

thalamus serving as information hub. Thalamo-cortical loops contain local 40-Hz oscillators. Matrix neurons distribute synchronous oscillations to extended cortical areas and serve as a communication carrier. Thalamic core neurons provide specific functional connections. Multiple modulatory inputs allow dynamic reconfiguration of networks. MEG recorded gamma oscillations are small and synchrony is modified with fast temporal dynamics. Thus, imaging gamma band networks is challenging especially for contributions from deep brain sources. The novel approach is to synchronize 40-Hz networks with periodic sensory stimulation at the target frequency and observe the dynamics of steady-state oscillations. Single trial magnetic field data were projected into source domain using a beamformer. Phase coherence between the 40-Hz auditory stimulation and source activity was calculated as statistical parameter and mapped across the brain volume. Advantages of this parametric statistics are that it does not require a non-activated control interval or a noise estimate. In MEG from a passive auditory listening task, we identified synchronous oscillations in left and right auditory cortices, distinct sources in the thalamus, bilateral inferior frontal cortices, and the anterior cingulate cortex. Temporal dynamics of synchrony revealed that networks can be established or reconfigured within 200 ms.

1-6-19: Brain changes during sleep transition: Evidence from MEG localization of differences between 8-11Hz and 12-15Hz frequency

*Valentina Gumenyuk¹, Stephen Robinson¹, Thomas Roth¹, Norman Tepley¹, Christopher L Drake¹

¹Henry Ford Hospital, Sleep center/MEG lab

During the sleep onset process the multisource alpha rhythm changes dramatically. In order to begin to understand the functional role of alpha during the sleep transition, the spatial and temporal changes in low(8-11 HZ)and high alpha(12-15 HZ)should be investigated. The aim of this study was to determine uncorrelated(unique) magnetic neural sources associated with low and high alpha activity during the transition to sleep in normal subjects.Methods:Three healthy normal sleepers participated. Both the MEG(148 sensors) and standard EEG activity of sleep were recorded simultaneously(0730-0830) during a 1 hour MEG recording. MEG images of the difference between low and high alpha activity were computed using a constrained minimum-variance beamformer. The results of subtraction (8-11 Hz minus 12-15 Hz) were mapped for each subject in 1 minute intervals. Results: Preliminary data indicate a similar pattern of topographical changes in brain organization for magnetic sources of low and high alpha activity across all subjects during the sleep onset process. The uncorrelated magnetic sources for 8-11 Hz were dominant in the occipital and temporal lobe, whereas 12-15 Hz sources localized more predominantly in the frontal lobe during the transition to sleep. Changes from low alpha with posterior predominance to high alpha with anterior predominance coincided with sleep onset. Changes in low alpha were easily seen in both the MEG and EEG whereas the pattern of increased frontal predominance in high alpha during sleep onset was observed with MEG brain mapping but was not visually apparent in the EEG data. Conclusion: Brain micro-changes in MEG alpha activity during transition to sleep reflect spatial and temporal changes, suggesting within and between brain regions neural organization in generating low and high alpha activity. Acknowledgment: This study is supported by NIH grant MH068372.

1-6-20: MEG localization of sleep spindle amplitude in healthy subjects

*Valentina Gumenyuk¹

¹Sleep Disorders and Research Center/MEG laboratory, Henry Ford Hospital, Detroit, Michigan, USA , ²MEG laboratory, Henry Ford Hospital, Detroit, Michigan, USA

Despite the large number of studies that have investigated sleep spindles, the neuronal generators underlying these brain oscillations and even the functional significance of the sleep spindle itself remain unclear. The aim of the study was to determine the cortical brain regions generating maximal activation during sleep spindles in healthy individuals. Five volunteers (Mean age: 29.7; 4 females; right handed) free of any medical, psychiatric, or sleep disorders, were studied. Whole-head 148-channel magnetoencephalography (MEG) and electroencephalography (EEG) were used for data collection. Sleep EEG spindles were visually identified. The distribution of brain activity corresponding to each spindle was calculated using a combination of Independent Component Analysis and MR-FOCUSS and was localized using MEG data superimposed upon individual MRIs. The absolute maximum of spindle activation was localized to right precentral gyrus (PrG) and postcentral gyrus (PoG) across all individuals. The PrG and PoG brain regions are involved in sensory and motor processing, and are also important for the generation of sleep spindle oscillations. Given that these areas are strongly involved in tasks related to sensorimotor functioning, studies addressing the potential functional significance of the present findings are warranted. This study is supported by NIMH Grant 068372 and NINDS Grant R01 NS30914.

