

Proceedings

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The 9th German Mapping Meeting, Giessen

September 22 – 23, 2000

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Lesion- and stimulationinduced plasticity. - Flor, H. (Department of Neuropsychology, Ruprecht-Karls-University of Heidelberg, Central Institute for Mental Health, Mannheim, Germany).

The central nervous system and the cerebral cortex in particular have the potential to reorganize after behaviourally relevant alterations of peripheral input. The functional meaning of this altered representation manifests itself in perceptual and behavioural correlates that often seem to be associated with negative symptoms in humans. In the somatosensory system, the distortion of the somatotopic map is correlated with chronic pain or phantom limb pain. In the auditory cortex, altered tonotopy correlates with tinnitus strength. Repetitive synchronous and behaviourally relevant stimulation to several digits may result in a fusion or in a disordered arrangement of digit representation. Smearred somatotopy may give rise to disordered movements and play a role in focal dystonia. Plasticity has also been demonstrated to occur after a period of extensive training which has repeatedly activated a certain representational zone in the cortex. In the case of repetitive activity, the size of the activated area has been found to enlarge. Behavioural techniques that systematically alter peripheral input have the potential to affect cortical reorganization and beneficially influence a number of disorders, ranging from tinnitus and phantom pain to focal dystonia and stroke. We show examples for the assessment of these changes using multichannel EEG or MEG combined with structural magnetic resonance imaging or functional magnetic resonance imaging.

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Visual attention with continuous stimulation: oddball, mismatch and omission. - Sammer, G., Kirsch, P., Stark, R. and Vaitl, D. (Department of Clinical and Physiological Psychology, University of Giessen, Germany).

Measuring the slow BOLD-response with fMRI requires the use of interstimulus intervals (ISI) of some seconds duration, while in ERP-studies the ISIs usually are short. However, with long ISIs the subject's attention might not only be attracted by the stimulation but brain activity could be biased by ISI-related processes. The aim of the present study was to replace the ISI by continuous stimulation for an applicability to both ERP- and fMRI measurements. A rotating pointer stimulus (0-228 deg within 8s) was used, thus no ISIs were required any more. Either the pointer rotated clockwise (standard), counter-clockwise (deviant, to be counted), did not move (omission) or just the outer half of the pointer moved clockwise (mismatch). With this a visual oddball, a visual mismatch and a stimulus omission paradigm were combined into a single design. Clearly, the ERPs (30 EEG-channels, 15 subjects) revealed differences between all of the stimulus categories. The oddball-evoked wave-

form showed a widespread P3a and P3b as usually seen in visual oddballs. However, the mismatch condition showed a fronto-central topography, lacking a posterior peak. The stimulus omissions elicited a pronounced vertex-negativity at about 280 ms. Summarizing, the results give evidence about the suitability for ERP-studies. The fMRI-data analysis is under progress.

Right hemispheric shift for processing of negative facial expression. - Herrmann, M.J.*, Ellgring, H.+ and Fallgatter, A. J.* (* Psychiatric Neurophysiology, Department of Psychiatry and Psychotherapy, University Hospital of Wuerzburg, Germany; + Institute of Psychology, University of Wuerzburg, Germany).

The processing of facial expression was investigated using event-related potentials (ERP). 16 subjects were exposed to sad, happy and neutral facial expressions for 500 ms on a computer screen. The ERPs elicited by the facial expressions were recorded from 21 leads, and both the amplitudes and topography of the Global Field Power were calculated. The results show that neutral facial expressions elicit higher amplitudes compared to happy and sad faces in the early time segment from 148.4 - 265.4 ms. Furthermore a topographical effect could be found for the later time segment from 269.5 - 371.1 ms. For all three facial expressions the centre of gravity of the brain electrical fields were over the right hemisphere. For the happy faces the centre of gravity were more left hemispheric than for sad and neutral faces. These results indicate that the processing of facial expressions depends on their emotional content.

Face evoked potential maps during binocular rivalry - perception and brain electric activity. - Jedynak, A., Eger, E., Iwaki, T. and Skrandies, W. (Institute of Physiology, Justus-Liebig-University Giessen, Germany).

If the responses of subjects to physically identical stimuli are different then the process of perception may differ too. How does the evoked electrical brain activity vary with subjects perception? Schematic faces with three different emotional expressions competed with a scramble face of randomly arranged face elements under binocular rivalry. After a short and simultaneous presentation in the left and right hemifield the subject selected the side that appeared more face-like in a forced-choice reaction time task. The EEG was recorded in 30 channels distributed between the inion and 5% anterior of Fz. Data were averaged over 800 ms according to stimulus condition and subjects' responses. The behavioural data revealed a new functional eye dominance that established three groups (left, right, no eye dominance). The evoked potential data showed major components with mean latencies of 85, 160 and 310 ms. If perception reflected the use of the dominant eye, GFP was significantly in-

creased. The latency of the first component was shorter for negative emotional expressions when stimuli were presented to the right hemisphere, while topographic effects were mainly seen at high latency.

Differential ERP patterns for processing of target location and target identity: Evidence from priming studies. - Gibbons, H. and Rammsayer, T. (University of Goettingen, Germany).

An ERP study with 36 participants was conducted, employing both a visual target identification and a target localization task. In both tasks, negative (NP) and positive (PP) priming effects were assessed compared to a control condition. Contrary to former studies, the same stimuli were presented in both the identification and the localization tasks to exclude stimulus-specific influences on ERPs. Irrespective of priming conditions, ERPs in the identification task were more positive than in the localization task. This effect first occurred at approximately 50 ms at anterior sites, and peaked between 450 and 600 ms at left/central posterior sites. Furthermore, between 230 and 300 ms location-based PP and NP conditions elicited ERPs that were less positive than control ERPs. A positive right-hemisphere deflection at 430 ms was more distinct for NP compared to PP and control. With the identification task, ERPs to PP trials were less positive than to control trials between 310 and 440 ms at left posterior sites. Results are consistent with the notion of different subsystems subserving processing of identity and location information.

Endogenous laser evoked potential components in spatial and intensity discrimination tasks. - Schlereth, T., Baumgärtner, U., Magerl, W. and Treede, R.-D. (Institute of Physiology and Pathophysiology, Johannes Gutenberg University, Mainz, Germany).

Introduction: In oddball paradigms, an additional component of laser evoked potentials (LEP) occurs at a latency of about 570 ms, which has been characterized as P3b (Siedenberg and Treede 1996) possibly reflecting sensory or affective processing. We now evaluated endogenous components in sensory discrimination tasks. Methods: LEP were recorded from 10 subjects using a 32 channel EEG (Fz reference). Stimulation sites were the dorsum of the right and left hands. Subjects had to solve a spatial and an intensity discrimination task of two similar degrees of difficulty, and had to solve a mental arithmetic task (distraction task) in a balanced order. Latencies and amplitudes of single channels were analysed. Results: In all discrimination tasks P2 amplitude (~270 ms, measured at Cz) was significantly enhanced compared to distraction. P3 (~500 ms, measured at Pz) was only present in discrimination tasks. There was no task relevant effect on the N2 (~190 ms, measured at Cz).

