Effects of Gandharva Veda Music

on Mood States, Health, and Brain Functioning

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Abstract

Background and Objectives: This paper explores effects of Gandharva Veda music--traditional North Indian music-- on emotional and physical well-being. *Hypothesis:* Gandharva Veda music balances the mind and body. *Materials and Methods*: A professional Gandharvan performed 16 live and two online concerts.   Mood states were assessed with the Profile of Mood states (POMS) at the live concerts, emotional and physiological balance were assessed during the online concerts using a traditional Ayurveda diagnostic technique called "pulse diagnosis," and the EEG of a single Gandharvan was recorded while she played a raga. *Results*: In the first study (n=1,800), Gandharva Veda music led to significant decreases of negative emotions and significant increases of positive emotions. In the second study, 78 Ayurveda students reported significantly higher levels of vibrant health and significant lowers level of physiological blockages after the ragas. In the last study, high theta1 and alpha1 coherence patterns were seen both during   meditation practice and when the Gandharvan played the ragas, along with higher 12 – 50 Hz coherence during the ragas. *Discussion*: The responses on the POMS and pulse reading support the prediction that Gandharva Veda music creates a healthy influence for the listener. Also, the coexistence of higher alpha1 coherence, a marker of inner silence, and higher 12-50 Hz coherence, a marker of goal-oriented performance suggests that playing Gandharva Veda music may culture inner silence as the performer plays complex musical passages. *Conclusion*: Future research is warranted to explore the application of Gandharva Veda music across a wider population of healthy and clinical patients.

Keywords: Gandharva Veda, music therapy, Profile of Mood States, Ayurveda, EEG coherence

1. Introduction

Music is reported to affect the listener. A systematic meta-analysis reported that music therapy led to dose–dependent reductions in negative symptoms, depression, and anxiety (Gold, C, 2009, Hohmann, L, 2017). Seven studies reported that music therapy improved global cognition in dementia patients (Fusar-Poli, 2018). Music therapy reduced distressing memory intrusions, avoidance, emotional disturbance, and hyperarousal in children (Kowalik, J, 2011) and adults, (Landis-Shack, N, 2017) who had been diagnosed with posttraumatic stress disorder. Adding music therapy to physical rehabilitation led to improvements in gait parameters, and in fine and gross motor functioning (Weller, C.M, 2015). Music therapy appears to foster resilience and engage individuals who struggle with stigma associated with seeking professional help.

While familiarity affects the impact of music on levels of relaxation, intrinsic properties of the music such as tempo, rhythm and melodic complexity also correlate with levels of relaxation (Tan, X, 2012). It is noteworthy that intrinsic properties of music independently contributed to effects of music. This could explain why music has cross cultural effects (Chase, K.M, 2003). For instance, traditional North Indian music, Gandharva Veda, has been reported to positively affect Western audiences. A Gandharva Veda concert significant balanced three orthogonal emotional dimensions: tension, irritability, and lethargy (Olson, T.M, 2005). In a case study of elderly dementia patients, Gandharva Veda, compared to baroque and no music controls, led to decreased depression and stress levels (Gillorie, S.A, 2020).

Gandharva Veda music is improvisation within set rules that determine the tonal scales used and the overall structure: *Alap*, slow improvisation of the notes that will be used in the raga; *Jod*, adding a faster tempo to the

improvisation of the *Alap*; and *Jhala,* improvising with an accelerated energetic tempo (Olson, T.M, 2005). Gandharva Veda music is intended to foster harmony, inner calm, and greater health. When these songs are performed or heard at the right time of day, tension in the mind and surroundings are predicted to be neutralized, creating a healthy influence for the individual and the environment (Maharishi Mahesh Yogi, 1991).

This paper reports results from three studies that explored effects of Gandharva Veda music. Two investigated psychological and physiological effects of listening to Gandharva Veda concerts, and the third investigated brain patterns in a Gandharva Veda expert as she played. In each study, the Gandharva Veda music was performed by Reshma Srivastava, an expert sitar Gandharvan.

2. First Experiment

The first study compared scores on the Profile of Mood States, a standardized measure of emotional states, before and after a 50-minute Gandharva Veda concert in 16 different locations.

2.1 Materials and Methods

2.1.1 Subjects

Gandharva Veda music concerts were performed in Boise, Portland, Silicon Valley, Fresno, Laguna Beach, Ramona, Austin, New Orleans, Panama Beach, Asheville, Manhattan, Summit, Detroit, Chicago, Maharishi Vedic City Iowa, and Fairfield, Iowa. Over 1,800 people attended these 16 concerts.

