

Effects of Sound-based Meditative Healing Method on Stress, Tension, Cortisol's Level & Blood Pressure: A Randomised Controlled Trial

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Abstract

Psychological stress, depression, and tension are currently becoming very common in this developed world. Fighting these conditions has become a struggle for every individual. Introducing integrative traditional medicinal techniques such as sound-based meditations, especially from various forms of singing bowls, gongs and pre-recorded sound frequencies such as solfeggio frequencies (mainly 528 Hz), was found to be beneficial significantly. This study investigated the effects of sound-based meditation for four weeks, 60 minutes every day, on the stress, anxiety, tension, mood, cortisol levels, blood pressure and spiritual well-being of participants. One hundred men and women (mean age: 45 years) were included. They are divided into two groups, i.e., the control group (n=50) undergoes meditation without **received a sham sound intervention**, simulating the sound-based setup without therapeutic frequencies, and the experimental group (n=50) undergoes the intervention of all forms of sound-based meditation techniques. The observations revealed that the participants in the control group had no evidence of positive changes in the levels of **stress, anxiety, tension, cortisol, mood, or blood pressure ($p>0.05$)**, with no significant changes remaining. The experimental group reported significant positive changes in stress, anxiety, tension, cortisol, and blood parameters after the sound-based meditation intervention (**$p<0.001$**). This can be used in all stressful environments, such as meditation centres, counselling centres, companies, industries, and educational institutions, to bring back a harmonious and calm mind-set among the people.

Introduction

Conservatively, mental health issues, cardiac diseases such as hypertension, and addictive behaviour are all directly proportional to stress, tension and personal well-being (Richardson S). Long-term stress-related disorders such as hypertension, cardiovascular disease and impaired cognitive function require the exploration of interventions to mitigate these effects (Santisteban). Integrative approaches, such as singing bowls, gongs, hearing music and sound-based meditation, have gained attention for their potential to harmonise the mind and body (Modran) (Shen).

Sound-based meditation includes recorded sound frequency, such as solfeggio frequency (528 Hz), singing bowls, and gongs are rooted in ancient traditions and are believed to influence the body's bio-field and physiological responses (Allen L). These practices aim to induce relaxation, reduce stress and promote overall well-being through the therapeutic use of sound waves and vibrations (Shen). Despite the growing popularity of sound-based meditation, the research findings are limited.

This randomised controlled trial investigated the effects of sound-based meditation on stress, anxiety, blood pressure, and cortisol levels (Staufenbiel). The outcomes of the control group and the experimental group undergoing the sound-based meditation intervention were compared. This study seeks to provide empirical evidence for the efficacy of sound-based meditation, especially solfeggio frequency (528 Hz), the singing bowl, gongs and pre-recorded harmonious sounds (Modran). The findings support the incorporation of sound-based meditation healing techniques for stress, anxiety, trauma, blood pressure and other psychological illnesses.

Methods

The study consisted of a convenience sample of 100 participants, with ages ranging from 21–65 years; the mean age = 46.37 years, SD = 13.50 years, 50 females (n = 50) and 50 males (n = 50). Sound-based meditation was

conducted at the Meditation Centres of the UNS Research Council, Tamil Nadu, India. This randomised controlled study was performed over approximately four weeks.

The data were collected by the principal investigator Mr. Suresh Sathyanarayanan. Dr Hemachandran Ravikumar, MRSB. Rsci (UK) drafted the reports and generated the scientific findings. All the participants provided written concerns about volunteering in the study, and the study was approved by the Institutional Review Board (IRB) & Institutional Ethics Committee (IEC) of the UNS Research Council.

The participants are randomly divided into two groups. The control group (n = 50) comprises 50 participants received a sham intervention involving non-therapeutic ambient noise (e.g., white noise or neutral tones) or wore headphones playing silent/low-volume audio, designed to simulate the setting of the experimental condition without providing the therapeutic elements of sound-based meditation.”, and the other group is an experimental group (n = 50) comprising 50 participants who undergo sound-based meditation (Intervention). The demographics of the groups are presented in Table 1.

