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Functional Microstates and EEG Topography: The "Atoms of Thought". D. Lehmann (EEG-EP-Mapping-Labor, Neurology Dept., University Hospital, CH-8091 Zürich, Switzerland).

Multichannel EEG can be displayed as endless series of maps of momentary landscapes of potential distributions. Non-identical maps must have been generated by the activity of different neuronal populations. It is to be assumed that different map landscapes correspond to different steps/ modes/ weights/ contents of perception and cognition. Formal recognition of these "atoms of thought" is possible via data-driven adaptive segmentation of the map series into epochs of quasi-stable landscapes in the sub-second range (functional microstates). The microstates are embedded into macrostates defined by frequency domain characteristics. The functional significance of the different microstates (e.g., cognitive style or processing step) can be defined by studies of EEG during spontaneous mentation or of ERP after information input. Deviations from normal repertoires or normal concatenations (syntax) are seen in induced state changes (e.g., drugs) and in psychoses. The type of deviation (duration, state frequencies, types of states, sequences) describes brain mechanisms of cognitive and emotional disturbances.

Cognitive and age-related effects on brain electric microstates during reading. D. Brandeis*, D. Lehmann, Th. König, and M. Krause (Neurology Department, University Hospital, Zürich, Switzerland * Now at the Dept. of Child and Adolescent Psychiatry, Zürich, Switzerland).

Brain electric microstates during reading of different endings of sentences were measured via spatial ERP analysis in several studies. Adaptive segmentation identified a distinct microstate in the 240-350 ms time range, preceding the conventional N400. Its topography varied with linguistic factors and age. Young adults (N=17) had a transient left-lateralization of the negativity, which was replicated in a new study (N=12). Expected word endings evoked anterior negative maps, and unrelated word endings posterior negative N400-like maps. Maps to "wrong color" endings, which were semantically related to the expected color showed only small topographic differences from maps for "expected color" endings. Elderly subjects (N=15, mean age 65 years) showed a different pattern: The transient left-lateralization was absent, and the posterior negativity was delayed and attenuated to unrelated words, but not to "wrong" colors. Analysis of the map landscape demonstrates that age and linguistic context affect the brain microstates during reading. Only small delays occur with age for the earlier microstates. Age appears to alter specific microstates related to selected language processes, an effect which can not be explained by general slowing. (Supported by the Swiss National Science Foundation)

Are there any proofs for a supramodal concept representation? - An EEG probability mapping study. Astrid v. Stein, H.Petsche, O. Filz, P. Rappelsberger (Wien).

In 20 subjects of both genders the question was tested whether or not reproducible EEG-changes may be found if objects are presented in different ways: on the screen either as pictures (PI), or by presenting their names to be read (RE), or acoustically by calling their names (AC). Up to 40 objects were presented in these ways in random order for 2 s each and every 4-5s. Simultaneously the EEG was recorded from 19 electrodes with respect to averaged ear electrodes, digitized and processed. Significant changes of amplitude and coherence with respect to the averaged activity at rest were mapped. For all ways of presentation (PI, RE, AC) several regions were

found in which significant changes of coherence with repect to the activity at rest occurred. Common to all three ways of presentation was an increase of coherence in the lower beta band between T5-P3 and T6-P4, respectively, over the region of g.angularis. If the objects were presented verbally (AC, RE), an increasing temporo-parietal coherence was found bilaterally; the increase was only found on the right side, when pseudowords (without real content) were presented. With presentation of the pictures of the objects (PI) coherence increased only on the right side. These findings support the assumption that the region of G. angularis seems to have some significance for concept representation. The fact that pseudowords led to an exclusively right side coherence increase gives evidence for an additionally involved process of GESTALT analysis in the right angular region.

The influence of a well defined cognitive task on the brainelectric activity of children in the age between 12 - 14. Mientus, S. (Charite Center of Neurology) Rappelsberger, P. (University of Vienna, Neurophysiological Institute) Tembrock, G. (Humboldt-University of Berlin, Department of Behavioural Biology).