2.1.2 Procedure

Before the concert, the audience was introduced to the research. If they wished to participate, they were given the *Profile of Mood States (POMS)* to complete. These forms were collected before the concert began. Each form had a subject number on it. Everyone was asked to remember their number. After the concert, the audience members were given a second copy of the POMS to complete. They added their subject number from the first POMS test.

The *Profile of Mood States* is a 40-item instrument that yields a score for seven emotional sub-categories: tense, angry, fatigues, depressed, self-esteem, vigor and confused. Internal consistency coefficients on this measure range from 0.90 to 0.95 (McNair, D.M, 1971).

2.1.3 Data Analysis

The POMS responses were averaged in the seven sub-categories of this measure: tension, anger, fatigue, depression, self-esteem, vigor, and confusion.

2.1.4 Statistical Analysis

Repeated measures MANOVA was used to test differences on the seven POMS sub-categories from pre- to post-test.

2.2 Results and Discussion

The repeated measures MANOVA yielded significant pre- post-test decreases on negative emotions (tension, anger, fatigue, depression, and confusion) and significant increases on positive emotions (self-esteem, vigor). The results are presented in Figure 1 below with means and standard errors.
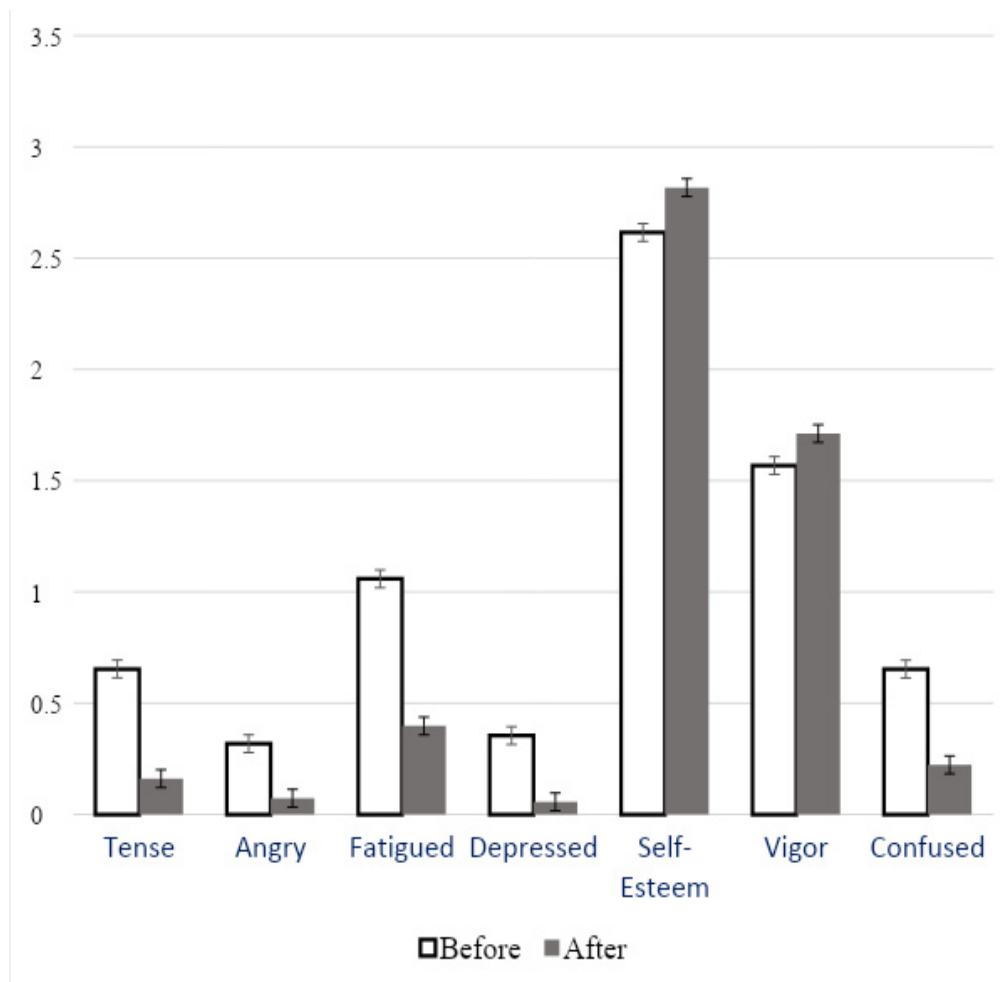
Figure 1. Scores on the seven subscales on the Profile of Mood States. White bars indicate scores before the Gandharva Veda concert and grey bars represent scores after.

