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Brain-wide gamma activity during passive listening of rhythmic Quranic recitations in a naturalistic setting under MEG/EEG simultaneous recording

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Abstract

The involvement of high-frequency brainwaves in the neural processing of rhythmic Quranic recitation remains unclear, compared to the low-frequency brainwaves. This study examined the synchronisation of high-frequency gamma brainwaves (30–80 Hz) during passive listening to Quranic recitation in three different rhythmic styles. This experimental, cross-sectional study

involving 29 healthy adult participants (14 Muslim, 15 non-Muslim) was conducted at the MEG laboratory at Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia. The average gamma source estimation was calculated using minimum-norm imaging, and the whole-brain functional connectivity of magnetoencephalography-electroencephalography (M/EEG) data was quantified using phase-locking value. The results revealed that the gamma waves synchronised in a network of brain regions that included the supramarginal gyrus, anterior cingulate cortex, hippocampus, central region, temporal lobe, inferior frontal gyrus, Rolandic and frontal operculum, cerebellum, visual network regions, and superior parietal gyrus. The findings highlight brain-wide activation during Quranic recitation in Quran-naïve non-Muslim participants, comparable to that in Muslim participants familiar with the employed rhythmic recitation. Both groups also exhibited increased language perception of the Quranic recitation, although they did not understand Arabic (non-Arab natives). The high-frequency gamma activity in this study suggests that receptive listening to different styles of rhythmic Quranic recitation engages neural networks responsible for language and musical perception, emotional regulation, memory and attention, visual mental imagery, and multisensory processing. © 2026 by Ab Aziz et al.

Author keywords

Electroencephalography (EEG); Functional connectivity; Gamma brainwave; Magnetoencephalography (MEG); Quranic recitation

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Abstract

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