ISSN: 2321-5690
IJOPT
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
editor.ijopt@gmail.com

# THE EFFICACY OF HEAL HEART CHAKRA MUSIC THERAPY ON HEMODYNAMIC PARAMETERS AND STRESS LEVEL IN PRE-HYPERTENSIVE STAFF MEMBERS OF A TERTIARY CARDIAC CARE HOSPITAL – AN INTERVENTIONAL STUDY

**Dr. Miral Vyas (PT)[1], Dr. Mihir Mehta (PT)[2], Dr. Ayesha Mulla (PT)[3], Dr. Falak Oza (PT)[4]**

[1*] MPT in Cardio-Respiratory Disorders, U. N. Mehta Institute of Cardiology & Research Centre,
[2,4]Assistant Professor in Physiotherapy, U. N. Mehta Institute of Cardiology & Research Centre,
[3]I/C Principal & Associate Professor in Physiotherapy, U. N. Mehta Institute of Cardiology & Research Centre
***Corresponding Author:** miralvyas5star@gmail.com
DOI: https://doi.org/10.63299/ijopt.060464

## ABSTRACT

**Background:** Individuals with systolic blood pressure [SBP] of 120-139 mm Hg &/or diastolic blood pressure [DBP] of 80-89 mm Hg are considered as prehypertensive. Early intervention prevents progression to hypertension. Some relaxation trainings have achieved positive results in reducing BP and stress level. This study aimed at finding effect of heal heart chakra music therapy on hemodynamic parameters & stress level.
Objective: To find out the effect of heal heart chakra music therapy on hemodynamic parameters & stress level in pre-hypertensive individuals.
**Methods:** After ethical approval, a total of 60 participants fulfilling selection criteria were randomly allocated to control [CG] & intervention groups [IG]. IG [n=30] received music therapy [heal heart chakra music] once a day, 5 days/week for 4 weeks. CG [n=30] received advice to prevent hypertension. Hemodynamic parameters and stress level [Perceived Stress Scale-10] were measured before and at end of 4th week. Statistical analysis was performed using SPSS software [version-27.0].
**Results:** SBP & DBP significantly reduced [$p<0.05$] in IG as compared with CG. There was no significant difference [$p>0.05$] in heart rate within and between groups. Stress level significantly reduced between groups and within IG.
**Conclusion:** Heal heart chakra music therapy significantly reduces BP and stress level in prehypertensive subjects, but does not affect heart rate. Hence, music therapy is recommended in pre-hypertensive individuals to prevent progression to hypertension.
**Keywords:** Blood Pressure, Heal Heart Chakra Music Therapy, Pre-hypertension, Stress

## INTRODUCTION

High blood pressure (BP), also known as elevated BP, continues to be a prevalent condition that has a major effect on global health.[1] When combined with other metabolic disorders like obesity and diabetes, hypertension and prehypertension increase the risk of cardiovascular diseases such as ischemic heart disease and stroke.[1]

**PREHYPERTENSION:**

The state between normal blood pressure and hypertension is known as prehypertension.[1]

The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) has released its Seventh Report, which includes a new classification that includes the term "prehypertension" for individuals with systolic blood pressure (SBP) between 120- and 139-mm Hg and/or diastolic blood pressure (DBP) between 80- and 89-mm Hg.[2]

With the help of healthy lifestyle choices and early intervention, this new classification seeks to identify individuals who may benefit from lowering blood pressure, delaying the aging-related rise in blood pressure to hypertensive levels, or completely avoiding hypertension.[2]

**TABLE 1: CLASSIFICATION OF BLOOD PRESSURE FOR ADULTS [2]**

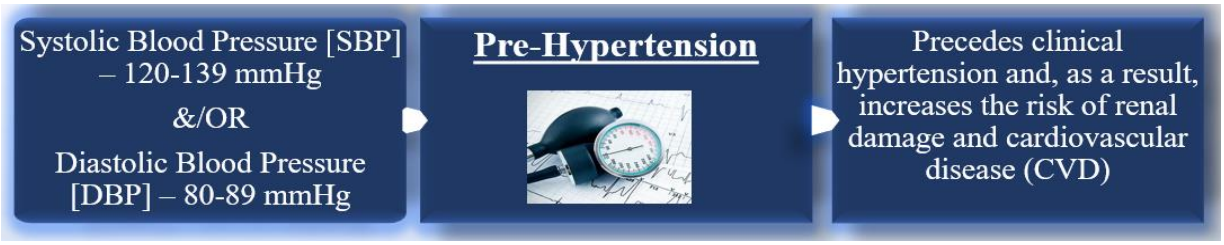
| BP CLASSIFICATION | SBP (mmHg) | DBP (mmHg) |
|---|---|---|
| Normal | <120 | And <80 |
| Pre-hypertension | 120-139 | or 80-89 |
| Stage-1 hypertension | 140-159 | or 90-99 |
| Stage-2 hypertension | ≥160 | or ≥100 |