3. Second Experiment: Mental and Physiological Balance, as Assessed by Pulse Reading

The second study explored effects of an online Gandharva Veda concert on mental and physiological balance, as assessed by a traditional diagnostic technique from Ayurveda called "pulse-reading." In pulse-reading, one uses the index, middle and ring finger to feel the pulse on the wrist (Kaur et.al, 2015). Each heartbeat sends a wave of activation through the circulatory system. These patterns of activation can be detected in the radial pulse. Students learn how to distinguish categories of vibrations in the pulse that are connected to vibrant health, called *ojas*, and blockages in the system, called *ama* (Ferguson et al, 2022).

3.1 Materials and Methods

3.1.1 Subjects

Seventy-eight students involved in training in Ayurveda took part in this study. As part of their training, they were developing expertise in pulse-reading.

3.1.2 Procedure

The Gandharvan played two ragas over Zoom. Before the concert, the students assessed levels of *ojas* and *ama* in their pulse and rated with a 5-point Likert scale their current levels of eight emotional states including: calm, joy, compassion, happiness, expansion, love, courage and feeling stressed. The anchor statements they used were: "0" not at all, "1" somewhat, "2" moderately, "3" significantly, and a "4" very significantly.

They then closed their eyes and enjoyed the first raga. The purpose of the first raga was to integrate and stabilize emotions and mood. After the first raga, the students took 10 minutes or so to assess *ojas* and *ama* in their pulse and rate their emotional tone at that time, again using the 5-point Likert scale.

They then closed their eyes again and enjoyed the second raga, which was more devotional. Again, after the raga ended, the students took 10 minutes or so to assess their pulse and rate their emotional tone with the 5-point Likert scale.

3.1.3 Statistical analysis

Two repeated measures MANOVA was performed. One tested difference in self-reported levels of *ojas* and *ama* before and after each raga. The other tested differences in the emotional states before and after each raga.

3.2 Results and Discussion

3.2.1 Effects on Ojas and Ama

The repeated measures MANOVA compared levels of *ojas* and *ama* before the concert and after the first and second raga. This analysis revealed significantly higher values of *ojas* and lower values of *ama* from before the concert, to after the 1st raga to and after the 2nd raga. *Ojas* rose from baseline to after the first raga and again rose after the second raga (linear contrast, $F(1,64) = 33.2$, $p < .001$). *Ama* decreased from baseline to after the first raga and decreased again after the second raga (linear contrast, $F(1,64) = 16.1$, $p < .001$). Figure 2 presents the means and standard error for *ojas* and *ama* during these three periods.
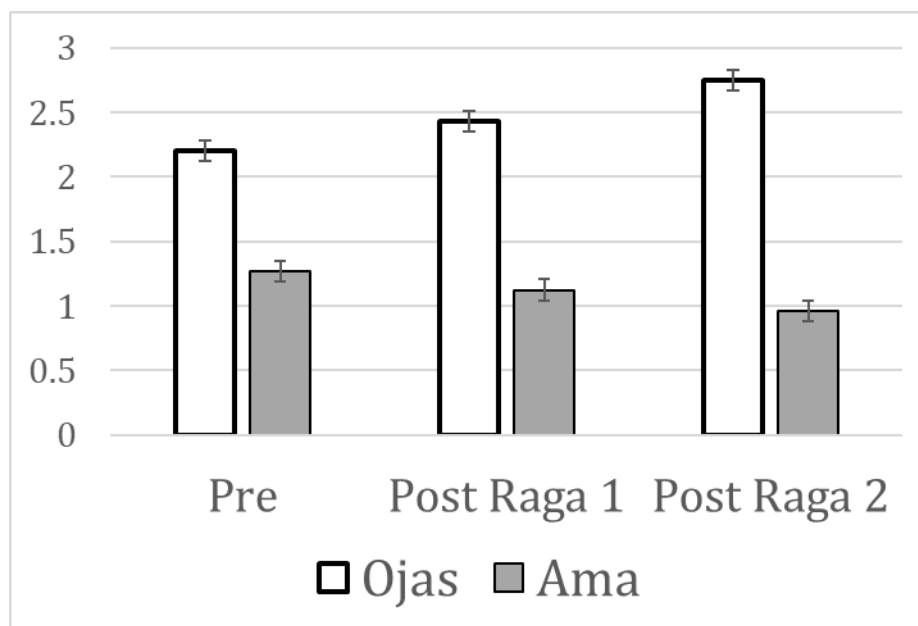

