

Analysis of frequency dependent Vedic chanting and its influence on neural activity of humans

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ABSTRACT

In this paper a novel methodology is proposed to identify and to compare the frequency range of different Vedic chantings from Rig Veda, Yajur Veda, Atharva Veda and Sama Veda. Nowadays in spite of busy schedule and hectic work, the human beings are mostly stressed. To get rid from this stressed state, one of the best solutions is listening Vedic chantings. The alpha brainwaves are in the frequency range of 8-12 Hz under giving relaxation to stressed human being. Three selected samples from each Veda have been processed through the simulation compiler Praat and the parameters like spectral response, pitch, intensity, formants and pulses have observed. In the above identified parameters, the frequency in intensity calculation is taken for each sample. This frequency is compared with the brainwaves for which the frequencies are in the ranges of 0 Hz to >27 Hz (alpha, beta, gamma, theta and delta). The extracted signal frequencies from Vedic chantings are compared with frequencies of brainwaves. Among the four Vedas, the frequencies extracted from Sama Veda lies in alpha frequency range. The remaining is fluctuating from alpha.

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1. INTRODUCTION

Different challenges are faced by the people work in the industries, offices and even in business, our attentiveness and concentration are decreased and increasing their stress and anxiety. This situation creates health problems like increasing stress, blood pressure, and stress management is gaining importance day by day [1]. Vedas as authority of Sabda pramana [2], Shabda hints to words expressed verbally as a mantra. This Shabda or sound or acoustic signal that generates out by the pronunciation of Vedic texts and mantras is believed to have a profound effect on our mental system [3]. The sound of traditional patters produces vibrations that have a beneficial psychological effect on both the chanters and listeners.

Vedic melodies produce incredible sonic vibrations that can change vitality at all stages of development [4]. They affect the psyche and reach subliminal levels where our karmic patterns are preserved. The best possible recitation of the mantras can diminish stress and pressure [5].

Hindu and Buddhist practitioners utilize meditation to focus the mind and shut out extraneous distractions that interfere with concentration [6]. Sound-based Vedic chanting (such as a powerful mantra) has the potential to heal and elevate consciousness [7]. Speech and chanting are old religious traditions used to assist people increase their ability to move energy to the body and mind [8].

Neuroscientists are fascinated by the mental process that occurs during probing. Equipped with technology to analyse brain activity such as emotions induced by brainwave activation alpha wave, beta wave, gamma wave, delta wave and theta wave [9]–[12]. Electroencephalogram (EEG) stimuli such as sound have been shown in experiments to alter the brain [13]–[15]. Some researchers they practice and listen Vedic sounds like ‘OM’, Om Namah shivaya, observed stress, anxiety and blood pressure before and after. They observed levels of these parameters decreased [16]–[19].

The brain waves work almost like musical notes. Some are low frequency; others are high frequency. Together they have the power to create harmony and brain relaxation. The thoughts, emotions and sensations are in perfect balance, cantered and open to everything that surrounds a human being [1], [20]–[25]. The classification of brain waves is as follows shown in Figure 1.

Table 1 shows the frequency and its effect on brain. As per the survey of literature alpha waves gives more relaxation to brain and improves the critical thinking. “I want to train my Alpha brain waves to be more relaxed and get more inner peace”. The alpha waves will be generated in those in-between, twilight times when a human being is calm but not asleep. The frequency range of alpha waves may vary from 8-12 Hz. Classification of Alpha waves and their effects are shown in Table 2 [15], [19].

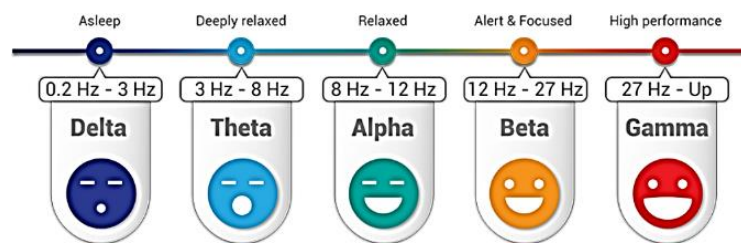


Figure 1. Brain wave frequency range

Table 1. Segregation of frequency for brain wave

Frequency range (Hz)	Name	Brain activity and effect	Waveforms
> 27	Gamma waves	Higher mental activity, including perception, problem solving, and consciousness	
12-27	Beta waves	Active, busy thinking, active processing, active concentration, arousal, and cognition	
8-12	Alpha waves	Calm relaxed yet alert state	
3-8	Theta waves	Deep meditation /relaxation, REM sleep	
0.2-3	Delta waves	Deep dreamless sleep, loss of body awareness	

