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Dynamic brain patterns in neocortical areas during interpersonal transactions

Results:

Brain imaging performed during a variety of psychophysical experiments has demonstrated that specific neocortical areas change their activity when subjects are experiencing other subjects. Where in the brain self/other awareness is represented is an emerging area of investigation. We have addressed the neuronal dynamics of interpersonal interactions using simple psychophysical paradigms while recording brain activity using magnetoencephalography (MEG). We build on current concepts of brain function and propose that the coordinated (synchronized) activity in distinct cortical areas will reveal brain regions involved in "self" versus "others" processing. In general, the analysis of synchronization of cortical regions derived from the MEG recordings revealed enhanced synchronization between the activity of the midline and the prefrontal cortex, and that the midline cortex synchronizes its activity with parietal areas as well. The pattern of synchronization was similar when study participants experienced noxious stimuli (a self-administered painful stimulus to the fingers of the right hand) as when they were watching films of other people or animals experiencing pain. However, these synchronization patterns differed from those obtained when the participants visualised photographs of faces, themselves included. We thus conclude that midline and prefrontal cortices are important in the processing of sensory painful stimulation, and in generating empathy towards others' pain. We expect that these studies will serve as preliminary background to undertake the investigation of reflective self-awareness and its relation to interpersonal transactions.

Published work:

Papers

Enhanced measured synchronization of unsynchronized sources: inspecting the physiological significance of synchronization analysis of whole brain electrophysiological recording. L Garcia Dominguez, R Wennberg, JL Perez Velazquez, R Guevara Erra. *International Journal of Physical Sciences*, 2(11), 305-317, 2007

Synchronization and signal superposition: are we measuring the underlying brain synchrony?

R Guevara Erra, R Wennberg, L Ward, JL Perez Velazquez, L Garcia Dominguez. In preparation, 2008

Abstracts and conference presentations

Brain coordination dynamics of the processing of self-referential stimuli. L Garcia Dominguez, W Gaetz, D Cheyne, R Wennberg, JL Perez Velazquez. 12th Human Brain Mapping Conference, Florence (Italy), 2006. *NeuroImage* 31(Suppl 1), S119, 2006

Variability of brain coordination dynamics in normal physiology and pathology. J Belkas, R Guevara Erra, L García Dominguez, V Nenadovic, J Hutchison, JL Perez Velazquez. 2nd International Nonlinear Science Conference, Heraklion (Greece), 2006

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Enhanced measured synchronization of unsynchronized sources: significance for brain recordings. L Garcia Dominguez, R Wennberg, JL Perez Velazquez, R Guevara Erra. 16th Annual Computational Neuroscience Meeting (CNS*2007), Toronto, 2007

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