



## Mind-Body Harmony: Exploring the Scientific Basis of the Gayatri Mantra's Effects on Well-being

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**Abstract :** Mantras, integral components of the Vedas, possess inherent Vibrational qualities designed to influence the human body in specific ways. Numerous researchers and scientists have empirically demonstrated that the recitation of mantras has a calming effect on the mind and soul. This study focuses on investigating the scientific aspects of the Gayatri Mantra and its potential medical benefits for the human body. Through this survey, it is noted that the efficacy of the mantra appears to be influenced by the language used. While existing research predominantly explores the observed effects on individuals, there remains an unexplored opportunity to investigate the structural properties of the Gayatri Mantra. Thus, there exists considerable potential for further research in this domain.

**Keywords -** Mantra, sound, effects, human body, vibrations, Brain waves.

### I. INTRODUCTION

Mantra represents a meaningful combination of Sanskrit words which can be Chanted, listen or mediate upon in a particular grammar and meter respectively. Gayatri mantra is considered one of the most powerful Vedic mantras, its existence can be seen in the Rig Veda (3.62.10). In this mantra as per the description of Taittiriya Aranyaka (2.11.1-8). Prefixes has been added to have complete form of Gayatri mantra.

ॐ भूर्भुवः स्वः तत्सवितुर्वरेण्यं भर्गो देवस्य धीमहि धियो यो नः प्रचोदयात् ॥

There exist multiple interpretations of the Gayatri mantra. Swami Vivekananda offered a translation that reads: "We meditate on the glory of that Being who has produced this universe; may She enlighten our minds." A scientific perspective on the Gayatri Mantra suggests the following interpretation: The movement of the earth (bhur), planets (bhuvah), and galaxies (swah) at immense velocities generates the sound "Om," representing the formless God. This deity (tat), who manifests as the light of suns (savitur), is deserving of reverence (varenyam). Therefore, it is advocated that we meditate (dheemahi) upon the light (bhargo) of this divine entity (devasya) and engage in the chanting of Om. May this divine force (yo) illuminate and guide (prachodayat) our intellect (dhiyo) towards the right path.

### Brain Waves:

Brain waves are oscillating electrical voltages in the brain measuring just a few millionths of a volt. There are five widely recognized brain waves, and the main frequencies of human EEG waves are listed in Table 1 along with their characteristics [12]

Table 1. Characteristics of the Five Basic Brain Waves

Frequency band	Frequency	Brain states
Gamma ( $\gamma$ )	>35 Hz	Concentration
Beta ( $\beta$ )	12-35 Hz	Anxiety dominant, active, external attention, relaxed
Alpha ( $\alpha$ )	8-12 Hz	Very relaxed, passive attention
Theta ( $\theta$ )	4-8 Hz	Deeply relaxed, inward focused
Delta ( $\delta$ )	0.5-4 Hz	Sleep

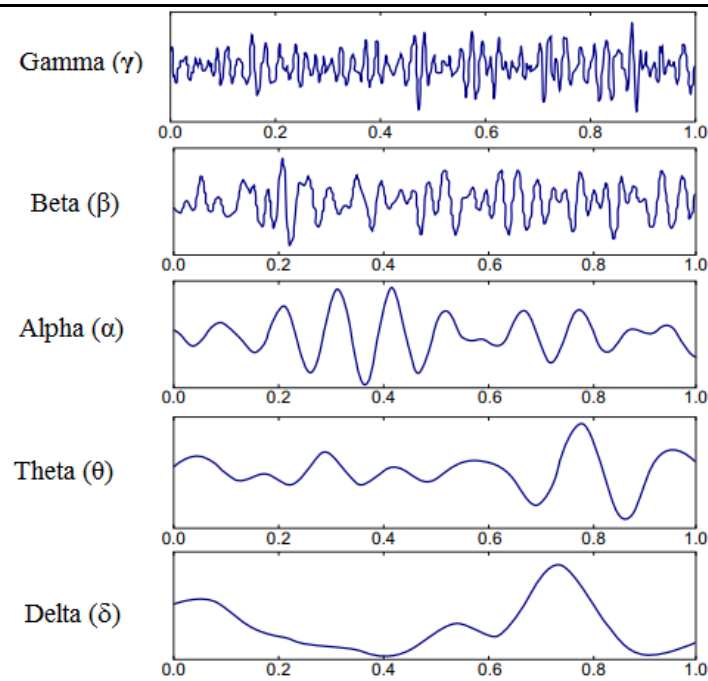


Figure 1. Brain wave samples with dominant frequencies belonging to beta, alpha, theta, and delta bands and gamma waves.

