NEUROANATOMY

www.neuroanatomy.org

VOLUME 5 [2006]
Supplement 1

5th National Congress of Neuroscience
Zonguldak–Turkey, April 10-14, 2006

ABSTRACT BOOK

The conference is organized under the auspices of
TUBITAK, *TUBAS*, *BAD,* and
Zonguldak Karaelmas University.

e-ISSN 1303-1775 • p-ISSN 1303-1783

activity was defined as the time of symmetrically highest activity. Student's t-tests were used to test for significant differences between the means with significance set at $p<0.05$. Melatonin phase advanced the neuronal activity peak. In controls the neuronal activity made peak near at CT 6 ($p>0.05$) however in melatonin injected hamsters the neuronal activity made peak nearly at CT 3.30 representing an advance of about 2.30 h ($p<0.01$). The results have shown that the rhythm of the SCN activity in Syrian hamster may be regulated by the timed exogeneous melatonin administrations.

Key words: Melatonin, SCN, Syrian hamster, Neuronal firing rate

O4

Effect of stimulus presentation frequency on BOLD response

Bayraktaroglu Z [1], Emir UE [2], Ozturk C [2], Ademoglu A [2], Demiralp T [1].

Istanbul University, Istanbul Faculty of Medicine, Department of Physiology[1], Bogazici University, Institute of Biomedical Engineering[2], Istanbul, Turkey.

zbay@istanbul.edu.tr

The joint use of the EEG as an electrophysiological technique with a high temporal resolution and neuroimaging techniques such as fMRI and PET that reflect neural activity with a high spatial resolution will help to understand better the activity patterns of neural systems during cognitive processes. Within this framework, a correct modeling of the neurovascular coupling is still a very important gap for revealing the relationship between the BOLD response and functional neural activity patterns.

Tonic neural discharges can be expected to generate increases in BOLD response, whereas it is not yet systematically investigated how the metabolic activity changes during regular oscillations in the EEG bands such as alpha and gamma.

It is well known, that regular oscillations at the stimulation frequency and its harmonics occur in the EEG, when the brain is stimulated in any sensory modality with stimuli at high presentation frequencies. The steady-state evoked potentials obtained with this type of stimulation show increased amplitudes at stimulus presentation frequencies close to the peaks in the EEG spectrum (10, 20, 40 and 80 Hz).

In this study, the BOLD responses during visual stimulation with stimulus presentation rates between 1-20 Hz have been systematically studied and the change of the BOLD response in relation to the stimulus presentation frequency has been analyzed.

The visual stimulus was the reversal of a checkerboard produced on a computer screen. The stimuli were projected with a video projector located outside of the MRI room through a semi-transparent panel located in the room onto a mirror fixed in front of the eyes of the subject.

The BOLD measurements were conducted with 3 Tesla Philips MRI System. A single shot T_2^* weighted gradient echo planar imaging sequence was used for BOLD measurements. Ten transverse slices of 64x64 were acquired with a slice thickness 3.5 mm positioned through the visual cortex. At the end of the fMRI scan 180 images were acquired. A 3D MPRAGE sequence was used for high resolution anatomic scan. Subject's head stabilized during scans to eliminate movement artifacts. The stimuli were presented at 0.5, 1, 2, 4, 5, 6, 7, 10, 12, 14, 16, 18, 20 Hz.

It has been observed that the BOLD response showed two peaks at 5 and 10 Hz. The decreasing BOLD amplitude with increasing frequencies built another peak around 18 Hz. The fact that the BOLD response did not show a linear increase or saturation with increasing frequencies, but displayed increases and decreases around certain frequencies, shows the presence of a relation ship between the metabolic activity and the electrical oscillations in the EEG. For a more comprehensive description of this relationship, the measurements are currently extended by applying stimulus presentation frequencies between 1-100 Hz on a larger group of subjects.