Conclusion: Discrimination tasks enhance the vertex positivity, but not the vertex negativity, of late LEP. In addition, a late parietal positivity was only present, when stimuli were task relevant.

Supported by DFG 236/13

Brain activity during auditory imagery of notes studied by means of MEG. - Schürmann, M.*⁺, Raij, T.*⁺, Fujiki, N.* and Hari, R.* (* Brain Research Unit, Low Temperature Laboratory, Helsinki University of Technology, FIN HUT; + Institute of Physiology, Medical University Luebeck, Germany).

Imagery can be triggered with a stimulus that is typically associated with another, such as musical notation with pitch of sound. We investigated the location and time course of brain activity during auditory imagery of visually presented notes and two control conditions in 11 experienced musicians. In the imagery task, musical notes were projected to a screen once every 1.5-2 s, and the subject imagined the corresponding pitches. MEG responses were recorded using a 306-channel Vectorview device (Neuromag Ltd.) and studied with grand average minimum current estimates (MCEs; Uutela, K. et al. Neuroimage 10, 173-180, 1999). During imagery, strong activation was found in a left lateral temporo-occipital area (maximum: 280 ms; 3.9 times stronger than for visual control) and in a supratemporal region anterior to the left auditory cortex (maximum: 370 ms; 2.3 times stronger than for visual control). The results suggest that auditory association areas respond to visually presented musical notation.

Supported by the EU's Large-Scale Facility Neuro-BIRCH III at the Brain Research Unit.

Hemispheric differences of alpha-activity-suppression by music and speech in psychiatric patients and controls. - Albers, M. and Klotz, J.M. (Sozialpsychiatrischer Dienst, Kreis Mettmann, Germany).

Functional psychoses may be associated with abnormal lateralization of cortical cerebral activity. This study investigated whether listening tasks designed to elicit lateralized hemispheric activation induce different patterns of change in alpha-activity in patients hospitalized for affective disorders or schizophrenia, paranoid type, compared to normal controls. 20 medicated psychiatric inpatients meeting DSM-III criteria for either Schizophrenia, paranoid type (295.3) (N=10) or Affective Disorders (296.2, 3, 4) (N= 10) were studied after remission of acute symptoms using a 16-channel EEG connected to a "Brain-Star" brain mapping system. They were compared to each other and to 10 normal controls. The tasks were listening to 2 pieces of music and to 2 kinds of speech with eyes closed. For no task differences in activation of the hemispheres were discernible. The three groups differed

from each other in mean alpha power, patients with paranoid schizophrenia unexpectedly reaching the highest values while controls reached the lowest. Reactions to all tasks were most pronounced in controls as was the variability of individual EEG patterns. The effect of the tasks employed to differentially activate the hemispheres on alpha-activity was unable to be detected.

EEG-coherence analysis of naturally spoken English relative clauses. - Weiss, S.*⁺, Müller, H.M.*⁺, King, J.W.*[^], Kutas, M.*[~] and Rappelsberger, P.*⁺ (*Brain Research Institute, Integrative Neurophysiology, Vienna, Austria; + Experimental Neurolinguistics Group, Faculty of Linguistics, University of Bielefeld, Bielefeld, Germany; ^ Department of Psychology, University of Missouri-Columbia, USA; ~ Department of Cognitive Science, University of California at San Diego, La Jolla, USA).

In this experiment spoken relative clauses were presented to 24 participants, while EEG was recorded from 23 scalp sites. In half of the sentences the subject of the main clause was also subject of the relative clause (SS-sentences), while in the other half it served as the object of the relative clause (SO-sentences). Generally, comprehension of SO-sentences is more difficult for the listener due to greater demands on working memory (WM). Previous analyses of sentence-length event-related potentials during these sentences yielded a widespread negativity of the SO-sentences relative to the SS-sentences, especially at fronto-central sites. Even though the analysis of event-related brain potentials provides data with exquisite temporal resolution, it is limited in showing processes of functional interaction (=synchronization) between different brain areas. We, therefore, applied coherence analysis to the data, enabling us to assess relationships between local and distant brain regions as well as between the two hemispheres during the comprehension of these sentences with relative clauses. Coherence analysis revealed strong involvement of activity at left frontal sites (approximately over Broca's area) in both sentence types. However, SO-sentences exhibited greater coherence between activity at left and right frontal electrode sites. Perhaps the more WM-demanding sentences have greater involvement of the right hemisphere than the easier subject relative sentences.

Supported by the FWF P13578-MED.

Cannabis-induced topographic changes in pre/post EEG activity during rest and music perception. - Fachner, J. (Institute for Music Therapy, University Witten/Herdecke, Germany).

In scientific literature cannabis is found to change or enhance time-, space-, body- and movement perception, emotion, imagery and association patterns. Presented here

is an explorative study on Cannabis and Music Perception, conducted in a qualitative and quantitative way in a habituated setting. EEG-Brainmapping Data (rest; pre/post listening; 28 EEG traces; smoked Cannabis ϕ 20 mg Δ^9 THC) were averaged and treated with a T-test and a visual topographic schedule. Compared to pre-THC-rest and pre-THC-Music in the post-THC-Music-EEG a rise of Alpha percentage and power was observed in the parietal cortex on four subjects, while other frequencies decreased in power. Decreased amplitudes could represent a decreased cell-firing mode caused by cannabinoidreceptor mechanism. Comparing pre/post music EEGs, differences ($p < 0.01$) were found in the right frontotemporal cortex on Theta and on Alpha in the left occipital cortex. Changes in temporal and occipital areas and increasing α -signal strength in parietal association cortex seem to represent a neural correlate of altered music perception and hyperfocusing on the musical time-space. Alpha amplitude changes remind on "reverse Alpha" findings in studies with gifted individuals.

Correlating EEG alpha power and intelligence. - Doppelmayer, M. and Klimesch, W. (University of Salzburg, Austria).