1-6-21: High gamma parietal and prefrontal activity revealed by human intracortical recordings during saccade decision and preparation

*Karim Jerbi^{1,2}, Samson Freyermuth¹, Olivier Bertrand², Philippe Kahane³, Jean-Philippe Lachaux², Alain Berthoz¹

¹LPPA, UMR 7152, CNRS, Collège de France, Paris, France, ²Brain Dynamics and Cognition, INSERM U821, Lyon, France, ³Department of Neurology and INSERM U704, Grenoble Hospital, Grenoble, France

Recent studies of oculomotor behavior using magnetoencephalography and intracerebral EEG recordings have revealed modulations of cerebral oscillations in various brain structures involved in the preparation and/or execution of saccades. The significance and spatio-temporal organization of such rhythmic cortical activity in the human brain during oculomotor planning and decision is still poorly understood.

We recorded intracerebral data from implanted epilepsy patients performing a delayed saccade task. The direction (left or right) of the saccade to be performed after a variable delay period was either instructed (Preparation) or left as a free choice (Decision). We set out to compare activations involved in preparational and decisional processes as well as to investigate directional selectivity of the various structures probed. Most importantly, this study reports data from a unique implantation in a patient with depth electrodes recording simultaneously from widely separated posterior parietal and prefrontal areas including precuneus, superior parietal lobule (SPL), dorsolateral prefrontal cortex (DLPFC) and pre-supplementary eye fields (pre-SEF).

We found a significant increase in high gamma oscillations (60-130 Hz) both in parietal and prefrontal structures during the delay-period with variable spatio-temporal patterns depending on the task (preparation/decision/control). Delay-related modulations of gamma activity but also of slower oscillations were found in various parieto-prefrontal structures, both laterally and medially. Finally, by comparing gamma activity observed during the delay period and at saccade execution we were able to disentangle the purely motor components from the preparation and decision related activations.

1-6-22: The Measurement of Brain Wave on Mothers after Childbirth

*Hiroko Kotani^{1,2}, Takashi Maeno³, Shoogo Ueno^{3,4}, Masao Saito¹, Iku Nemoto¹

¹Research Center for Advanced Technologies, Tokyo Denki University, ²Research Fellow of the Japan Society for the Promotion of Science, ³University of Tokyo, ⁴Kyushu University

Recently in Japan, the number of mothers who find it difficult to take proper care of their children has been increasing due to smaller families and too much information about childcare. One solution might be "baby massage". The following tests have been done; the measurement of brain waves, heart beats, blood pressure, the body surface temperature and the stress hormone concentration in saliva. These tests were taken place before and after the mother has performed the baby massage. One of the brain waves is the alpha wave. When the alpha wave appears, it is said that the person is in a relaxed states. The concentration of the stress hormone cortisol in the saliva also has been reduced by half. Five mothers massaged babies younger than 1- year- old for 15 minutes. Also we found that the alpha wave of the mothers doubled after the baby massage and blood pressure fell by around 15% in all participants. These tests into massage have proved that not only a baby benefits but also a mother. As for the baby massage, it turned out that it becomes a means to obtain a relaxed feeling. Although the mother, after the delivery, often experiences physical and mental difficulty in general, the bonding of a mother and a child is deepened by performing baby massage, and it was suggested that it can become a method of reducing stress in childcare.

1-6-23: Spatial filter reconstruction of artifacts for spontaneous MEG analysis

*Hiroaki Tanaka¹, Naohiro Tsuyuguchi², Shinichi Sakamoto^{3,4}

¹MEG Center, Yokogawa Electric Corporation, Kanazawa, Japan, ²Department of Neurosurgery, Osaka City University Graduate School of Medicine, Osaka, Japan, ³Department of Neurosurgery, Hokuto Hospital, Obihiro, Japan, ⁴Department of Radiology, Osaka City University Graduate School of Medicine, Osaka, Japan

Recent advancements in spatial filter methods have allowed analysis of MEG data without prior knowledge of the number of sources and arbitrariness of optional sensors selection which show dipole pattern. This properties are suitable for MEG source analysis especially spontaneous activities. But in analysis of spontaneous activities, there are problems of kinds of artifacts, such as electrocardiograph, eye blinking, metallic materials. These artifacts are measured as large sources. On the other hands, many kinds of spatial filter analysis method are based on leadfield weighted calculation, therefore results of reconstruction images are tend to be biased on center of head sphere. These phenomenon results in difficulties of confirmation whether these artifact like reconstruction images comes from actual artifacts or the spatial filter characteristics. In this report, we analyzed these kinds of artifacts with sLORETA (considered as no localization bias spatial filter method) to investigate how these artifacts affect results of

reconstruction images of the spatial filter analysis and compared with characteristics of sLORETA. From this results, we try to applied spatial filter methods to analyze slow wave activities in patients with ischemia.

