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Different stages of auditory processing on the cortical level. Time-course and neuroanatomical correlates. - S. Koelsch*+ (*Max-Planck-Institute of Cognitive Neuroscience, Leipzig, Germany; +Harvard Medical School, Boston, USA.

On the cortical level, several stages of auditory information processing can be investigated with ERPs. P1 and N1 appear to reflect decoding of basic parameters of auditory information such as pitch and intensity. These components are mainly generated in primary and peri-primary auditory cortex. The mismatch negativity (MMN) reflects operations of auditory sensory memory, and is assumed to be generated mainly in the auditory cortex directly adjacent to primary auditory fields (possibly along with primary auditory areas), with important contributions from frontal cortical regions (fronto-opercular and dorso-lateral pre-frontal cortex). Whereas the physical MMN is elicited on the mere physical basis of auditory stimuli, the abstract feature MMN reflects auditory sensory memory operations that are sensitive to abstract regularities. Even more complex regularities have to be processed in order to decode musical (or linguistic) information. Processing of such complex, sequential auditory information relies on "higher" cortical mechanisms that are located in a number of structures in the frontal, temporal, and parietal lobe. Processing, e.g., of musical syntax appears to rely on frontal (IFLC, DLPFC, vlPMC) and anterior temporal cortices. Combined evidence from EEG, MEG, and fMRI provides insight into time-course and neuro-anatomical correlates of different stages of auditory information processing.

Sound and trance in a ritualistic setting – two single cases with EEG brainmapping. - J. Fachner* and S. Rittner+ (*University Witten/Herdecke, Chair for Qualitative Research in Medicine, Germany; + University Heidelberg, Dept. for Medical Psychology, Germany).

Two receptive trance-inducing methods (Body-Monochord; Goodman trance postures with fast rattling) were compared to rest. 28 EEG traces of two highly hypnotisable subjects (male/female) were obtained with a mobile brain imager during a group therapy ritual. Narratives, psychometric measures (PCI and 5-D ABZ Test) and amplitude/significance mapping were explored. Both trance inductions caused an increase of β-II-%, the posture an additional θ-%-increase. While monochord playing of the male subject induced frontal desynchronisation with increase of β-II-%, the female EEG showed a synchronisation with changes ($p<0.001$) in visual and somato-sensoric regions. Her **α**-changes might indicate change of processing to a trophotropic trance state. Both showed increase of β-II-% indicating ergotrophic trance. During rattling both subjects exhibited frontal-central increases of θ-%. While female subject exhibited more pre-/frontal increases, male subject exhibited more parietal-occipital increases. Changes ($p<0.001$) on β-ranges, spectral edge frequencies and θ-%-increases mark this state. Guttman (1990) observed high and low frequency increases in the DC-EEG and called it "paradoxical arousal". Our results might support his observation.

The error negativity (N_e)/error-related negativity (ERN) following feedback stimuli: electrophysiological correlates of response evaluation. - M. Ruchsow, J. Grothe, M. Spitzer and M. Kiefer

(Universitätsklinik Ulm, Abteilung Psychiatrie III, Ulm, Germany).

It is an open question whether the error negativity (N_e) or error-related negativity (ERN), an electrophysiological index of anterior cingulate activation, reflects response conflict or response evaluation in error monitoring processes. We investigated event-related potentials (ERP) in a guessing task which did not induce response conflict. Subjects had to guess which of the four aces of a French card play would be presented next and received feedback at random. We observed a negative ERP deflection in trials following negative feedback which was identified as ERN/N_e. Dipole analysis of scalp potentials indicated sources in the anterior cingulate and left inferior prefrontal cortex. The observation of the ERN/N_e following negative feedback during mere guessing suggests that this ERP component mirrors response evaluation processes comparing expected and actual response outcome rather than response conflict.

A magnetic correlate of pre-attentive, auditory periodicity analysis. - St. Berti*, E. Schröger+, A. Mecklinger^, Ch. Herrmann~ and B. Maeß# (*Psychologisches Institut, Johannes Gutenberg-University Mainz, Mainz,Germany; +Institut für Allgemeine Psychologie, University Leipzig, Leipzig, Germany; ^Experimental Neuropsychology Unit, Saarland University, Saarbrücken,Germany;~Institutfür Psychologie, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany; #Max-Planck-Institute for Cognitive Neuroscience, Leipzig, Germany).