Table 2. Classification of alpha (α) brain wave

Frequency range (Hz)	Effect on brain
8-8.3	Music, art, invention, and problem solution all require creative thought. Overcoming difficult issues or problems due to simplicity with which answers can be found through re-evaluation. This is a form of self-purpose inter-awareness. Schumann's resonance it's very grounding because it's the same frequency as the earth's magnetic field. To treat drug, alcohol, and food addictions, among other things. Provides the "satisfied" feeling that a person would ordinarily obtain from their addiction.
8.3	Enhances clairvoyance in the presence of visual images and metal items.
8-8.6	Reduced stress and anxiety
9	Brings awareness of body imbalances
8-10	Start of "super learning", your passive ability to memorise and learn new information. It stimulates problem-solving creativity and intuitive ideas. This is not active learning, but rather a calm state in which your mind absorbs information without active concentration.
10.5	Blood pressure is reduced. The Thymus, heart, blood, and circulatory system are all connected to the Heart Chakra.
10.6	Relaxed and alert.
11	Relaxes you while keeping you alert. Can be a lucid condition (day dreaming) but not from weariness. Thoughts and feelings may float through your mind, calming you down. It can be a bridge between the conscious mind and the unconscious mind. Reduces stress levels.
12	Gives mental stability

2. METHOD

The voice clips of Vedic chantings (Rig Veda, Yajur Veda, Sama Veda, and Atharva Veda) have been processed thorough Praat simulation tool. The parameters like sound spectrum (spectrogram), pitch, intensity, pulses, formants have observed for all the four Vedas chantings. From the spectrogram the frequency ranges of the sound waves have been identified. These frequency ranges are classified and divided as delta, theta, alpha, beta, gamma range of frequencies. In the above observed frequency ranges, the voice clips having frequency in the range of Alpha have taken and make it listen by the listener and observed their emotions by using MATLAB (emotion recognition). The process flow to identify the frequency range of Vedic chanting is shown in Figure 2.

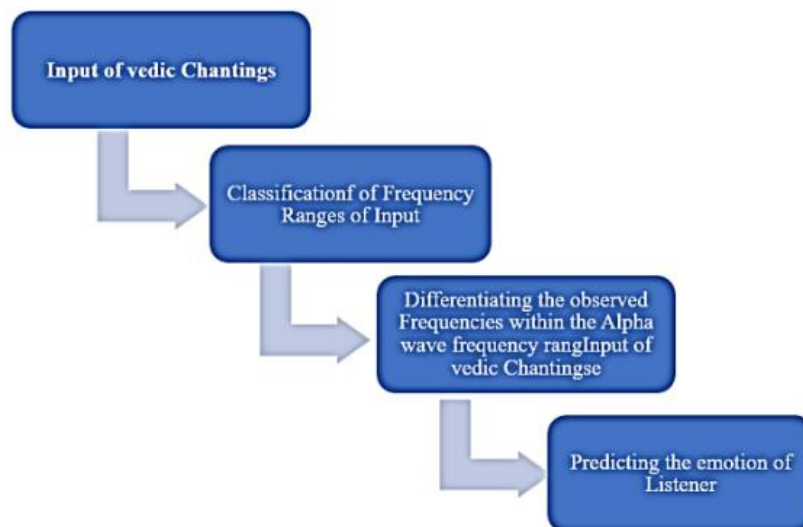


Figure 2. Process flow to identify the frequency range of Vedic chanting

The speech signals of four Vedas (Rig Veda, Atharva Veda, Yajur Veda and Sama Veda) has been analysed using the simulation tool Praat. The time duration of the speech signal for which the analysis has been done is below 10 sec. Three different speech signals with different types of mantras (Chanting) from each Veda has considered for analysis. The spectral response of the input speech signal (Vedic chanting) is observed within the spectral frequency range of 1 to 20 Hz. The parameters spectral frequency, pitch, intensity, formants and pulses for a speech signal (Vedic chanting) were investigated in this research. The frequency range detected in the analysed speech stream is compared to the frequency range of brain waves (delta, theta, alpha, beta and gamma).

