

# REVIEW OF SCIENTIFIC ANALYSIS OF SACRED SOUND OM (AUM)

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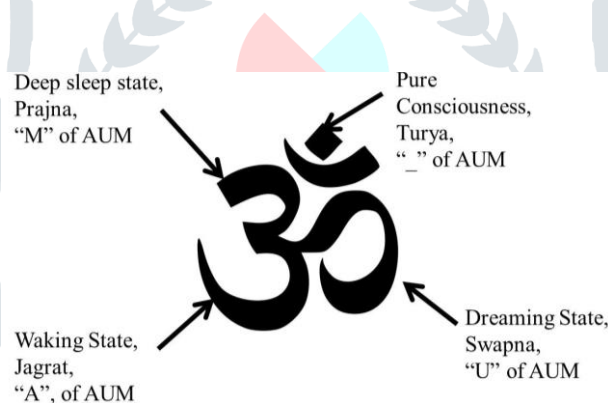
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**Abstract:** Since ancient times sacred sounds like "OM", Gayatri Mantra and Mrutunjay Mantra etc. have played a major role not only culturally but also in keeping mentally and physically healthy. From available literature it is scientifically proved. But, still there is need to extent this research work to prove the effect of sacred sounds particularly "OM" on our important parts of the body like the heart and overall health. There are various methods of chanting the sound "OM" as per available ancient literature like the Mandukya Upanishad. So it is often confusing for a common man to find the exact or ideal way of chanting the sound "OM". So in this paper reviews the research work done in the area of sacred sound OM and its scientific analysis. The work reviewed is mainly divided into four areas namely Basic understanding of sound OM, Health benefits of sound OM, Spectral analysis of sound OM and Artificial intelligence techniques and sound analysis.

*Index Terms-* OM, AUM, Spectral analysis, sacred sound.

## 1.1 Introduction

The OM sound is considered as the most sacred sound in many traditions. The figure 1.1 describes basic meaning of OM and its different curves.



**Figure 1: Meaning of OM (AUM) - Four states of human consciousness**

Of all the syllables, the most powerful and the most significant one is the single syllable called Pranava, the AUM, or Omkara, pronounced as 'OM'. The syllable has sound, meaning, application and efficiency. OM or AUM is spiritual mantra, important to obtain peace and calm. The time-frequency analysis has been decided that the OM chanting affords steadiness in the mind scientifically. When we chant the mantra AUM, the process covers the full range of the vocal elements (from larynx to lips) that produce the sound of any language. AUM represents the whole phenomena of producing sound. Also it is the essence of the entire range of the sound phenomena. It is the matrix of all the various sounds. It is recognized as the seed Centre of all sounds.

## 1.2 Four constituents of AUM

The Pranava (AUM) is a combination of four parts, namely-a) A (Akara), b) U(Ukara), c) M(Makara) and d) Bindu and Nada. These parts are symbolic of-Creation, Preservation, Dissolution and Deliverance, which form the eternal life-death rhythm that goes on in an endless cycle. Thus, Pranava is the sound manifestation of GOD.

There are four states of AUM- (1) The sound 'a' is the symbol of the waking state( Jagrath Avastha) (2) The sound 'u' is the symbol of the dream state ( Swapna Avastha). (3) The sound 'm' is the symbol of the deep-sleep state (Sushupti Avastha). (4) The closing sound of the syllable, followed by silence, is the symbol of transcendental state (Turiya).

Since the work related to sound OM is really vast, this paper has covered the literature related to OM sound with major four areas. These areas are:

1. Basic understanding of sound OM
2. Health benefits of sound OM
3. Spectral analysis of sound OM
4. Artificial intelligence techniques and sound analysis

### 1.2.1 Work related to Basic understanding of sound OM

Since ancient times sacred sounds like "OM", Gayatri Mantra and Mrutunjay Mantra etc. have played a major role not only culturally but also in keeping mentally and physically healthy. From available literature it is scientifically proved. But, still there is need to extent this research work to prove the effect of sacred sounds particularly "OM" on our important parts of the body like the heart and overall health.. There are various methods of chanting the sound "OM" as per available ancient literature like the Mandukya Upanishda. So it is often confusing for a common man to find the exact or ideal way of chanting the sound "OM". So in this proposed work more effect will be made to compare different methods of chanting the sound "OM" which will give the maximum health benefits. The tools and methods that are currently applied are Spectral Analysis, Audio Analysis, and Artificial Intelligence Techniques. The work done by Sonia Mehta explains the uniqueness of AUM. It is the murmuring sound of this cosmic universe. The importance and imagery of AUM is clarified in Mandukya Upanishad followed up by the pertinence of AUM in Buddhism, Jainism, and Sikhism and in the epic Bhagavad Gita. [1]