The changing of brainelectric activity induced by a sensomotoric task like learning a manual labyrinth was investigated with a group of 36 children in the age between 12 and 14 years. The children where devided into 3 subgroups by the help of a psychological behavioural questionaire. This questionaire containes 6 complexes of criteria to describe the personal ability of learning. The investigations where made with 19 electrodes placed on the scalp according to the 10/20 system and in reference to the linked earlobes. The impedances where 5 kohm or less. At first the raw data where transformed by the help of the fast fourier transformation. Afterwards the evaluation of data continues with an analysis of power, amplitude and coherence (based on cross spectral analysis). The aim of this investigation was to find out general and special influences of a defined learning process and its correlates. The so yielded results show that there is a significant relation between brainelectric activity and the combination of motoric activity with the task. Especially significant results where found for this method in an in-crease of theta-power in the right hemisphere in case of visuospatial activation. In general the percentage of alpha decreases while the children are involved of visuospatial activation but an increase in alpha-power was to be seen too. The results of the analyses of coherences lead to the conclusion that the more difficult that means the more complex the task the more significantly higher are the coherences.

EEG mapping during mental practice of motor skills. Hansen Ellen, Weiss T., Beyer L., Rost R. (Institute of Physiology, University of Jena, Teichgraben 8, 6900 Jena, FR Germany).

We have studied EEG in connection with mental practice, a form of psychoregulative procedure when a subject imagines its own performance of a given motor sequence not providing any real movement. MP is considered as a model of complex motor skills concerning information processing and motor control. We proposed that both general and specific activation processes during mental practice (motor imagination) may be describable by changes of EEG background activity over areas participating in these central nervous mechanisms. Significant power decreases in EEG background activity are demonstrated in different regions of both hemispheres during mental practice of motor skills in ten students. Diminution of alpha and theta power in occipital and parietal regions are interpreted as a participation of the visual and associative cortex in motor imagination. Repetition of motor imagination during one session involves more cerebral regions in the neurophysiological process, which appears in a significant decrease of theta, alpha, and beta1 power of the central and frontal areas, too. This may be interpreted as a specific and more pronounced activation of regions implicated in the motor system.

Real-time Analysis of EEG by a powerful multiprocessorsystem (MPS). Roscher, Güther (F.-von-Schill-Str. 15, O - 3037 Magdeburg).

The EEG is characterised by high dynamic in time and space. Powerful computers, special configured MPS can analyses this komplex signals in real-time. The presented MPS is a transputernetwork based on high performance communication links, connected with one or several PC/AT (386/486). The analysis of the EEG is carried out on the transputernetwork in two levels. The first level analyses each signal in one process, recognises the extreme values and the characteristic of each signal. The second level uses the patented method of virtual sources, to analyse the context between the signals on different channels. The MPS can classify and reconize each EEG-activity in less then 50 milliseconds. The results are presented on the screens of the PCs in real-time. The experimentator can mark the EEG-activities of interest and the MPS recognizes these activities to start a stimulus or other activities (store EEG-activities of interest). In this way we realize a new quality in psychophysiological experiments.

Segmentation of evoked potentials in the time domain - comparison between one and multi process models. H. Buchner, I. Ludwig, I. Radermacher, A. (Ferbert Department of Neurology, RWTH Aachen, FRG).

The EEG gives the opportunity of a high time resolution in functional brain research. Segmentation in time is necessary to identify different functional states of the brain. Different procedures for segmentation were developed on the basis of analog or parallel models of information processing; global field power, moving dipole, principle component analysis and multiple dipole analysis. These different procedures were compared using early median nerve SEPs. The global field power analysis revealed 3 peaks of field power leading to three sequential processes. The moving dipole solution separated three representations of activity in time and space. The principle component analysis and the multiple dipole analysis demonstrated 5 to 7 difference sources with overlapping activity in time. In the case of the early SEPs a multiple parallel process model corresponds physiology. In general, the principle component analysis can decide whether an analog or parallel process model should be used for segmentation.

Current Localization in the Brain obtained by Spatial Filtering of Magnetic Field Data. P. Grummich, H. Kober, J. Vieth (Dept. of experimental Neuropsychiatry, University of Erlangen, Germany).