Contrary results have been reported concerning the relationship of EEG measures and intelligence. We used two different intelligence tests (LGT-3 and IST-70) to test the hypothesis whether alpha power in general and in 3 different subbands is related to the performance in these intelligence tests. EEG was recorded during a resting situation with eyes closed in 74 subjects. The results indicate a strong positive correlation between alpha power and intelligence. Interesting differences between the two tests and alpha power subbands were obtained. While the upper alpha band shows the strongest correlation with the IST-70, the power of the lower-1 and lower-2 alpha band shows a more consistent relationship with the LGT-3. With respect to the different subtests of the two tests and the fact that IST-70 deals mostly with semantic memory demands, whereas the LGT-3 is related to the ability to learn new material, we can conclude that EEG power of the upper alpha is more related to the ability to process semantic information whereas the two lower alpha bands are associated with attentional demands that dominate during encoding processes. These results are well in line with recent findings of Klimesch (1999) concerning the frequency specificity of different EEG subbands.

Drowsiness detection by alpha-related events in the EEG. - Tietze, H.*, Hargutt, V.*, Knoblach, W.*, Fallgatter, A.+ and Krueger, H.P.* (* Dept. of Psychology, Center for Traffic Sciences, University of Wuerzburg, Germany; + Dept. of Psychiatry, University of Wuerzburg, Germany).

Diminished vigilance, increased drowsiness and finally sleepiness are well documented effects of long duration tasks. Usually, these processes are described by changes in spectral parameters which are calculated by Fourier transformation. A major problem is that in the very first stages of decreasing vigilance effects are not powerful enough to raise power significantly. Moreover, a sufficiently high resolution in the frequency domain unfortunately results in poor time resolution. In contrast, the progress of fatigue is assumed as not monotonous and occurs as short periods of lapses in wakefulness as a consequence of reactive performance increase. Therefore, a new rationale is introduced which extracts so called "alpha events". The beginning and end of these events can be determined with an accuracy given by the time resolution of the measurement itself. Resulting parameters are the duration of these events and the duration of the pauses between them. The diagnosticity of the approach has been demonstrated in a driving simulation task. 12 young subjects were instructed to drive on a quite monotonous highway at different times of the day. The results reveal that vigilance is characterised by smaller pauses between events whereas severe sleepiness is characterised by an increased event duration.

Topographic time-frequency decomposition of the EEG. - Koenig, T.+, Marti-Lopez, F.*, Valdes-Sosa, P.* (* Cuban Neuroscience Center, La Habana, Cuba; + University Hospital of Clinical Psychiatry, Bern, Switzerland).**

Topographic time-frequency decomposition is a new computerized EEG analysis method combining previously available techniques from time-domain spatial EEG analysis and time-frequency decomposition of single channel time series. A new, physiologically and statistically plausible topographic time-frequency representation of human multi-channel EEG is obtained. The original EEG is accounted by the coefficients of a large set of user defined EEG like time-series localized both in time and frequency; these coefficients are optimized to have maximal spatial smoothness and minimal norm. The coefficients are then cluster-analyzed to yield a small number of model scalp field configurations, which vary in intensity as a function of time and frequency. A small number of EEG field configurations are obtained, each with a corresponding time-frequency (Wigner) plot. These are the advantages of the method: It does not assume that the data is composed of orthogonal elements, it does not assume stationarity, topographical maps are obtained and it allows to include user defined, specific EEG elements such as spike and wave patterns. The method will be introduced formally and examples are given which include artificial data and multichannel EEG during different physiological and pathological conditions.

Robust delay estimation applied to cortical and peripheral signals. - Lindemann, M.^{*+~}, Raethjen, J.^{+^}, J.Timmer[^], G. Deusch^{**}, G. Pfister^{*} (* Department of Physics and + Neurology, University of Kiel; ^ Department of Physics, University of Freiburg; ~ Department of Physics, University of Kiel, Germany).

Delay times are of great interest in physiological systems. Their estimation is not straightforward. The superposition of a time delay and a transfer function that characterizes the properties of the system complicates the estimation. We present two methods for the estimation of time delays based on cross-spectral analysis. The first method is well established in neuroscience. It relies on fitting a straight line to the phase-curve and does not take into account the special form of the transfer function. The second one, called Hilbert-transform-method, has been rarely used in the biomedical context, but provides a method for dealing with non-trivial transfer functions. We discuss specific advantages and problems of both methods. We demonstrate their application to the estimation of delay-times between Electroencephalogram and peripheral activity, measured by Electromyography and Accelerometry. This provides a real-world example for the large class of systems, in which the straight-line-fit yields unsatisfactory results, while the Hilbert-transform-method allows for a highly robust estimation of the delay time. In addition the Hilbert-transform-method provides an estimate of the transfer function yielding valuable information on the dynamical properties of the system under study.

Microstates of synchronous oscillations and instantaneous coherence analysis. - Schack, B.^{*}, Krause, W.⁺, Krause, U.⁺ (* Institute of Medical Statistics, Computer Science and Documentation, Jena, Germany; + Institute of Psychology, Jena, Germany).

Usual EEG coherence analysis is limited to the investigation of EEG epochs of repeated tasks. The approach of momentary coherence estimation allows the continuous analysis of every single task. On this basis, short intervals with a stable run of band coherences may be observed. The stability of sets of band coherences is determined by the vector correlation of band coherences for different time points. Thus, the EEG epochs may be subdivided into intervals with highly correlated momentary band coherences, the so-called microstates of synchronous oscillations. For data reduction the large set of these segments is clustered into six classes. The time of occurrence of elements of the clusters and the duration of the correspondent segments allows the investigation of time-variable oscillatory activity of neural networks. The method of coherence segmentation is applied to categorization processes of words and pictures in order to identify the modality of mental representation. A previous analysis of maximal coherence resulted in high values at

T3/C3, C3/Cz, T3/T5, C3/P3, F3/Pz to be typical for categorization. The distribution of segments of the cluster with high coherence values within the left hemisphere differs extremely with regard to the modality (categorization versus pattern comparison) both for presentation of words and pictures. At the same time this distribution does not differ with regard to the kind of stimulus. In category tasks a category concept is activated both for word and picture presentation. It could be concluded, that there is no evidence for the amodality of mental representation in categorization tasks.

Time-variant quadratic phase couplings in the EEG and their relations to thalamo-cortical interrelations. - Witte, H., Schack, B. and Arnold, M. (Institute of Medical Statistics, Computer Science and Documentation, Jena, Germany).

Quadratic phase couplings have been investigated in two EEG patterns, the burst-interburst pattern in neonates in quiet sleep and in burst-suppression patterns in sedated patients. Both patterns consist of flat EEG periods (interburst, suppression) between burst activities. A strong quadratic phase coupling can be demonstrated during bursts between delta oscillations and theta-activity as well as delta- and alpha activity especially at the frontal electrodes (Fp1, Fp2). The time-variant analysis (Gabor expansion) shows a transient coupling during the first two seconds after burst onset. The components with higher frequencies are amplitude-modulated by the delta oscillation and appear as onset triggered (burst onset) spindle-like activity. The strength and time dynamics of the interrelations are different between delta- and theta activity as well as delta- and alpha activity. The results are similar to experimental findings, where the genesis of patterns in the experiment can be attributed to thalamo-cortical interrelation.