### 1.2.2 Work related to Health benefits of sound OM

The work done by Chaudhari Kiran<sup>1</sup>, et. al. includes Thyroid Epidemiological (EPI) Study directed crosswise over metro urban communities in India. According to this study 10% grown-ups in India are experiencing thyroid issue and ladies are multiple times bound to be influenced than men. There are numerous drug techniques to fix this issue, yet inferable from the destructive reactions there is have to locate an option mitigating treatment. Yoga, contemplation and reciting has been found to bring down feelings of anxiety by impacting our hormone wellbeing or impact on our hormonal framework as the thyroid organ react to the vibrations while endocrine framework and by initiating the pituitary and pineal organs.. At the point when you do an altered posture, gravity guides the blood stream to the neck and the head which invigorates the thyroid organs. It is intriguing to realize that, in any event, something as essential as reciting OM. Vibrational recurrence assumes a significant job in the improving of our physical wellbeing, since it enables potential to incite itself into any structure, including particles, molecules, organic life and even sicknesses. [2]

Another work by Tarun Routhan, et. al.[3] demonstrated that the sound created through reciting has gigantic constructive outcomes on the human psychological capacities. Thusly this examination was taken to comprehend in the case of reciting (with/without music) has any helpful impact on sports focused nervousness (SCA). 84 NSO understudies of Kamala Nehru College (DU) were chosen based on homogeneity on Sports Competitive Anxiety Test (SCAT) created by Martens et al 1990. The chose subjects were then isolated into 3 gatherings to be specific Group-A (N= 32), Group-B (N=32) and Group-C (N= 20). All the 3 gatherings completed 40 minutes of NSO movement, two times every week, for about two months. While bunch A did an additional session of reciting with light music for 20 minutes; bunch B did an additional session of reciting with no music for 20 minutes and gathering C didn't play out any reciting action over that period. The aftereffect of the investigation demonstrated that all the three gatherings had essentially decreased their SCA subsequent to doing the reciting rehearses/NSO action. It was discovered that SCA of Group-C was essentially higher than the gathering A and bunch B, while there was no noteworthy distinction found between bunch A and bunch B. Along these lines it was presumed that reciting fundamentally diminishes the games focused uneasiness and consequently can be utilized as a remedial treatment to control it yet what direction of reciting is increasingly advantageous, is as yet not clear. Thus this demonstrates a further requirement for research to know the best method for reciting practice to diminish the games focused nervousness [3]

The work on reducing stress is carried by Jyoti Kori et. al. Today we are heading toward materialistic progress at the cost of our health, physical as well as mental. In this blind pursuit, instead of peace we end up in stressed life in most of the times. Unfortunately neither we understand that we are under stress nor get any training of stress management while we study or work. Consulting psychiatrist is still a taboo in India. Stress creates adverse effect on physical as well as mental health. The effect of "stressful situation" on our body is rapid pulse rate. Short term stress is easy to control. But long term stress may lead us to mental illness like anxiety, depression, breathlessness, sleep disorders, eating disorders etc. So it is very important that we use techniques to lessen the adverse effect of stress at right time. [4]

The research work done by Jai Paul Dudeja includes the theoretical and the experimental aspects of mantra-based meditation technique are analyzed scientifically in this paper. The word 'Meditation' comes from the Latin root "meditatum", which means "to ponder". Meditation is a technique for resting the mind leading to peace, happiness, bliss, and self-realization. There are a large number of meditation techniques in the world. Mantra-based meditation is one such technique in which a sound, word or phrase (called "mantra") is recited either aloud or silently during meditation. It has been established by the experience as well as the experiments that the correct frequency of mantra sound, along with the correct intent, helps the practioner oxygenate the brain, reduce heart rate, blood pressure, get cured by many ailments, create calm brainwave activity and achieve immunity from outside mental disturbances. The primary aim of this paper was to make the larger number of people, including the intelligentsia, aware of

this wonderful gift of Almighty so that they themselves could try practicing meditation for their own benefit and consequently transmit peaceful vibrations to the society in this age of planetary turmoil.[5]