Poster: 1-7 Basic MEG: Language

1-7-1: An MEG study of phonological processing of kanji words in Japanese native speakers and Chinese learners of Japanese

*Qiang Wei¹, Aya Ihara¹, Tomoe Hayakawa^{1,2}, Tsutomu Murata¹, Eriko Matsumoto^{1,3}, Norio Fujimaki¹

¹NICT, Kobe, ²Teikyo University, ³Kobe University

Japanese and Chinese share same kanji (morphogram) characters, but the phonological correspondence of kanji words is different. To investigate the change of neural activities related to phonological processing by language learning, we compared neuromagnetic signals of Japanese native speakers with those of Chinese native speakers who had been learning Japanese as a second language (learner) during silent reading of kanji word pairs in a priming paradigm. The prime words were phonologically same (SAME) as or different (DIFF) from the target words as Japanese, but not as Chinese, or pseudo-characters (PSEUD). We have reported that in Japanese native speakers, neural activity in the left posterior superior temporal and inferior parietal area (LpST/IP) became weaker at 350-600 ms by the phonological repetition [1]. In addition, we provided evidences that the activity was larger for DIFF than for the other conditions in the left anterior temporal area (LaT) at 350-500 ms, and was larger for SAME than for the other conditions in the left inferior frontal cortex (LIFC) at 400-500 ms. These results suggest that the LaT is related to lexico-semantic process, and that the LIFC subserves the selection of semantic representation among competing alternatives. The present study showed that in learners, the neural activities were not obviously different between conditions in the LaT and LIFC. However, the difference in activation between conditions in the LpST/IP was shown, depending on Japanese proficiency: the phonological repetition effect was shown in high level learners, but not in low level ones. This is considered to reflect that the low level learners had less phonological knowledge on kanji pronunciations in Japanese. Acknowledgement: this research was partially supported by JSPS KAKENHI 19330214, 19700314. [1] Q. Wei et al., *Neuroreport* 2007, 18: 1775-1780.

1-7-2: Reflection of English Educational Policy for Japanese learners investigated using Auditory Evoked Magnetic Fields

Nobuyoshi Harada¹, Sunao Iwaki¹, Mitsuo Tonoike^{1,2}

¹Institute of HSBE, National Institute of AIST ²Department of MSE, Ciba University,

The effect of the Japan's educational policy related to English was investigated through elicitation of auditory evoked magnetic field (AEF) with English word sounds on different scores of word familiarity and word frequency. A previous study investigated the effects of word familiarity in Japanese for elicitation of AEF (Harada N., 2005). Amplitude and the latency of the sustained field of AEF decreased with the increment of the score of word familiarity. The effect of word familiarity and word frequency in English were observed with the elicitation of AEF for English word sounds in native Japanese speakers. Connine's word sets (Connine CM.,1990) was employed, and which was constructed from five word lists, scores of word familiarity were 7-6, 6-5, 5-4, 4-3, only 7-6 score condition was separated high and low word frequency conditions, while scores 6-5, 5-4, 4-3 for word familiarity reflected low word frequency conditions. A sustained field after N100m was only observed for the left hemisphere. A decrement of amplitude and the latency of sustained field was observed on only high familiarity (Hi-Fa: 7-6) and high frequency (Hi-Fr) conditions. There was no decrement for high familiarity (Hi-Fa) and low frequency (Lo-Fr) conditions, compared with other low familiarity (Lo-Fa: 6-5, 5-4, 4-3) and Lo-Fr conditions. The effect of word familiarity for English was observed by the diminution of amplitude and latency of a sustained field of the left hemisphere, similar to the results of word familiarity for Japanese words, except under Hi-Fa and Lo-Fr conditions for English. Japanese subjects responded to Hi-Fa and Lo-Fr word sounds in English as if a Lo-Fa condition of a Japanese word. English language education in Japan highly depended on the text book, and the word frequency for English words in the text books was combated for word familiarity in Japanese, who did not have the same acquisition process for English as a N

1-7-3: Magnetic Reflections of Second Language Learning

*Christian Dobel¹, Christo Pantev¹, Markus Junghoefer¹, Pienie Zwitserlood²

¹Institute for Biomagnetism and Biosignalanalysis, University of Muenster, ²Institute for Psychology, University of Muenster