Design

The participants were provided with standardised questionnaires before meditation, which included the Hospital Anxiety and Depression Scale (HADS) (Snaith). Tension, anger and stress are analysed via the Profile of Mood States (POMS-SF) (Shacham) to assess well-being. Blood pressure was monitored via automated sphygmomanometers (O'Brien E) regularly before and after sound-based meditation. Additionally, the morning blood cortisol level (J Aubets) was evaluated before the commencement of the trial and four weeks after the completion of sound-based meditation. Following meditation, the participants were also asked about the questionnaires with post-meditation questionnaires to evaluate the significance of the trial.

Table 1

Characteristic	All (n = 100)	Males (n = 50)	Females (n = 50)
Age in years, mean (SD)	49.7 (13.0)	42.0 (15.8)	51.0 (12.0)
Education Background			
High school	10	12	8
Some college	30	28	32
BA/BS	35	34	36
Masters	20	18	22
PhD/MD	5	8	2
Marital Status			
Single	40	45	35
Partner	10	12	8
Married	30	25	25
Divorced	18	15	20
Widowed	2	3	2
Meditation experience, %			
Yes	80	85	75
No	20	15	25
Bowl experience, %			
Yes	60	58	62
No	40	42	38

Sound Meditation Protocol

The participants were advised to bring yoga mats or blankets to perform sound-based meditation (Goldsby). They can choose their comfortable position. The participants can also lie down in a supine position to synchronise easily with the process. The participants in the control group and the experimental group were evaluated separately. The control group (n = 50) and experimental group (n = 50) are numbered with participant IDs for easy evaluation. The participants are arranged in circular form so that the sound-producing instruments and pre-recorded sound frequency can be played from the centre.

The musical instruments consisted of a Singing bowl, gongs, Tingshas (Cymbals), Bells, Small Bells, and recorded Sound Frequencies such as 528 Hz (Solfeggio frequency). The meditation is focused mainly on the recorded sound frequency efficiency (approx. 75%), and the remaining (approx. 25%) is concentrated on the efficiency of singing bowls and bells.

The room is made of higher ambient water for easy ventilation, and insane sticks are used to make it more presentable. The singing bowls were large, ranging from 10–12 inches, and the small bowls were 4–6 inches. Crystal bowls were also used in this trial, along with smaller bells, to make the sounds more pleasant to hear. The sounds were primarily produced by the recorded sound frequency of 528 Hz and vibrations created by hitting or tapping the singing bowls, bells and gongs with mallets.

The room was made available with a 5.1 Channel speaker system (four-channel speaker in four corners, one in the centre and one subwoofer) to create surrounding effects of the sound frequency. Each participant had at least one singing bowl, one crystal bowl and one bell near His or her head. The bowls and bells were struck with a wooden mallet (Goldsby) in a regular sequence to synchronise with the background playing frequency of 528 Hz recorded solfeggio frequency. The duration of this sound-based meditation is approximately 60 minutes every day. The control group participants designed to replicate the sensation of sound-based meditation without producing therapeutic frequencies, the control group underwent a sham condition. This involved running white noise through the same 5.1 speaker system utilising the same ambient arrangement. The teacher used the same framework to keep consistency and lower expectations impact. In contrast, the experimental group was advised to visit once daily in the centre during the allotted time. Additionally, they were asked to perform self-meditation in their homes or silent spaces at their convenience, with the provided pre-recorded sound frequency for 20 minutes in the morning after waking up and 20 minutes before sleeping at night. They were advised not to be involved in harsh arguments, emotional conflicts or late-night sleep. The participants were provided with a vegan diet chart for easy digestion, and they were advised to stay calm until the completion of the trial. (*The participants are free to withdraw in case of any emergencies with a letter of withdrawal to the principal investigator*). At the beginning of the sound healing meditation, the field controller instructed everyone about the trial and advised everyone to lie down, and if they wished to fall asleep, they were allowed to do so. Every participant had one instructor sitting near their head to strike the gongs and singing bowl in synchrony with background recorded sounds. The field controller told them to observe the sensations and changes happening in their bodies during meditation and asked them to relax and enjoy the meditation. Then, the sound meditation began. After the conclusion of the meditation, the field instructors advised the participants to gently become aware of their surroundings and were also instructed to take their time in readjusting to a state of awareness (Goldsby).

Data analysis

The analysis was performed with SciPy 1.0, Microsoft Excel 2007, and D. (2007), Matplotlib: 2D Graphics Environment for the calculations, trends, and graphs. The data were normally distributed.

