IS BRAIN RHYTHM AND QURAN RHYTHM HARMONIC?

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Introduction

Muslims believe that the Holy Quran is a complete code of life, a guide book or manual from Allah (God) for whole man kind.

Listening of the Quran has a calming and relaxing effect.

“and recites the Quran with a measured rhythmic recitation or in a slow style” [Al-Quran, Part 29, chapter 73; verse 4].

The Prophet (peace be upon him) said, “Allah (God) does not listen to anything as He listens to the Prophet reciting the Quran in a nice, loud and pleasant tone”. Sufyan the companion said, “This hadith (Saying of Prophet) means: The Prophet regards the Quran as something that makes him dispense with much worldly pleasure” (Sahih Al-Bukhari, Vol 6, Hadith No.542).

The neuronal mechanisms underlying this pleasing effect from rhythmic Quranic listening remains unclear

Introduction

The relaxing effect during prostration during a salat (Muslim prayer) has been studied using Electroencephalography (EEG) spectral analysis by Autoregressive modeling (Salleh & Ibrahim, 2009).
Another study suggested that the natural music 'recitation of Quran' is able to relax and eliminate the mental stress by using visual and multimedia system (Nawsher *et al.* 2010).

Besides, that the use of Quran recitation as a complementary and alternative therapy has been documented in a cross-sectional study of 1408 individuals in Riyadh to improve their common health problems (Norah Al-Rowais *et al.*2010)

In a randomized control trial and double blind study of 120 premature infants in Iran to improve their physiologic states (Keshavars *et al*. 2010).

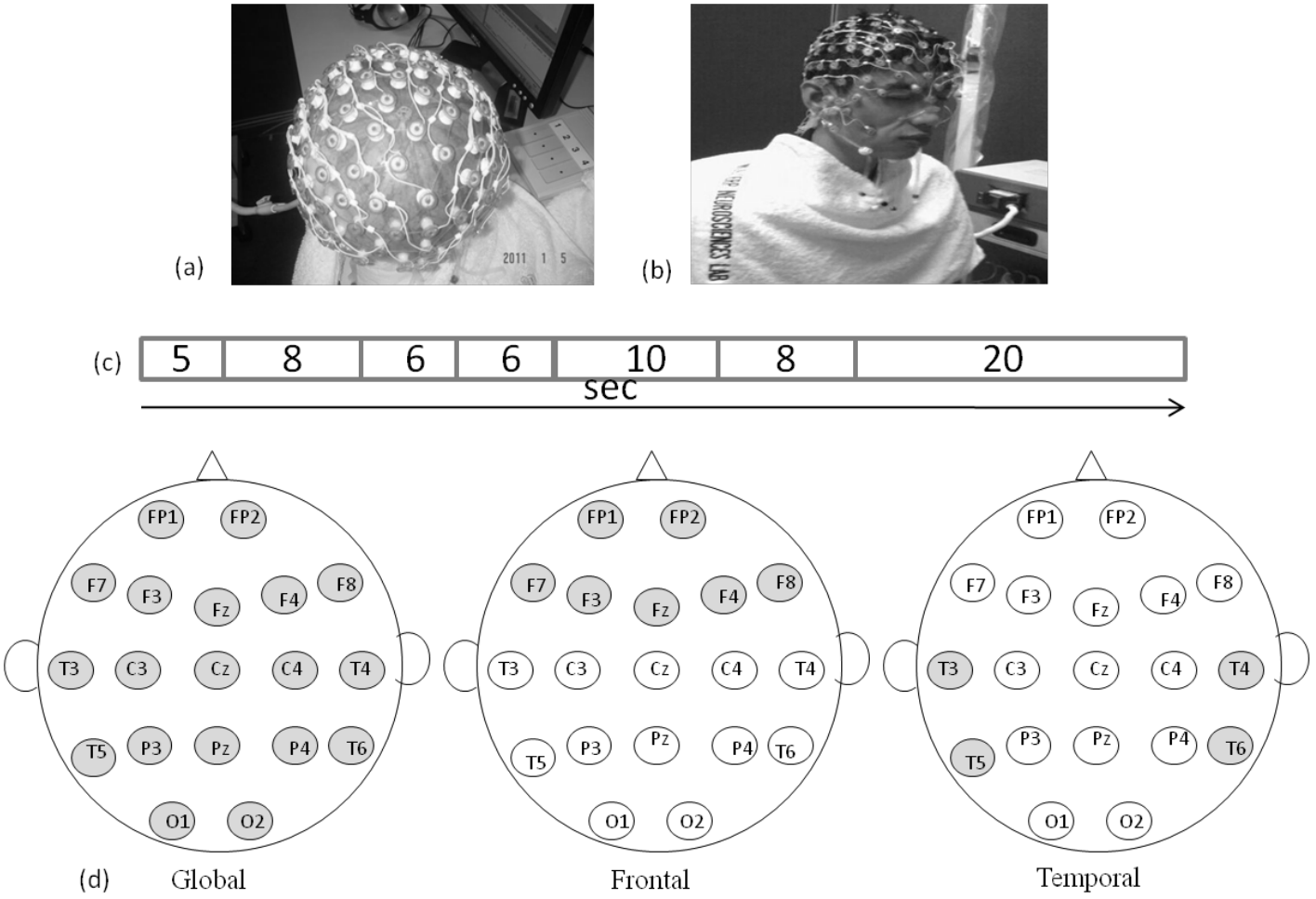
A review of 176 completed questionnaires showed that 99 parents (56%) had used the complementary and alternative medicine (CAM) in children attending a pediatric neurology clinic in North Jordan for their child's specific neurological illness and the most common modalities (77%) were prayer/reciting the Quran (Samah K. Aburahma, 2010).