## II. LITERATURE REVIEW

Mantras are an essential component in many meditation technique. People are uttering the sacred sounds in order to attain the higher meditative states. we have enlist the work which has been done so far to understand the Gayatri mantra.

### 2.1. Magnetic resonance spectroscopy (MRS)

Rama jayasundar , K.Rajshekar, at AIIMS Research on Gayatri Mantra: "A preliminary study of the shift in left/right biochemical asymmetry by conscious mental routine" This study employed magnetic resonance spectroscopy (MRS) to investigate the chemical laterality of the human frontal lobes in a non-invasive manner. Proton MRS examinations were conducted using the STEAM technique on a cohort comprising 25 normal right-handed male participants. Notably, significant interhemispheric disparities were noted in the spectral data obtained from all subjects. Additionally, a subset of two volunteers underwent weekly examinations over a consecutive five-week period. Furthermore, the study explored alterations in chemical laterality in response to a conscious mental routine in one participant who engaged in this routine for four weeks following the initial MRS assessment. [1].

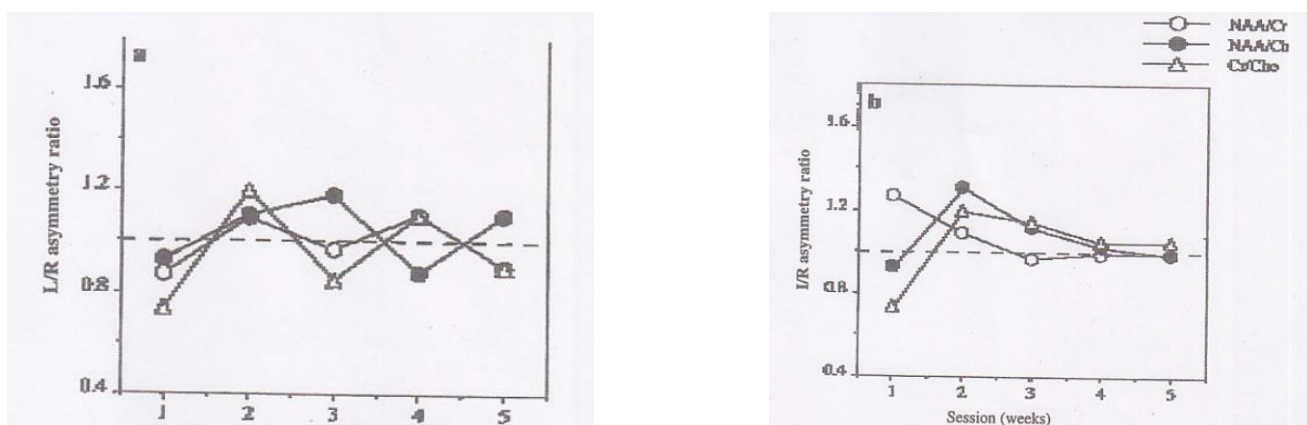


Figure 2. Plot of L/R asymmetry ratio Vs. time in a volunteer (a) who was not undergoing any mental routine procedure and (b) who was on a mental training routine

This study noted significant alterations in the brain, particularly in the prefrontal cortex, which is associated with planning, problem-solving, and awareness. Individuals who engaged in reciting mantras showed an increase in the release of a neurotransmitter called GABA. Insufficient levels of GABA have been linked to conditions such as sleep deprivation and depression.

## 2.2. Spatial and Verbal Memory Score

K. A. Manoj Narayanan, N. Venugopalan work on "Effect of Gayatri mantra chanting on cognitive functions in school children" The study comprised thirty hostel students (15 boys and 15 girls) aged between 11 and 14 years, who volunteered to participate. Prior to the study, baseline measurements were recorded for all participants. Subsequently, the students received training in chanting the Gayatri mantra for seven days by a Vedic pundit. Following this training period, participants commenced chanting the mantra once daily, five days a week, starting at 6 am, under the guidance of a Vedic expert. Each chanting session lasted for 10 minutes, and this routine was maintained for a duration of 16 weeks. Post-intervention measurements were then recorded at the conclusion of the 16-week period [2].