Figure 2. Levels (Mean, std error) of *ojas* (white) and *ama* (grey) at baseline and after each concert.   *Ojas*, level of vibrant health, increased from baseline to after each raga.   In contrast, *ama*, level of blockages in the system, decreased from baseline to after each of the ragas.

3.2.2 Effects on Eight Emotional States

The second repeated measures MANOVA compared levels of eight emotional qualities after the first and second raga. These eight qualities included: calm, joy, compassion, happiness, expansion, love, courage and feeling stressed. The repeated measures MANOVA yielded significant concert x variable interaction ($F(4.1,213) = 3.9$, $p = .004$). Calm, joy, compassion, happiness, expansion, and love were significantly more after the second raga, which was more devotional, compared to after the first (all $p < .01$). There were no differences in being stressed or feeling courage between the two ragas. ($p > .05$).

Figure 3 presents the means and standard error for these eight emotional states after the two ragas. Notice the average for both ragas was 2 or above on all positive qualities and less than 0.5 on the negative quality of "stressed."
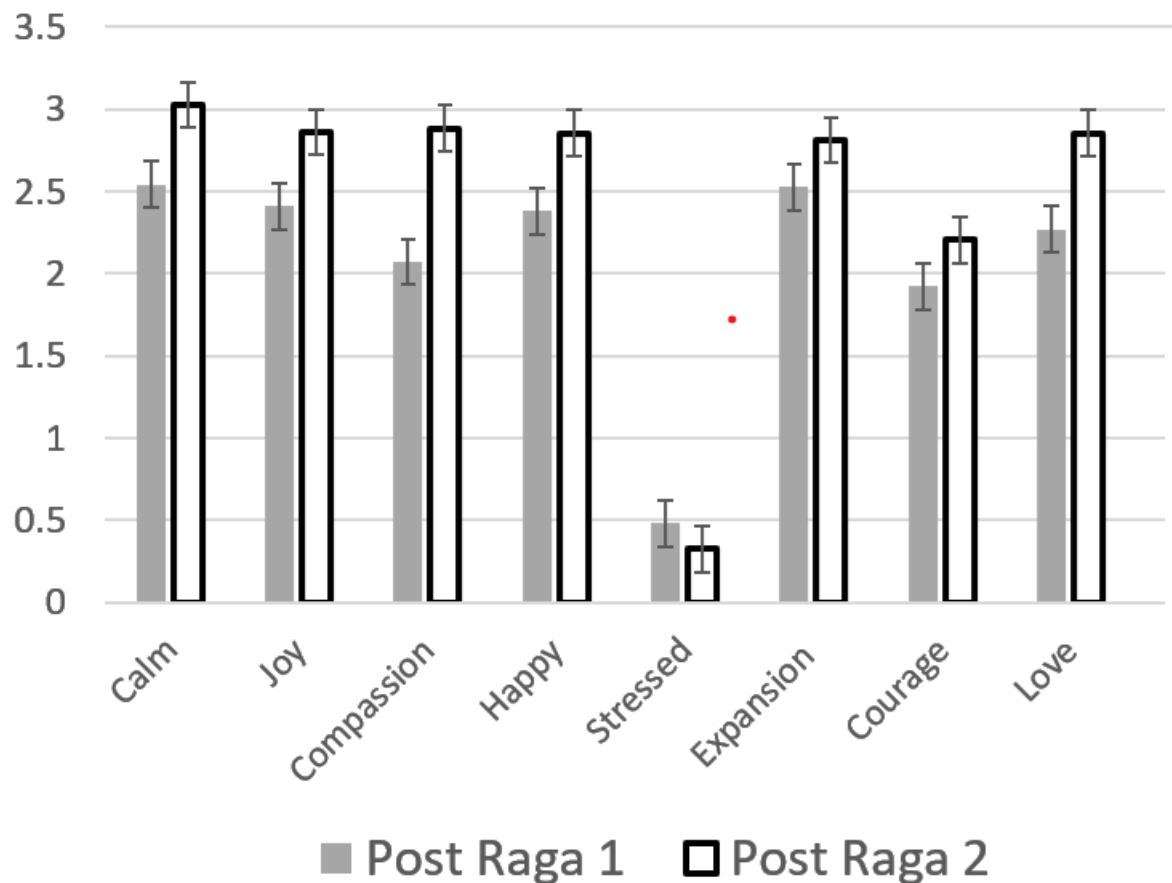
Figure 3. Qualities (Mean std error) after Raga 1 and Raga 2. The responses ranged from 0 -to 4. The second raga, which was more devotional, resulted in higher values of positive emotions.