Other listening method resembling music has been chosen for its soothing effect on psychological patients (Morgan *et al*. 2010) with Nasyid music seemed more relaxing than the rock music (Ros Shilawani S. Abdul Kadir *et al.* 2010).

There are several studies on the technical aspect of Electroencephalographic (EEG) studies on Chinese poem (Li & Yang, 2010) and on voice features matching for Quran reader to prevent mistake during Quran reciting (Waqar Mirza Muhammad *et al*. 2010).

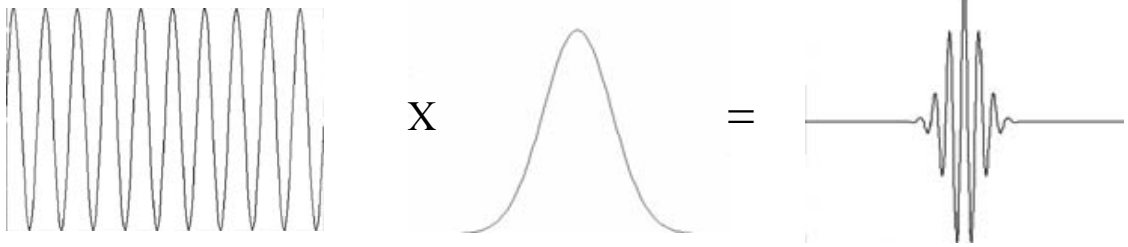
However scientific exploration of neuronal oscillation during melodious Quran listening remain scarce and several questions about the efficiency of entrainment effect of emotion and relaxation in memory formation of Quran listening are yet to be answered.

Methodology



Seven (n=7) healthy right handed (Muslim) volunteers (one female, mean age ± STD, 35.5y ± 6.6) without any neurological including no hearing disturbances and without drug history were recruited. The volunteers are habitual daily Quran listener. Informed consent was obtained from all subjects prior to testing. This study was approved by the Human Ethical Committee of University Sains Malaysia (USMKK/PPP/JEPeM [234.3.(09)]

