

Schedule of Poster Presentations and List of Posters

Monday, June 12, 2006

11:30-12:30

Second Floor, Palazzo degli Affari

COGNITION AND ATTENTION

Attention

- Multiple Action Encoding Strategies in the Human Brain Revealed by MEG During the Observation of Oro-Facial Movements.** *S.D. Muthukumaraswamy, B.W. Johnson, W.C. Gaetz, D.O. Cheyne, Department of Psychology, University of Auckland, Auckland, New Zealand* 1 M-AM
- Neural correlates of covert orienting of visual spatial attention along vertical and horizontal dimensions.** *Shihui Han, Lihua Mao, Bin Zhou, Wu Zhou, Department of Psychology, Peking University* 3 M-AM
- Exploratory Study of Continuous Meditation Using fMRI.** *Klaus B. Børentsen, Freya Winther, Anders C. Green, Tue Hartmann, Hans Stødkilde-Jørgensen, University of Aarhus, Department of Psychology* 5 M-AM
- On the functional anatomy of intrinsic, phasic and self-induced alertness.** *Rene Vohn, Lydia Beck, Walter Sturm, Clinical Neuropsychology at the Department of Neurology, University Hospital Aachen* 7 M-AM
- Temporal changes in neural activation underlying cognitive learning processes in patients with schizophrenia: An fMRI study.** *Kathrin Koch, Gerd Wagner, Kathrin von Consbruch, Igor Nenadic, Christoph Schultz, Jürgen R. Reichenbach, Heinrich Sauer, Ralf Schlösser, Department of Psychiatry, University of Jena* 9 M-AM
- Multiple spotlights of visual attention?** *Carmen Morawetz, Petra Holz, Juergen Baudewig, Stefan Treue, Peter Dechent, MR-Research in Neurology and Psychiatry, Georg-August-University of Goettingen, Germany* 11 M-AM
- Cerebral mechanisms of cognitive fatigue in Multiple Sclerosis using fMRI.** *John DeLuca, Helen Genova, Glenn R. Wylie, Kessler Medical Rehabilitation Research and Education Corp.* 13 M-AM
- The angular gyrus is equally involved in different aspects of action awareness.** *Chloé Farrer, Scott H. Frey, John Van Horn, Gene Tunik, David Turk, Scott T. Grafton, Institut des Sciences Cognitives, UMR5015 CNRS 69675 Lyon* 15 M-AM
- ERP and fMRI correlates of endogenous and exogenous mechanisms of spatial selective attention.** *Elena Natale, Carlo A. Marzi, Massimo Girelli, Enea F. Pavone, Stefan Pollmann, Department of Neurological and Visual Sciences, Section of Human Physiology, University of Verona, Verona, Italy* 17 M-AM
- Effects of Task Demands on Irrelevant Deviant Sound Detection Measured Using Simultaneous ERP and fMRI.** *Merav Sabri, Colin Humphries, Jeffrey R. Binder, Einat Liebenthal, Department of Neurology, Medical College of Wisconsin, Milwaukee, WI* 19 M-AM
- Sustained attention in healthy siblings of schizophrenic patients: an event-related functional magnetic resonance study.** *Gianna Sepede, Antonio Ferretti, Mauro Gianni Perrucci, Francesco Gambi, Fiore Di Donato, Francesco Nuccetelli, Anatolia Salone, Cosimo Del Gratta, Armando Tartaro, Filippo Maria Ferro, Gian Luca Romani, Dept. of Clinical Sciences and Bio-imaging, University of Chieti, Italy* 21 M-AM
- A relevant analysis of task difficulty and brain activity during meter inspection: an fMRI study.** *Naoki Miura, Makoto Takahashi, Jobu Watanabe, Shinya Uchida, Shigeru Sato, Kaoru Horie, Masaharu Kitamura, Toshio Wakabayashi, Katsuki Nakamura, Ryuta Kawashima, CREST, JST, Japan* 23 M-AM

Please note: Institution listed is where most of the work was completed.

A Combined ERPs and fMRI Approach to Investigate the Neural Correlates of Reading in the Human Brain

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Introduction. Multi-modal approach to the study of brain functions is especially helpful in the case of reading processes, since they require the integration among sensory, motor and cognitive neural activities. The aim of the present work is to propose a mathematical framework for combining neurophysiological recordings (event-related potentials - ERPs) and functional magnetic resonance data (fMRI). These methodologies are not invasive, have complementary spatiotemporal resolution and provide significantly correlated measures of brain activity.