For obtaining current localizations in the brain from magnetic field data measured outside the head commonly there is applied nonlinear optimization. In this one tries to change the location and strength of one or several sources until their fields approximate best the actually measured field. If the measured field is a superposition of the fields of multiple sources this algorithm often stops in wrong locations. There are localizing algorithms, which do not use optimizing and therefore do not have this kind of problems. We tested an algorithm, which projects the measured magnetic field data through a set of spatial filters. The output is for different voxels a measure for the current flowing there. Measurements were made of a phantom, of the spontaneous activity of a healthy volunteer (alpha rhythm) and of a patient having a right intracerebral cyst. The evaluation of the last measurement demonstrated, that the localizations obtained with spatial filtering are located for different times at different areas around the cyst. They are close to the cyst, even at times where the localization results obtained with optimization using a single dipole model were locates several cm apart from the cyst.

Clinical Application of movement-related neuromagnetic Fields. Kristeva R.[1], Walter, H.[2], U. Knorr[2], Steinmetz, H and Cheyne, D.[3]. (1 - Inst. Exp. Audiology, Univ. Münster, Germany, 2 - Neurol. Univ. Klinik, Düsseldorf, Germany, 3 - SFU, Burnaby, Canada).

The two largest components of the movement-related neuromagnetic fields of the brain are the motor field component (MF) and the movement-evoked field I (MEFI) component. The MF component most likely reflects the final corticospinal motor outflow and the MEFI local sensory input from the moving part of the body. Using the moving dipolemodel, an attempt was made to use it for a clinical purpose: non-invasive mapping of central sulcus. The strategy of this approach stems from the results from our previous studies indicating that the MF is localised in the precentral gyrus and MEFI in the postcentral gyrus and indicating that both components show homuncular organisation. Neuromagnetic fields were recorded from 3 right-handed subjects in a Bereitschaftspotential-paradigm for three different movement conditions:foot, 2nd finger and mouth. The estimated dipole locations were projected on corresponding structural MRI data. The three-dimensional projection onto MR structural data shows reliable pericentral locations.

A New Method: Simultaneous Registration of PET-Images and EEG-Brain Mapping. Boettcher M. ([1]), Riedel R.-R.([2]), Pegel C. ([3]), Kreiser H. ([3]), Herdering W. ([3]), Kirchner U. ([3]), Strohbusch U. ([1]). (1) I. Institut of Experimental Physics, University of Hamburg, Luruper Chaussee 149, D-2000 Hamburg 50. 2) Department of Psychiatry, RWTH Aachen, Pauwelstraße 30, D-5100 Aachen 3) BTZ Beschleuniger- und Tomographie-Zentrum Hamburg, Luruper Chaussee 149, D-2000 Hamburg 50).

In the past PET images and EEG brain mapping were taken only time shifted. The new method presented here allows simultaneous registration of PET images and EEG signals: For the PET-scans the PENN-PET 240 H (UGM Medical Systems Inc.) is used and the images are reconstructed in 64 slices with 2 mm spacing. The EEG's are registrated with a CATEEM-system (12 bit A/D converter with battery supply, 16 + 1 channels, sampling rate: 512 Hz/channel, ECG, Pro-Science GMBH). The A/D converter is placed close to the electrodes. The digitized EEG-signal is transferred to the server by glassfibers. Fifteen minutes prior to the injection of the 18 Fluor-deoxy-glucose (7.8 mCi) the EEG-recording is started and continued during the total examination time interval together with the PET-images which are taken in a multiframe mode with a time-binning of about five minutes. The correlation of the glucose metabolism and the EEG data in the corresponding ROIs of the brain will be presented and discussed.

Space-oriented, data-driven segmentation of event-related map series into microstates distinguishing nouns from verbs. T. Koenig and D. Lehmann (EEG-EP Mapping Lab, Neurology Department, University Hospital, CH-8091 Zurich, Switzerland).

In order to identify brain electric microstates which distinguish between word classes, 20-channel ERP map series evoked by (written) nouns and verbs in 17 normals were analyzed. In the first nine subjects, data-driven optimization of window size for map series segmentation into optimally discriminating microstates was done to formulate hypotheses for testing the second eight subjects.

Each map landscape was assessed by the location of the maximal and minimal potential. The grand mean of these descriptors was computed for each time point over runs, conditions and subjects. Stability of landscape over successive times was recognized by the descriptors remaining within spatial windows. The data-driven window size was determined by optimal discrimination between conditions, i.e.: computing all segments for all window sizes that yielded more than three segments, testing all for probability of chance difference between conditions, computing Fisher's mean probability for each window size, and accepting the window size with best mean probability. Six microstates were found at optimal window size.