Key words: Electroencephalogram, Functional Magnetic Resonance Imaging, Event-Related Oscillations, Steady-state Evoked Potentials, BOLD

O5

Brain potentials during encoding and retention processes of short term memory

Ergen M [1], Uslu A [1], Yildirim E [2], Bayraktaroglu Z [1], Gurvit H [3], Demiralp T [1].

Istanbul University, Istanbul, Department of Physiology [1], Istanbul University Institute for Forensic Medicine [2], Istanbul University, Istanbul Faculty of Medicine, Department of Neurology [3], Istanbul, Turkey.

mehmet.ergen@gmail.com

In order to investigate electrophysiological correlates of encoding and retention phases of Sternberg paradigm, which is a short term memory test, EEG (electorencephalogram) sweeps recorded during these test phases were analyzed. To apply two levels of memory load we used two versions of this paradigm with memory sets consisting of 3 and 5 letters. During the encoding phase, single letters were presented sequentially with 2 s intervals on a computer screen. Following this phase, retention phase started and lasted for 3 seconds. In the third phase, probe stimuli were presented and subjects were asked to recognize the letters that were present in the memory set. During the repeated trials of this paradigm EEG was recorded from 30 channels according to 10/20 system to obtain sweeps starting from 1 s before the first stimulus of the memory set until the end of the whole encoding and retention phases. Evoked acitivity that is phase-locked with stimuli was calculated by applying wavelet transform on average responses of each subject, and total activity, which additionally contains signal components that are not phase-locked to the stimuli, was calculated by applying wavelet transforms of single trials and averaging the absolute values of these transforms. In both tests with 3 and 5 letters, a gradual decrease in the alpha amplitude was observed in the total time-frequency transform of the poststimulus EEG of the occipital area during the presentation of stimuli to be encoded, that gradually increased with each item being added to the memory set. However, during the retention period, mean amplitude of alpha band in the total time-frequency transform was higher in the 5 letters paradigm than in the 3 letters paradigm. As alpha desynchronization is generally suggested to be proportional to the amount of cortical resources allocated to a mental process, increased alpha desynchronization observed by each additional item during encoding of the memory set could be interpreted as increased allocation of cortical resources for the encoding of stimuli. Besides, establishment of load dependent alpha oscillations with higher amplitudes in the 5 letters test, suggests that alpha oscillations in this phase reflect another distinct functional mechanism for the maintenance of stimulus representations. This dichotomous pattern observed during enconding and retention phases implies the co-existence of alpha acitivities reflecting distinct functions.

Key words: short term memory, electroencephalography (EEG), evoked potentials, alpha rhythm, cortical synchronization

O6

Sexual dimorphism in medial vestibular nucleus of adult rats: a stereologic study

Ayyildiz M [1], **Kozan R [1]**, Agar E [1] , Kaplan S [2].

Ondokuz Mayis University, Faculty of Medicine, Department of Physiology [1], Department of Histology [2] Samsun, Turkey.

rkozan@omu.edu.tr

The vestibular system helps to maintain equilibrium. There are four vestibular nuclei within the brain stem (superior, lateral, medial, and inferior). The medial vestibular nucleus (MVN) is a largest of them. In this study, we used five-month-old 5 male and 5 female Wistar rats (weighing 180-220 g). The animals were deeply anaesthetized with urethane (1.25 g/kg, i.p.) and perfused intracardially. Thereafter, the brains were immediately removed from the cranium and treated in routine tissue processing, were embedded in paraplast and sectioned at 40-µm-thickness in the horizontal plane. The slides were stained with Cresyl violet staining. The volume and the total number of neurons in the left and right MVNs of adult male and female rats were estimated using stereological techniques. Data were analysed by Wilcoxon Signed Ranks test and Mann Whitney U test. The volumes of MVN were 0,67±0,03 and 0,71±0,02 in the left and right MVNs of female, and 0,61±0,03 and 0,55±0,02 in the left and right MVNs of male rats, respectively.