When presented periodically, white noise is perceived as a rhythmic auditory event. In a recent ERP study a train of negative deflections was obtained in an attend as well as in an ignore condition reflecting the periodicity of the stimulus and suggesting that the periodicity analysis is due to a pre-attentive process. In the present study we were interested in whether the processing of periodicity can be tapped by MEG, too. Streams of 2 sec of semi-periodic noise with cycle-length of 200 ms were presented in an attend and an ignore condition. In the attend condition the subjects were instructed to detect streams of non-periodic white noise that occurred with low probability instead of a periodic stream. The MEG data was filtered offline with 3 to 8 Hz bandpass and was averaged for periodic noise stimuli between 1000 and 2000 ms after stimulus onset. We obtained a train of negative deflections in the magnetic response for both attend and ignore condition that is time locked on the periodic noise. This pattern is most pronounced at left-frontal and left-temporal brain regions. Thus, our data confirm that the pre-attentive periodicity analysis can be tapped by MEG.

EEG theta power during haptic object recognition in Bulimia nervosa patients. - S. Jankowiak*, C. Ettrich+, B. Assmann+, A. Dähne+ and M. Grunwald* (*EEG Research Laboratory, Department of Psychiatry, University Leipzig, Leipzig, Germany; +Department of Child Psychiatry, University Leipzig, Leipzig, Germany).

Clinical practice and applied research supply evidence that Anorexia nervosa is accompanied by distortions of body image. For the development of adequate body representations the integrative function of the right parietal cortex is responsible. Grunwald et al. (2001) showed that there is a dependency between distorted body image of anorectic patients and right parietal dysfunction which was correlated with diminished haptic ability of perception. To test the hypothesis of a cortical dysfunction as a basis of the body image disturbance by Bulimia nervosa (BN) the EEG (theta power) data of 14 bulimic patients were analyzed during haptic stimulus-processing and a rest interval. The task consisted in palpating blindly the structure of sunken reliefs without time limitation and to draw it subsequently (eyes opened). Data of bulimic patients were compared to 14 healthy controls who did not differ in terms of sex, age, and IQ. It turns out that the haptic reproductions submitted by the bulimic patients are poorer than those of controls. Theta power of BN patients under haptic requirement is increased at frontal and decreased at parietal areas compared to controls. These results suggest that BN have deficits in haptic information-processing that may correspond with an impaired body representation.

Differentiation of causal and induced interactions between components of multidimensional EEG signals by means of time-variant multivariate Granger causality. - W. Hesse*, Th. Weiss+, W.H.R. Miltner+ and B. Schack* (*Institute of Medical Statistics, Computer Science and Documentation, University Jena; +Institute of Psychology, University Jena).

The time-variant Granger causality (GC) is a measure to detect short-lasting directed interactions between components of a multidimensional (EEG-)signal. In prior studies relations between two selected components were investigated by means of bivariate GC. The problem with bivariate GC is the detection of spurious directed relations within a high-dimensional signal. Interaction between two components of a high-dimensional signal may be caused by the hidden influence of other components or by sources which are not measured. Our aim was the development of a time-variant multivariate approach of GC in order to differentiate causal and induced interactions. The general idea of causality is as follows: If a signal X causes a signal Y, the knowledge of the past of both X and Y should improve the prediction of the presence of Y in comparison

with the knowledge of the past of Y alone. The multivariate approach of GC extends this idea to the observation of the past of all signal components. The application of multivariate GC to the EEG of a pain study shows that cortical topography of electrical answers of pain stimulus on hand and face are in agreement with previous EP-analysis. Additionally we found short-time directed interactions by the pain transmission.

Mathematical analysis of multichannel EEG and associative learning processes. - A. Klein, A. Jedynak, T. Sauer and W. Skrandies (Institute of Physiology, and Department of Mathematics, Justus-Liebig University, Giessen, Germany).

We investigated the influence of associative learning on EEG coherence. The study was split in two phases ("acquisition" and "extinction") in which two groups of thirteen subjects each (learning and control group) were stimulated visually by the presentation of a random series of Landolt- and full rings. In the conditioned group learning was induced in the acquisition phase by pairing the presentation of a Landolt ring with electric stimulation of the median nerve with a probability of .67, while the presentation of a full ring was never accompanied by electric stimulation. The control group received electric stimulation with a probability of .5 independent of the type of visual stimulus. In the extinction (test) phase visual stimuli were presented without electric stimulation. The EEG was recorded in thirty channels, and the data were analyzed for changes in coherence induced by the visual stimuli in the acquisition and test phase. Conventional coherence and coherence based on a wavelet transformation was computed. FFT-based coherence analysis showed a highly spatially structured pattern in the change of coherence for the whole matrix of channels, while wavelet coherence in addition revealed the temporal structure of changes for selected pairs of channels.