Results

The analysis revealed significant differences in all parameters, i.e., HADS-A score, HADS-D score, cortisol level, and blood pressure and the spiritual score were also recorded (Table 2).

Table 2

Table 2

shows the average means and standard divisions before and after sound-based meditation, and the abbreviations include the Hospital Anxiety & Depression Scale (HADS) (Snaith). Tension, anger and stress are analysed via the Profile of Mood States (POMS-SF) (Shacham).

Measure	n	Pre Mean	Pre SD	Post Mean	Post SD	Change Mean	p-value	η^2
HADS_Anxiety	100	10.29	2.72	9	2.96	-1.29	0.004	0.08
HADS_Depression	100	10.19	3.25	8.58	2.68	-1.62	0.000	0.13
Cortisol_Level	100	15.23	1.28	13.52	1.62	-1.71	0.000	0.4
Blood Pressure	100	130.12	5.34	124.4	5.81	-5.72	0.000	0.33

The effect varied across age, group, and sex and between the control groups (received a sham sound meditation designed to mimic the therapeutic environment without delivering actual healing frequencies (e.g., white noise)). And the experimental group (received full-spectrum sound-based meditation using singing bowls, bells, and pre-recorded 528 Hz Solfeggio frequencies). The age group effect has shown that participants aged approximately 20–39 years (middle-aged) and 40–59 years (seniors) have the most significant reductions in tension, anxiety, and depression, with moderate to high effect sizes, indicating positive intervention efficacy. However, the age group of 60–79 years (seniors) is smaller, although the values are statistically significant.

Table 3

Measure	Group	n	Pre Mean	Pre SD	Post Mean	Post SD	Change Mean	p-value	η^2	Significance
Tension (POMS)	Control	50	9.92	2.8	10.28	3.05	0.36	0.567	0.01	No
Tension (POMS)	Experimental	50	10.65	2.62	7.71	2.23	-2.94	0.000	0.39	Yes
Anxiety (HADS)	Control	50	9.92	2.8	10.28	3.05	0.36	0.567	0.01	No
Anxiety (HADS)	Experimental	50	10.65	2.62	7.71	2.23	-2.94	0.000	0.39	Yes
Depressed Mood (HADS)	Control	50	10.45	3.28	9.8	2.32	-0.66	0.256	0.03	No
Depressed Mood (HADS)	Experimental	50	9.94	3.24	7.35	2.46	-2.58	0.000	0.3	Yes

(Table 3). “Yes” indicates that the results are significant according to the Hospital Anxiety and Depression Scale (HADS) (Snaith). Tension, anger and stress are analysed via the Profile of Mood States (POMS-SF) (Shacham).

The sex analysis revealed that females experienced greater reductions in tension and anxiety than males did, with a statistically significant difference ($p < 0.05$) and a moderate effect size. Additionally, both genders showed a

reduction in depression, in some cases with a greater effect size ($\eta^2 = 0.21$), with females showing moderate significance compared with males. Ref Fig: 1,2,3,4.

The experimental group showed substantial decreases in tension, anxiety, depression, and cortisol, with a statistically significant effect size ($\eta^2 = 0.39$) and high statistical significance ($p < 0.001$). The control group exhibited negligible changes across all the parameters and did not produce a significant value, which made the intervention more significant. Ref Fig: 1,2,3,4.

Discussion

This was a randomised control study designed to examine the potential effects of sound frequency and solfeggio frequency (528 Hz) on tension, anger, anxiety, and spiritual well-being. The study revealed a significant change in all the parameters that were considered, which proves that sound-based meditation is an efficient intervention.

The average difference in the pre-and post-meditation scales was highly significant for the participants in the experimental group compared with those in the control group; these findings support the hypothesis that sound meditation relaxes tension & helps decrease stress

The reduced value of the cortisol level from premeditation (average mean = 15.23) to post-meditation (average mean = 13.52) shows that the intervention is significant in supporting the hypothesis that sound meditation reduces stress among the experimental group and that the control group undergoing the placebo effect (received a sham sound meditation designed to mimic the therapeutic environment without delivering actual healing frequencies (e.g., white noise)) has shown less significant results.