A classification of blood pressure for adults 18 years of age and above is provided in Table 1. The classification is based on the mean of two or more accurately measured, seated blood pressure readings obtained during two or more office visits.[2]

The category linked to the higher of the two pressures is used if SBP and DBP belong to different categories.[3]

**PREHYPERTENSION & RISK OF CARDIOVASCULAR DISEASE:**




Because the association between blood pressure and the risk of cardiovascular disease (CVD) is constant throughout the whole blood pressure range, prehypertension itself is associated with BP-related morbidity and mortality.[3]

Across the whole blood pressure range—including ranges that were previously considered to be normal—the risk of CVD increases steadily.[3]

Subclinical atherosclerosis, which includes elevated coronary atherosclerosis and increased intima-media thickness in the carotid and brachial arteries, is known to be associated with prehypertension.[3]

**PREHYPERTENSION & STRESS:**

Stress can cause hypertension by raising blood pressure frequently and activating the nervous system to produce large amounts of hormones that constrict blood vessels.[4] Stress-related factors that can affect blood pressure include white coat hypertension, job strain, race, social environment, and emotional distress.[4] Furthermore, combining one risk factor with more stress-inducing factors increases the effect on blood pressure.[4] Overall, the evidence suggests that stress can affect the course of hypertension even though it may not be the direct cause of it.[4]

**MANAGEMENT OF PREHYPERTENSION [1]:**

Early detection of pre-hypertension can reduce the risk of cardiovascular disease and the development of hypertension. To avoid prehypertension and hypertension, it is recommended that young adults undergo primary intervention in addition to lifestyle modification. Non-pharmacological treatments help delay the progression of prehypertension to hypertension. Non-pharmacological therapies include things like physical activity, avoiding pressure or stress, music therapy, dietary adjustments, lifestyle modifications, and cutting back on alcohol consumption. Reducing sodium intake is the most efficient method of lowering blood pressure.

**MUSIC THERAPY AS A NON-PHARMACOLOGICAL INTERVENTION [6,7,8]:**

Music therapy is the clinical and scientifically validated use of music interventions to meet physical, emotional, mental, social, and cognitive needs in a therapeutic setting. Music interventions are used for stress reduction in a variety of settings because of the positive effects on psychological stress experiences (like restlessness, anxiety, and nervousness) as well as physiological arousal (like heart rate, blood pressure, and hormone levels).

It has been established that music and the body's seven "chakras," or beta physical energy sources, function in unison. There are 7 major chakras in the body. "Chakra" means "circulating," as the name implies, and it emphasizes that the body's chakras are constantly moving and never stationary. When the "swar" notes are sung correctly in the ascending (aaroha) and descending (avroha) orders, they synchronize with the Chakra toning from Root to Crown and Root to Root, respectively. When the chakra and tone frequencies align, the chakra's rhythm and vibration return to normal, enabling the resolution of both mental and physical issues. Best example is Chakra Sound Meditation. Every one of the seven chakras has a unique expression that can be affected either positively or negatively depending on various internal or external factors.

The heart chakra is located in the chest. It is also known as “Anahata”. “Yam” is the chant sound for the heart chakra. This chakra is associated with green colour.

Studies have found out effect of music therapy on hemodynamic parameters and stress level in prehypertensive and hypertensive individuals, but it is extremely uncommon for studies to use the “heal heart chakra music” as the music therapy. Therefore, this study aimed at finding out the efficacy of heal heart chakra music therapy on hemodynamic parameters and stress level in prehypertensive staff members of a tertiary cardiac care hospital.

## METHODOLOGY

**Study Design**: An Interventional Study

**Study Setting**: Staff members of a tertiary cardiac care hospital, Ahmedabad

**Study Population**: Subjects of either gender in the age group of 20 to 60 years with prehypertension (Systolic BP 120-139 mm Hg, Diastolic BP 80-89 mm Hg)

**Sample Design**: Simple Random Sampling (Chit Method)

**Sample Size**: 60

The formula used for sample size calculation was –

$n = r+1/r*[SD^2 (Z_\beta+Z_{\alpha/2})2/d2]$[9]

Where,

r = Ratio of control to cases

SD = Standard Deviation [From previously published studies]

$Z_\beta$ = Standard normal variate for power

$Z_{\alpha/2}$ = Standard normal variate

d = Expected mean difference between case and control [From previously published studies] Sample size calculation was done at 90 % power, 5 % Type 1 error and 95 % confidence interval using means and standard deviation from previously published study.