3. RESULTS AND DISCUSSION

Veda is defined as a collection of hymns and mantras. These are chanted during rituals. When listening chantings by neuro transmission, human brain will excite and generate brain waves (delta, theta, alpha, beta and gamma). Vedas are mainly classified into four Vedas. They are Rig Veda, Yajur Veda, Atharva Veda and Sama Veda. Analysing these four Vedas chanting, checking of their frequencies are done with in alpha frequency range.

3.1. Atharva veda

The Atharva Veda is filled with a number of enchantments, charms, and spells. This sets it apart from other Vedas, which place more of an emphasis on ceremonial and sacrifice. Figure 3 shows the analysis of three specimens taken from Atharva Veda and recording of EEG signals. Analysing these three signals frequency ranges by using Praat simulation tool, most of these specimen frequency ranges are in alpha brainwave frequency range. From Table 3 it is evident that most of the selected Vedic chanting is in the range of alpha brain waves which gives the relaxation to the brain of human being (listener).

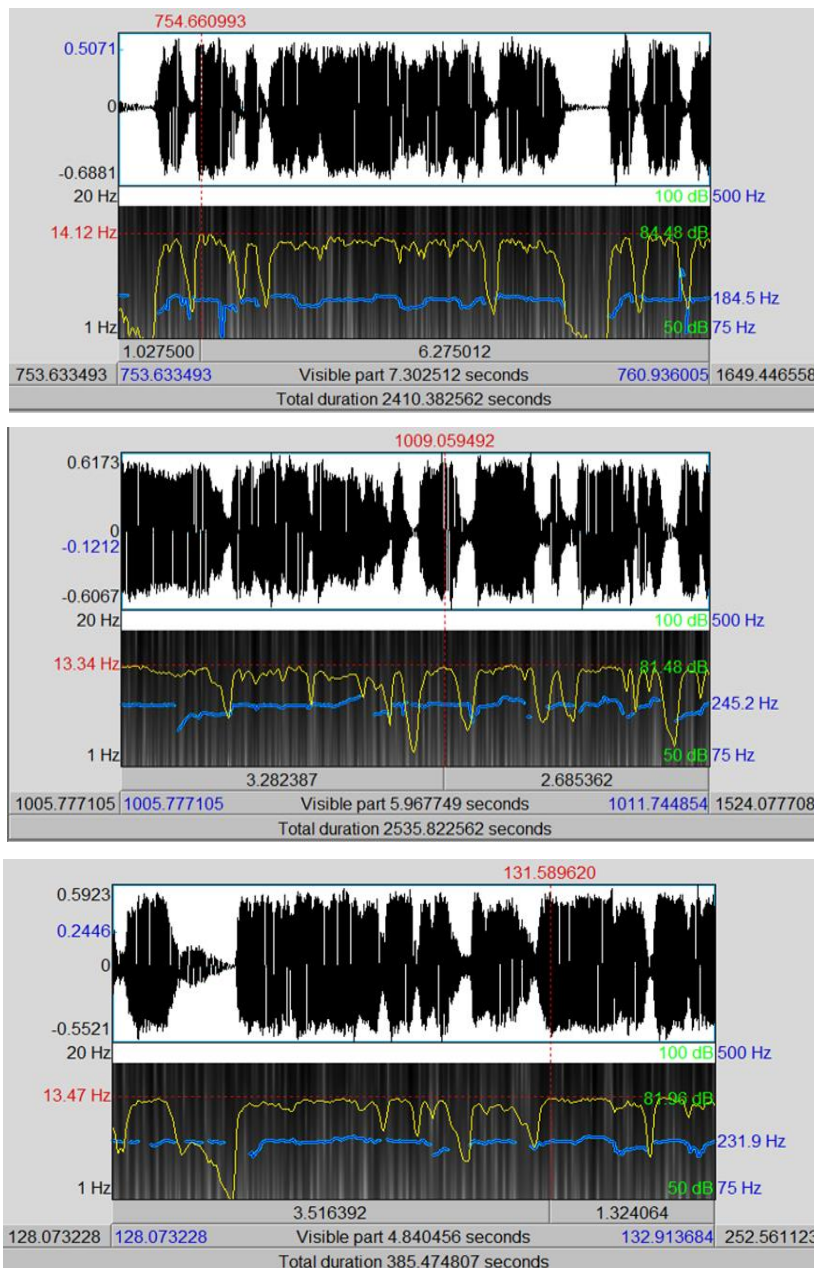


Figure 3. Analysis of Atharva Veda sound files AV-01, AV-03 and AV-07

Table 3. Analysis and frequency range of chanting in Atharva Veda

Specimen No.	Frequency range (Hz)	Band	Brain activity and effect
AV-01	4.676-12.83	Theta and alpha	i). Deep meditation /relaxation ii). Calm relaxed yet alert state
AV-03	1-12.57	Delta, theta, and alpha	i). Deep meditation /relaxation
AV-07	1-13.74	Delta, theta, and alpha	ii). Calm relaxed yet alert state iii). Dreamless Sleep and loss of body awareness

3.2. Rig veda

Rig Veda contains hymns about their mythology. A collection of Vedic Sanskrit hymns from ancient India is known as the Rigveda or Rig Veda. It is one of the four revered Vedic scriptures that Hindus consider to be canonical. The earliest known Vedic Sanskrit text is the Rigveda. The earliest texts in any Indo-European language are found in its early strata. Figure 4 shows the analysis of three specimens taken from Rig Veda and recording of EEG signals. Analyzing these three signals frequency by using Praat simulation tool, most of these frequency ranges are in alpha brainwave frequency range. From Table 4 it is evident that most of the selected Vedic chanting is in the range of theta and alpha brain waves which gives the relaxation and alertness to the human brain (listener).