Table 2. Spatial and verbal memory scores before and after intervention

Parameter	Before intervention (n=30)	After intervention (n=30)	P value
Spatial memory	6 ±3	8 ±1	0.0010*
Verbal memory	4±2	6±1	0.0001*

\*P<0.05 is significant

This study found a notable increase in both spatial and verbal memory scores subsequent to the chanting of the Gayatri mantra.

## 2.3. Effect on Attention, Memory and Anxiety

Shambo Samrat Samajdar work on" Gayatri Mantra Chanting and its Effect on Attention, Memory, Anxiety and Mental State in Young Athletes: A Prospective Study" The objective of this study was to investigate the impact of Gayatri mantra chanting on attention, memory, anxiety, and mental state among healthy young athletes. Forty-five athletes participated in the study and were divided into three groups of 15 each. Two groups engaged in meditation, with one group incorporating Gayatri mantra chanting into their meditation practice, while the other group practiced meditation alone. The third group served as the control. All participants underwent evaluations for attention using tasks such as the six-letter cancellation and digit-letter substitution tests. Memory was assessed through tasks including the digit span test (both forward and backward) and a multiple-choice apparatus. Anxiety levels were measured using the state-trait anxiety inventory, and mental state was evaluated using the Mini-Mental State Examination (MMSE). Assessments were conducted at baseline and after a three-month period [4]. In this study, participants who engaged in GM chanting demonstrated notable enhancements in attention and memory functions. The GM group exhibited reduced instances of failed attempts and displayed quicker responses to auditory and visual stimuli during a multiple-choice task. Additionally, participants in the GM group demonstrated sustained visual attention, improved scanning abilities without distraction, and enhanced concentration, as evidenced by their performance on the digit cancellation test. Furthermore, significant reductions in both state and trait anxiety levels were observed among GM chanters compared to the control group. These improvements in mental well-being were consistent across both meditation groups. In conclusion, GM chanting appears to have a considerable impact on individuals' overall well-being. It influences attention, memory, anxiety levels, and overall mental state positively. Regular practice of GM chanting holds promise for enhancing learning abilities, concentration, promoting prosperity, fostering inner strength, fostering peace, and improving overall quality of life..

Sripad Ghaligi, et.al works on "Effect of vedic chanting on memory and sustained attention" A study compared the impact of chanting on memory and sustained attention between a group with two years of chanting experience and a group with no exposure to chanting. The data was analyzed using the non-parametric Mann Whitney U test. Results revealed that the chanting group exhibited significant improvements in memory test scores and notable reductions in total errors and time taken for cancellation tests compared to the non-chanting group..[11]

## 2.4. Effect on Mindfulness

Sang Ayu Ketut Candrawati et.al works on " Effects of Mindfulness with Gayatri Mantra on Decreasing Anxiety in the Elderly" in this work it was observed that there were significant effects of mindfulness with Gayatri mantra on decreasing the anxiety in the elderly Hindus in Bali with a p-value of 0.000 (  $\alpha$  -value = 0.05). [6]

Susan Thomas et.al works on " Effect of Gayatri Mantra Meditation on Meditation Naive Subjects: an EEG and fMRI Pilot Study" The International Journal of Indian Psychology January - March, 201 6 ISBN: 978-1-329-92551-9 In this study, it was observed that newcomers to meditation may experience restlessness when exposed to continuous listening of the Gayatri mantra. The ideal duration for such exposure was determined to be between 10 to 15 minutes. Following a 15-minute session of listening to the Gayatri mantra, there was a slight increase noted in the percentage of gamma waves among meditation-naive individuals. Brain imaging via fMRI revealed activation in specific regions of the brain, notably the right insula, associated with bodily self-awareness and emotional processing, among meditation-naive participants while listening to the Gayatri mantra. The methodologies developed in these investigations proved valuable for studying brain responses during meditation practices. [7]

Pranali R. Raorane et.al works on "Sanskrit Shloka Chanting and Mindfulness" Individuals aged between 45 and 55 were selected for participation, and they were divided into two distinct groups. One group, referred to as the experimental group, comprised 15 individuals who regularly recited Sanskrit shlokas for approximately 25 minutes each morning at a consistent time.

