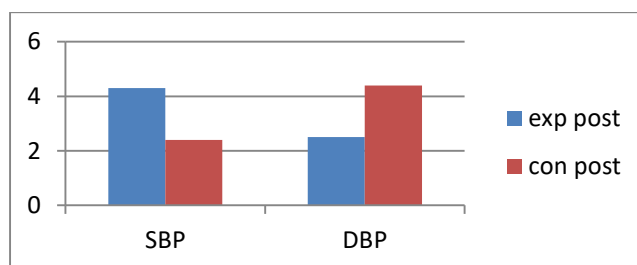
Post Blood Pressure in experimental and control group

Post mean RR experimental and control group

Post LF/ HF ratio in experimental and control group

DISCUSSION

The main aim of this study was to examine the influence of mind sound resonance technique on autonomic nervous system regulation. In this study there is a significant change seen in RMSSD, PNN50, NN50 and SDNN may be suggestive of vagal dominance which means reducing the sympathetic activity and stimulating the vagal efferent activity, as shown by Telles S in the study done on yoga where decreased RMSSD suggestive of vagal dominance.[7] There were also some changes seen in the mean RR, SBP, DBP, LF, HF, LF/HF and HR but statistically insignificant similar to the study conducted by Telles et.al, in 2010 which concluded that 8 week of hatha yoga program showed that there is an improvement in the HF power component, and the LF/HF ratio, but failed to reach statistical significance.[8] When there is excess of job strain it reduces the HRV which shows a sympathetic dominance by Vrijkotte T et al.[9] where in this study the employees have excess of job strain with sympathetic activity by significant change in the PNN50 and NN50, were it shows there is parasympathetic dominance indicative of vagal tone as it has already shown in the study that PNN50 and NN50 are both indicative of vagal tone.[10] In this study there was chanting of mantras may block the stress releasing hormones and increases immune function as stated Neuroscientist Marian Diamond from the University of California.[11] The stress and chronic diseases are mediated by endocrine pathways of the sympathetic nervous system (SNS) by the hypothalamic-pituitary-adrenal (HPA) axis.[12,13] Cortisol, the main effector by the activation of HPA, cortisol is released and it increases the fatty acid and glucose concentration which inhibits insulin, further leading to hyperglycemia and hyperlipidemia.[14,15,16] Many of the studies have concluded that individuals with high work-related stress were more likely to develop metabolic syndrome,[17] and coronary artery disease (CAD),[18,19] .

The results of this study also showed a significant decrease in heart rate even in the control group. These changes may be due to the supine rest position given to the control group instead of intervention. This can be well justified by the previous study done by Bera T K et al.[20] where they stated that in lying posture or in Shavasana, body remains in a well-supported condition. The Centre of gravity is nearest to the ground. The extensors and flexors are not required to work against the gravitational force, they are relaxed. The force required for the heart to pump blood against gravity is reduced to a great extent. Similarly even in our study, may be this same mechanism might have led to the relaxation response in the control group. Hence, we can say that even supine rest posture can establish a psycho-physiological relaxation that induces physiological stress to a certain extent. There are not much significant changes seen which may be because, as it was one of the advanced yoga relaxation technique. The subjects were also not exposed to yoga anytime they couldn't chant the mantras mentally and were not relaxed. As in this study it is shown that there are some changes in autonomic variables and some are significant, where by chanting mantras will create vibratory sensation around the ears and these sensations are transmitted through branches of the vagus nerve.[21] By chanting the mantras there is deactivation of limbic areas, amygdala, hippocampus, Para hippocampal gyrus, insula, orbitofrontal cortex, cingulated cortex and thalamus. Siddharth et al. reported that chanting OM mantra regularly will stabilizes the brain, removes of worldly thoughts and increase the energy levels and improves attention.[22,23]

CONCLUSION:

Therefore in this study the overall results were suggestive of vagal dominance which means reducing the sympathetic activity and stimulating the vagal efferent. This advanced technique of Mind Sound Resonance Technique thereby relieves stress and stabilizes autonomic function of the body. By which the physical, psychological and psychosomatic disorders can be eradicated in the society.

Abbreviations: SD=Standard deviation, HR=Heart rate, mean RR= Mean of R-R interval, RMSSD=The square root of the mean squared difference between adjacent N-N intervals, NN50=Consecutive normal sinus (NN) intervals exceeds 50 ms, pNN50=The fraction of consecutive NN intervals that differ by more than 50 ms, VLF=Very low frequency power, LF=Low frequency Power, HF=High frequency power, LF/HF=Low frequency/High frequency ratio, SBP=Systolic blood pressure, DBP=Diastolic blood pressure.

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