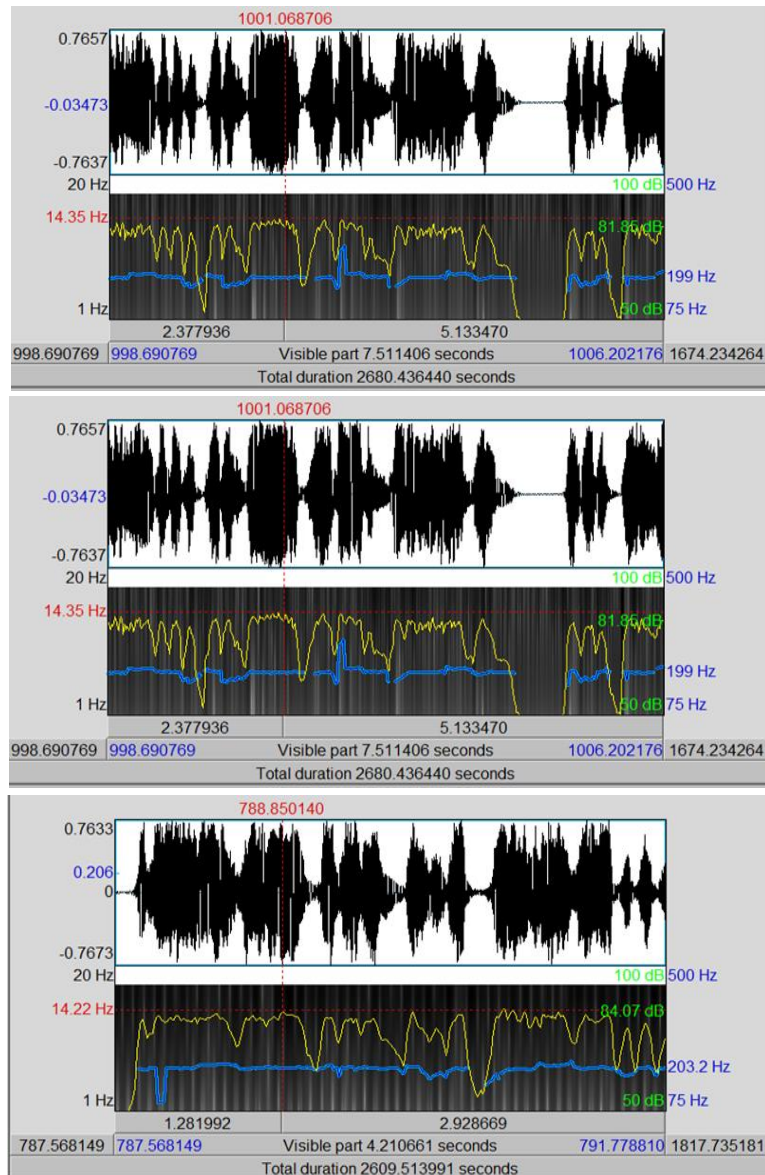


Figure 4. Analysis of Rig Veda sound files RV-01, RV-02 and RV-08

Table 4. Analysis and frequency range of chanting in Rig Veda

Specimen No.	Frequency range (Hz)	Band	Brain activity and effect
RV-01	3.952-13.123	Theta and alpha	i). Deep meditation/relaxation
RV-02	3.952-13.96	Theta and alpha	ii). Calm relaxed yet alert state
RV-08	2.11-13.49	Delta, theta, and alpha	i). Deep meditation/relaxation ii). Calm relaxed yet alert state ii). Dreamless sleep and loss of body awareness

3.3. Yajur veda

Yajur means worship and Veda means knowledge. It contains Veda primarily of prose mantras for worship rituals/mantras. It is one of the four Vedas and one of the scriptures of Hinduism. It has ritual-offering formula that was said by a priest, an individual performed ritual actions in front of the yagna fire. It is mainly grouped into two i.e., Krishna Yajur Veda and Shukla Yajur Veda.

3.3.1. Krishna Yajur veda

Krishna Yajur Veda means motley collection of verses. The Brahmana scriptures are incorporated into the samhitas of Krishna Yajur Veda. Figure 5 shows the analysis of three specimens taken from Krishna Yajur Veda and recording of EEG signals. Analyzing these three specimens by using Praat simulation tool, most of these frequency ranges are in range of alpha brainwave frequency. From Table 5 it is evident that most of the selected Vedic chanting is in the range of delta, theta and alpha brain waves which gives the relaxation, alertness, dreamless sleep and loss of body awareness to human being (listener).