From the previously published study [10],

Post mean SBP of the intervention group – 119.94 mmHg

Post mean SBP of the control group – 127.05 mmHg

Hence, expected mean difference between case and control, d = 127.05 – 119.94 = 7.11

Post-SD of the intervention group – 8.35

Sample Size (n) = $1+1/1*[(8.35)^2*(1.28+1.96)^2/(7.11)^2]$

n = 2*69.72*10.50/50.55

n = 28.96 (≈29)

Hence, minimum sample size calculated was 29. For two groups, 60 samples were taken [30 samples per group].

**Duration of the Intervention**: 5 days per week for 4 weeks [20 sessions]

Selection Criteria: Table 2 shows the selection criteria for this study.

**TABLE 2: SELECTION CRITERIA**

| INCLUSION CRITERIA | EXCLUSION CRITERIA |
|---|---|
| Pre-hypertensive subjects [Systolic Blood Pressure – 120-139 mm Hg &/OR Diastolic Blood Pressure – 80-89 mm Hg] [Measured 2 times after 10 minutes of rest and 2 minutes of interval between two measurements] | Hypertensive patients with/without anti-hypertensive medications and Pre-Hypertensive subjects who are on anti-hypertensive medication |
| Age group – 20-60 years | Subjects with unstable angina and myocardial infarction |
| | Subjects with Hearing problems |
| | Subjects with recent history of cardiovascular or respiratory disorders |

| | |
|---|---|
| | Non-cooperative Subjects & not willing to participate |

**Outcome Measures:**

1. Systolic Blood Pressure [SBP] & Diastolic Blood Pressure [DBP]:

   To measure the blood pressure, "Mercury Sphygmomanometer" was used. Mercury Sphygmomanometer is a reliable and valid tool to measure blood pressure.[11]

2. Pulse Pressure [PP] [12]:

   Pulse pressure was measured as the difference between systolic and diastolic blood pressures. (Pulse Pressure = Systolic Blood Pressure – Diastolic Blood Pressure)

3. Mean Arterial Pressure [MAP] [13]:

   MAP was measured using the formula as follows: MAP = DBP + 1/3(PP)

4. Heart Rate [HR] & Saturation of Peripheral Oxygen [SPO2] [14]:

   Heart rate and Saturation of Peripheral Oxygen were measured using the "Pulse Oximeter".

5. Rate Pressure Product [RPP] [15]:

   Rate pressure product was measured as the product of heart rate × systolic blood pressure.

6. Respiratory Rate [RR] [16]:

   Respiratory rate was assessed using "manual counting method" – counting number of breaths in one minute.

7. Stress Level [17]:

   Stress level was measured using Perceived Stress Scale – 10 [PSS-10].


**Figure 5: Outcome Measures**

**Procedure:**

The Institutional Ethics Committee provided ethical approval [Reference No.: EC/Approval/16/Physiotherapy/29/08/2022]. The cardiologist had initially diagnosed pre-hypertension in the participants. After that, every participant had their blood pressure measurements taken thrice at a time and average of the 3 measurements was considered as the final measurement. The measurements were taken with the subjects seated in a chair and after ten minutes of comfortable sitting. Three measurements were taken and 2 minutes of interval was given in between the measurements. After screening the employees of a tertiary cardiac care hospital, the study was initiated. The screening criteria of the study were followed in selecting the subjects. Subjects who fulfilled the selection criteria were then included in the study. Each participant signed a written informed consent form. With equal subjects in each group, all participants were assigned randomly to the music therapy group and the control group. Each group consisted of 30 participants. The randomization was done by using "chit method". Prior to participation,

all outcome measures were evaluated for each participant in each group. All of the outcome measures were evaluated again for each participant in each group after four weeks. There were no dropouts or any adverse events during the study.

**Division of the groups:** A total of 60 participants were randomly allocated into two groups (Group A & B) with each group having equal participants. The allocation was concealed. The subjects were asked to pick a chit from the ballot box, which included the papers marked as "Group A" & "Group B", designating Music Therapy group and Control group respectively, to determine the group to which the subjects should belong. After picking up the paper, the subjects were assigned to either Group A or B, using the label which was marked on the paper. Through this process, each subject had equal opportunity of being allocated to the Groups A & B thus, the systemic bias was minimized.

Figure 2 shows the flowchart of the procedure.