Neurophysiological findings in schizophrenia and schizotypy from a syndromal perspective. - Gruzelier, J. (Imperial College of Science Technology and Medicine, London, UK).

A syndromal perspective is helpful in clarifying heterogeneity of findings in schizophrenia and schizotypy. Our model was based on approach (left) and withdrawn (right) hemispheric specialisation theory, underpinning activated versus withdrawn syndromes. All patients possessed reality distortion. Activation has been widely overlooked, however factor analyses of global symptom inventories (BPRS, PANSS) have consistently provided an activation/ excitement factor. A wide range of neuro-psychophysiological evidence supports the syndrome-asymmetry relation including new data with the P300 and earlier N100 and P 200 components and with recognition memory for words and faces. Reversals in

functional asymmetry have followed symptom recovery. Turning to the unreality syndrome, in psychometric schizotypy this has been associated with early processing anomalies including P50 suppression and habituation, and has shown replicable associations with extremes of pubertal timing, especially early maturation, as has delayed MMN development to duration deviants. It is proposed that the functional asymmetries reflect imbalances in thalamo-cortical arousal systems. They underpin approach/withdrawal behaviour that is manifested in temperament, personality and clinical syndrome and precedes language development. Structural views of schizophrenia have deflected attention away from the dynamic nature of the processes underpinning the disorder and their implications for treatment.

Gruzelier, J. *Schizophrenia Bull.*, 1999, 25: 91-120.

Mapping spatial cognition of left-right relations. - Brandeis, D.* and Jola, C. (* Department of Child and Adolescent Psychiatry, University of Zurich, Switzerland; + Department of Psychology, University of Zurich, Switzerland).**

The occurrence of centro-parietally negative N400 maps after unrelated words or incorrect mathematical solutions suggests similar semantic representations of meaning and numbers. We examined whether analogous N400-effekt also occur after unexpected spatial relations. Statements like "red is left of blue" were followed by images representing 13 different left-right relations between two colored bars (Knauff 1997). After 20% of the images, a "yes-no" question appeared and required a response. ERPs of 12 young adults were recorded in 42 channels (0.1-70 Hz, A/D 500Hz, extended 10-20 system). Accuracy and ERP maps at the GFP maximum in the N400 time range were examined with t-tests. Accuracy (after excluding one subject with high error rates) was highest for prototypical relations, their mirror images and total overlap configurations. Prototypes elicited the strongest P300; compared to the prototype all 12 other relations produced N400-like differences (350-500ms). For the prototype's mirror-images, these effects appeared only after 400 ms. Mismatch of spatial relations thus yields N400-like effects which may also be interpreted as P300 reductions. In contrast to the behavioral judgements, these ERP mismatch effects also occur after matching but not prototypical spatial relations. The findings also suggest that prototypical left-right relations have sharply delimited representations of their spatial configuration.

Reliability of electrophysiological correlates of the cognitive control of an anticipated prepared response. - Aranda, D.†, Herrmann, M.J.*, Fallgatter, A.J.* (*Psychiatric Neurophysiology, Department of Psychiatry and Psychotherapy, University Hospital of Wuerzburg,

Germany; †Catedra de Psiquiatria, Facultad de Ciencias Médicas, Universidad Nacional de Asunción, Paraguay).

Recent studies have shown the Continuous Performance Test (CPT) as a robust neuropsychological method for the activation of basic cognitive processes related to the control of a motor response. During EEG recording, it has been possible to isolate two stable topographical parameters, corresponding to the execution (Go-Centroid) and the inhibition (NoGo-Centroid) in the time-window of the P300 (Fallgatter et al., 1997). The aim of the study was to investigate the reliability of these topographical parameters. For that purpose 13 healthy voluntary were tested 2 times with the CPT with an interval of 2.74 years. The test-retest correlation revealed an excellent reliability (Pearson correlation coefficient $r \geq 0.85$; $p \leq 0.005$). The current results indicate, that these parameter are reliable measures for the assessment of cognitive response control.

Dynamics of the mass-shift in hydrocephalic patients detected via evoked potentials (EP) and brainstem reflexes (BSR). - Christophis, P., Reiter, D., Woszczyk, A., Böker, D.-K. (Department of Neurosurgery, Justus-Liebig-University, Giessen, Germany).

To detect the changes of the brainstem function during brain-shift, following a hydrocephalic volume expansion, 107 patients (58f, 49m, aver. age 58y) were investigated via EP and BSR. 60% of the cases in the group of acute hydrocephalus (n=71) after subarachnoid (SAH/n=42) and intracerebral haemorrhage (ICH/n=29) show marked changes in BAEP (wave III). All ICH-patients and 39% of the SAH-patients had a pathological MSSEP (N20) unilaterally. VEP was changed mostly (97%) bilaterally. The BR and the MR were pathological more frequently (>90%). Patients with chronic and normal pressure hydrocephalus (NPH) had less frequent changes of BAEP (wave III/50%) and of cortical MSSEP (24%). In contrast VEP changes were very frequent (86%). The BR was changed in about 50% and the MR in 62% of the cases. NPH-patients (n=12) show changes of EP and HSR seldomly. Present findings suppose that the acute hydrocephalus lead to both, a mesencephal irritation caused by a supratentorial volume increase and following bitemporal compression, and an infratentorial brainstem irritation caused by a cranio-caudal axial brainstem shift. The irritation of the visual path (VEP changes) seems to take place in the perimesencephalic region due to mesencephalic compression and is not a result of the ventricle widening.

Short term outcome of epilepsy in children evaluated by spectral analysis. - Dralle, D. (Dept. of Pediatrics,

Justus - Liebig University Gießen, Germany).

Spectral analysis of the EEG (19 channels, 10-20 system, computed average reference, only artefact free epochs) was performed by fast fourier transformation (FFT). The values of the absolute power of four frequency bands (delta, theta, alpha, beta) from each electrode of the right hemisphere were compared with the values of the corresponding electrode of the left hemisphere. The values were classified as being increased or decreased on one side independent of the extent of the difference. Whenever the values of the absolute power of all four frequency bands were increased on one electrode of the right (or left) hemisphere this electrode was determined to be a centre of increased absolute power. On the reverse a centre of decreased absolute power had to be on the corresponding electrode of the contralateral side. The EEG recordings of 5 children aged 9-15 years with grand mal and focal seizures were studied. In two patients the etiology of the seizures was idiopathic. One child suffered from hemiparesis after connatal stroke, one patient had an oligodendroglioma and a further child had a meningoangiomas. All patients had periods of high and periods of low seizure frequency. During the follow-up of one year two or more EEG recordings were analysed. In periods when the children were seizure-free centres of both increased and decreased absolute power were observed on one hemisphere. Whereas during periods of seizure decompensation only centres of either increased or decreased absolute power were present. These findings were independent of the native EEG and therefore they are an additional information of the degree of the acuity of the epilepsy.