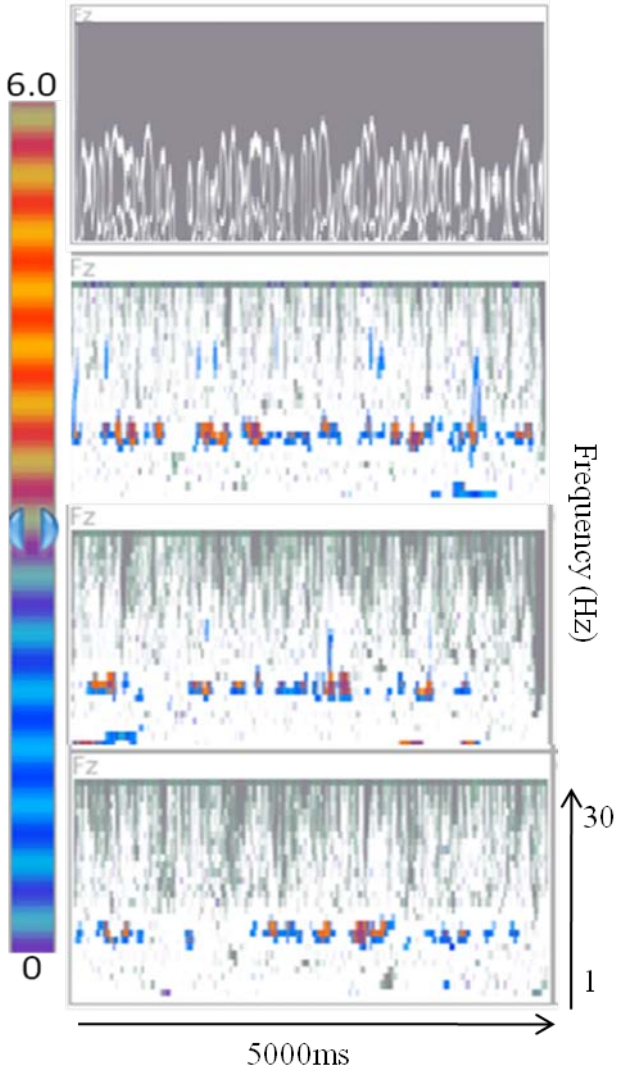
Data Analysis and Result

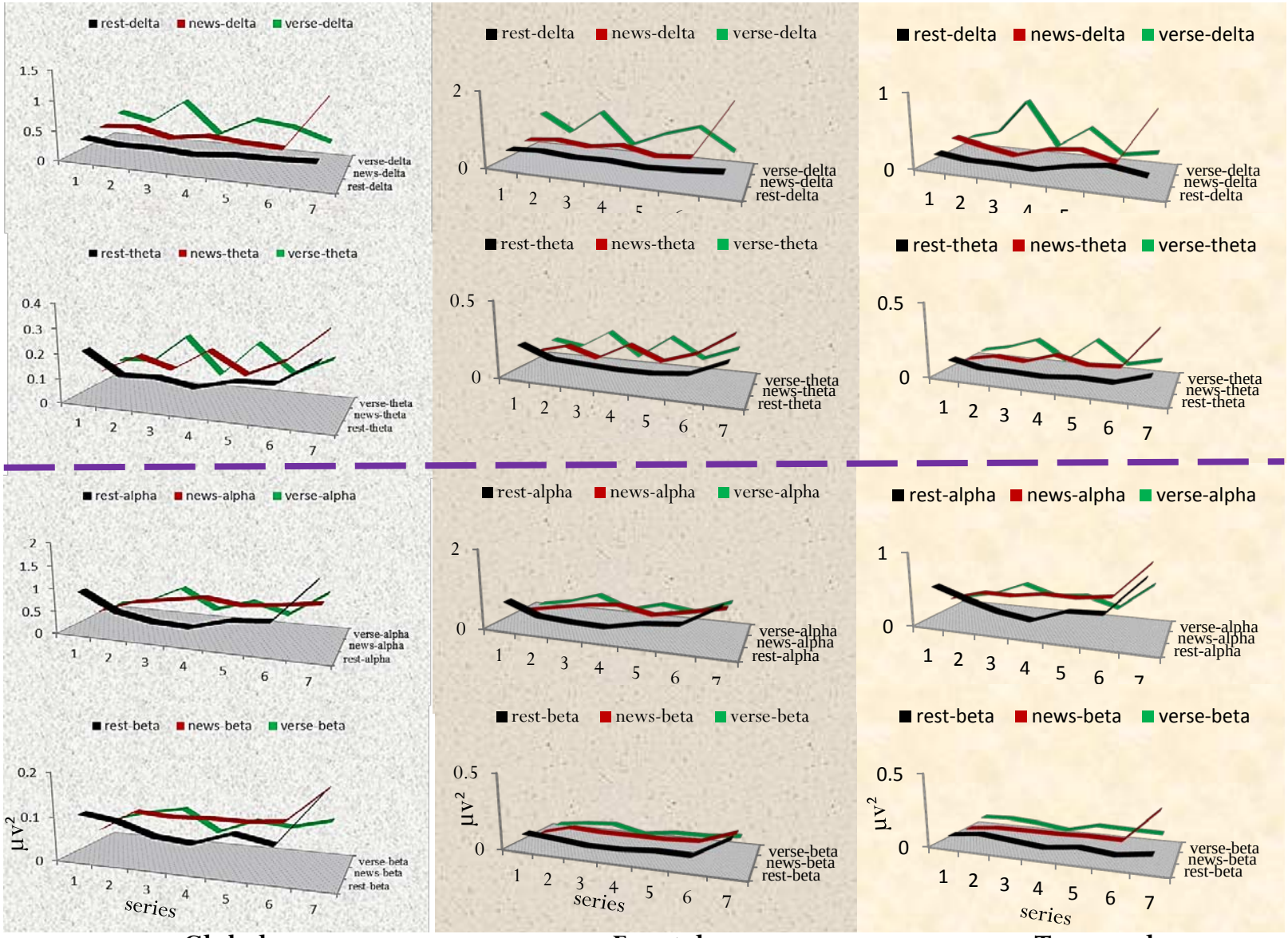


sine wave envelope function wavelet

The Morlet wavelet-based time-frequency analysis was done to obtain mean amplitude of power from equal first 5 sec epoch of all segments for beta (13–30Hz), alpha (7–13Hz), theta (4–7Hz) and delta (1–4Hz) frequency bands.

Representative wavelet graph from Pomelo (upper), at rest (upper-middle), at news listening (upper-lower) and during Quran listening (lower panel) from Fz region. X-axis is the time and Y-axis is the frequency of 1 to 30 Hz .The left bar is the color code for the intensity of mean power. Red and blue colors represent high and low power, respectively.





3-D graph of power (amplitude squared) of delta, theta, alpha and beta frequencies during rest, news and Quran listening from grand averaged (n=7) data from global, frontal and temporal region. black, red and green color indicate the experimental conditions of resting, news and Quran listening, respectively.

Table1: Autocorrelation output table for delta and theta power from the global region. P value in bold-italic is significant (p <0.050) and in bold is near significant (0.050<p<0.100).

Series: verse-Delta		**region :Global**			
Lag	Autocorrelation	Std. Error [a]	Box-Ljung Statistic		
			Value	df	Sig. [b]
1	-0.636	0.309	4.253	1	***0.039***
2	0.159	0.282	4.571	2	0.102
3	0.19	0.252	5.141	3	0.162
4	-0.24	0.218	6.348	4	0.175
5	0.083	0.178	6.567	5	0.255
Series: verse-Theta					
Lag	Autocorrelation	Std. Error [a]	Box-Ljung Statistic		
			Value	df	Sig. [b]
1	-0.746	0.309	5.847	1	***0.016***
2	0.468	0.282	8.605	2	***0.014***
3	-0.219	0.252	9.358	3	***0.025***
4	0.063	0.218	9.442	4	**0.051**
5	0.007	0.178	9.443	5	**0.093**

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

Table2: Autocorrelation output table for delta and theta power from the frontal region. P value in bold-italic is significant (p <0.050) and in bold is near significant (0.050<p<0.100).