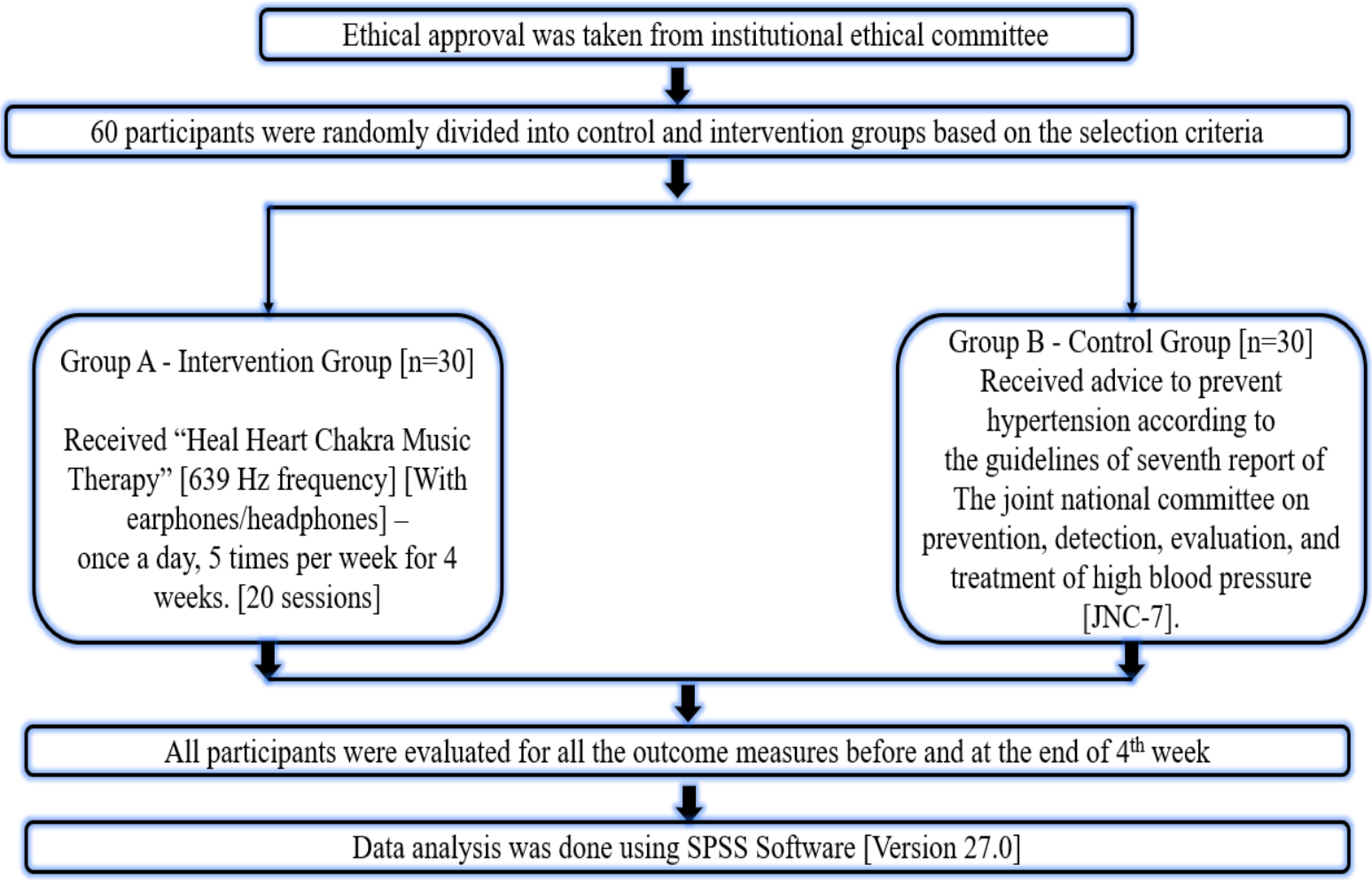



**Figure 2: Flowchart of the procedure**

The following interventions had been performed on each group.

Group A: Heal Heart Chakra Music Therapy Group

Group B: Control group – Received advice to prevent hypertension

**1. Group A:**

Group A received music therapy once a day, 5 days/week, for 4 weeks. The music therapy sessions included the "Heal Heart Chakra Music"

[Frequency-639 Hz] with earphones/headphones, which was 32 minutes and 52 seconds in duration. Every participant sat in a chair with their own earphones and received music therapy in a quiet setting. Figure 2 shows the picture showing the participant receiving heal heart chakra music therapy.

**Figure 3: Picture showing the participant receiving heal heart chakra music therapy**

**2. Group B:**

Participants of the group B were given advice to prevent hypertension. The advice was given according to the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure's Seventh Report. All patients with hypertension or prehypertension are advised to modify their lifestyles, according to the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure's Seventh Report. Changes include cutting back on sodium in the diet to less than 2.4 g per day; exercising for at least 30 minutes a day, four days a week; restricting alcohol intake to one drink or less for women and two drinks or less for men; adhering to the Dietary Approaches to Stop Hypertension eating plan, which is low in fat and salt and high in fruits, vegetables, potassium, calcium, and magnesium; and losing at least 10 pounds (4.5 kg) of weight.[2] Figure 3 shows the picture showing participant receiving advice to prevent hypertension according to JNC-7 guidelines.