The second group, known as the control group, included 15 individuals who did not practice chanting or meditation. To assess mindfulness levels, all participants completed the Kentucky Inventory for Mindfulness Skills (KIMS). [9]

The findings of the study were consistent with past research studies and have led to the following conclusion: Sanskrit Shloka Chanting helps to improve mindfulness scores as compared to the Non – Chanting group.

## 2.5. Antimicrobial Activity of Yagya's Smoke

Ruchi Singh & Sunil Kumar Singh work on "Gayatri Mantra Chanting Helps Generate Higher Antimicrobial Activity of Yagya's Smoke" Yagya, often referred to as fire rituals, represents an ancient Vedic Indian practice utilized for herbal inhalation therapy and environmental purification. In this study they compare the antimicrobial properties of smoke extracts derived from Yagya and non-Yagya processes. In the context of this study, Yagya involves the burning of specific types of dried medicinal plant materials (known as Hawan samagri) along with ghee, accompanied by the recitation of mantras. On the other hand, non-Yagya refers to the burning of wood and Hawan samagri with ghee, without the recitation of mantras. An apparatus was devised to mimic the burning process, enabling the capture of smoke fractions for assessment of antimicrobial activity against human pathogens. [3].

Table 3. Results

Experiment Condition						
Parameter	Yagya	Non-Yagya	Yagya	Non-Yagya	Yagya	Non-Yagya
Concentration	1.25	1.25	2.5	2.5	5	5
S.aureus	9	8	12	11	15	14
B.subtilis	8	6	11	9	13	15.5
E.coli	10	9	13	12	16	15
P.aeruginosa	8.5	8	12	10.5	14	13
S. typhi	10.5	9	13	11.5	15	14
p value	0.0093*		0.0017*		0.0004*	
Mean	9.2	8	12.2	10.8	14.6	13.5
SD	1.04	1.23	0.83	1.15	1.14	1.32
N	5	5	5	5	5	5

Antimicrobial activity of the methanol extracts of different concentrations of yagya and non yagya smoke was applied to discs containing different bacterial cultures previously treated with 1.25 mg/disc concentration, 2.5 mg/disc concentration, 5 mg/disc concentration of dried smoke-methanol-extract. N indicated number of sample for paired TTEST; SD indicated standard deviation. Symbol \* indicated that p value was <0.05.

In this work it was observed that Smoke of yagya, which had mantra chanting in treatment showed statistically significant antimicrobial activity for all concentrations compared to smoke of non-yagya where mantra chanting was absent while other variables were same in both the procedure.

## 2.6. Cardio Respiratory Responses and Alpha Wave in Athletes

Ms. Payel Das et.al works on " Effect of guided meditation on cardio respiratory responses and alpha wave in athletes: a comparative analysis among the concept of dharana" Author's aim of the study was to investigate the comparative effect of different guided meditation techniques on heart rate, respiratory rate, systolic blood pressure and alpha brain wave. 36 female athletes of All India University level from different team games from Gwalior District The age ranged from 21-25 with mean and SD  $22 \pm 3.4$  were selected using random method of sampling from different team game in equal number then divided randomly in equal numbers (nine in each) into four groups (three experimental and one control group). Breath awareness meditation, Mantra chanting meditation and Meditation with visualization were given to the experimental with placebo control training for 30-10 minutes 5 days in a weeks for 12 months. Finally no significant differences ( $p > 0.05$ ) were found among the effect of different guided meditation techniques on Systolic Blood Pressure, Alpha Brain Wave, and Resting Heart Rate except Resting Respiratory Rate ( $p < 0.05$ ). Resting Respiratory Rate found in breathing meditation and visualization group only in reducing the resting respiratory as inhibitory stretch mechanism is enhanced due to increased tidal volume and parasympathetic activation.[10]

In this paper author conclude that guided meditation with breath awareness meditation with inner visualization and Meditation on Gayetri Mantra Chanting were equally effective in reducing the Heart rate, Systolic Blood Pressure and alpha brain frequency as no significant effect was not found among the effect of the different passive training except Resting Respiratory Rate. Breath awareness meditation with inner visualization were equally effective in reducing respiratory rate than mantra chanting group

because of inhibitory stretch reflex mechanism in respiratory tissue due to increased tidal volume and decreased oxygen consumption. But respiratory rate has not reduced significantly in mantra meditation after 12 weeks might be due to conscious effort made during chanting as the athletes were naïve mediators and also might felt restless during chanting of mantra.