Three map descriptors showed differences between the word classes at $p<.10$ in the first nine subjects, and one of the three hypotheses was confirmaed in the second eight subjects: a more right location of the negative extreme potential for nouns than for verbs during the microstate (segment) between 532-616 msec latency, indicative of word class-dependent activity of different neuronal populations.

Neurometric diagnostic classification and subtyping in psychiatry. E.R. John (Brain Research Laboratories, NYU Medical Center, 550 First Ave., New York, N.Y. 10016).

Neurometric analysis provides over a thousand quantitative features of the resting EEG and almost an equal number of ERP features. These features are subjected to transformation for Gaussianity, age-regression and, finally, Z-transformation relative to a normative database. The result of this evaluation is to provide a data matrix, in which the columns represent anatomical regions, the rows represent different electrophysiological features, and each entry represents the probability that the corresponding region-feature lies within normal limits. The data from one row of this "Z-matrix" can be used to construct an interpolated topographic map. These maps are useful in diagnosis of certain conditions, especially where focal lesions may be involved. However, psychiatric disorders are characterized, not by focal lesions, but by complex disturbances of brain organisation which constitutes a pattern of deviations from normative values. Such patterns can be recognized by multiple discriminant functions. The set of normative equations can be considered to reflect a set of simultaneous constraints which are satisfied when the functional neuroanatomical systems of the brain are in homeostatic balance. Such balance can only be achieved when neurochemical transmitters are in proper availability. We can consider the Z-matrix to define a multidimensional signal space. A patient can be represented as an abnormality vector which leaves the (normal) origin and extends into the signal space, with a length indicating the severity and a direction indicating the nature of the disease. Hypothetically, the direction implicitly contains information about the nature of the underlying neurochemical imbalance. It has been possible to construct many discriminant functions which can accurately classify patients with different DSM-III-R diagnoses. More important, using cluster analysis we have been able to show the existence of various subtypes within each major diagnostic category. Since these subtypes have distinct neurometric profiles, it is theoretically consistent with our hypothesis above that we are obtaining increasing evidence that members of different subtypes respond to different treatment. We believe that the selection and evaluation of optimum treatments, especially with drugs, will be the major future value of neurometric methods.

Reference Free Analysis of Spontaneous EEG in Aging and Dementia of Alzheimer Type using FFT-approximation. T. Dierks, R. Ihl, L. Frölich, K. Maurer (Dept. of Psychiatry, Univ. of Würzburg, Germany).

A frequently used method to analyze the spontaneous human EEG is the FFT. FFT-power results are, however, dependent on the choice of reference when recording the EEG. Recently methods have been developed to overcome this problem (e.g., FFT-approximation), these methods allow to draw pathophysiological conclusions regarding brain function. The aim of the present study on brain electrical activity was to quantify differences from normal brain function caused by dementive processes in dementia of Alzheimer type (DAT) using the method of FFT-approximation. The major findings were: elderly healthy subjects showed a more superficially located beta-activity of higher magnitude compared to younger adults. In DAT-patients, we demonstrated a shift of alpha- and beta-activity towards frontal brain regions. The amount of this shift correlated with the degree of dementia. Furthermore DAT-patients had higher magnitudes in the slow frequency range, correlating with the severity of dementia, and lower ones in the alpha- and beta-range compared to age-matched controls. The application of an adequate neurophysiological method allows an interpretation of brain function similar to other functional imaging methods like CBF, SPET, and PET.

Haldol-DecanoatR-responsivity in schizophrenics - measured with computerized topographical electroencephalometry. Schellenberg, R., Dimpfel, W., Hofmann, H.-C., Milch, W.+ and Woelk, H. (+Pro Science Private Research Institute, Kurt-Schumacher-Strasse 9, 6307 Linden 2, + Psychiatric Hospital Giessen, Licher Strasse, 6300 Giessen).