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Space-frequency decomposition of multi-channel EEG data. - J. Wackermann (Dept. of Empirical and Analytical Psychophysics, Institute for Frontier Areas of Psychology and Mental Health, Freiburg i.Br., Germany).

In multi-generator models of brain electrical data (mEEG), there is a well-known trade-off between phase correlations between generating activities, and topographic correlations between generated fields. Due to this indeterminacy, multi-generator models have to involve additional constraints to ascertain unique solutions, as is the restriction to orthogonal generating fields in the spatial principal components model (SPC). A more realistic model, free from such unphysiological constraints is proposed. Within the space-frequency decomposition approach (SFD), non-orthogonal generating fields are admitted, and a global functional on Fourier-transformed activities is defined ("spectral separator"). Starting with a classical SPC solution, an iterative algorithm maximises the spectral separator in a sequence of rotations and "skewing transforms" applied to the generating fields. This process results in a reduction of an epoch of mEEG data into a pre-defined number of spatially correlated generator fields, driven by underlying activities of maximally distinct frequency spectra. Applicability of the SFD approach is demonstrated on examples of spontaneous alpha EEG, paroxysmal spike/wave patterned EEG, and separation of EEG activity from superimposed physiological artefacts.

Comparison of global tests for evaluating high-dimensional data. - C. Hemmelmann, M. Horn, B. Schack and T. Süße (Institute of Medical Statistics, Computer Sciences and Documentation, University of Jena).

For evaluating a difference between two conditions or two groups, one often has to consider several variables, simultaneously. In order to find a global effect over all variables a so-called global test has to be used. Several global tests exist which can be used for comparing high-dimensional parameter vectors. In computer simulations, we compared tests of Läuter et al. (1996), the test of Simes (1986) and permutation tests with different test statistics with regard to their power. The power of each global test depends on the correlation between the variables, on the relative number of variables for which differences exist, and on other factors. However, the dependence on all these factors is different from test to test, so that none of the tests dominates the other ones, generally. From simulation results, we derived rules which test can be recommended under which special constellations of given data. Consequently, each analysis of multivariate data should start with estimating the correlation between the variables and the number of effective variables in order to decide which global test is appropriate. The test procedures are applied in the analysis of high-dimensional EEG data. Some examples are presented.

Truly simultaneous ERP and fMRI mapping. - D. Brandeis*, S. Brem*, K. Bucher+, P. Halder*, Th. Dietrich+, Th. Koenig^, P. Summers~, Th. Loenneker+ and E. Martin+ (*Department of Child and Adolescent Psychiatry, University of Zurich; +MRI Department, University Children's Hospital Zurich; ^Psychiatric University Hospital, Bern; ~Department of Neuroradiology, University Hospital Zurich).

Truly simultaneous ERP and fMRI mapping is essential to track spontaneous or irreversible activation in individuals at high resolution . The huge MR-gradient and ballistocardiogram artefacts can be largely corrected in

the continuous EEG , but the smaller ERPs have so far only been measured between fMRI scans. We demonstrate that truly simultaneous mapping can be both reliable and efficient. ERPs to rapid randomized sequences of hemifield checkerboards were recorded from eight young adults using MR-compatible EEG amplifiers (62 EEG und 2 EKG channels, 5 kHz 32mV A/D, hardware filters 0.1-250 Hz). After correction, ERPs during fMRI (1.5T, TR=3s; gaps <20%) and outside the scanner were compared. All EEGs were corrected successfully. Hemifield ERPs during fMRI displayed mirror-symmetric P1 and N1 topographies without systematic differences to those recorded outside. Corresponding Global Field Power curves were highly correlated. EEG spectra during and between scans hardly differed, but both exhibited more noise than outside. Truly simultaneous ERP - fMRI mapping is thus more efficient and flexible than previous approaches. This may be critical for studies with patients or children.

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Unfolding EEG spatial complexity as function of frequency. - J. Wackermann, P. Pütz and M. Gäßler (Dept. of Empirical and Analytical Psychophysics, Institute for Frontier Areas of Psychology and Mental Health, Freiburg i.Br., Germany).