Brain sources of EEG gamma frequency distinguish different meditation-induced, altered states of consciousness. - Faber, P.L.*, Gianotti, L.R.R.*, Achermann, P., Jeanmonod, D.^ and Lehmann D.* (*The KEY Institute for Brain-Mind Research, University Hospital of Psychiatry, Zurich; Switzerland; *Institute of Pharmacology, University of Zurich, Switzerland; ^Dept. of Neurosurgery, University Hospitals, Zurich, Switzerland).

EEG "40-Hz frequency" ("gamma" band) was described as prominent characteristic of brain electric activity during states of consciousness altered by meditation (e.g., Banquet 1973) and hypothesized to be important (cf. "binding problem") in normal conscious experiences (Gray et al. 1989; Kulli and Koch 1991; Singer et al. 1997). We analyzed 27-channel EEG of an experienced meditator (Lama Ole) during four different meditations, two minutes each: (1) "Buddha in front of me"; (2) a

100-syllables Mantra; (3) "Dissolving"; (4) "Regeneration"; this sequence was repeated immediately. The computed (FFT-Dipole-Approximation) locations of the intracerebral source gravity centers of the EEG gamma band (35-44 Hz) differed significantly (MANOVA) between meditations. Post-hoc tests of locations showed: meditation1 (visualizing) was more posterior than meditations 2 (verbalizing), 3 and 4; meditation 2 (verbalizing) was more left than meditations 1 (visualizing), 3 and 4; meditation 1 (visualizing) was more inferior than 2 (verbalizing), 3 and 4, and 3 and 4 were more inferior than 2 (verbalizing). All differences had the same direction in both sequences. Thus, during three of the self-initiated, altered states of consciousness that were associated with different subjective states, different brain neuronal populations (active in the gamma band) could be distinguished. (IGPP grant #670806).

Brain electric activity in believers and critics of paranormal phenomena after correctly or incorrectly guessed random events. - Gianotti, L.R.R., Faber, P. and Lehmann, D. (The KEY Institute for Brain-Mind Research, University Hospital of Psychiatry, Zurich, Switzerland).

We investigated whether disbelief (criticism) or belief in paranormal phenomena is associated with different brain electric signatures after correctly or incorrectly guessed random events. 37-channel EEG was recorded in two groups of healthy subjects, "critics" (n=13) and "believers" (n=10). The groups differed in their paranormal belief measured with the Magical Ideation scale (Eckblad and Chapman 1983). Subjects guessed the orientation of an arrow target (pointing upwards, right, down or left in pseudo-random sequence) by pressing one of four buttons (320 cases/subject). One second later, the target was displayed. The 448 msec EEG epochs (112 samples) after target display were averaged separately for correct and incorrect guesses of each subject, and the mean scalp locations of the electric gravity centers during the analysis epoch were computed for both groups. There were no significant differences of the gravity center locations of believers vs critics, neither for correct nor for incorrect guesses. But, the gravity center for correct guesses of all subjects was significantly ($p=0.004$, $n=23$) more anterior compared with incorrect guesses. The subjective feelings following an incorrect or a correct guess thus involved the activity of different neuronal assemblies, but believers and critics did not differ in this respect.

Supported by grant #670806, IGPP, Freiburg, Germany.

Face specific brain potential seems to be independent of facial expression. - Herrmann, M.J.*, Ellgring, H.* and Fallgatter, A.J.* (* Psychiatric Neurophysiology, Department of Psychiatry and Psychotherapy, University Hospital of Wuerzburg, Germany; * Institute of Psychology, University of Wuerzburg, Germany).

Recently, different research groups described a face-specific brain EEG potential at about 160 ms after stimulus presentation. Most studies analysed this face-specific brain potential using smiling faces as stimuli. But as Pizzagalli et al. (1999) reported, differences in amplitudes according to the emotional valence of the stimuli could be found as early as 100 ms after stimulus presentation. In order to investigate the effect of facial expressions for face-specific brain EEG-potentials, event related potentials (ERPs) to faces with sad, happy and neutral expression were compared to ERPs elicited by buildings. 16 subjects had to decide, whether the presented stimuli was a building or a face while the EEG were recorded from 21 scalp leads. We could confirm the often reported face selective activity between 125 and 238 ms at vertex after the presentation of a face. In contrast to our former hypothesis we could not find any differences in amplitudes for the sad, happy or neutral facial expressions for that time segment. The results indicate that face perception seems to be processed independently from decoding facial expressions.

Correlation study of P50 pre-pulse inhibition and implicit learning in schizophrenic patients. - Hsieh, M.H.*, Liu, K.+, Liu, S.K.*, Hwu, H.G.*, Chiu, M.J.^ (* Department of Psychiatry; ^ Department of Neurology, National Taiwan University Hospital, Taipei, Taiwan; +School of Education, University of Washington, Seattle, USA).

Schizophrenics are impaired in sensory gating which results in information flooding. The gating deficit has been demonstrated by ratio decrement of the auditory P50, in a paired stimulus paradigm. We examined the correlation of impaired implicit learning of the Reber's artificial grammar and impaired pre-pulse inhibition. Ten schizophrenic patients (mean age 35.1 ± 10.6) and 10 normal subjects controlled for age (33.3 ± 9.9) and sex participated in the study. Schizophrenic patients performed as well as normal subjects with letter-string implicit learning (56.4 ± 8.2 versus 61.7 ± 5.3 , $p > 0.1$) but not as well with color patterns (48.8 ± 6.4 versus 58.6 ± 5.0 , $p < 0.002$). Patients also showed impaired auditory pre-pulse inhibition at P50 (43% versus 65%, $p < 0.05$) but not at N100 or other components. Correlation analysis did not showed significant results among items of implicit learning and the P50 potentials. Dissociated deficits of implicit learning between the letter strings and color patterns in schizophrenic patients may indicate failure of sensory

gating on the flooding input of color-patterns. The lack of correlation between deficit in pre-pulse inhibition and color learning may be explained by either different mechanism underlying the two deficits or the heterogeneity among schizophrenic patients.

Topography of EEG spectra and visual selective attention. - Jedynak, A., Hayakawa, T. and Skrandies, W. (Institute of Physiology, Justus-Liebig-University, Giessen, Germany).