**Figure 4: Participant receiving advice to prevent hypertension [According to JNC-7 guidelines]**

**RESULTS**

Microsoft Excel 21 and SPSS software [version 27.0] were used to conduct the statistical analysis. The significance level was kept at 5% and the confidence interval (CI) at 95%.

To get a descriptive analysis, the mean and standard deviation were used. SBP, DBP, PP, MAP, HR, RPP, RR, SPO2, Stress Level were the outcome measures that were recorded at the baseline and after the 4-weeks of intervention. These variables were analysed using both within group and between group analysis.

The normality of the data was checked using the Kolmogorov-Smirnov test, and statistical tests were chosen in accordance with the results of that analysis.

Baseline characteristics were compared using the appropriate tests which showed no significant

difference at the baseline among all the variables, which shows that the data was comparable. Table 3 shows the baseline characteristics.

**TABLE 3: BASELINE CHARACTERISTICS**

| VARIABLE | MUSIC THERAPY GROUP [MEAN ± SD] | CONTROL GROUP [MEAN ± SD] | P VALUE |
|---|---|---|---|
| **Age [Years]** | 37.93 ± 10.18 | 37.87 ± 8.54 | 0.78 |
| **BMI [kg/m$^2$]** | 24.96 ± 3.45 | 24.68 ± 2.28 | 0.73 |
| **Total MET-Min/Week** | 526.22 ± 237.05 | 529.25 ± 198.98 | 0.85 |
| **MNA SCORE** | 12.93 ± 0.83 | 13.03 ± 0.96 | 0.67 |
| **PRE-SBP** | 130.51 ± 3.73 | 129.69 ± 3.68 | 0.34 |
| **PRE-DBP** | 82.73 ± 1.33 | 83.31 ± 2.69 | 0.50 |
| **PRE-PP** | 47.69 ± 4.23 | 46.38 ± 2.72 | 0.12 |
| **PRE-MAP** | 98.63 ± 1.45 | 98.77 ± 2.78 | 0.86 |
| **PRE-HR** | 80.20 ± 2.24 | 79.40 ± 3.62 | 0.35 |
| **PRE-RPP** | 10446.84 ± 874.72 | 10244.31 ± 615.11 | 0.21 |
| **PRE-RR** | 17.07 ± 1.08 | 17.17 ± 1.05 | 0.56 |
| **PRE-SPO2** | 98.77 ± 0.57 | 98.93 ± 0.45 | 0.25 |
| **PRE-STRESS SCORE** | 11.60 ± 7.66 | 10.47 ± 6.72 | 0.59 |
| **PRE-FATIGUE SCORE** | 21.23 ± 13.77 | 20.77 ± 12.82 | 0.95 |
| **PRE-ANXIETY SCORE** | 2.57 ± 2.43 | 2.70 ± 2.09 | 0.67 |
| **PRE-DEPRESSION SCORE** | 6.03 ± 3.44 | 5.07 ± 3.71 | 0.34 |

Within group analysis showed significant difference in the SBP, DBP, MAP & Stress Level within the music therapy group. There was no significant difference in any variable within the control group. Table 4 shows the within group analysis.

**TABLE 4: WITHIN GROUP ANALYSIS**

| VARIABLE | MUSIC THERAPY GROUP [MEAN ± SD] | P VALUE | CONTROL GROUP [MEAN ± SD] | P VALUE |
|---|---|---|---|---|
| **SBP** | 126.87 ± 3.84 | **<0.001 [t test]** | 129.47 ± 3.49 | 0.32 [t test] |
| **DBP** | 79.10 ± 2.34 | **<0.001 [t test]** | 83.00 ± 2.23 | 0.20 [t test] |
| **PP** | 46.87 ± 4.93 | 0.43 [t test] | 46.47 ± 2.51 | 0.74 [t test] |

| | | | | |
|---|---|---|---|---|
| **MAP** | 95.62 ± 1.77 | **<0.001 [t test]** | 98.49 ± 2.45 | 0.16 [t test] |
| **HR** | 80.03 ± 6.16 | 0.94 [Wilcoxon signed rank test] | 78.97 ± 3.70 | 0.32 [Wilcoxon signed rank test] |
| **RPP** | 10170.11 ± 663.81 | 0.15 [t test] | 10282.09 ± 589.96 | 0.48 [t test] |
| **RR** | 16.73 ± 0.69 | 0.17 [Wilcoxon signed rank test] | 17.03 ± 1.10 | 0.44 [Wilcoxon signed rank test] |
| **SPO2** | 99.00 ± 0.37 | 0.07 [Wilcoxon signed rank test] | 98.97 ± 0.41 | 0.74 [Wilcoxon signed rank test] |
| **STRESS SCORE** | 2.03 ± 2.36 | **<0.001 [t test]** | 10.10 ± 6.46 | 0.29 [Wilcoxon signed rank test] |

Between group analysis showed significant improvement in SBP, DBP, MAP & Stress Level. Table 5 shows between group analysis.