## 2.7. Spectral Analysis

B. S. Badak, A. A. Gurjar et.al work on , "Spectral Analysis of Gayatri Mantra and its Correlation with Energy Centres of the Human Body," 2023 7th International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Kirtipur, Nepal, 2023 This study undertakes spectral analysis of the Gayatri mantra through manual segmentation, identifying frequencies with the highest energies for each segment. It examines both Vedic and non-Vedic chanting methods, finding that the frequencies produced by chanting the Gayatri mantra exhibit strong correlation with the natural resonant frequencies of the human body. Moreover, the results indicate that the Vedic chanting approach demonstrates greater symmetry compared to the non-Vedic method.[14]

TABLE 4. OVERVIEW OF THE METHODOLOGY USED IN EACH STUDY TILL DATE

Methodology	Study Description	Participants	Measurements	Duration of the Experiment
Magnetic Resonance Spectroscopy (MRS)	Investigated the effect of Gayatri Mantra on brain biochemical asymmetry using MRS. Proton MRS examinations conducted on 25 normal right-handed male participants. Weekly examinations performed on a subset of two volunteers.	25 normal right-handed male participants	Chemical laterality alterations	Five-week period
Spatial and Verbal Memory Score	Explored the impact of Gayatri mantra chanting on cognitive functions in school children. Baseline measurements recorded before training. Post-intervention measurements obtained after a 16-week chanting period.	Thirty hostel students aged 11 to 14 years	Spatial and verbal memory scores	16 weeks
Effect on Attention, Memory, and Anxiety	Investigated the influence of Gayatri mantra chanting on attention, memory, anxiety, and mental state among healthy young athletes. Participants evaluated at baseline and after a three-month period.	Forty-five healthy young athletes	Attention, memory, anxiety levels, mental state	Three-month period
Effect on Mindfulness	Explored the effects of Gayatri mantra chanting on decreasing anxiety in elderly Hindus, and on brain activity in meditation-naïve subjects. Participants assessed for mindfulness levels using various tools.	Elderly Hindus, meditation-naïve subjects	Mindfulness levels, brain activity	Variable (depending on study)
Antimicrobial Activity of Yagya's Smoke	Examined the antimicrobial properties of Yagya's smoke with and without mantra chanting against human pathogens. Smoke fractions captured and tested for antimicrobial activity.	Not specified	Antimicrobial activity	Not specified
Cardio Respiratory Responses and Alpha Wave	Investigated the effect of different meditation techniques, including Gayatri Mantra chanting, on cardio respiratory responses and alpha brain waves in athletes. Participants divided into groups and given specific techniques for 12 months.	Thirty-six female athletes	Cardio respiratory responses, alpha brain waves	12 months
Spectral Analysis	The Gayatri mantra was subjected to spectral analysis through manual segmentation. Both Vedic and non-Vedic chanting methods were compared to discern their spectral characteristics.	Practitioners proficient in both Vedic and non-Vedic chanting methods participated in the study to	Spectral analysis identified frequencies with maximum energies for each segment of the Gayatri mantra. The analysis aimed to discern any	The study's duration encompassed participant recruitment, data collection, and analysis, allowing for

		ensure accurate execution of the chants for analysis.	differences in spectral characteristics between Vedic and non-Vedic chanting approaches.	comprehensive examination of spectral patterns and comparison between chanting methodologies.
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### III. CONCLUSIONS

Based on the research papers referenced in this survey, it has been observed that chanting the Gayatri mantra generates vibrations with positive effects on brain function, leading to a calm mind, clear thinking, and enhanced intelligence quotient. Notably, chanting in Sanskrit appears to have a more profound impact compared to English language. However, existing studies have primarily focused on the mantra's effects on individuals without delving into its structural analysis. Questions remain unanswered regarding the arrangement of the mantra and the potential impact of uttering each syllable in different ways. Therefore, there is significant scope for analyzing the structure of the Gayatri mantra to uncover the hidden secrets embedded in this ancient practice passed down by our ancestors..

### IV. ACKNOWLEDGMENT

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