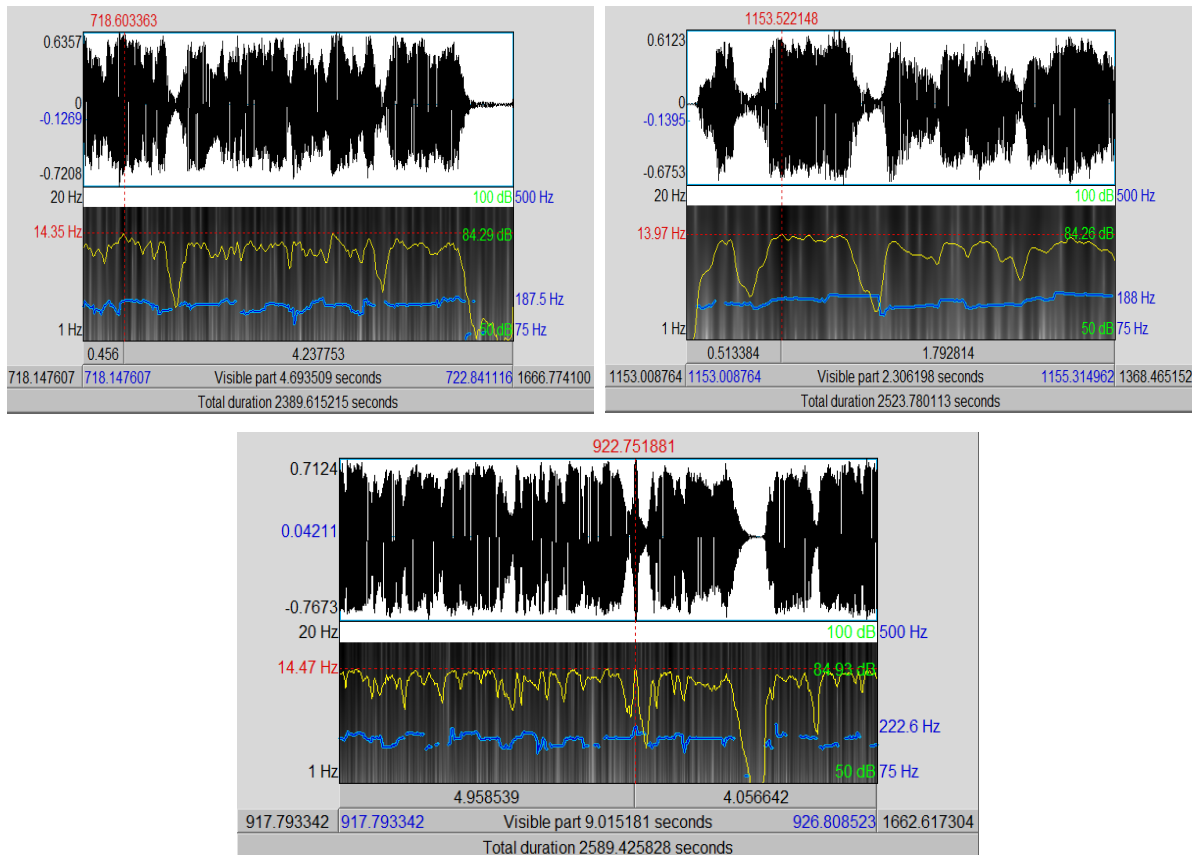


Figure 5. Analysis of Krishna Yajur Veda sound files KYV-01, KYV-02 and KYV-03

Table 5. Frequency range of chanting in Krishna Yajur Veda

Specimen No.	Frequency range (Hz)	Band	Brain activity and effect
KYV-01	1-13.03	Delta, theta, and alpha	i). Deep meditation/relaxation
KYV-02	1.8-13.49		ii). Calm relaxed yet alert state
KYV-03	2.939-14.04		iii). Dreamless sleep and loss of body awareness

3.3.2. Shukla Yajur veda

Shukla Yajur Veda means well-arranged verses. The phrase "white" or "bright" refers to the Shukla Yajur Veda, which is the "well-arranged, clear" Yajur Veda. Figure 6 shows the analysis of three specimens taken from Shukla Yajur Veda and recording of EEG signals. Analyzing these three specimen signals by using Praat simulation tool, most of these frequency ranges are in alpha brainwave frequency range. From Table 6 it is evident that most of the selected Vedic chanting is in the range of theta and alpha brain waves which gives the relaxation and alertness to the human brain (listener).