### 1.2.3 Spectral analysis & EEG of OM chants

The work done by **A.A.Gurjar et. al.** includes systematical analysis and dissection of the traditional meditation chanting sound OM using sophisticated mathematics. In this paper for analysis and dissection of Sanskrit Divine sound “OM” wavelet packet based speech analysis is used. Sanskrit divine sound OM does not have a translation. Therefore, the Hindus consider it as the very name of the Absolute. In the scriptures of ancient India, the OM is considered as the most powerful of all the mantras. It has been recognized that the mantras have beneficial effects on human beings. The syllable OM is quite familiar to a Hindu. It occurs in every prayer. Invocation to most gods begins to Indian culture. It has religious significance in other religions also and is considered to be a cosmic sound, a primordial sound; the worldly thoughts are removed by chanting OM Mantra.[6]

Another work done by Contzen Pereira is on the Effect of the mantra Om Mani Padme Hum on human body and Based on the results of these studies, this paper evaluates the frequencies associated with each syllable of the mantra comparing it to therapeutic/healing effects that have been known or studied for some frequencies by holistic healers, meditators and non-invasive medical practitioners. Om Mani Padme Hum is a six syllable mantra in Tibetan Buddhism associated with the bodhisattva – Avalokitesvara. This mantra as known by the Buddhist generates positive energies within the body through mystical vibrations and frequencies when chanted repeatedly. The mantra has shown enhanced cognitive effects in organisms without auditory apparatus where the interaction is assumed to be taking place at a cellular and biochemical level (Pereira 2015a, b; Pereira 2016a,b).The study confirms that the mantra Om Mani Padme Hum is made up of frequencies that are known to generate powerful vibrations when chanted. These vibrations during chanting are assumed to be creating a resonance effect, as a result of formation of constructive interference patterns between the frequencies of each syllable which maybe the reason this chant exhibits a therapeutic/ healing effect on the body and its functions. Spectral analysis of mantra the first step of the classification is speech and nonspeech discrimination. In this step, a novel algorithm based on K-nearest-neighbor (KNN) and linear spectral pair’s vector quantization (LSP-VQ) is developed. The second step further divides nonspeech class into music, environment sounds, and silence with a rule-based classification scheme. A set of new features such as the noise frame ratio and band periodicity are introduced and discussed in detail. [7]

The works done by Bhavna Harne and Dr.A.S.Hiwale uses a discrete wavelet transform based feature extraction method to examine the effect of Om meditation on the brain. With twenty-three healthy engineering college students between the age group of twenty to twenty-two chosen as subjects for the study, EEG signals were obtained before performing Om meditation as well as after performing Om meditation. EEG signals were classified into Gamma, Beta, Alpha, Theta and Delta bands by using detailed coefficients and approximate coefficient obtained by five level wavelet transform. Feature such as relative power using the Welch method was extracted from each band and was analyzed using two way repeated analysis of variance. Findings make known increased theta power .and higher theta amplitude in after condition at all regions in comparison to the before the condition of meditation but results were not significant. No significant results were found in any other band. As described in other studies, increased theta power is a sign of relaxation. Results revealed through the study were promising results for single day testing and immediate effect of Om meditation. The study emphasizes the importance of Om meditation which could work wonders for people under stress if adopted as a daily routine. As Om meditation is simple and easy to practice, it could open a new horizon for naïve meditators. [8]

Also another paper by the same author Bhavna P. Harne, et. al. Loud Om meditation using EEG is suggested in the paper. Meditation and yoga both have positive effects on physical, as well as mental health. Om mantra chanting, a simple and easy to practice, also comes under the aspect of meditation. The “Om” mantra is also considered as the very name of the absolute. Om meditation not only affects the various parts of the brain, such as pre-frontal cortex, vagus nerve, amygdala and others but also affects the heart rate and respiratory rate. Considering the healing effects of Om meditation, through this paper, the author had tried to explore all the relevant work done in the field of Om meditation. The survey includes a large number of papers covering the research previously conducted by many researchers, their results and different techniques adopted to study the effect of Om meditation on human beings. Studies on Om meditation are categorized under four different heads: Neuroimaging studies, EEG studies, evoked potentials studies and other methods. Even though the existing research evidenced capability of Om meditation in curing anxiety and depression, more rigorous studies with better design, with larger sample size and with different control groups are required.[9]

