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Differences in Brain Waves and Blood Pressure by Listening to Quran-e-Kareem and Music

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ABSTRACT

Background: Quranic recitation and music do not share any features in terms of content besides the use of melodies, but it is a common belief, that both have positive effect on reducing blood pressure and anxiety level of patients. This research investigates and compares the effects of listening to Quranic recitation and soft music on human brain waves especially Alpha and Beta waves by electroencephalogram (EEG) using Power-Lab.

Material and Methods: A clinical trial was carried out in the Physiology Department of Islamabad Medical and Dental College. There were 22 participants, divided into two groups (A and B) with 11 participants in each group. Group A included students with ages 20-25 years and Group B comprised of teaching faculty between 40-60 years. All the study participants were Urdu-speaking, Pakistani Muslims having normal hearing. Sample selection was based on non-random convenient sampling. Paired T-test was used to compare means of Alpha and Beta waves amplitude, with p value < 0.05 considered as statistically significant.

Results: Listening to Quranic recitation results in greater amplitude of Alpha waves in both younger and older age groups ($p=0.01$). The cross comparisons of systolic blood pressure at rest and after music for Group A showed significant results ($p=0.04$) indicating that soft music increases systolic blood pressure in younger people. Diastolic blood pressure comparison proves that it decreases by Tilawat in older age-groups ($p<0.05$).

Conclusion: EEG showed that Quran generates comparatively higher amplitudes of Alpha than Beta waves, which reflects the calmness and relaxation of the participants while listening to Quranic recitation. Furthermore, there was a mild reduction in diastolic blood pressure in older subjects after listening to Quranic recitation.

Key words: Blood Pressure, EEG, Quranic recitation, soft music

Authors' Contribution:

^{1,2} Conception, synthesis, planning of research and manuscript writing ^{3,4} Interpretation, discussion, Data analysis, Active participation in data collection.

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Introduction

Many previous research studies have shown that music has physiological effects which are quantifiable. Some studies have made use of EEG to verify the influence of music on human brain activity.¹ Sound activates the pituitary adrenal-cortical axis and the sympathetic-adrenal-medullary axis.² Chepesuik (2005) in his review article on noise pollution has cited a number of studies reporting the effect of loud sounds on human behaviors and physiological measurements such as blood pressure,

heart rate and blood flow.³ The cerebral cortex contains a large number of neurons. EEG signals acquisition is a reliable tool in biomedical engineering for signal analysis. A common method to measure human brain activity is by using Electroencephalography, which is a medical imaging technique that reads scalp electrical activity generated by brain structures. When brain cells (neurons) are activated, local current flows are produced. Only large collections of active neurons can generate recordable

electrical activity on the head surface.⁴ Activity of these neurons is to some extent synchronized in regular firing rhythms (brain waves).⁵ Electrodes placed in pairs on the scalp can pick up variations in electrical potential that derive from this underlying cortical activity.⁶ EEG recordings contain a great deal of information that can be used to characterize the signals for clinical and research purposes.⁷ EEG mainly consists of four basic frequency components namely: (a) Delta - 0.5-4 Hz - associated with the deep sleep, (b) Theta - 4-8 Hz - associated with drowsiness, (c) Alpha - 8-12 Hz - associated with relaxed, alert state of consciousness, (d) Beta - 14-30 - associated with active, busy or anxious thinking. The amplitudes of the EEG signals typically vary between 10 and 100 μ V (in adults more commonly between 10 and 50 μ V).¹

Listening to music plays an important role among higher brain centers.⁸ Quran is the Holy book of Muslims which covers all aspects of human life and treatment of diseases can be one of the aspect of verses of the Holy Quran.⁹

Quranic recitation and mainstream music are generally opposed to each other in terms of content, but it is a common belief, that both have positive effect on reducing blood pressure and anxiety level of patients.¹⁰ Soft music, "Morning light" is played in this study while others have used hard music like rock or relaxing music like Mozart k.448.¹¹ This research investigated and compared the effects of listening to Holy Quran and soft music on Alpha and Beta brain waves by EEG using Power-Lab with only 2 electrodes, while others have used 19¹² or 21 electrodes respectively.¹³ Verses from Surah Rehman (25th to 40th verses) were used in this study.¹² Moreover, differences in blood pressure at rest and after listening to soft music and Quran were also noted.¹⁴