Numerous studies have shown that spatial complexity of multi-channel EEG (Ω) is a sensitive measure of brain functional states; but the classical definition of Ω does not account for the dependence of spatial synchronisation on frequency. This dependence is revealed by profiles of Ω-complexities calculated from eigenvalues of cross-spectral matrices, separately for each frequency point, $\Omega(f)$. In contrast to methods relying merely on phase relations obtained from raw FFT-transformed data, the proposed method takes into account the global co-variance structure of the data. Examples are given of $\Omega(f)$ profiles for 19-channel EEG recorded with eyes closed, or eyes open with and without diffuse red light stimulation (ganzfeld). Comparisons between $\Omega(f)$ profiles and power spectra reveal primary maxima of synchronisation corresponding to maxima in power spectra, but also secondary local maxima of synchronisation which are not necessarily located at global power maxima. In particular, secondary synchronisation maxima occur at $\approx$12.5 Hz with eyes open and deprivation of visual input.

ERPs during unconscious language processing. - T. Koenig*, D. Eckstein+ and W. Perrig+ (*University Hospital of Clinical Psychiatry, Bern, Switzerland; + University of Bern, Institute of Psychology, Switzerland).

The aim of the study was to identify neural correlates of unconscious reading. Word and nonword primes were visually presented in context mask characters obtained by adding mirror letters. This yielded geometric patterns that prevented conscious reading. Primes were followed by unmasked target words or nonwords. 74 channel ERPs were recorded from 19 subjects and averaged for the four different stimulus types. 4 subjects consciously identified the masked words and were excluded. ERPs were segmented into microstates and compared using a bootstrapping algorithm. Microstates showing significantly different topographies were analyzed using SPM of LORETA. In unmasked words, there were word effects before 100 ms in the right superior parietal lobulus and left occipital lobe and later (before 132ms) in the right inferior temporal gyrus. Masked words showed ERP differences from 160 to 252 ms in the left supramarginal gyrus (BA40). The unmasked word effects corrobate other findings of early visual word recognition, highlighting the importance of automization in reading. Furthermore, a mirroring was observed: Whereas unmasked words activated right language areas, masked words deactivated left language areas. Masking the stimuli also delayed processing. Assumptions of structural analogy of conscious and unconscious word processing may thus be inappropriate.

Frequency analytical dissociation of nondistinguishable ERP components: a new way of fractionating language processing. - D. Roehm*, M. Schlesewsky*, I. Bornkessel+ and H. Haider^ (*Junior Research Group Neurolinguistics, Philipps University Marburg; +Max Planck Institute of Cognitive Neuroscience, Leipzig; ^Department of Linguistics, University of Salzburg).

We describe the application of a fundamentally new analysis technique for EEG research on human language comprehension. This technique, which draws upon the frequency characteristics of the neurophysiological responses elicited by the processing of linguistic stimuli, allows for a dissociation of event-related potential components that appear indistinguishable from a surface perspective. It thereby contributes substantially to the solution of the mapping problem that has arisen as a result of the absence of a one-to-one correspondence between particular components and cognitive sub-domains or sub-processes. More precisely two apparently indistinguishable language-related N400 s that reflect a grammatical violation vs. atypical animacy properties show increased evoked power in the upper-theta (5.5-7 Hz) and lower-theta band (3.5-5 Hz), respectively, and an interaction in the delta band (1-3 Hz). The scope of our analysis far surpasses previous frequency-based approaches to language processing in that it not only subdivides language-related EEG activity into frequency bands, but also provides a measure of the inherent frequency-based characteristics of this activity, i.e. of whether differences be-

tween two conditions should be attributed to differences in power (neural activity) or in the degree of phase locking (consistency of timing across trials).

Language-evoked brain activity: similarities and differences of different languages. - W. Skrandies*, M.J. Chiu+ and Y.R. Lin+ (*Institute of Physiology, University of Giessen, Giessen, Germany; +Department of Neurology, NTUH, Taipei, Taiwan).

We studied how affective meaning of words is reflected in brain electric activity. Specifically, we deal with the question of differences in evoked potentials measured in subjects of different language and culture. Meaning was quantified statistically by the "semantic differential technique" in 52 German and 55 Chinese subjects resulting in three independent dimensions. The correlation between groups was very high (between 0.83 and 0.92). Words belonging to different semantic classes were presented visually, and the EEG was recorded in 32 channels from 22 German and 23 Chinese subjects. Evoked potentials were computed for each semantic class. Significant differences in electrical brain activation between semantic word classes were seen as early as 80 ms after stimulus onset in both groups. Spatial principal components analysis revealed very similar topographical components in German and Chinese subjects (r>0.85). In addition we could show that linear discriminant functions could be used to classify brain activity elicited by words of different semantic dimensions. This was possible not only within but also across languages.

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Electrophysiology in dementia pathophysiological aspects and clinical relevance. - Th. Dierks (Dept. of Psychiatric Neurophysiology, University Hospital of Clinical Psychiatry, Bern, Switzerland).