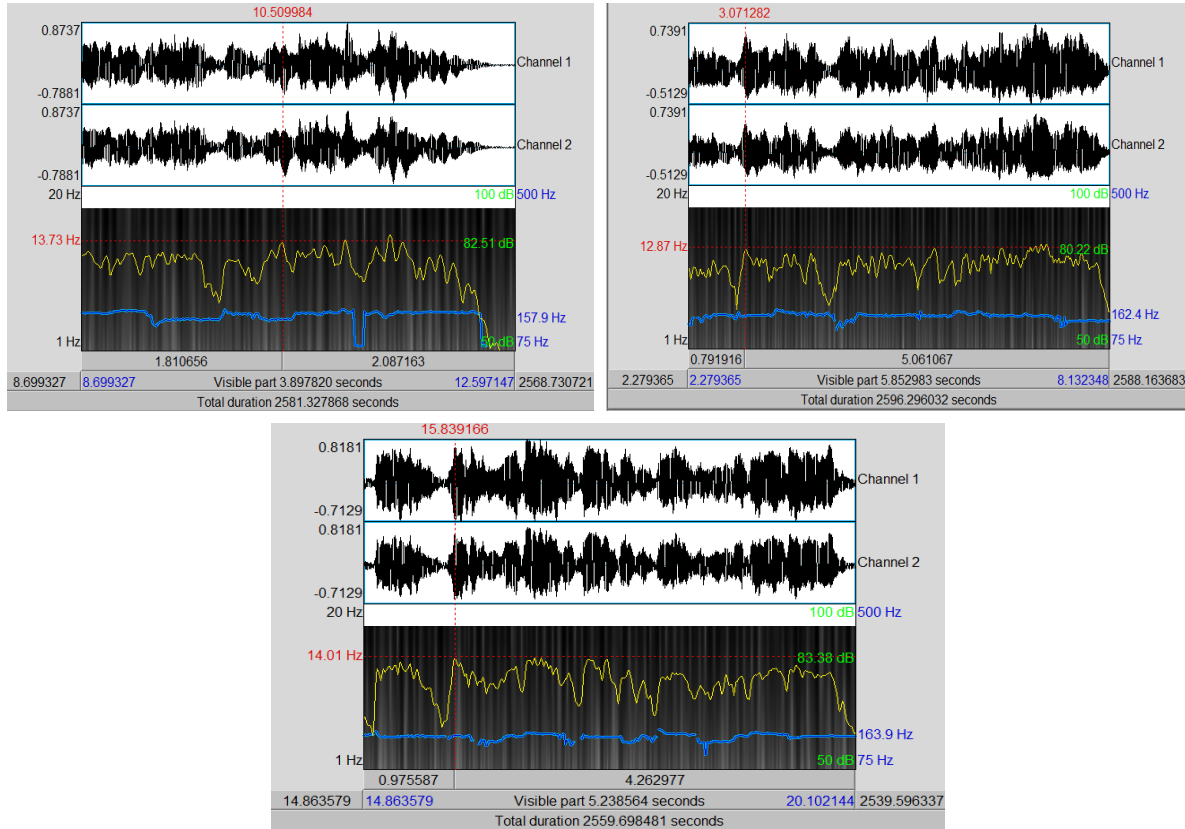


Figure 6. Analysis of Sukla Yajur Veda sound files SYV-01, SYV-02 and SYV-03

Table 6. Frequency range of chanting in Sukla Yajur Veda

Specimen No.	Frequency range (Hz)	Band	Brain activity and effect
SYV-01	6.638-14.33	Theta and alpha	i). Deep meditation/relaxation
SYV-02	4.23-13.4	Theta and alpha	ii). Calm relaxed yet alert state
SYV-03	5.156-13.86	Theta and alpha	

3.4. Sama veda

Sama Veda consists mainly of hymns about rituals with swaras (Raagas). The Sama Veda is known as the Veda of chants and songs. Hinduism's sacred texts include this old Vedic Sanskrit literature. It is a liturgical text with 1,875 verses and is one of the four Vedas. Only 75 verses were not taken directly from the Rig Veda. Figure 7 shows the analysis of three specimens taken from Sama Veda and recording of EEG signals. Analyzing these three specimen signals frequency range by using Praat simulation tool, most of these frequency ranges are in alpha brainwave frequency range.

From Table 7 it is very clear that most of the selected Vedic chanting is in the range of Alpha brain waves which gives the relaxation to human brain (listener). From the Table 8, all the selected speech signals (Vedic chanting's) have compared and identified the range of frequencies which fall in brain wave frequency. Their effect on brain is also observed and tabulated. Among all the Vedic chanting's, the chanting's taken from Sama Veda fall in the alpha brain wave range which effects the human brain and keep the brain in relaxed state which are in the frequency range of 8-12 Hz.