Series: verse-Delta		**region: Frontal**			
Lag	Autocorrelation	Std. Error [a]	Box-Ljung Statistic		
			Value	df	Sig. [b]
1	-0.572	0.309	3.436	1	**0.064**
2	0.096	0.282	3.552	2	0.169
3	0.174	0.252	4.027	3	0.259
4	-0.237	0.218	5.209	4	0.267
5	0.187	0.178	6.31	5	0.277
Series: verse-Theta					
Lag	Autocorrelation	Std. Error [a]	Box-Ljung Statistic		
			Value	df	Sig. [b]
1	-0.878	0.309	8.085	1	***0.004***
2	0.667	0.282	13.696	2	***0.001***
3	-0.423	0.252	16.508	3	***0.001***
4	0.21	0.218	17.43	4	***0.002***
5	-0.073	0.178	17.599	5	***0.003***

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

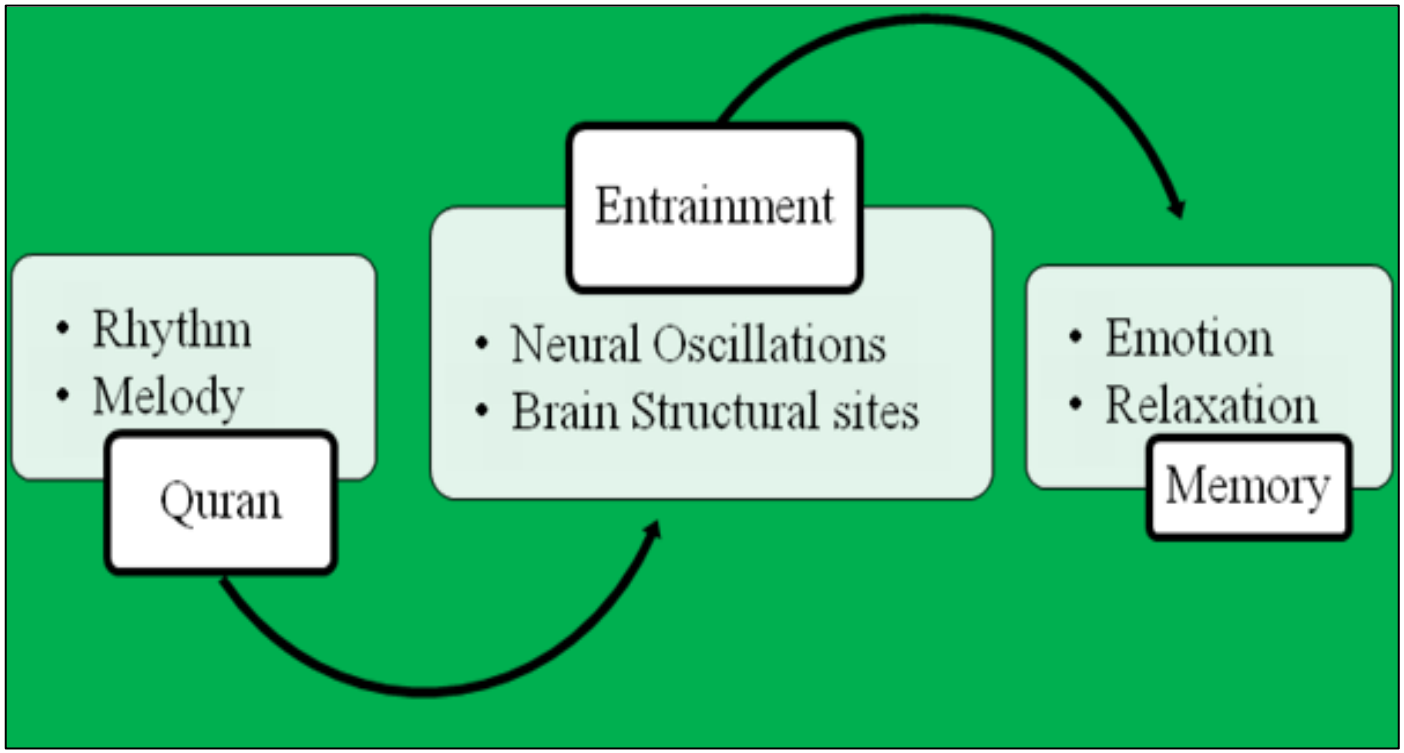
Table3: Autocorrelation output table for theta power from the temporal region. P value in bold-italic is significant (p <0.050) and in bold is near significant (0.050<p<0.100).