Numerous investigations have aimed at demonstrating the clinical use of EEG in cognitive disorders. But it has also been applied in the field of pathophysiology with the aim of understanding the cerebral processes underlying cognitive deficits better. In general in Alzheimers Disease (AD) a slowing of the EEG has been described. It correlated in some frequency bands with the severity of the cognitive deficits more or less linearly, whereas in other less so. Thus frequency bands like alpha and theta seemed more to be a state marker of cognitive function in AD, whereas beta activity could be seen as a trait marker. Topographical changes of EEG in AD reflected alterations of cerebral glucose metabolism and results indicated that topographical parameters may be more sensible to alterations of brain function in AD compared to more conventional EEG analysis and may predict AD in a preclinical stage. Quantitative EEG results are also described to be more sensitive in AD diagnosis, but less specific compared to other functional imaging procedures like PET and SPECT. Using appropriate analysing methods it seems to be helpful as well as a clinical tool and as for determining pathophysiological processes involved in AD.

Electrophysiological dysfunction in the anterior cingulate cortex in attention deficit hyperactivity disorder (ADHD). - A.J. Fallgatter*, A.-C. Ehlis*, M. Rösler+, W.K. Strik^, D. Blocher~ and M.J. Herrmann* (*Dept. for Psychiatry and Psychotherapy, University of Wuerzburg, Germany; +Institute for Forensic Psychiatry, University of the Saarland, Homburg / Saar, Germany; ^Clinical Psychiatry, University of Bern, Switzerland; ~Clinic for Psychiatry and Psychotherapy, Wuerzburg, Germany).

Attentional deficits, problems in inhibition of inadequate motor activity and increased impulsivity belong to the clinical core deficits in ADHD. These three symptoms may be, at least partially, be explained by a dysfunction of the anterior cingulate cortex (ACC), which is considered as an important interface between prefrontal cortex and limbic system. By means of a simple method (Continuous Performance Test (CPT) with simultaneous 21 channel-EEG), it seems feasible to measure an electrophysiological correlate of the ACC-function termed NoGo-Anteriorisation, NGA. This ERP-measure is characterized by a high interindividual stability, a high short- and long-term test-retest reliability and is independent from age- and gender. The NGA was diminished in 24 adult patients with personality disorders and additional hints for an ADHD during childhood as compared to age- and gendermatched healthy controls. By means of a three-dimensional source location analysis with LORETA an electrical dysfunction of the ACC in this patient group was shown. Moreover, a corresponding dysfunction of the ACC was also found in children with ADHD in comparison to healthy control children. In future studies the question will be addressed whether this electrophysiological method may contribute to the diagnosis of ADHD and whether treatment effects on ACC-function are measurable.

EEG complexity in four groups of juveniles. - E. Bräker, A. Federspiel, C. Hug and M. Koukkou (University Hospital of Psychiatry Bern, Switzerland).

Following the hypothesis a) that the psychobiological changes which characterize human development reflect the increase of complexity of the neuronal (mnemonic) networks (synaptogenesis; Fuster 1995), and b) that this increase is reflected in the developmental EEG changes (Nunez 1995), we report on developmental changes of EEG dimensional complexity (correlation dimension) in four age-groups of juveniles. 19-channel EEG with eyes closed was collected during

resting (20 × 2sec epochs) from a group of 11 year old (n = 15), a group of 13 year old (n = 10), a group of 14 year old (n = 18) and a group of 15 years old (n = 12) subjects. To measure dimensional complexity, the Grassberger and Procaccia's (1983) algorithm (Dvorak 1986) was used. We found differences between the three younger groups (11y, 13y, 14y) mainly in the frontal regions, suggesting systematic increase of neural complexity with age, and distinct higher levels of complexity in all regions were found in the oldest (15y) juveniles.

Effects of Rivastigmine medication in Alzheimer patients using frequency-domain dipole modeling and LORETA. - L.R.R. Gianotti*+, G. Künig*, P.L. Faber+, R.D. Pascual-Marqui+, K. Kochi+, D. Lehmann+ and U. Schreiter Gasser* (*Gerontopsychiatrisches Zentrum Hegibach and +The KEY Institute for Brain-Mind Research, Psychiatrische Universitätsklinik, Zurich, Switzerland).