The paper by A.A. Gurjar, et. al. includes Spectral analysis for OM mantra to study its structure and to identify the factors, which have been found to influence the human nerve system. By this analysis , the author wants to conclude that stress gets minimized after OM chant.The author explains that our attentiveness and concentration are taken from us by the proceedings take place around us in the world in recent times. Different challenges and impediments are faced by the people work in the industries, offices and even in bussniess. It is tough to handle the stress sometimes. Therefore, to come out of the aforementioned troubles, meditation is essential for all human beings.In the same way, for psychological stress, speech signal is uttered to be a considerable indicator. In the direction of mediating human subject, OM is a spiritual mantra, outstanding to fetch peace and calm. The entire psychological pressure and wordly thoughts are taken away by the chanting of OM mantra.Elimination of disruption and introductionof new dynamism in the body are given by the OM chanting.The consciousness could be promoted through the repetition of OM mantra.Furthermore, this mantra transcends the restrictions of a mentality. To systematically understand the meditative chant, termed the divine sound OM, is the endeavor of this research work.[10]

### 1.2.4 Research work related Artificial intelligence techniques and sound analysis

The work done by Pritish Chandna, et. al. Presents a deep neural network based singing voice synthesizer, inspired by the Deep Convolutions Generative Adversarial Networks (DCGAN) architecture and optimized using the Wasserstein-GAN algorithm. They use vocoder parameters for acoustic modeling, to separate the influence of pitch and timbre. This facilitates the modeling of the large variability of pitch in the singing voice. They design network which takes a block of consecutive frame-wise linguistic and fundamental frequency features, along with global singer identity as input and outputs vocoder features, corresponding to the block of features. This block-wise approach, along with the training methodology allows us to model temporal dependencies within the features of the input block. For inference, sequential blocks are concatenated using an overlap-add procedure. They show the performance of model is competitive with regards to the state-of-the-art and the original sample using objective metrics and a subjective listening test. They also present examples of the synthesis on a supplementary website and the source code via GitHub.

## 1.3 DISCUSSIONS

The sound is generated due to vibration of air particles. The waves generated in air, has areas of compression and rarefaction. The sound OM generated while chanting creates vibration waves in air. This chanting creates a positive vibration in human body and in turn it has very positive effects. Till today lot of research has been done to find the scientific evidence for these effects of OM chanting on human body.

There are various methods of chanting OM. These various methods are going to be compared in this work. One of the methods which are now days more popular is to chant as A-U-M. Each word i.e. A, U and M have their own frequencies. Each of these sounds has unique effect on respective parts of body. The sound of 'A' has more effect on the portion just below the navel or just below the stomach. Whereas the sound 'U' cause maximum vibration in the region near heart. The last sound is of 'M' creates vibration above the region of throat.

But still there is lot of work is remaining to be done to achieve this goal of scientifically proving how OM chanting improves health positively, like reducing stress, improvement in sharpening memory, benefits in making heart healthier. The central hypothesis of this work is that the subject will have improved pulse rate and then reduction in blood pressure. The collected data which includes the different samples from male and female subject will be analyzed and artificial techniques will be used. Develop an algorithm to decide the degree of correctness of OM chanting. So the hypotheses of this work will different frequencies while chanting OM has different effect on Blood pressure and Pulse Rate. This work will also involve analysis of parameters in terms of pitch, frequency, power spectral density in relation with ideal chanting of OM sound. [11]

## 1.4 CONCLUSION

The review of the literature on sacred sound OM is done constraining the areas in four major regions. These are Basic understanding of sound OM, Health benefits of sound OM, Spectral analysis of sound OM and Artificial intelligence techniques and sound analysis.

Still lot of other areas are to be reviewed which may be audio analysis, cymatics and OM chanting and scientific analysis of OM sound to validate the positive effects on consciousness.

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