Computerized topographical electroencephalometry (CATEEM) is a useful instrument for quantitative estimation of neuroleptic responsivity in schizophenics. Depot-neuroleptics normally are given in 4-weeks-intervalls to get a stabilized clinical state. In 13 paranoid-hallucinatoric schiophrenics (ICD 295.5) treated with Haldol-DecanoatR quantitative EEG was derived to characterize the functional state of the haloperidol treated brain. The 16-channel qEEG was derived and after on-line FFT plotted as power spectra and brain map. 20 minutes after i.m.-injection of 2 ml (100 mg haloperdol) Haldol-DecanoatR the functional state was calculated again and plotted as time-coures of power changes in each frequency band. The alpha-1-power (7-9.5 Hz) increased selectively and highly significant ($p<0.002$) at all derivations. For all alpha-1-power values the 90%-confidence intervall limits of the medians have been above the 100% reference values. Most prominent alpha-1-power increases were measured right parietotemporal with increases of 179% at T6 and 173% at P4.The method is valid to estimate the changes of the functional state of the schizophrenics to optimize neuroleptic therapy.

Organic psychosyndrome in old age: The acceleration of the slowed computerized EEG as a basic necessity for the clinical efficacy of nootropics. E. W. Fünfgeld (Med. Fakultät der Universitäten Marburg und Saarbürcken/Homburg und Schloßberg Klinik Wittgenstein, W-5928 Bad Laasphe).

Changes in transmitter systems, reduced cell membranes fluidity, disturbance of the blood brain barrier, calcium overloading, stress factors, free radicals, exitotoxines and aberrations in protein metabolism are regarded as a disturbance of a neuro-biochemical variety of functions (A.Carlsson, 1989). Functional changes were seen in the clinical orientated cartography of the frequency distribution in use since 5 years (Dynamic Brain Mapping, System Itil, N.Y.) especially in the 20-frequency band analyses. 3500 patients were investigated simultaneously with the conventional and computerized method, some patients with follow-up till more than 50 investigations. Broad spectrum nootropics as Ginkgo biloba (EGB 761), Phosphatidylserine, Piracetam, Pyritinol and Zinc are used. More focused acting drugs as e.g., calcium channel blockers, memantine, -lipon acid and native phosphorus have been used as well. Patients who showed a trend to faster frequencies and/or a reduction of the Theta Anteriorisation (first Mapping program) were categorized as responders. As a consequence the therapy with this drug was continued. Only in those patients who showed these reactions - depending on the mode of application after hours, days or weeks - a clinical amelioration in drive, assiduity and concentration capacity was observed. In some cases delirious states disappeared. Case examples will be presented.

Reduction and Classification of EEG-Data of the Computer-aided Topographical Electroencephalometry in Special Clinical Studies. L. Rölz, S. Wolter, E. Schöntube (Bereich Medizin (Charite) der Humboldt-Universität zu Berlin; Klinik für Aänsthesiologie und Intensivtherapie Schumannstraße 20/21 PF 140; O - 1040 Berlin).

The progress in the validation of cerebral functional conditions and in the further development of computerized polygraphical monitoring systems demands the application of reduction methodes neurophysiological and clinical more channel data and their automatically classification. The method in the reduction of more channel data consists in the production of parameter distributions of EEG-data of the "Computer Aided Topographical Electroencephalometry", how for example the absolute and relative power in the frequency bands DELTA, THETA, ALPHA1, ALPHA2, BETA1 and BETA2, the median and edge frequencies and further parameters. The results of these investigations were subjected to cluster analysis. The classification of EEG-parameters as indicators of cerebral functional conditions were effected by means of the discriminant analysis. First results from the classification of EEG-data with the help of neural computer networks will be presented. The practibility of these methods was demonstrated by means of the reduction and classification from clinical data
- in a normstudy of EEG-data of the Computer Aided Topographical Electroencephalometry (CATEEM) by 100 healthy probands and
- in a study of the influence from psychometrically test methods on the EEG by 52 healthy probands.

Clinical applications of EEG - Mapping in Neurosurgery. Helmut Bartsch (Department of Neurosurgery, University of Regensburg, 8400 Regensburg, Franz-Josef-Strauß Allee 11, Germany).