The scores were obtained from the Hospital Anxiety and Depression Scale (HADS) for Anxiety & Depression. Tension, anger and stress are analysed via the Profile of Mood States (POMS-SF) and compared to form an analysis table. The ($P < 0.001$) value after meditation shows that the change is significant on the positive side. (Ref. Table 2, 3)

While the physiological effects of sound meditation on the brain are still unknown, findings have shown that it promotes psychological well-being among participants. Similarly, (Arroyo-Anlló) presented a systematic investigation of music-based interventions in Alzheimer's disease patients to evaluate the emotional skills that produced some minor changes in the experimental group compared with the control group; however, it was a good intervention for future studies (Goldsby), emphasising that the effect of sound meditation on the brain is unknown. Nevertheless, they were successful in determining the effects of singing bowl meditation on mood, tension, stress and spiritual well-being in an observational study. This study was limited to observing only the experimental group, and it highlighted the need for interventions involving sound-based meditation among the control and experimental groups. Another study revealed that the potential influence of sound waves on the body's biofield may contribute to changes in mood and psychological responses (Allen L). Additionally, a study focused on the effect of the singing bowl on blood pressure through 3D imprinting data (Barrass). Another randomised crossover study (Landry) determined that the physiological and psychological effects of Himalayan singing bowls are significant in directed relaxation sessions. A previous study (Allen L) investigated the effects of a quartz bowl on altering the energy balance of the body via acupuncture meridians.

The effects of singing bowls, gongs, and bell-based relaxation were highly efficient on the basis of previous studies. Our study mainly concentrates on randomised control studies to determine the exact significance of

sound-based meditation. On the basis of the available data from the study, it is clear that the intervention is important for reducing stress, tension, and blood pressure and for creating a harmonious mind-set. Additionally, to follow sound-based meditation, the participants need not be experts; they can even fall asleep during the session and experience deep relaxation.

In summary, this randomised controlled study revealed the beneficial effects of sound-based meditation, especially solfeggio sound frequency (528 Hz), on tension, stress, blood pressure and anxiety among individuals. In addition, future research could explore the effects of long-term interventions on various psychological conditions in greater depth.

Crucially, including a sham sound condition reduces the risk of expectation effects or nonspecific benefits connected with the meditative setting, therefore strengthening the evidentiary basis. Although the control group showed no significant changes, the experimental group constantly demonstrated gains in all evaluated areas, therefore highlighting the possibilities of sound-based treatments in clinical and wellness environments.

Limitations

The limitation of the present study is the short timeline. This study, however, provides the groundwork for future long-term studies regarding the effects of sound-based meditation.

Declarations

Author Contributions

Mr. Suresh Sathyanarayanan designed the study; Dr. Hemachandran Ravikumar provided ideas on the final design and selection of assessment tools. Both authors were involved in the collection of data, summarising, statistical analysis and finalising the report.

Dr. Hemachandran Ravikumar provided the initial draft of the manuscript, and the final version is made available by considerations of both.

Declarations of conflicts of interest

The authors declare that they have no potential conflicts of interest concerning the study design, research analysis or publication of this article.

Data Availability

Ravikumar, Hemachandran (2025), "Analysed Data's of Effects of Sound-based Meditative Healing Method on Stress, Tension, Cortisol's Level & Blood Pressure: A Randomised Controlled Trial.", Mendeley Data, V2, doi: 10.17632/ts5sbcxgv9.2

Trial Registration:

The trial was registered under Clinical trial registry of India with registration number CTRI/2025/01/078996. Trial Registered Prospectively on 20/01/2025.

Consent to Participate

All participants voluntarily agreed to participate in the study and provided written informed consent prior to enrolment. The study team ensured that participants understood the purpose, methodology, and potential risks or benefits of the trial. Consent was obtained in accordance with institutional guidelines approved by the Ethics Committee of the UNS Research Council, India.

Ethical Approval

This study was conducted in full compliance with the ethical principles outlined in the

Declaration of Helsinki (2013 revision). Ethical clearance was obtained from the Institutional Review Board (IRB) and the Institutional Ethics Committee (IEC) of the UNS Research Council, India. Approval ID: UNS/IEC/2024/12/11. All procedures involving human participants were carried out in accordance with relevant guidelines and regulations.