19-channel resting EEG of 16 Alzheimer type dementia (DAT) patients was analyzed before and 3 months after initiation of rivastigmine (Exelon®) medication. For both sessions and each of seven frequency bands (delta, theta, alpha1&2, beta1,2&3), EEG model source localizations (FFT-Dipole-Approximation [1]) and 3-dimensional distributions of current density (LORETA functional tomography [2]) were computed. MANOVAs of the source localizations showed effects for beta3 ($p<0.03$), beta2 ($p<0.1$) and alpha2 ($p<0.1$). Posthoc tests specified a shift to more right-sided locations for beta3 ($p<0.06$) and beta2 ($p<0.04$) and a shift to more inferior location for alpha2 ($p<0.02$) under medication. Under medication, posthoc LORETA imaging showed maximal increased, right-predominant activity in gyrus parahippocampi (BA 27,28) for beta3 and beta2 and in superior frontal gyrus (BA 8,9,10) for alpha2. In conclusion, rivastigmine increased brain electric activity in regions that are well known to be involved in memory functions (gyrus parahippocampi) and that are affected in DAT patients already in early disease stages.

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Pascual-Marqui, R.D., Michel, C.M. and Lehmann, D. Low resolution electromagnetic tomography: a new method for localizing electrical activity in the brain. Int. J. Psychophysiol., 1994, 7: 49-65.

Reduced lateralisation and amplitude of the late mismatch negativity (late MMN) in kindergarten children with familial risk for dyslexia. - U. Maurer, S. Brem, K. Bucher and D. Brandeis.

Developmental dyslexia is a common learning disorder with a substantial genetic or familial background. Dyslexia is characterised by perceptual deficits, and particularly by a phonological core deficit, possibly due to a deficit in more general auditory processing. Markers of these deficits might help concerned families to seek early training or provide relief. Differences in automatic auditory processing between kindergartners with (n=31) and without (n=29) familial dyslexia-risk were investigated using frequency and phoneme mismatch negativity (MMN) paradigms with small deviance and short intervals. During an early mismatch response segment children at risk tended to have more mid-frontal positivity than controls, especially to phoneme deviance. Significant group differences were found in the late MMN segment, where the mismatch response of children at risk was attenuated to frequency deviance and less left lateralised to phoneme deviance. This indicates deviant automatic processing of phoneme and simple tone deviance in children at risk. These differences might be just related to the dyslexia-risk or even more specifically to future reading difficulties and thus be used for early recognition.

Sentence parsing in patients with schizophrenia and major depression. - M. Ruchsow, G. Grön, M. Spitzer and M. Kiefer (Department of Psychiatry, University of Ulm, Germany).

We investigated sentence parsing processes using event-related potentials (ERP). Stimulus material consisted of three different conditions: (1) congruent sentences, (2) semantic mismatching sentences, (3) and syntactic mismatching sentences. Former studies found more negative N400 amplitudes in semantic mismatching sentences and more positive P600 amplitudes in syntactic mismatching sentences 1. The N400 component reflects semantic processes whereas the P600 component reflects syntactic-semantic integration processes. We investigated these ERP components in patients with schizophrenia and major depression in order to determine deficits in sentence parsing. Subjects carefully had to read altogether 192 sentences presented on a computer screen while a 64 channel EEG was recorded. Patients with schizophrenia as well as patients with major depression showed a less positive P600 amplitude compared to control subjects. There were no group differences with regard to the N400 component. Our results suggest deficits in syntactic-semantic integration processes in both patients groups which are most likely due to a language non-specific cognitive deficit e.g. in working memory.

Friederici, A.D., Steinhauer, K. and Frisch, S. Lexical integration: Sequential effects of syntactic and semantic information. Memory and Cognition, 1999, 27(3): 438-453.

Processing of emotional stimuli: where is the topographical effect?- M.J. Herrmann, H. Ellgring and A.J. Fallgatter (University of Wuerzburg, Germany).

Some published studies claimed that the emotional content of processed stimuli was reflected by topographical changes of the brain electrical field. However until now, no replicated effects were described. Therefore the point in time and the directions of these topographical effects can not be ruled out. We investigated the topographical effects of the processing of emotional faces as well as emotional pictures of the international system of affective pictures (IAPS) in three different samples of healthy subjects. Event-related potentials were averaged and filtered with a bandpass of 2 Hz to 20 Hz as in the studies before. We analysed the centroid localisation of the positive and negative brain electrical field during different time segments within the first 650 ms of picture processing. Although we found differences in the location of the positive and negative centroids for the different facial expressions as well as for the positive, negative and neutral emotional pictures, these could not be replicated throughout all different samples. It has to be mentioned that the differences of the centroid localisation were only significant using an error probability of 5%, and therefore without alpha adjusting. According to our data, we can not conclude that the emotional content of stimuli is reflected in the topographical effects of the event-related potentials.