The topography of the spectral amplitude distribution of the spontaneous EEG during pattern discrimination tasks in the visual hemifields is analysed. Sixteen healthy adults discriminated low contrast gratings of two spatial frequencies and two orientations flashed sequentially and randomised in the left or right visual hemifield. The rare task relevant stimuli (probability = 20%) had to be counted. Thirty channels recorded the EEG with a regularly placed array of electrodes between the inion and Fz. Relevant stimuli increased amplitudes in the delta band and reduced alpha activity on the contralateral occipital regions. Beta activity of frequencies between 13 and 22 Hz was reduced in central and parietal areas.

Supported by the Deutsche Forschungsgemeinschaft, DFG SK 26/8-2.

Brain electric microstates: developmental norms. - Koenig, T.**^, Prichep, L.+, Valdes-Sosa, P.^, Braeker, E.^, Lehmann, D.-, Isenhardt, R.+ and John, E.R.+ (* University Hospital of Clinical Psychiatry, Bern, Switzerland; +Brain Research Laboratories, NYU School of Medicine, New York; ^ Cuban Neuroscience Center, Havana, Cuba; ~The KEY Institute for Brain-Mind Research, PUK, Zurich, Switzerland).

In EEG, time epochs with stable field topography can be observed. These so-called brain electric microstates presumably correspond to a sustained coherent activity of extensive functional networks. When EEG data is parsed into distinctive microstates, one can classify and quantify different brain functional states mediated by such networks; the time resolution is compatible with rapid information processing. We established the age norms for basic microstate parameters such as mean duration and frequency of occurrence using an EEG database of 496 subjects between 6 and 80 years. We found that brain electric microstates evolve in a discontinuous and non-linear way. Several putative brain developmental stages were observed, separated by changes in microstate parameters. These stage changes occurred at 12, 16 and 21 years of age. The result is discussed in the framework of developmental psychology and state dependent information processing.

EEG beta-2 band intracerebral source locations during positive and negative emotions elicited by music reading and playing. - Lehmann, D., Kondakor, I., Koenig, T., Frei, E., Kochi, K. and Witt, S. (The KEY Institute for Brain-Mind Research, University Hospital of Psychiatry, Zurich, Switzerland).

In our earlier studies, emotions of positive and negative valence (general attitude, or induced by hypnosis or drugs) were most prominently associated with lateral differences of the gravity center location of the EEG beta-2 frequency sources (18.5-21 Hz): positive emotions had more left-sided location than negative emotions. We tested whether self-induced emotions show similar signatures of lateralisation. - Witt's interpretation technique demands creation of emotions during musical interpretation. We recorded 27-channel EEG from Witt and seven of her students (median: 8.5 practice years), each after reading of four short music passages (selected for strong emotions: joy, sadness, fear, anger; randomized sequences) and after playing them, and during the brief intermissions (= "baselines"). Beta-2 frequency band (18.5-21 Hz) EEG was analyzed (FFT-Dipole-Approximation) into intracerebral locations of source gravity centers; the locations after music reading and playing were averaged for each emotion and referred to the locations during the appropriate baselines. A paired t-test (N=8 subjects) confirmed ($p < 0.035$) the hypothesized left-right difference between the location for positive emotion (joy) versus the mean location for the three negative emotions. - Thus, left-lateral brain preponderance of excitatory beta-2 brain activity during positive, right-lateral during negative emotions occurs during spontaneous, hypnosis- and drug-induced, and self-induced emotions.

EEG-Coherence analysis and foreign language processing. - Reiterer, S. and Rappelsberger, P. (Institute of Brain Research, Integrative Neurophysiology, University of Vienna, Austria).

The present EEG-study focuses on the differences in cortical activity of "good" and "poor" foreign language learners. The target language was English. 38 female, right-handed, native speakers of German participated in the study. Mean age was 24. The group of the good learners were advanced students of English and the "poor" learners consisted of "non-language" students (other disciplines) with just basic knowledge and little interest in English. The EEG was recorded while the informants had to watch short sequences (app. 2 min) of TV news in American English, British English and German. The data were further processed spectralanalytically. The main interest lay in the differences between the two groups concerning the extent and direction of hemispheric involvement (RH versus LH) and the overall activation patterns (global/diffuse versus focal cortical activity).

Preliminary results: Extensive Right Hemisphere activation could not be attested, neither for the group of the "poor" learners nor for the students of English. Just from a descriptive point of view, there was a clear bias for the involvement of the Left Hemisphere in both groups (most clearly within the frequency bands theta, alpha 1+2, beta 1) irrespective of the modality of presentation. The differences found in coherence increase and decrease can be interpreted in terms of the "Cortical Efficiency"-paradigm (with the English-students showing far less increase of coherence and more decrease than their "Non-English-studying" counterparts. This is evident in the alpha1 band.

Effects of temporal gaps between successive fixation targets on evoked brain activity and discrimination performance. - Skrandies, W. and Anagnostou, E. (Institute of Physiology, University of Giessen and Dept. of Neurology, University of Munich Germany).

We investigated how a specific oculomotor task influences afferent visual processing. Twenty healthy subjects performed visually guided saccades. Between the offset of the fixation light and the onset of the new target a temporal gap of a randomized length between 190 and 210 ms was introduced. This technique is known from previous studies to elicit express saccades. In a control condition, no gap was used. During the eye movement one of four patterned visual stimuli with different orientations were presented. Discrimination performance and the simultaneously recorded EEG activity was analyzed. In the gap condition, the number of correct discriminations increased. However, evoked brain activity was not affected by the gap. This contrasts the notion that parieto-occipital areas are the most important sites of sensorimotor integration. These data suggest that recordings from more anterior scalp areas might clarify the role of frontal regions, like the frontal eye fields. We conclude that intrasaccadic visual processing is clearly influenced by presaccadic events. Under the short time constraints prevalent in the saccadic task, fixation target cues are not only used for motor planning, but also specify the visibility of the visual pattern presented during the eye movement.

Supported by DFG Sk 26/5-3 and DFG Sk 26/8-3.

MutliChannel qEEG and cognitive evoked potentials (P300) after the application of olanzapine in healthy subjects. - Hubl, D.*, Kleinlogel, H.*, Frölich, L.*, Weinandi, T.*, Maurer, K.* and Dierks, T.+ (*Department of Psychiatry, University of Frankfurt/Main, Germany; +University Hospital of Clinical Psychiatry, Bern, Switzerland).