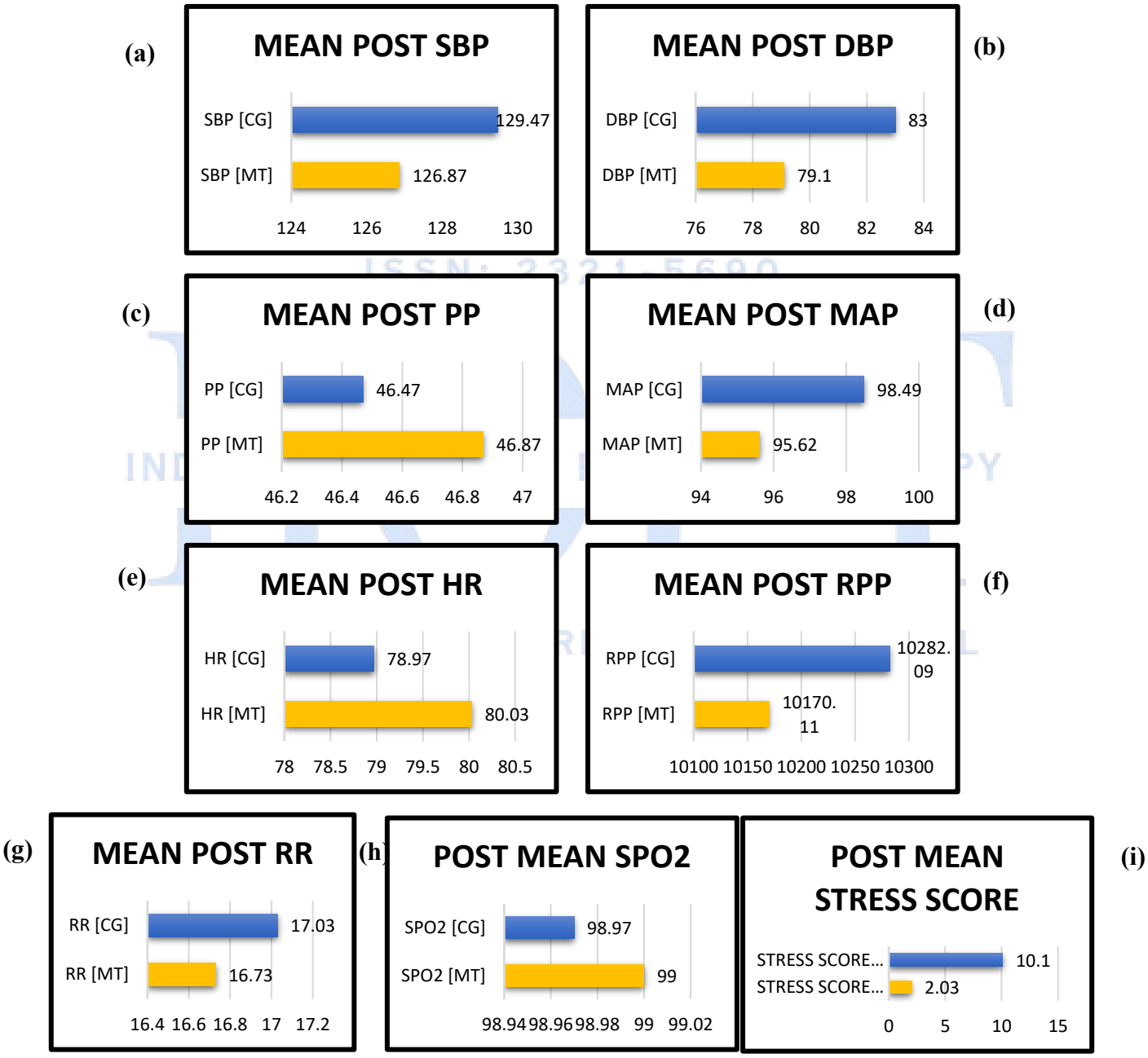


**TABLE 5: BETWEEN GROUP ANALYSIS**

| VARIABLE | MUSIC THERAPY GROUP [MEAN ± SD] | CONTROL GROUP [MEAN ± SD] | P VALUE |
|---|---|---|---|
| **POST SBP [t test]** | 126.87 ± 3.84 | 129.47 ± 3.49 | **0.008** |
| **POST DBP [t test]** | 79.10 ± 2.34 | 83.00 ± 2.23 | **<0.001** |
| **POST PP [t test]** | 46.87 ± 4.93 | 46.47 ± 2.51 | 0.69 |
| **POST MAP [t test]** | 95.62 ± 1.77 | 98.49 ± 2.45 | **<0.001** |
| **POST HR [Mann-Whitney U test]** | 80.03 ± 6.16 | 78.97 ± 3.70 | 0.36 |
| **POST RPP [t test]** | 10170.11 ± 663.81 | 10282.09 ± 589.96 | 0.49 |