Human Ethics and Consent to Participate Declarations

The study was approved by the Institutional Ethics Committee (IEC) of the UNS Research Council and conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent prior to participation. The researchers ensured the confidentiality and anonymity of participant data throughout the study.

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Ethical Approval

The study was approved by the Review and Ethics Committee of the UNS Research Council, India. All participants provided written informed consent about the trial.

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Figures

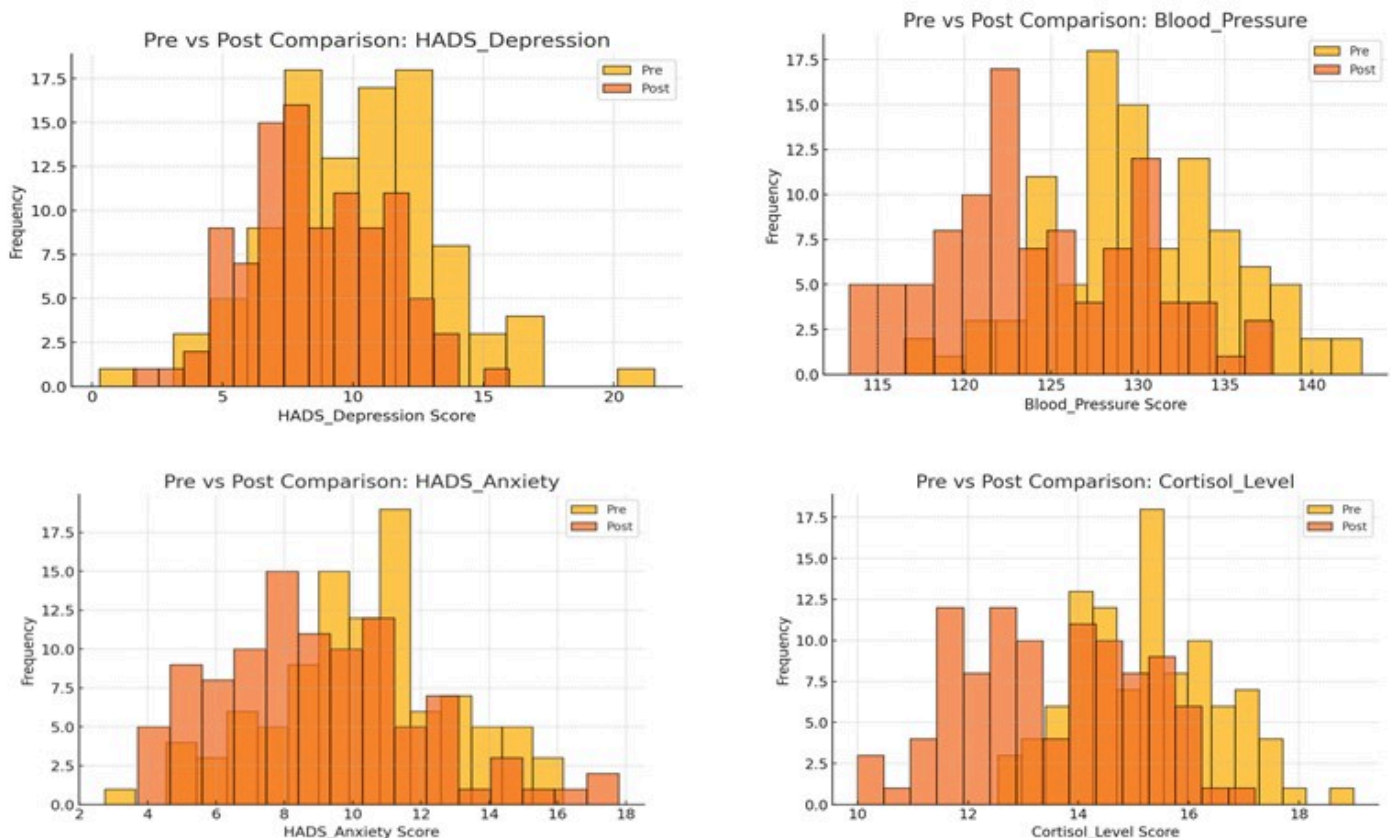


Figure 1

Graph showing the significant differences among the groups

Supplementary Files

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- [Tabletrial.docx](#)
- [TrialDataSheet2025.pdf](#)