Purpose: Olanzapine is an atypical antipsychotic drug with less severe side effects compared to typical

ones. We investigated the effect of olanzapine on electrical brain activity in 10 healthy subjects in QEEG and cognitive evoked potentials. **METHODS:** A multichannel EEG was recorded before and after (3h, 6h, 9h) application of placebo or olanzapine (2,5mg, 5mg). A vigilance controlled QEEG was analysed by spectral analysis for 9 frequency bands. An auditory P300 was analysed for amplitude and latency. Statistical effects were tested by a repeated measurement MANOVA. QEEG: Treatment vs. time interaction resulted in a dosage independent increase in theta and delta bands after drug application. For alpha2 and the beta bands a dosage dependent decrease could be observed. The spatial effects demonstrated a significant increase of the delta activity at parieto-occipital electrodes, a decrease in alpha2 band in central and occipital electrodes and an increase in frontal electrodes on beta2 band. P300: There was a trend towards an increase of the P300 amplitude after drug application whereas the latency results were inconsistent. **Conclusion:** The increase of delta and theta-activity is fitting to the frequency distribution observed for to other atypical antipsychotic drugs. Whereas the decrease of beta activity after olanzapine application is atypical.

Global Field Synchronization (GFS), a new measure for functional connectivity in frequency-domain EEG: Findings in acute neuroleptic-naive schizophrenics. - Koenig, T.*+, Lehmann, D.+ , Saito, N.^, Kuginuki, T.^, Kinoshita, T.^ and Koukkou, M.* (*University Hospital of Clinical Psychiatry, Bern, Switzerland; +The KEY Institute for Brain-Mind Research, PUK, Zurich, Switzerland; ^ Department of Neuropsychiatry, Kansai Medical University, Osaka, Japan).

In order to study global functional connectivity in frequency domain EEG, the measure of Global Field Synchronization (GFS) was developed. After computing the FFT, the sine and cosine parts of each channel are displayed as points in two-dimensional, frequency-dependent Nyquist diagrams. Elongated shapes of these clouds of entries indicate a dominant phase over electrodes, suggesting globally synchronized brain electric activity. More circular clouds thus indicate the relative absence of global synchronization. The shape of the clouds is numerically assessed for each frequency by comparing the ratio of the first and second eigenvalues of the principal components of the sine/cosine values of all electrodes. Higher ratios indicate more elongated clouds, thus more synchronization and assumingly higher functional connectivity. The measure is independent of the reference, contains no implicit source models and avoids the problem of multiple testing. In a first study of resting EEG of two independent groups of acute, first-break, neuroleptic-naive schizophrenics compared to healthy controls, GFS values were found to be consistently re-

duced for theta activity (6.5-8.0Hz). In the context of literature relating theta activity to memory functions, the result is interpreted as a functional disconnection of widespread neurocognitive processes subserving working memory functions in schizophrenia.

Independent Component Analysis of event-related potentials in schizophrenics and healthy subjects. - Feige, B., Valerius, G., Maes, H. and Olbrich, H. (Department of Psychiatry and Psychotherapy, Freiburg, Germany).

The diminished P300 component in schizophrenic patients is known also for completely different diagnoses with reduced cognitive scores. Therefore it can be assumed that possible hints towards information processing deficits specific for schizophrenia would precede the P300 in time. The signal analysis technique of Independent Component Analysis (ICA; cf. Makeig et al. 1999) allows to model the topographical composition of overlapping potential distribution in a hypothesis-free manner not only in their succession in time, but also across subject groups. **Materials and methods:** In 30 schizophrenic patients and a matched group of healthy subjects, an auditory oddball paradigm with easily distinguishable stimuli was executed. The EEG was topographically derived from 33 scalp electrodes (10-20 system with additional leads in-between). The event-related potentials of all single subjects were submitted to the ICA training phase. **Results:** The preliminary analysis shows a left-temporal negative component with an activity maximum between 90 and 160 ms, which was clearly diminished in schizophrenics in comparison to the controls. Following in time were other differences, including the known reduction in the P3b component. Using only one paradigm, it cannot be conclusively determined whether these differences depend upon the first or have an independent relevance for the pathophysiology of schizophrenia.

Makeig, S, Westerfield, M, Jung, T-P, Covington, J, Townsend, J, Sejnowski, TJ, Courchesne, E *J Neurosci.*, 1999,19: 2665-2680.

Changes of brainstem reflexes (BSR) and evoked potentials (EP) during cranio-caudal mass-shift of the brain along the brainstem axis. - Christophis, P. (Department of Neurosurgery, Justus-Liebig-University, Giessen, Germany).

A cranio-caudal axial shift of the brain occurs especially if a space-occupying lesion is expanding diametrically to the brainstem axis. To detect the dynamics of this shift 48 patients with parietal, frontal and basal ganglia tumours were examined via BSR and EP. The R1 of BR was changed bilaterally in 38% of the patients. Frequently (65%) the R2 and R2c were changed bilaterally. The MR was very frequently (88%) pathological bilaterally.

Mostly (92%) the BAEP (wave III=70%) was pathological bilaterally. The cortical MSSEP was ipsilateral to the tumour in 80% and the VEP in 60% of the patients bilaterally changed. Present findings suppose that brain structures closest to the tumour are immediately irritated or damaged through the tumour expansion. The irritation of mesencephalic structures however seems to be indirectly caused by the brain-shift. Not only supratentorial but also infratentorial far to the tumour, an irritation of the brainstem function was found. The main irritation point is localised in the cerebello-pontine region demonstrated by changes of wave III (BAEP) and of R1 (BR). It is supposed that the brainstem shift lead to a contrary course and perfusion disturbances in this region via fixation of the brainstem on the cerebellar peduncles.

Continuous neuro-monitoring via somatosensory evoked potentials (SSEP) for optimising therapy of vasospasm. - Reiter, D., Christophis, P., Woszczyk, A. and Böker, D.-K. (Department of Neurosurgery, Justus-Liebig-University, Giessen, Germany).

Triple-H therapy in patients suffering from vasospasm after aneurysmal bleeding is an important factor for the outcome. Improvement of circulation in vasospastic arteries by increasing the arterial blood pressure (ABP) should be observed by SSEP-monitoring after stimulation of the median nerve (MSSEP), and the ABP adjusted to current circumstances. Of three patients after subarachnoid haemorrhage (H&H-grade III) caused by rupture of middle cerebral artery (MCA) aneurysm, ABP and intracranial pressure (ICP) were continuously monitored. Transcranial Doppler-Sonography and MSSEP were recorded daily. After increase of cerebral blood flow (CBF) velocity the ABP was increased gradually in steps of 10 mmHg under control of MSSEP. An amplitude decrease of cortical potential of MSSEP was recorded if an increase of cerebral blood flow velocity in the contralateral MCA was detected. During modification of triple-H-therapy, no significant changes of amplitude after raising ABP around 10 mmHg were observed. However, further elevation of ABP around 30-40 mmHg was followed by an increase of amplitude with simultaneous decrease of central conduction time and stabilisation of the MSSEP. In cases of cerebral vasospasm the effect of ABP elevation can be continuously monitored by MSSEP. This could be an additional aid in the management of further therapy.