4. Third Experiment: EEG Patterns of a Gandharvan

While the first two studies investigated effects of Gandharva music on the listener, the last study investigated the effects of playing a raga on brain patterns in the Gandharvan herself, as she played a raga.

4.1 Materials and Methods

4.1.1 Subjects

EEG was recorded while Reshma Srivastava played a daytime raga. She is a professional sitar player, playing the sitar over 40 years. She has been recognized as a leading expert in sitar playing, as well as an experienced teacher of Gandharva Veda music

4.1.2 Procedure

Reshma came into the Brain Center in the early afternoon. Furniture was re-arranged to give her enough room to sit and comfortably play her sitar. EEG was recorded while she did her meditation practice, Transcendental Meditation, and then played a traditional raga that was appropriate for that time of day. Coherence patterns during Transcendental Meditation were used as the benchmark for interpreting the coherence maps while playing the raga. Transcendental Meditation is a technique designed for transcending active mental processes to inner silence.   This process of transcending is marked by frontal alpha1 coherence (Travis et al, 2010).

Thirty-two active sensors were applied in the 10-10 system with a forehead ground. Sensors on the left and right earlobe were applied for re-referencing offline. All signals were recorded with the BIOSEMI ActiveTwo System (www.BIOSEMI.COM), digitized online at 256 points/s, with no high or low frequency filters, and stored for later analyses using Brain Vision Analyzer.

4.1.3 Transcendental Meditation

Compared to meditations such as Vipassana in the Focused Attention category or Mindfulness in the Open Monitoring category, Transcendental Meditation is in the Automatic Self-transcending category of meditations (Travis & Shear, 2010). Transcendental Meditation is structured for transcending "…the experiencer steps out of the process of experiencing and arrives at the state of Being. The mind is then found in the state of Being" (Maharishi, 1969, p. 29). This practice is marked by frontal alpha1 EEG (Travis et al., 2010). Alpha oscillations have been found to play an active role in the suppression of task-irrelevant processing, (Jensen and Mazaheri, 2010) being negatively correlated with local cortical excitability (Palva and Palva, 2011). Frontal alpha could indicate that task-irrelevant frontal executive processing is being reduced—thoughts are being minimized as inner silence is growing (Travis, F. 2020).

4.1.4 Data analysis

Coherence was calculated within the three major divisions of the raga: the *Alap*, slow improvisation of the notes that will be used in the raga; *Jod*, adding a faster tempo to the improvisation of the *Alap*; and *Jhala,* improvising with an accelerated energetic tempo.

Coherence is a mathematical measure of the similarity of brain wave patterns in different frequency bands. Coherence is considered a measure of connectivity between brain areas (Thatcher et.al, 1986). If two parts of the brain are working together, then the electrical activity from those two brain areas will be similar. They will be resting and active in a coordinated way. EEG coherence ranges from 0 (the brain waves are very different) to 1 (the brain waves maintain a perfect stable relationship).

The data were visually scanned, and any epochs with movement of body, electrode, or eye artifacts were manually marked and not included in the spectral analyses. The artifact-free data were digitally filtered with a 2–50 Hz band pass filter, and fast Fourier transformed in 2-s epochs, using a Hanning window with a 20% onset and off set. Coherence was calculated in 0.5 Hz bins. Since only a single subject was recorded, the data are narratively discussed.