We now have experience with about 500 mapping procedures of spontaneous EEG activity in neurosurgical patients since the year 1988. In detail we examined 103 patients with malignant brain tumors, 57 patients with meningeomas, 42 patients with cerebrovascular disease and 35 patients with head injuries as well as 23 patients

with other diagnoses. All patients with meningeomas showed up with a characteristical map, that means a double peak activity in spectral analysis. In contrary, the conventional EEG showed a focus in only 80% of our patients. The situation in malignant brain tumors is quite different. Brain mapping showed no correlation between functional and morphological alterations in 78% of our patients even regarding the adequate hemisphere. On the other hand, EEG - mapping shows a reliable interhemispheric difference in the background - as well as in the alpha - activity in 85% of our patients with deep seated vascular malformations compared to 40% of our patients with abnormalities in conventional EEG. EEG - mapping is an excellent tool for functional monitoring in the intensive care unit in terms of hypoperfusion, ischemia or vasospasm. Mapping in patients with head injuries presents the possibility to detect and analyze minor functional disturbances in its topographic distribution which can not be seen on conventional EEG.

Scalp Topography of Pain-Related Evoked Potentials. Treede, R.-D. (Institute of Physiology, University Hospital Eppendorf, Martinistr. 52, D-2000 Hamburg 20, FRG).

Several stimulus modalities have been used to study evoked potential correlates of pain perception. We prefer radiant heat pulses, because they activate nociceptors without concomitant activity in mechanoreceptors. The aim of this study was to differentiate activity of the somatosensory cortex from unspecific cognitive potentials. Small spots within the innervation territory of the radial nerve were stimulated with laser radiant heat pulses (20 ms, 15 W, 20 mm2). The EEG was recorded from 14-27 electrodes evenly distributed over both hemispheres. The vertical EOG was recorded for artefact control. Scalp maps were computed from instantaneous amplitudes using a surface spline algorithm and were displayed as contour plots. The largest amplitudes occurred at about 240 ms (vertex negativity) and 390 ms (vertex positivity). Stimulation of the left hand and the right hand yielded similar topographies. The maxima were more posterior than those of corresponding SEP components following electrical nerve stimulation. A mid-latency negativity with a peak latency of about 170 ms was recorded contralateral to the stimulated hand. Its scalp maximum was clearly lateral of the primary somatosensory area. Late pain-related evoked potentials projected more posterior than ordinary SEPs. With brief laser stimuli, a mid-latency component N170 was identified that may arise in the secondary somatosensory cortex.

Electrical Brain Mapping of Responses to Visual Lateral Half-field Stimulation in Comparison to Full-Field Stimulation. Taghavy A., Hamer H. (Univ.-Dept. of Neurology; 8520 Erlangen; Germany).

Application of electrical brain mapping of pattern reversal visual evoked potentials (PVEPs) to the well-known "paradoxical lateralisation" due to half-field stimulation may help to further its analysis. PVEPs were derived from 16 locations on the scalp (int. 10/20-system) against linked mastoids in 13 healthy male students (23-32 y) during 3 sessions of binocular stimulation: I: full-field stimulation; II: right half-field; III: left half-field. The distribution of the amplitudes of the resulting potentials (N80, P100 and N140) were measured and "mapped" (including "increment mapping") from peak to baseline. The statistical comparison between the "maps" in condition II and III revealed highly significant differences in N80 peaks of mainly O1, P3 and T5 vs O2, P4 and T6 ($p < 0.001$) in sense of the "paradoxical lateralisation". The P100 amplitudes behaved similarly but by far less prominently so (T5 vs T6 only: $p < 0.01$). N80 arose ipsilaterally to the stimulus mainly in the temporal and occipital electrodes remaining there, whereas the P100-potential started in the contralateral occipital electrode extending to the ipsilateral electrode and reaching there its maximum. Accordingly, N80-potential, which has recently been shown to be due to stimulation of retinal periphery, is mainly responsible for "paradoxical lateralisation". Furthermore, the algebraic sum of half-field potentials did not differ significantly from the topography of the components of the separately recorded full-field response.

Stereoscopically evoked cortical potential fields and their relation to perception. W. Skrandies and M.-J. Chiu (Institute of Physiology, Justus-Liebig-University, 6300 Gießen, FRG).