Attention and emotion: an event-related potential analysis of facilitated emotional stimulus processing. - H. Schupp*, J. Stockburger*, M. Junghöfer+, F. Bublatzky, A.I. Weike* and A.O. Hamm* (*University of Greifswald, Germany; +University of Konstanz, Germany).

Previous studies consistently observed the selective processing of affective compared to neutral cues. fMRI studies revealed increased activations by emotional photographs in posterior, visual processing areas (e.g., occipital gyrus) and more anterior, ventral temporal structures (e.g., fusiform gyrus). Event-related potential studies also revealed the early facilitation of affective stimulus encoding. Specifically, emotional pictures were associated with an endogenous posterior negativity, which appears around 200 ms and lasts for about 100 ms. Following this line of research, the present study explored whether the selective encoding of emotional pictures is sustained while subjects performed an explicit cognitive attention task. Emotional and neutral pictures were shown as a rapid (333 ms) and continuous stream of images (rapid serial visual presentation paradigm). The explicit attention task was implemented as standard oddball task either in the visual or auditory modality and was unrelated to the emotional content of the pictures. Event related brain potentials were recorded using a dense sensor geodesic net. As expected, explicit attention to target stimuli was reflected in specific ERP components. Interestingly, an enhanced perceptual processing of emotional cues was observed despite the non-emotional task irrespective of the modality of the explicit task. Specifically, pictures high in emotional arousal were associated with a pronounced temporo-occipital negativity. These data demonstrate the facilitated emotional stimulus processing even when attention is explicitly devoted to other non-emotional stimulus features. (Supported by the DFG).

Elektrocortical changes during expectance of exposure to virtual tunnels in tunnel phobics. - A. Mühlberger*+, H. H. Bülthoff+ and P. Pauli* (*University of Würzburg, Institute for Psychology I; +Max-Planck-Institute for Biological Cybernetics).

According to Davidson's (1992) model of anterior brain asymmetry and emotion, certain regions within the left prefrontal cortex are part of a system that implements approach-related behaviour and certain regions within the right anterior temporal and prefrontal regions are part of a system that implements withdrawal-related behaviour, especially during exposure to or anticipation of phobic stimuli. But only few data show this during or before exposure in phobic subjects. In our study 15 phobics who suffer from a fear of tunnels and matched controls were tested in three different simulated driving scenarios: a driving scene in an open environment, one through a gallery, and one in a tunnel. In an anticipation period before this exposure and directly after the exposure, anxiety and electroencephalograms from 20 scalp locations were recorded. Waiting for the exposure should induce anxiety while completed expose should not. Significant changes were found in anxiety. As expected, right frontal alpha-Power (F4) was reduced in anticipation of the exposure, but not after the exposure. This result was most pronounced in alpha1-Power values. While this result corroborates the hypothesis of Davidson, we could not find the additionally expected asymmetry in more lateral (F7/F8) or anterior temporal (T3/T4) regions.

Oscillatory brain activity as a measure of affective perception and behavior. - A. Keil, M. Stolarova and St. Moratti (University of Konstanz, Germany).

Emotional Perception of stimuli that are motivationally relevant are related to integrated neural activity among a variety of neuro-anatomical structures. Here we suggest a framework for the understanding of perception and action regulation in presence of behaviorally relevant information. The role of large-scale networks in dynamic and variable neuronal

architecture underlying this particular function is highlighted. Evidence is presented supporting the view that macroscopic (neural mass) oscillations are crucial for signal transmission and plastic changes in these networks. Thus, important aspects of neural functioning can be studied using large-scale electrocortical measures with respect to time course and topography, employing frequency-domain analyses. These issues are illustrated with experimental data from studies of selective attention, operant conditioning, gestalt perception, and emotional perception.

The importance of evoked potentials for indication of brain decompression via craniectomy in acute brain oedema. - P. Christophis, A. Massah, U. Nestler and D. -K. Boeker (Dept. of Neurosurgery, Centre of Neurology and Neurosurgery, Justus-Liebig-University, Gießen, Germany).

To check the indication's criteria and to access the efficacy of decompressive craniectomy, thirty patients with posttraumatic oedema were investigated during the clinical course of posttraumatic phase. Their clinical status according to Glasgow Coma Scale (GCS) and clinical examination of brainstem reflexes (CBSR), intracerebral pressure (ICP), the findings of computer tomography (CT-scan) and the findings of evoked potentials (EP) were documented preoperatively. The clinical patient's outcome was evaluated according to the Glasgow Outcome Scale (GCS). The GCS-score was compared with the documented clinical, electrophysiological and CT-scan findings to verify the indication's criteria for craniectomy given in appropriate posttraumatic time to avoid irreversible brain damage. The findings of EP and CT-scan turned out to be the best predictors for good and also for bad outcome. EP and CT-scan findings also seem to indicate the best time for craniectomy. On the other hand the elevation of ICP (> 20 mmHg), low GCS-score, and marked changes of CBSR was associated in most cases with higher morbidity and mortality. The early surgical decompression should be carried out when indicated via EP-changes and CT-findings before critical elevation of ICP, marked changes of CBSR, and occurring irreversible brainstem damage.