| | | | |
|---|---|---|---|
| **POST RR [Mann-Whitney U test]** | 16.73 ± 0.69 | 17.03 ± 0.10 | 0.29 |
| **POST SPO2 [Mann-Whitney U test]** | 99.00 ± 0.37 | 98.97 ± 0.41 | 0.74 |
| **POST STRESS SCORE [Mann-Whitney U test]** | 2.03 ± 2.36 | 10.10 ± 6.46 | **<0.001** |

Graph 1 shows the between group comparison of all the outcome measures.




**GRAPH 1: BETWEEN GROUP ANALYSIS OF (a) SBP, (b) DBP, (c) PP, (d) MAP, (e) HR, (f) RPP, (g) RR, (h) SPO2 & (i) Stress Score**

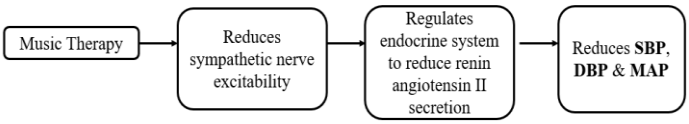
## DISCUSSION

This study aimed at finding out the effect of heal heart chakra music therapy on hemodynamic parameters and stress level in pre-hypertensive staff members of a tertiary cardiac care hospital.

The present study found significant improvement in SBP, DBP, MAP and Stress Score within the intervention group and between groups. But there was no significant difference in the PP, HR, RPP, RR and SPO2 within groups and between groups.

The research suggested that music could inhibit and balance brain waves, capable to activate limbic system related with emotion. When the limbic system activates, the individual would feel relaxed. The music can affect sympatho-adrenergic activities that have a role in plasma catecholamine concentrations and also can affect the release of stress-released hormones and stimulates the body to produce nitric oxide (NO) molecules that work on blood vessel tone and could decrease blood pressure.[18]

Music therapy reduces the sympathetic nerve excitability with regulates the endocrine system to reduce renin angiotensin II secretion, which results in reduction of SBP, DBP and MAP.[6]




Findings of this study is in accordance with study done by Mateja Lorber et al. who found significant reductions in SBP after music therapy.[18]

As HR and RPP did not show significant difference, it suggests that myocardial oxygen demand remained the same.

Music Therapy may reduce the cortisol levels which may induce reduction in the Stress Level. [6,18]


Music-inspired Positive emotions are believed to be especially helpful for stress recovery because they may help reverse the negative effects that negative emotions during stress cause, thus facilitating the process of stress recovery. According to some theories, music can serve as an anchor to divert attention from ruminative thoughts or depressive moods that follow a stressful event. This can keep physiological activation from prolonging and promote a more regular stress recovery process.[19]

A systemic review and meta-analysis done by do Amaral et al. shows significant improvement in SBP after music therapy in the hypertensive individuals which is in accordance with the present study.[20]

The findings of the present study are also in accordance with the study done by Kirthana Ubrangala Kunikullaya et al. A randomized controlled trial with a prospective design was conducted on one hundred pre-hypertensives and stage I hypertensives in that study. Following the music intervention the systolic & diastolic blood pressure showed significant improvement in the study participants.[21]

So, the present study suggests that heal heart chakra music therapy can be safe, non-invasive & cost-effective intervention for reducing blood pressure and stress level in the prehypertensive adults.

## CONCLUSION

Heal Heart Chakra Music therapy significantly reduces SBP, DBP, MAP and Stress Level in Pre-Hypertensive Adults, but does not affect PP, HR, RPP, RR, SPO2 in these patients.

## LIMITATION OF THE STUDY

The device with which music therapy was given were provided by participants themselves. Hence, reliability of all the devices could not be checked.

Time of the day during which participants received music therapy was not same for all the participants.

## FUTURE RECOMMENDATION

Future studies can compare this therapy with other relaxation trainings.

To find out effect of other chakra meditation music therapy on hemodynamic parameters and stress level.

To find out the effect of music therapy on the doses of anti-hypertensive medications in hypertensive individuals.