Methods. ERPs and fMRI were separately recorded from 8 healthy adults with the same event-related (ER) design with jittered inter-stimulus interval (ISI). Stimuli consisted of single letters and non-alphabetic symbols visually presented. Three reading tasks were adopted: *letter presentation* and *symbol presentation* (*passive* condition), that consisted in simply watching at letters and symbols respectively; *letter recognition* (*active* condition), that consisted in reading aloud the letters. ERPs obtained from each task were decomposed into their main potentials with Independent Component Analysis (ICA); Low Resolution Electromagnetic Tomography (LORETA) was applied to estimate the current density distribution inside the brain. Analysis of fMRI with multiple linear regression produced a cortical activation map for each task. The Euclidean distance between LORETA and fMRI local maxima and the extent of regions with significant overlap between the two maps were computed for integrating the information provided by the two methodologies.

Results. The results obtained from the integration between LORETA and fMRI maps are different in the three reading tasks. During symbol presentation, bilateral temporal regions were similarly activated with both methodologies. During letter presentation and letter recognition, close LORETA-fMRI local maxima were found in bilateral temporal, right parietal and occipital lobes and medial precuneus.

Conclusions. The distance between LORETA and fMRI local maxima depends on the local coupling between electrical and hemodynamic brain activity and on the different spatial resolution of the two maps. ERPs-fMRI integration is performed after a separate analysis of the two datasets: therefore the results obtained with the two methodologies do not influence each other. The results obtained from applying the method to healthy adults indicate that there is a good correspondence between LORETA and fMRI maps in several regions commonly related to linguistic processes. Thus, the results of this study support the value of the proposed approach, which proves to usefully exploit the optimal temporal resolution of ERPs and the optimal spatial resolution of fMRI for investigating the grapheme-phoneme association mechanisms naturally active during reading.

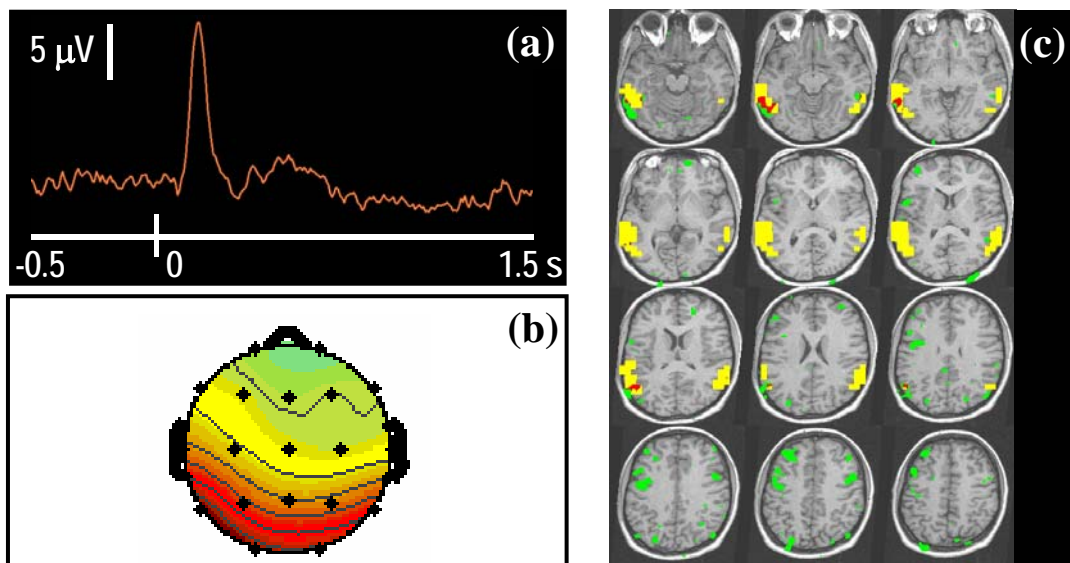


Figure : (a) Time course and (b) scalp map of an independent component (IC) estimated from the ERPs recorded during the letter presentation task from a single subject: this IC represents a physiological potential occurring at about 160 ms labelled N2. (c) Superimposition of (yellow) LORETA map of the corresponding IC and (green) fMRI map of the letter presentation task: red-coloured regions indicate significant overlap of the two maps.