MEG and Pico Tesla-TMS in Greece
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Editorial

Magnetoecephalography (MEG) is a non-invasive method that detects the magnetic fields produced by the neuronal activity of the brain. In our lab, biomagnetic measurements were performed using a whole-head 122-channel MEG gradiometer device (Neuromag-122, Neuromag Ltd., Helsinki, Finland) (Figure 1A). We used an electromagnetically shielding room for the MEG in order to avoid extraneous electromagnetic noise. The spontaneous MEG recordings were taken with a sampling frequency rate of 256 Hz and associated Nyquist frequency 128 Hz, which was well above the constituent frequency components of interest in our MEG recordings and avoid aliasing artifacts. The MEG signals were filtered with cut-off frequencies at 0.3 and 40 Hz. The research protocols were approved by the Research Committee of the Democritus University of Thrace. Funding for this work was provided by a collaboration of General Secretariat of Research and Technology, GR and ERGO AEBE, INC, GR under a research program (Grant Number: 80623).

Transcranial Magnetic Stimulation (TMS) is a non-invasive, easy to perform, without direct contact with the underlying skin and has been used to investigate a variety of clinical conditions. Anninos and Tsagas [1] invented an electronic device that increased the (2-7 Hz) frequencies of the recorded MEG of each participant towards frequencies of less than or equal to its frequencies of the alpha frequency range (8-13 Hz) (Figure 1B). Their invention is a piece of equipment for smoothing the dysfunctions of the central nervous system in combination with the use of the MEG. The device consists of one generator of alternative low voltage that produces a number of selected coils of one group which consists of alike rows of coils, or a plurality of groups of similar coils arranged in rows. The pico Tesla (pT) (1pT=10^-12 T)-TMS electronic device is a modified helmet containing up to 122 coils that cover the 7 brain regions: Frontal, vertex, occipital, right-left temporal, right-left parietal. It produces pT-TMS range modulations of magnetic flux in the alpha frequency range of each subject. The pT-TMS device was constructed for each participant to generate a square wave (so as to look like the firing activity of neurons in the brain) (Figure 1C) [2-9].

Anninos et al. [10] proposed a “Neural Net Model” that suggested that pT-TMS causes a temporally modulated neuronal reserve in areas showing irregular activity in the frequencies of 2-7 Hz. This suggestion is in accordance with information presented by other researchers.

Figure 1: A) The 122-channel MEG system. B) The pT-TMS electronic device. C) The frequency output of the device using an oscilloscope (1 ft=10^{-15} Tesla).

References