To compare the effect of heal heart chakra music therapy with the western music therapy on hemodynamic parameters and stress level.

## CLINICAL IMPLICATION

Heal Heart Chakra Music Therapy can be implicated for pre-hypertensive adults to prevent progression to hypertension.

## REFERENCES


1. Srivastava A, Mirza TM, Sharan S. Prehypertension.
2. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo Jr JL, Jones DW, Materson BJ, Oparil S, Wright Jr JT, Roccella EJ. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. hypertension. 2003 Dec 1;42(6):1206-52.
3. Svetkey LP. Management of prehypertension. Hypertension. 2005 Jun 1;45(6):1056-61.
4. Kulkarni S. O′ Farrell I., Erasi M., Kochar MS. Stress and hypertension. WMJ. 1998;97(11):34-8.
5. Ayada C, Toru Ü, Korkut Y. The relationship of stress and blood pressure effectors. Hippokratia. 2015 Apr;19(2):99.
6. de Witte M, Pinho AD, Stams GJ, Moonen X, Bos AE, van Hooren S. Music therapy for stress reduction: a systematic review and meta-analysis. Health Psychology Review. 2022 Jan 2;16(1):134-59.
7. De Witte M, Spruit A, van Hooren S, Moonen X, Stams GJ. Effects of music interventions on stress-related outcomes: a systematic review and two meta-analyses. Health psychology review. 2020 Apr 2;14(2):294-324.
8. Kumar S. Fostering Mental Wellbeing by Healing Chakras through Music Therapy.
9. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Indian journal of psychological medicine. 2013 Apr;35(2):121-6.
10. Mir IA, Chowdhury M, Islam RM, Ling GY, Chowdhury AA, Hasan ZM, Higashi Y. Relaxing music reduces blood pressure and heart rate among pre-hypertensive young adults: A randomized control trial. The Journal of Clinical Hypertension. 2021 Feb;23(2):317-22.
11. Arifin WN, Nadiah WA, Irfan M, Wee CX, Draman N, Naing NN. Intraclass correlation in practice: Assessment of reliability of manual blood pressure measurement among assessors in a clinical trial. Education in Medicine Journal. 2011 Dec 1;3(2).
12. Homan TD, Bordes S, Cichowski E. Physiology, pulse pressure.
13. DeMers D, Wachs D. Physiology, mean arterial pressure.
14. Iyriboz Y, Powers S, Morrow J, Ayers D, Landry G. Accuracy of pulse oximeters in estimating heart rate at rest and during exercise. British journal of sports medicine. 1991 Sep;25(3):162.
15. Stoschitzky K. Blood pressure, heart rate, or the Rate Pressure Product: what is the best predictor

of clinical outcome? European Heart Journal Open. 2022 Sep 1;2(5): oeac063.

16. Karlen W, Gan H, Chiu M, Dunsmuir D, Zhou G, Dumont GA, Ansermino JM. Improving the accuracy and efficiency of respiratory rate measurements in children using mobile devices. PloS one. 2014 Jun 11;9(6): e99266.
17. Baik SH, Fox RS, Mills SD, Roesch SC, Sadler GR, Klonoff EA, Malcarne VL. Reliability and validity of the Perceived Stress Scale-10 in Hispanic Americans with English or Spanish language preference. Journal of health psychology. 2019 Apr;24(5):628-39.
18. Lorber M, Divjak S. Music therapy as an intervention to reduce blood pressure and anxiety levels in older adults with hypertension: a Randomized Controlled Trial. Research in gerontological nursing. 2022 Mar 1;15(2):85-92.
19. Adiasto K, Beckers DGJ, van Hooff MLM, Roelofs K, Geurts SAE. Music listening and stress recovery in healthy individuals: A systematic review with meta-analysis of experimental studies. PLoS One. 2022 Jun 17;17(6):e0270031. doi: 10.1371/journal.pone.0270031. PMID: 35714120; PMCID: PMC9205498.
20. do Amaral, M. A., Neto, M. G., de Queiroz, J. G., Martins-Filho, P. R., Saquetto, M. B., & Oliveira Carvalho, V. (2016). Effect of music therapy on blood pressure of individuals with hypertension: A systematic review and Meta-analysis. International journal of cardiology, 214, 461–464. https://doi.org/10.1016/j.ijcard.2016.03.197
21. Kunikullaya, K. U., Goturu, J., Muradi, V., Hukkeri, P. A., Kunnavil, R., Doreswamy, V., Prakash, V. S., & Murthy, N. S. (2015). Music versus lifestyle on the autonomic nervous system of prehypertensives and hypertensives--a randomized control trial. Complementary therapies in medicine, 23(5), 733–740. https://doi.org/10.1016/j.ctim.2015.08.003