4.2 Results and Discussion

The coherence maps during Transcendental Meditation practice (Figure 4a) and during the three sections of the raga (Figures 4b – 4d) are presented below. In these figures, the first and third rows present coherence looking down at the top of the head. The second and fourth rows present coherence look straight at the front of the face. Each column is a different frequency band (as indicated under the 'heads' in the 2nd and 4th rows). The dots on the heads indicate where brain waves were recorded. The strength of the line between the dots represents the magnitude of coherence between the signals recorded at these two areas of the scalp: the darker the line indicating higher coherence. Notice the frontal peaks in the alpha1 (8-10 Hz) band. This is the marker most often seen when the attention is turned within during the process of transcending (Travis, F. 2022). In Reshma, coherence was also higher in the theta1 band (4-6 Hz) during TM practice. This EEG frequency is considered a marker of drowsiness suggesting that she may have been a little sleepy in parts of her 10-min TM practice (Wada Y, 1996).
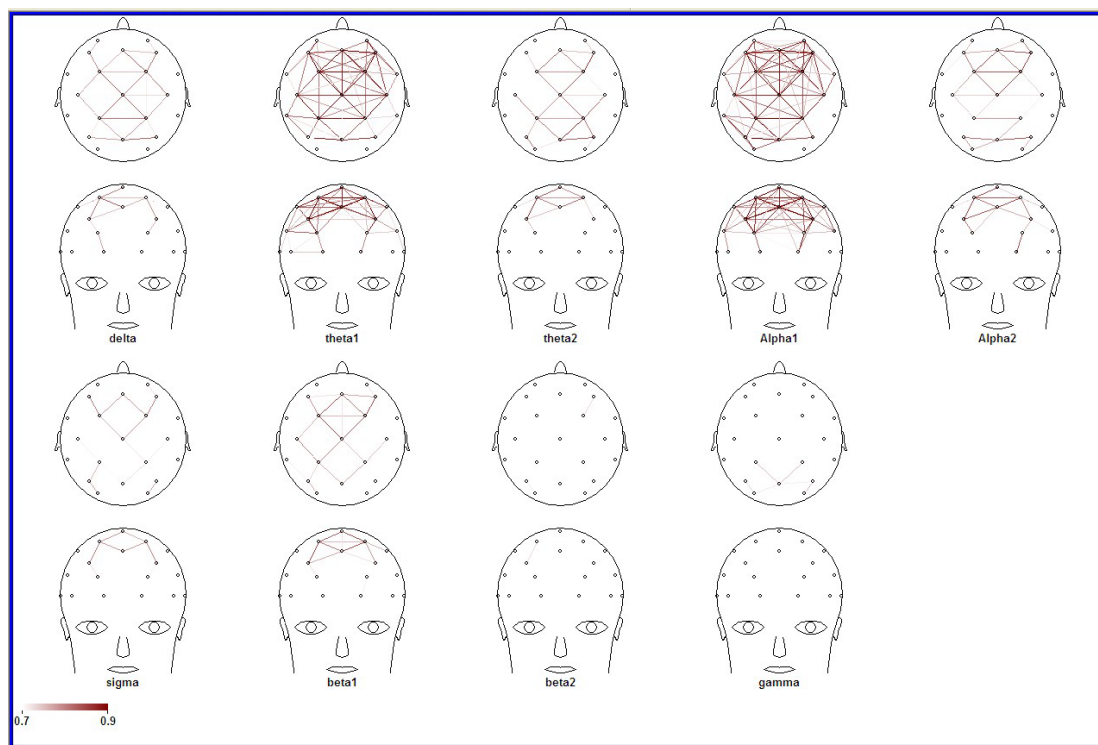
Figure 4a. Coherence during Transcendental Meditation practice. Notice peaks of EEG coherence in the theta1 and alpha1 frequency bands.