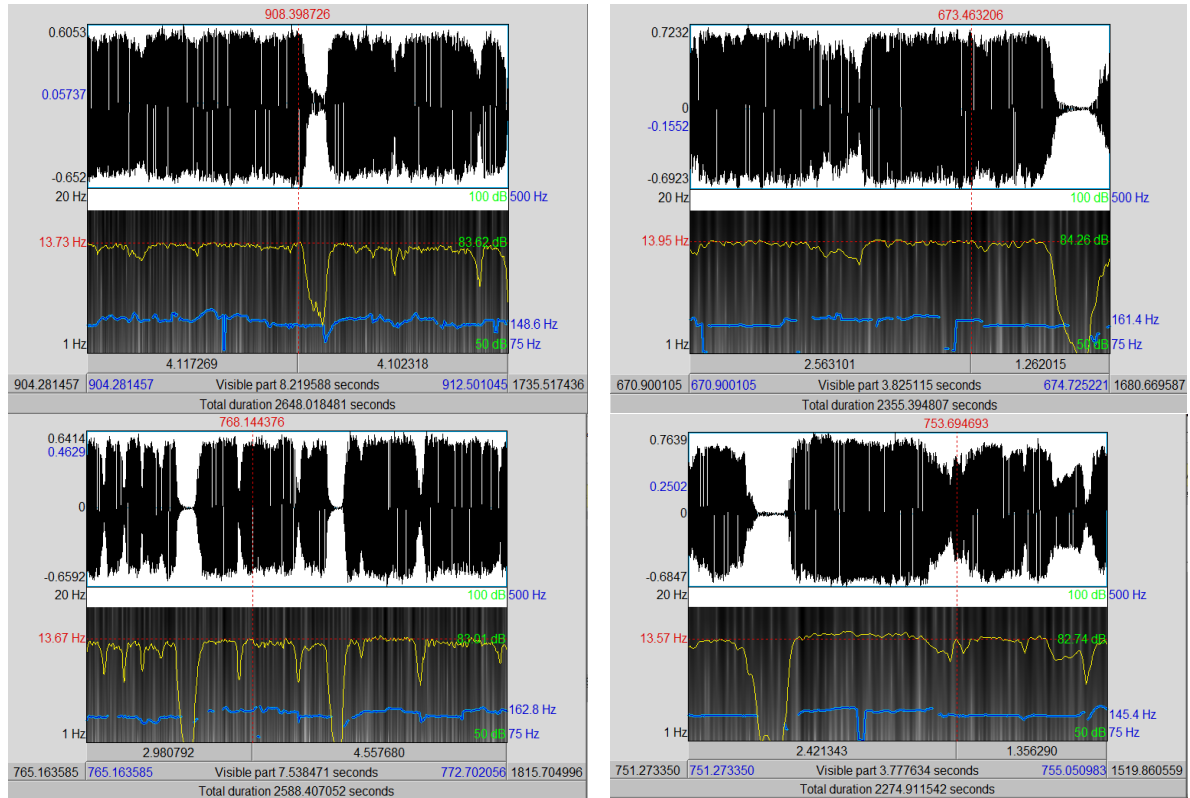


Figure 7. Analysis of Sama Veda sound files

Table 7. Frequency range of chanting in Sama Yajur Veda

Specimen No.	Frequency range (Hz)	Band	Brain activity and effect
SV- 01	8.861-13.4	Alpha	i). Deep meditation/relaxation ii.) Calm relaxed yet alert state
SV- 02	7.696-14.51	Alpha	
SV- 03	8.583-13.86	Alpha	
SV-04	2.62-14.14	Theeta and alpha	

Table 8. Consolidated frequency range of Vedic chanting

Chanting taken from	Specimen No.	Min. freq. (Hz)	Max. freq. (Hz)	Band	Brain activity and effect
Atharva Veda	AV-01	4.676	12.83	Theta and alpha	i). Deep meditation/relaxation ii). Calm relaxed yet alert state
	AV-03	1	12.57	Delta, theta, and alpha	i). Deep meditation/relaxation
	AV-07	1	13.74	Delta, theta, and alpha	ii). Calm relaxed yet alert state iii). Dreamless sleep and loss of body awareness
Rig Veda	RV-01	3.952	13.123	Theta and alpha	i). Deep meditation/relaxation
	RV-02	3.952	13.96	Theta and alpha	ii). Calm relaxed yet alert state
	RV-08	2.11	13.49	Delta, theta, and alpha	i). Deep meditation/relaxation ii). Calm relaxed yet alert state iii). Dreamless sleep and loss of body awareness
Krishna Yajur Veda	KYV-01	1	13.03	Delta, theta, and alpha	i). Deep meditation/relaxation
	KYV-02	1.8	13.49		ii). Calm relaxed yet alert state
	KYV-03	2.939	14.04		iii). Dreamless sleep and loss of body awareness
Sukla Yajur Veda	SYV-01	6.638	14.33	Theta and alpha	i). Deep meditation/relaxation
	SYV-02	4.23	13.4		ii). Calm relaxed yet alert state