Material and Methods

The present study was designed as a clinical trial comparing two groups of participants. Group A comprised of 11 healthy IMDC students of age range 20 to 25 years and Group B had 11 IMDC teaching faculty members of age range 40 to 60 years. Sample selection was based on non-random convenient sampling. Sample size was calculated using WHO calculator, taking 95% confidence interval (CI) and 80% power of the study. The initial

calculated sample size was 6 (3 in each group), but in order to increase the significance of the study we included 22 participants (11 in each group). Mean magnitude of Alpha waves before listening to Quran-e-Kareem 0.18571429 and during listening to Quran-e-Kareem is 1.27142857. Variance is 0.00809524 and 0.36238095 respectively.¹¹ All Urdu-speaking Pakistani Muslims having normal hearing were included in the study, while subjects with neurological disorders, formal music education, formal Quran recitation training and those on drugs like tranquilizers were excluded from the study.

This study was conducted in the morning from 9-11 AM. The subjects were made to sit on a relaxing chair. EEG was derived from two electrodes of Power lab. A frontal electrode was placed on the forehead and an occipital electrode on the scalp at the back of head. A third (ground or earth) electrode was also attached to record electrical interference. Before placing the electrodes, the placement area was swept using EEG abrasive skin prepping gel. The experiment was conducted at room temperature (25°C) with air conditioning. The participants were instructed to rest and close their eyes. Then, with the help of head phones, they listened to soft music ("Morning Light") by Serenity Studio for 2 minutes. EEG was noted in this duration.

After a rest of ten minutes, the participants then listened to Surah-Al-Rehman for 2 minutes in the voice of Qari Abdul Basit from 25th to 40thverse, and EEG was again recorded. Blood pressure was checked with the help of sphygmomanometer before and after play of each audio and mean B.P was calculated using the formula diastolic B.P +1/3 Pulse pressure. Ethical approval was obtained from the Institutional Review Board (IRB) of Islamabad Medical and Dental College. Written informed consent was taken from all the study participants. Confidentiality was maintained during and after the study and the participants were also informed about the results of the study.

Statistical analysis was performed using SPSS version 23. Paired T test was applied to the obtained data to compare EEG after soft music and after listening to Quran-e-Kareem; and to compare blood pressure before and after play of each audio. *P* value less than 0.05 was taken as statistically significant.

Results

Current study consisted of 22 participants, divided into two groups. Group A, comprised of 11 students with ages ranging from 20 to 22 years and mean age of 20.6 ± 0.68 years. While Group B consisted of 11 faculty members with age range of 40 to 70 years and mean age of 46.2 ± 8.7 years. Paired T-test was applied to compare mean values of systolic and diastolic blood pressure recorded at rest and in response to each audio played. The cross comparisons of systolic blood pressure at rest and after music for Group A are given in Table I showing statistically significant elevation of systolic blood pressure in younger age group with soft music ($p=0.04$). However, in Group B no effect on blood pressure was noted ($p>0.05$).

Table I: Comparison of Mean Systolic and Diastolic Blood Pressure recorded for Group A and Group B after listening to Tilawat and Soft Music				
Blood Pressure		Group A (n=11)		P Value
		Mean \pm SD	Total	Group A
Systolic	At Rest	124 \pm 8.1	0.6 \pm 5.2	0.69
	After Tilawat	123.4 \pm 6.9		
	At Rest	124 \pm 8.1	-3 \pm 4.4	0.046*
	After Music	127 \pm 8.3		
Diastolic	At Rest	79.5 \pm 4.6	-2.3 \pm 3.3	0.04*
	After Tilawat	81.7 \pm 5.3		
	At Rest	79.5 \pm 4.6	-3.4 \pm 9.9	0.29
	After Music	82.8 \pm 10.9		
Blood Pressure		Group B (n=11)		P Value
		Mean \pm SD	Total	Group B
Systolic	At Rest	118.8 \pm 8.4	3.18 \pm 9.2	0.28
	After Tilawat	115.6 \pm 5		
	At Rest	118.8 \pm 8.4	-1. \pm 7.9	0.69
	After Music	119.8 \pm 10		
Diastolic	At Rest	74.4 \pm 4.6	2.4 \pm 3.6	0.05
	After Tilawat	72 \pm 5.5		
	At Rest	74.4 \pm 4.6	2.4 \pm 3.6	0.58
	After Music	74.9 \pm 4.7		