Figure 4b-4d present coherence during the *alap*, *jod* and *jhala* sections of the raga. It is noteworthy that in all three sections of the raga—which require increasing fast hand movements and changing chord patterns—the coherence in the alpha1 band is similar to coherence during her eyes-closed Transcendental Meditation recording (Fig. 4a).
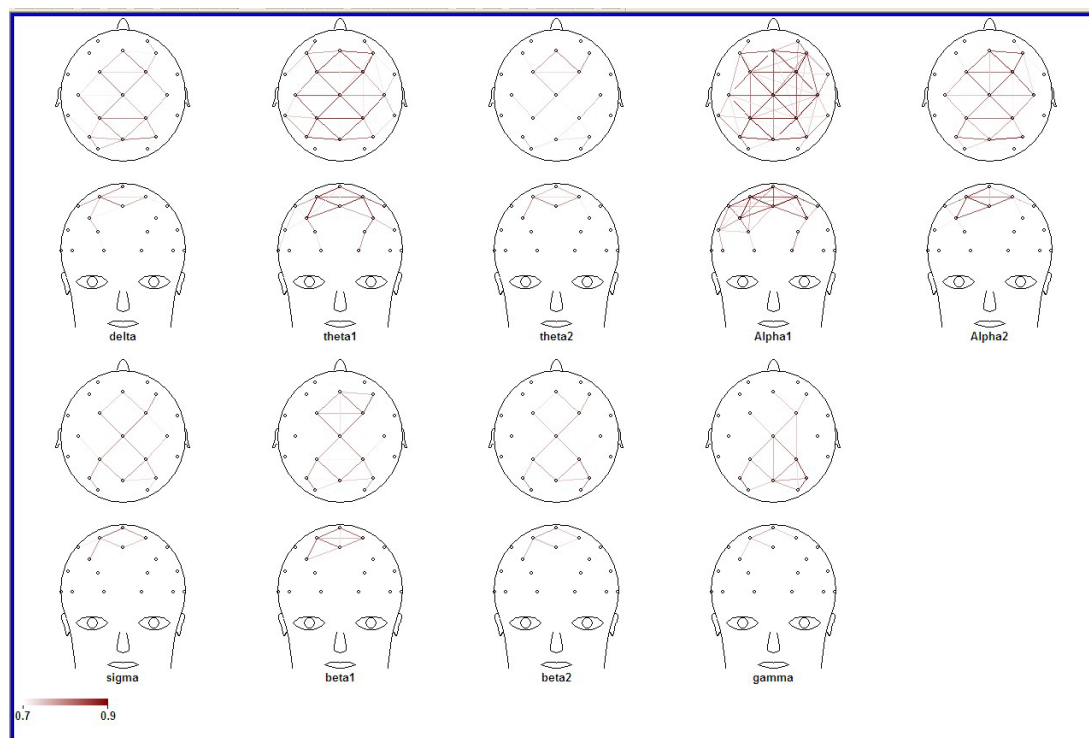