Series: verse-Theta		**region: Temporal**			
Lag	Autocorrelation	Std. Error [a]	Box-Ljung Statistic		
			Value	df	Sig. [b]
1	-0.717	0.309	5.396	1	***0.02***
2	0.295	0.282	6.495	2	***0.039***
3	0.011	0.252	6.497	3	**0.09**
4	-0.162	0.218	7.047	4	0.133
5	0.109	0.178	7.423	5	0.191

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

Theoretical model of the effect of Quran listening



Discussion

The global auto correlated power in theta frequency band indicates the relaxing effect of Quran listening as well as in the frontal and temporal regions signify emotional processing, which are consistent with other findings on studies examining the pleasant effect from music listening (Kobuto *et al.* 1993, Koelsch *et al.* 2006).
The correlation between frontal midline theta power changes and emotional processing has been documented in a study involving listening to a pleasant music (Sammler *et al.* 2007), although this is not specifically addressed in our study for a deductive comparison.

Data from a functional magnetic resonance imaging (fMRI) study had also shown activation of the temporal poles with other area like amygdala, hippocampus and parahippocampus during pleasant music listening (Koelsch *et al.* 2006).

On the basis that pleasing emotions enhance memory processing and music evokes strong emotion, hence music may involve in forming memories (Jäncke, 2008). In this present study, we demonstrated equivalent emotion being induced from the Quran listening which may also involve in the formation of memory. Cummulatively, data from these music studies and that of our preliminary observations tempt us to speculate that emotional processing during rhythmic Quran listening underlies the inter-relations with the entrainment to neural oscillation in different brain structures to facilitate memory processing.

However, despite technical limitations such as small numbers for auto correlation study (from short, first part of Quran which consist of seven verses and small number of sample size), this study raises further research queries. For instance, is the Quran perception similar to music and language perception or does it relate to both? In this study, the subjects are non-native Arabs, and to entertain the raised question in specific, it is best tested among native Arabs or those who understand Arabic language.

Conclusion

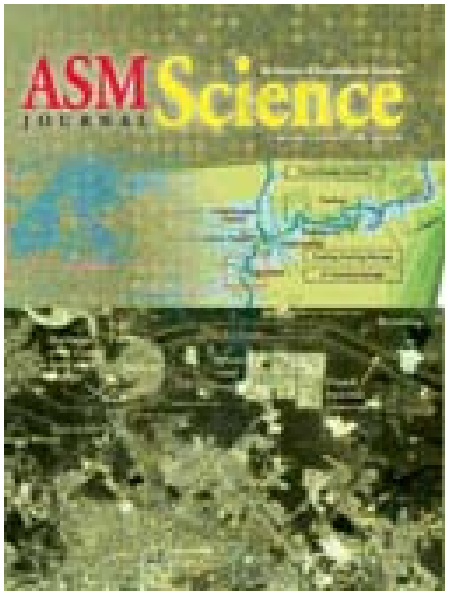
We investigated the character of the rhythmic oscillatory dynamics in the EEG of subjects during Quran listening compared to resting and Arabic news listening.

We had analyzed the mean power amplitudes of each frequency band by wavelet-based time-frequency analysis obtained from equally segmented EEG recordings during conditions of rest, news and Quran listening.

We presented the time series analysis of power from each three conditions in each frequency band from grand averaged data by autocorrelation analysis. This analysis showed significant cyclic overall trends of increasing and decreasing patterns of power in the low frequency brain waves oscillation in different head regions.

These results provided a prediction of the periodicity of the power of the oscillatory brain dynamics of both delta and robustly in theta that occur during Quran listening. Overall, this study has provided a plausible scientific basis to the emotion induction during Quran listening that mimics the data from music listening studies. This in turn, offers a promising perspective for future studies on Quran listening on translational neurophysiological, cognitive and biofeedback to modify brain behavior in health and disease.

Acknowledgement



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THANK YOU