The cortical fusion of binocular horizontal disparity in dynamic random-dot stereograms (RDS) results in depth perception. We investigated the scalp topography of RDS evoked brain activity in 15 healthy subjects. Stereoscopic checkerboards were presented on a monitor, and horizontal disparities were changed at different temporal rates between -15′ and +15′. The corresponding percept was the movement in depth of a checkerboard pattern. For comparison we used a conventional checkerboard stimulus with contrast borders, and all stimulus characteristics were identical (mean luminance, wavelength, retinal extension, reversal frequency). The potential fields recorded over the occipital brain areas displayed significant topographic differences between the RDS and contrast condition while component latencies were not significantly different. In addition, the strength of the potential field was much higher for contrast than for stereo stimuli suggesting that more neurones respond synchroneously to contrast changes than to disparity

changes. Stimulation frequency related brain activity was obtained at all temporal reversal frequencies, however, at high frequencies subjects reported not to perceive any movement in depth. A mean threshold of 4.81 Hz was found. Stimulus related brain activity could be recorded in all subjects far below the subjective threshold. The relation between stimulus frequency and potential field strength was different for stereo and contrast stimuli. In addition, for RDS patterns this functional relation showed significant differences between the left and right hemispheres. These data suggest that information processing in the primary visual cortex needs not to be followed by the perception of stimulus changes. In addition, our results show that different neuronal populations in the human visual cortex respond to contrast and stereo stimuli.

Topography of the VEP N3/N4 in Normals and Aphasics Comparative Study with Lexical Decision. N. Logemann[1], J. O'Neill[1,2,3], and H.-H. Janzik[1] (1Neurologisches Rehazentrum, Bonn-Bad Godesberg, Germany; 2VA Wadsworth Medical Center, Los Angeles, USA; 3UCLA Brain Research Institute, Los Angeles, USA).

VEPs were derived during a lexical decision task in aphasic patients and healthy readers. Stimuli comprised: content words (common nouns), function words (e.g., conjunctions), pseudowords (pronounceable nonwords), and nonsense words (impronounceable nonwords), presented in isolation on a video monitor. The task was to identify each stimulus as a word or a nonwords by means of a YES/NO keypress. Aphasic syndromes were classified by means of the Aachen Aphasia Test. RT and errors for the various subject groups and stimulus categories were measured and compared. EPs were derived from 19 10/20 sites and evaluated topographically. Results for normals confirmed the literature. N4-amplitude was proportional to stimulus semanticity. The N4 to word stimuli was maximall right parietally or right occipito- temporally. Nonword stimuli evoked a "Frontal Negativity". The N3 was maximum in the left temporo-occipital region to all stimulus categories. In motor aphasics, patients with a selectively disordered phonological word recognition strategy, the N3 was missing. The N4 of these patients was of equal amplitude to all stimulus categories and was clearly lateralized to the left. In sensory aphasics, patients with a selectively disordered semantic word recognition strategy, both the N3 and the N4 were present, but pathologically frontalized.

Clinical Course and Topography of the N3/N400 in Aphasias. N. Logemann1, J. O'Neill[1,2,3], and H.-H. Janzik1 (1Neurologisches Rehazentrum, Bonn-Bad Godesberg, Germany; 2VA Wadsworth Medical Center, Los Angeles, USA; 3UCLA Brain Reasearch Institute, Los Angeles, USA).

In an earlier study using semantic word stimuli, we found typical constellations of the N300 and N400 components of the VEP in healthy subjects and in aphasics, including characteristic N3/N4-topographies for aphasic subgroups. The question then arose, whether the pathological irregularities in the N3/N4 of language disordered patients would persist or whether they would change in the course of language therapy? therefore, we investigated 14 aphasics undergoing language therapy once a week for an average of 8 weeks. Of the 14 patients, 6 achieved a significant improvement in reading comprehension during therapy. In each case, there was a considerable increase in RT to word stimuli, as well as better performance on the AAT. For 8 patients, no significant improvement in reading comprehension was achieved during language therapy. Patients who didn't improve exhibited a remarkable stability in their N3/N4 components, as well as in RT and AAT scores, over the entire 8 weeks. Patients with clearly improved reading comprehension demonstrated a significant increase in N3-amplitude and a highly significant increase in N4-amplitude. Pathological topographies of the N3/N4 tended towards partial restitution of the normal pattern.