	SYV-03	5.156	13.86		
Sama Veda	SV- 01	8.861	13.4	Alpha	Deep meditation/relaxation
	SV- 02	7.696	14.51	Alpha	
	SV- 03	8.583	13.86	Alpha	
	SV-04	2.62	14.14	Theta and alpha	

4. CONCLUSION

A novel methodology has been proposed to identify and compare the frequency range of different Vedic chantings from Rig Veda, Yajur Veda, Atharva Veda, and Sama Veda. Three selected specimens of duration 10 min. From each Veda has been processed through the simulation compiler Praat and the parameters like a spectral response, pitch, intensity, formants, and pulses have been observed. In the above-identified parameters, the frequency in intensity calculation is taken for each sample. This frequency is compared with the brainwaves for which the frequencies are in the ranges of 0 to >27 Hz (alpha, beta, gamma, theta, and delta). The extracted signal frequencies from Vedic chantings are compared with frequencies of brainwaves. As per the literature, the brainwaves in the frequency range of 8-12 Hz (alpha) give more relaxation to the human brain. Among the four Vedas, the frequencies extracted from Sama Veda lies in the alpha frequency range. The remaining Vedic chanting frequencies are fluctuating from the alpha frequency range and the relaxation rate is varying. So, it is concluded that from the proposed work, by listening Sama Veda the human brain changes its state from stressed to reclined.


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