

The music of the (hemi)spheres sheds new light on schizophrenia

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In 1619, the pioneering astronomer Johannes Kepler published *Harmonices Mundi* in which he analyzed data on the movement of planets and asserted that the laws of nature governing the movements of planets show features of harmonic relationships in music. In so doing, Kepler provided important support for the, then controversial, model of the universe proposed by Copernicus.

In the latest issue of *Biological Psychiatry*, researchers at the University of California in San Diego suggest that careful analyses of the electrical signals of brain activity, measured using electroencephalography (EEG), may reveal important harmonic relationships in the electrical activity of brain circuits.

The underlying premise is a simple one - that brain function is expressed by circuits that fire, and therefore generate oscillating EEG signals, at different frequencies.

High frequency EEG activity called gamma, for example, might reflect the activity of fast-spiking cells which are often a subclass of inhibitory [nerve cells](#) containing parvalbumin. Represented musically, this would be a high pitch, i.e., toward the right side of the piano.

Lower frequency EEG activity, called theta, might come from cells that fire with a lower frequency.

As circuits interact with each other, one would see different "musical

combinations", like the chords of music, emerging in the [EEG signal](#). Abnormalities in the structure and function of brain circuits would be reflected in cacophonous music, chords where the musical "voices" are firing at the wrong rate (pitch), volume (amplitude), or timing.

It is increasingly evident that schizophrenia is a disorder characterized by disturbances in the "music of the [brain hemispheres](#)." This new report describes relationships between low- and high-frequency EEG oscillations in the human brain produced when high frequency auditory stimuli are presented to a research subject. The authors observed relatively slower oscillations and reduced cross-phase synchrony (for example, peak of theta coinciding with peak of gamma) in schizophrenia patients compared to healthy study participants.

Dr. John Krystal, Editor of [Biological Psychiatry](#), commented, "The new findings highlight the importance of understanding the relationships between different circuits. It seems that cortical abnormalities in schizophrenia disturb brain function, in part, by disturbing the 'tuning' of [brain circuits](#) in relation to each other."

More information: The article is "Hierarchical Organization of Gamma and Theta Oscillatory Dynamics in Schizophrenia" by Kenji Kirihara, Anthony J. Rissling, Neal R. Swerdlow, David L. Braff, and Gregory A. Light ([doi: 10.1016/j.biopsych.2012.01.016](https://doi.org/10.1016/j.biopsych.2012.01.016)). The article appears in *Biological Psychiatry*, Volume 71, Issue 10 (May 15, 2012)

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