Figure 4b. Coherence during *Alap* section of the raga. Notice peaks of EEG coherence in the theta1 and alpha1 frequency bands as well as sigma, beta, and gamma frequencies.
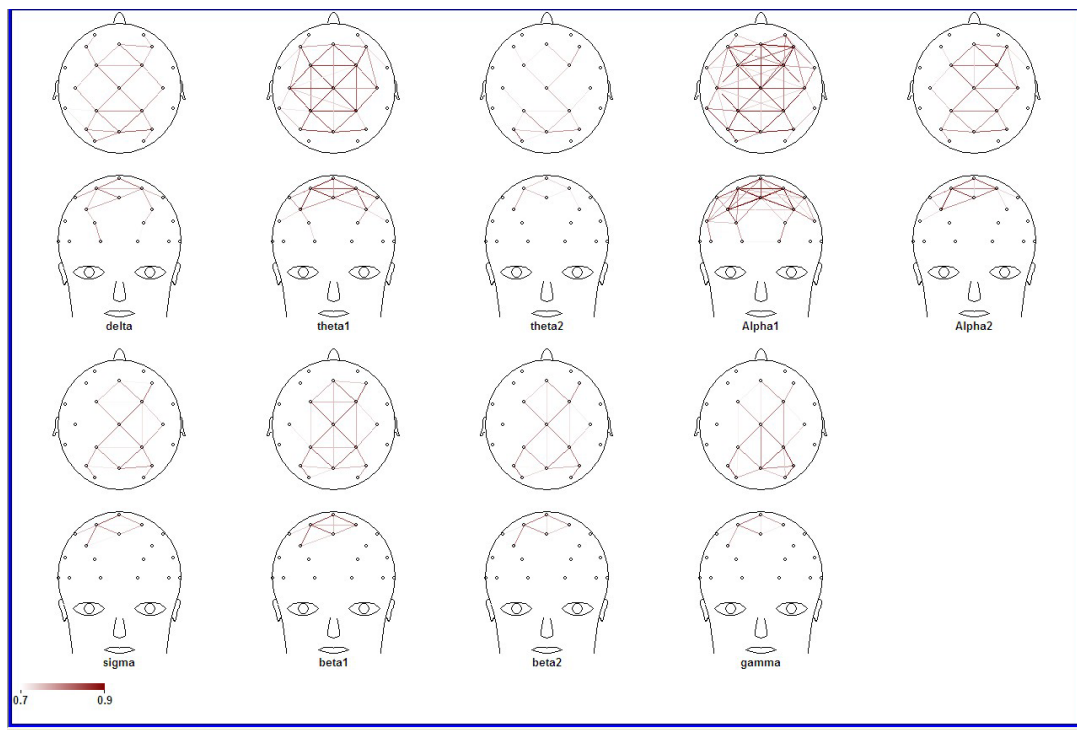
Figure 4c. Coherence during *Jod* section of the raga. Notice peaks of EEG coherence in the theta1 and alpha1 frequency bands as well as sigma, beta, and gamma frequencies.
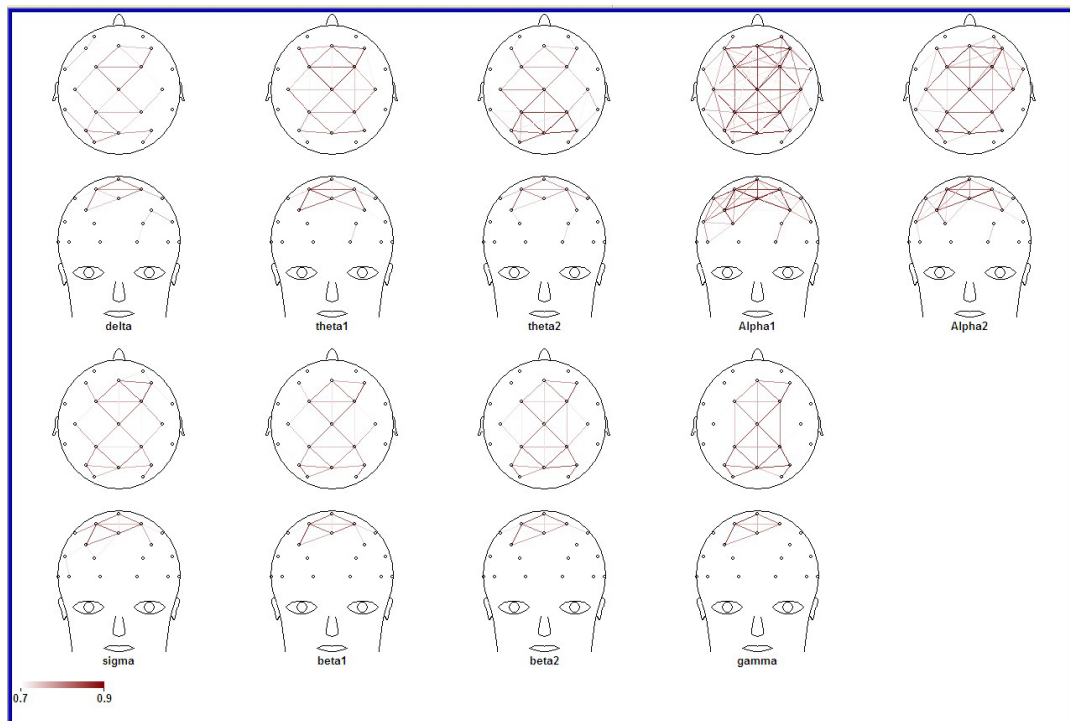

Figure 4d. Coherence during *Jhala* section of the raga. Notice peaks of EEG coherence in the theta1 and alpha1 frequency bands as well as sigma, beta, and gamma frequencies

It is striking that alpha1 coherence was high both during meditation practice, when Reshma's eyes were closed and her attention was transcending to inner silence, and when playing all segments of the raga—eyes are open, and she is performing complex motor movements. High alpha coherence is the mark of transcending during Transcendental Meditation; ones eyes are closed, sensory input is reduced, and attention moves from active mental processing to inner silence (Maharishi Mahesh Yogi, 1969). Faster frequencies are associated with eyes open focused mental activity (Kaur, R, 2015).   The coexistence of alpha coherence along with faster frequencies while playing the raga suggests that for Reshma, playing Gandharva Veda music integrates inner silence with very dynamic activity.

5. Conclusion

Gandharva Veda music is shown to positively effect emotional and physical functioning in healthy individuals in this study and has been reported to decrease depression and stress levels in elderly dementia patients in other research.   Future research is warranted to compare effects of Gandharva Veda music across a wider population of healthy and clinical patients. Future research could use active controls, such as Baroque music, and passive controls.   Gandharva music could be a valuable tool to support balance in mental and physiological functioning.

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