



Method and Apparatus for Detecting Consciousness

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Inventors: Giulio Tononi, Christof Koch, Marcello Massimini, Silvia Casarotto, Michele Colombo

The Invention

UW researchers along with collaborators have developed a method for determining the presence of consciousness in a patient suffering from disorders of consciousness such as coma patients, vegetative state patients (also known as unresponsive wakefulness syndrome), or minimally conscious state patients. This method utilizes pulsed perturbation the patient's cerebral cortex using either a magnetic pulse, delivered by a Transcranial Magnetic Stimulation (TMS) device, or an electrical pulse, delivered by a transcranial or intracranial electrode. Brain activity is recorded using one or more electroencephalographic (EEG) electrodes placed on the scalp or intracranial electrodes. Analysis of the resultant activity using time-domain, spectral and phase information, averaged over repeated pulses delivered at one or more cortical sites, shows the ability of neural circuits to sustain reverberant excitatory activity, a fundamental mechanism that supports the presence of consciousness. The method the inventors developed relies on the quantification of recurrent electrical events by means of time domain analysis (extraction of positive peaks), spectral decomposition (to characterize their frequency content) and phase quantification (to assess their causal relation to the initial perturbation). Using these three pieces of analyses from the EEG, the inventors developed a method that provides more sensitive and accurate information about the consciousness of patients, ensuring that any "consciousness" in the brain is found as well as extracting information about locations of damage and suggestions for treatments. Unlike calculations of PCI, these signal processing methods can be carried out in (almost) real-time and may not require data from many electrodes or over many trials.

Additional Information

For More Information About the Inventors

- [Giulio Tononi](#)

Tech Fields

- [Medical Devices : Neurological devices](#)

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