Mapping EEG spectra of adolescents during a car racing video game. - Brandeis, D. and Wittwer, A. (Department of Child and Adolescent Psychiatry, University of Zurich, Switzerland).

Despite hot public debates on the effects of videogames, it is not known how adolescents' brain func-

tions are affected during playing. Spectral amplitudes and topographies of 42-channel EEG from 15 adolescents (mean age 14.7 years, 4 females) were compared between a) the three active conditions video car race ("Gran Turismo"), relaxation (with audiovisual stimulation), and attention (visual CPT A-X), and b) the subsequent resting states (eyes closed). Self-rating scales (PANAS) were used to assess emotional involvement. MANOVA and t-tests were used. Car racing induced more positive emotional ratings, and more left-lateralized and anterior activity (emotional involvement) than the control conditions. Car racing also induced stronger alpha suppression (sensorimotor activation) than attention, and more frontal-midline-theta (working memory load) than relaxation. Aftereffects included deeper relaxation after the car race than after the control conditions. More experienced players had higher spectral alpha amplitudes throughout, pointing to biological differences. EEG mapping reveals high sensori-motor, attentional and emotional involvement during an action game, and quick resolution after the game.

Visual information processing of dyslexic children. - Scheuerpflug, P.*, Vetter, V.*, Roth, E.*, Bartling, J.+, Schulte-Körne, G.+, Remschmidt, H.+ and Warnke, A.* (*Department of Child and Adolescent Psychiatry and Psychotherapy, University of Wuerzburg, Germany; +Department of Child and Adolescent Psychiatry and Psychotherapy, University of Marburg, Germany).

Dyslexia is a disorder resulting from a developmental impairment to read and spell adequately. Specific deficits of subsystems like the magno- or parvocellular systems are assumed. This study examined whether dyslexics compared to controls show different evoked potentials to moving stimuli biased by the magnocellular system. We recorded the EEG of up to now 8 dyslexic and 15 control children according to standard parameters and procedures. 2 different tests were conducted: 1. the motion-onset paradigm showed a vertical grating pattern moving with different velocities to the right or left side. 2. the coherent-motion condition showed a random-dot kinematogram with a variable percentage of dots moving coherently to the left or right side. The results in the motion-onset condition indicate the significant influence of the speed to ERP-amplitudes at occipital electrodes, whereas in the coherent-motion condition the percentage of coherence has a significant influence to these amplitudes. Detailed investigations in topography and microstates are discussed.

Motion-in-depth: The influence of frequency and visual field location on visual perception and brain activity. - Skrandies, W., Jedynak, A. and Kirr, Ch.(Justus-Liebig University, School of Medicine, Giessen, Germany).

Dynamic random-dot stereograms selectively activate cortical neurons, and motion-in-depth stimuli can be perceived only up to a certain frequency. We investigated the influence of visual field location and motion frequency on stereoscopically evoked brain activity and psychophysical thresholds in 10 adults. Stereoscopic checkerboards were presented at random centrally, or in the left or right visual field with horizontal disparity changes between 2 and 16 Hz. Electrical activity was recorded from 30 electrodes over the parietal and occipital brain areas, and steady-state VEPs were quantified by FFT. During the experiment, the subject had to indicate whether and where stimuli had moved in depth. Analysis of the psychophysical data showed largest sensitivity with central stimuli (mean 4.48 Hz) while laterally motion-in-depth could not be perceived at frequencies exceeding 2.5 Hz. There was no difference between the left and right visual field. In more than 97% of all VEPs there was stimulus related activation. Evoked brain activity was also observed with subliminal stimuli, and regression analysis revealed a significant correlation between stimulation frequency and amplitudes which was different at different electrode sites. Our data show how VEP activity allows to predict psychophysical performance.

Supported by Deutsche Forschungsgemeinschaft, DFG Sk 26/5-3 and DFG Sk 26/8-3

Identification of left and right hemifield PVEP in primary school children. - Hoffmann, K.*, Feucht, M.+, Leistritz, L.*, Benninger, F.+, Reiter, D.* and Witte, H.* (*Institute of Medical Statistics, Computer Sciences and Documentation, Friedrich-Schiller-University Jena, Germany; +University-Hospital for Neuropsychiatry of Children, University Vienna/AKH, Vienna, Austria).

In healthy adults the P100 component of left and right hemifield PVEP shows lateral images of the electric field and the spatial distribution of the time-variant parameter instantaneous frequency (IF) characterised by higher values over the contralateral occiput. Accordingly, the identification of the stimulated hemiretina can be performed at P100 comparing the values of potential or IF at the occipital electrode positions. A more comfortable identification method tested for adults is the application

of generalised dynamic neural networks (GDNN) using the measured signals from single electrodes as external input. In this study, the P100 component of left and right hemiretina PVEP in primary school children was investigated and beyond it, the stimulated hemiretina was identified using the proposed identification methods (IF, GDNN). The study was performed on 40 healthy children (7-11 years) and 27 adults (25-40 years). In result, P100 latency as well as amplitude were significant higher in children than in adults for both hemifields. Moreover, the IF distribution showed lateral images for both hemiretina, but the values of IF in children were about 2 Hz lower than in adults. The best identification results were obtained using the GDNN classifier for groups (children: 95%, adults: 100%; input signals: P3 vs P4).

EEG correlates of distorted time experience: frequency bands and topography. - Wackermann, J., Pütz, P. and Miener M. (Institut für Grenzgebiete der Psychologie and Psychohygiene, Freiburg i. Br., Germany).

Twelve subjects participated in a study into brain electrical correlates of subjective experience (spontaneous mentation) in various states of consciousness: relaxed waking, sleep onset, and perceptual deprivation (ganzfeld). EEG was registered from nineteen scalp sites (10/20 system). Following a pre-defined schedule, subjects were prompted by a sound signal to report their momentary contents of mind, and self-rated their subjective experience along several scales. They were also asked to estimate the time elapsed since the beginning of data recording session to the prompt signal. Real times varied from 0.6 to 40 minutes. Subjective time errors were expressed by logarithms of $T_{\text{estimate}}/T_{\text{real}}$ ratios, corrected for an overall linear trend in the data. There was a tendency to underestimate time in relaxed waking, alpha-state before sleep onset, and ganzfeld; and to overestimate in reports given from sleep stages 1 and 2. 185 artefact-free 2-seconds epochs of EEG immediately preceding the prompt were FFT analysed and transformed to logarithms of relative integral band powers. Significant correlations ($p < .01$) between EEG power and time errors were observed mostly in a band (positive correlation) in frontal and occipital regions, and in a2 band 10-12 Hz (negative correlation) in frontal, parietal and occipital regions.