Difference-mapping of visually evoked potentials (VEP) in children with generalized seizures. - D. Dralle, A. Portisch and J. Töller (Pediatric Hospital, Justus-Liebig-University, Giessen).

In conventional 19 channel VEP mapping we recently demonstrated a long lasting negative component with a latency of about 160 ms at the temporal leads in 15 of 23 children with generalized seizures whereas only 2 of 15 normal children showed this hyperreaction. The question was, whether additional visually evoked responses could be detected by difference-mapping. We therefore calculated the differences of VEP amplitudes between the corresponding electrodes of the two hemispheres and the difference-mapping was performed by linear interpolation. Three groups of children were compared: 1. patients with generalized seizures with (n=15) and 2. without (n=8) temporal hyperexzitability as well as 3. normal children without a hyperreaction (n=13) in the conventional maps. All children showed a first marked difference between the two hemispheres between 100 and 130 ms beeing negative at the left temporal leads, followed by a second negativity on the right side beginning at about 130 ms. This right sides reaction lasted much longer in group 1 patients than in the others. During the 400 ms of difference-mapping an alternation of the negative component between the two temporal regions was registrated three times in patients of group 1, four times in normals and five times in patients of the second group.

Oscillations in the EEG during anesthesia for rapid opiate detoxification. - S. Wolter, M. Hensel, C. Friedel, K. Böhler, U. Hartmann and W.J. Kox (Berlin Charité (CCM), Berlin, Germany).

While cerebral burst-suppression-pattern (BS) indicate a deep narcosis, we observed spindle oscillations in EEG. These fronto-central, mainly sinusoidal rhythms, with amplitude that waxes and wanes, appeared after narcosis induction with propofol in opiate-dependent patients undergoing rapid opiate detoxification. To investigate these oscillations, artefact-free 2.5 s epochs of this activation, which varies inter-individually, were selected from 18 patients. A spectral peak frequency of 14.1 ± 1.2 Hz and a peak power of 430 ± 210 pW were calculated. By means of Low-Brain-Electromagnetic-Tomography (LORETA) mainly the primary and secondary motor cortex (Brodmann area 6,4,31) were localized as spindle sources. Why motor cortex areas do not yield to BS (BS ratio: 0.62 ± 0.15), which are normally predominant, but instead temporarily show an intermittent beta-activity has not yet been sufficiently understood. Pfurtscheller described a post-movement beta synchronisation (14-18Hz) in alert volunteers and has renewed the discussion on a cortical "idling" mode of sensorimotor areas. Sterman found that movements always attenuated when they recorded an increased 12-15 Hz activity. He suggested that this rhythm (SMR) shows immobility and a common set of physiological changes in sensorimotor function, including reduced excitability in afferent and efferent pathways. In fact, Dueck reported a reduced excitability of spinal motoneurons after several boli of Propofol. Further studies are required to assess the importance of spindle-like oscillations focused at motor cortex areas during Propofol-induced regionally specific depression of neuronal activity.

Topography of late VEP components and spectral EEG in patients with benign rolandic epilepsy of childhood. - W. Skrandies and D. Dralle (Institute of Physiology and Department of Neuropediatrics, Justus-Liebig University, Giessen, Germany).

We studied 11 patients (7-15 years of age) with benign rolandic epilepsy of childhood. Spontaneous EEG and flash evoked potentials were recorded from 19 channels. Following visual stimulation, five of the patients displayed a late sustained component over centro-temporal scalp regions (mean latency: 194.8 ms). The occurrence of this component was related to the spectra of spontaneous EEG and clinical parameters. Significant topographical differences were observed in the spectra of the spontaneous EEG of patients with and without a visual N200 component. The effects were most evident in the lower alpha (7.5-9.5 Hz) and beta band (13-15 Hz) when temporal, parietal and occipital regions of the left and right hemisphere were compared. There was also a tendency that children without N200 displayed more hypersynchroneous activity in the spontaneous EEG than children with N200 activity. This suggests a protective role of focal interictal spike activity, and probably coincides with a benign prognosis of epilepsy.