On comparison of mean diastolic blood pressure, no change was observed in Group A at rest and after playing

of Tilawat, while the difference was statistically significant for Group B (Table I). Regarding comparison of mean amplitude and frequency of Alpha and Beta waves, Tilawat results in greater amplitude of Alpha waves in both younger and older age groups (Table II). Independent T-test was also applied to compare mean values of Amplitude during Tilawat in Groups A and B for which non-significant results were obtained ($p=0.659$).

Table II: Comparison of Alpha wave Amplitude in response to Tilawat and Soft Music in Group A and Group B				
Alpha Wave Amplitude	Group A	Group B	P Value	
			Group A	Group B
For Tilawat	46.4 \pm 11.5	40.4 \pm 9.5	0.004*	0.000*
For Music	26.4 \pm 15.4	21.05 \pm 8.12		
Total	20.05 \pm 17.7	19.4 \pm 10.3		

Discussion

Quranic recitation and conventional music are generally opposed to each other in terms of content, but both have a positive effect on reducing blood pressure and anxiety level of patients.¹⁰ This research aimed at investigating the effects of listening to Holy Quran as compared to soft music also corroborates these findings by a reduction in blood pressure and increase in Alpha wave amplitude indicating a rested and calm state.

In a similar study, comparing the effects of listening to classical music and Quran-e-Kareem, it was observed that Quranic recitation demonstrated a positive transformation of the subjects' emotions from negative precursor emotions to calmness and happiness.¹⁵ These positive emotions were denoted by a positive valence for the EEG and ECG signals. In contrast, classical music showed a positive transformation with regard to the valence in the EEG analysis, however, with respect to the ECG music data analysis, the results revealed a negative transformation for most of the music tracks.¹⁵ EEG signals showed increased alpha waves and reduced beta waves while listening to Quranic recitation. In contrast, beta waves increase when listening to rock music. Another study compared the alpha waves of subjects listening to Quranic recitation and classical music. The results

showed that 12.7% of the samples demonstrated increases in the alpha band during Quranic recitation, while 9.97% of samples showed similar increases for classical music.¹⁶ Alternately, relaxing music data generated almost equal beta and alpha magnitudes but not as high as Quran recitation. In the current study, Paired T-test was applied to compare mean values of Systolic and Diastolic Blood Pressure recorded at rest and in response to each audio played. The cross comparisons of systolic blood pressure at rest and after music for Group 1 showed significant results ($p=0.04$) indicating that soft music results in elevation of systolic blood pressure in younger age group. However, in Group 2 it was non-significant ($p>0.05$).

The cross comparisons of Diastolic Blood Pressure recorded at rest and then after playing of Tilawat Audio was non-significant in Group A, however in Group B, significant results ($p<0.05$) were obtained, which proved that Tilawat improved diastolic blood pressure in older age groups. Mirbagher (2011) compared music and Quran sound effects on anxiety and vital signs of patients before abdominal surgery and concluded that both had positive effect on reducing blood pressure, pulse rate, and respiratory rate as well as anxiety level of patients, and Quran sound is more effective, which is consistent with current research findings.¹⁰ According to Nilsson, music stabilizes vital signs.¹⁶ Wallace et al. also found no change in blood pressure, pulse and respiratory rate.¹⁷ These differences among different studies may be due to variation in patient selection techniques and environmental or cultural conditions.

Conclusion

EEG analysis showed that Quranic recitation generates higher Alpha wave amplitudes than Beta wave, which reflects the calmness and relaxation of the subjects while listening to the Quran. Another positive finding was a mild reduction in Diastolic Blood Pressure especially in older participants, indicating the soothing and beneficial effects of reciting the Quran.

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