

EBBS workshop
HEMISPHERIC SPECIALISATION
AND
COMPENSATORY STRATEGIES
IN BRAIN DISORDERS

28th February - 3rd March 1999
Monte Verita, Ascona, Switzerland

ABSTRACTS

Organizers:

Stephanie Clarke, *University of Lausanne, Switzerland*

Marianne Regard, *University of Zurich, Switzerland*

Anna Grabowska, *Nencki Institute, Warsaw, Poland*

Sponsored by:

European Brain and Behaviour Society

Swiss National Science Foundation

Swiss Academies of Natural Sciences and Medicine

Centro Stefano Francini (Swiss Federal Institute of Technology)

Nencki Institute, Warsaw, Poland

Supported by:

Polish Neuroscience Society

Swiss Society for Neurorehabilitation

Swiss Society for Neuroscience

LECTURES

COMPENSATORY STRATEGIES IN BRAIN DISORDERS FROM A HISTORICAL PERSPECTIVE

M. Wiesendanger*Laboratory of Motor Systems, Department of Neurology, University of Berne, Inselspital BHH-M130, CH-3010 BERNE, Switzerland*

In my introductory talk, I will trace historical roots that led to present concepts of functional recovery. In the late 19th and early 20th Century, theories necessarily rested mainly on descriptive studies of functional restoration. However, it seems worthwhile to realize to what extent some of the theories were near to present day thinking. It was well recognized that dynamic processes leading to partial recovery followed acute lesions of the brain. Among them were Neurologists (Brown-Séquard, von Monakow, Riese), Biologists (e.g. Bethe, "der Vater der Plastizitätslehre"), and experimental Psychologists (e.g. Lashley). Unfortunately, much energy was lost by some of them in using their arguments of plasticity mainly to fight against the localizationists (those defending the strict "Zentrenlehre"). Making abstraction of these polemics, one can detect a rich material of old observations and deductions that are highly pertinent to modern views of functional restoration after brain lesions. I will particularly emphasize Lashley's *principle of motor equivalence* that has to do with the amazing flexibility of the organism to adapt to lesions with new behavioral strategies, an important factor that was somewhat neglected during the recent course of exciting discoveries in the domain of *structural plasticity*.

Relationship of Hemispheric Specialisation to Corpus Callosum Morphology

Joseph B. Hellige

Department of Psychology, University of Southern California, Los Angeles, CA 90089-1061, USA

A new study explored the relationship of structural and functional aspects of hemispheric specialisation to the size of the corpus callosum as assessed by MRI. Structural measures included total cortical volume (TCV), the length of the Sylvian fissures (SF) and area of the planum temporale (PT) as well as the midsagittal area of regions of the corpus callosum. In replications of previous studies, there was a negative correlation between TCV and the area of the CC splenium as well as a negative correlation between the magnitude of SF asymmetry and the area of the CC splenium. Functional aspects of asymmetry were assessed by visual tasks that required processing of pronounceable nonword trigrams or comparison of letter names and by auditory tasks that required processing of verbal or emotional information. The number and size of relationships between functional hemispheric asymmetry and CC size were small. Nevertheless, the magnitude of the right-ear advantage for the verbal dichotic listening task decreased as the size of the splenium increased. In replication of an earlier study, this occurred because right-ear performance declined as splenium size increased whereas left-ear performance was unrelated to splenium size. The magnitude of the left-ear advantage for an emotion-identification task increased as splenium size increased, suggesting that a larger splenium may be related to reduced left-hemisphere relative to right-hemisphere performance regardless of which hemisphere is dominant for the task. Results of the present study and others will be discussed in light of hypotheses about the diversity of excitatory and inhibitory consequences of interhemispheric interaction.

HEMISPHERIC COMPLEMENTARITY AND THE ROLE OF INTERHEMISPHERIC INHIBITION

T. Landis*Département des Neurosciences cliniques et Dermatologie, Clinique et Policlinique de Neurologie, Hôpitaux Universitaires de Genève, 1211 Genève, Switzerland.*

Hemispheric specialisation is the major difference between humans and monkeys. A physiological mechanism to explain the development of this specialisation could be topographic interhemispheric inhibition. If that was the case, complementarity of function between the two hemispheres should be demonstrable. I will show clinical evidence for complementarity of function between the two cerebral hemispheres and try to demonstrate the dynamics of inhibitory interaction between the two cerebral hemispheres which might be at the origin of hemispheric specialisation.

LATERALITY AND EMOTION: AN INTERACTIVE REGULATION**M. Regard***Neuropsychology Unit, University Hospital CH-8091 Zürich, Switzerland*

Clinical and experimental findings will be presented illustrating the interactive regulation between laterality and emotion. Results of tachistoscopic studies from normals and patients with unilateral lesions show that the two hemispheres process the same information, but they do so in complementary ways. This finding and the observation that kind of affective change displayed in patients relates to side and site of lesion, show that functional laterality plays an important role in the regulation of emotions. On the other hand, the finding of systematic associations between affective state and emotional meaning attributed to a stimulus with cognitive performance suggests that cognition is regulated by emotions. Thus, there is conjectural evidence that cognition and emotion are inseparable and that the topically organized systems, especially the two hemispheres, which are dominantly involved in cognition, play also a major role for the regulation of emotional behavior.

L5

**VISUAL ILLUSION AND HEMISPHERIC SPECIALISATION:
SEX RELATED EFFECTS OF BRAIN DAMAGE**

A. Grabowska, A. Nowicka, O. Szymańska

*Nencki Institute of Experimental Biology, Department of Neurophysiology
and Central Hospital of the Medical Academy, Warsaw, Poland*

The aim of this study was to investigate the effect of unilateral brain lesions on Mueller-Lyer (M-L) illusion in the two sexes. Patients with left hemisphere (LH) and right hemisphere (RH) damage and control subjects participated in the experiment. They inspected series of M-L patterns in which the shaft with out-going fins was gradually shortened until it induced a perception opposite to the original illusion, that is, the shaft with out-going fins appeared to be shorter than the shaft with in-going fins. The subjects' task was to decide, on each trial, whether the variable shaft was longer or shorter than the other one. The point where the judgements changed from one category to the other was established using the Spearman distribution method for determining psychophysical thresholds, and was considered the measure of the strength of the illusion. The higher the value of the threshold, the stronger the illusion. Our results showed sex-related hemispheric asymmetry in subjects' susceptibility to the M-L illusion, i. e., both LH and RH lesions in females, but only RH lesions in males resulted in an increase of the strength of illusion. Moreover, males with LH lesion as well as controls partially corrected the illusory perception with practice, while both LH and RH females and RH males did not show this learning effect. The results provide further support for the hypothesis that the brain hemispheres are organised differentially in men and women.

L7

Hemispheric Cooperation During Mental Rotation

Norman D. Cook, S. Tsuda and Lorenz Leumann

Faculty of Informatics

Kansai University

Osaka, Japan

Mental rotation is a classic "right hemisphere task," but previous clinical, EEG and brain scan studies have suggested an active role of the left hemisphere in at least some kinds of mental rotation. Using Metzler and Shepard-type geometrical objects, we have studied mental rotation in left- and right-handed subjects - both as tachistoscopic tasks and free-vision tasks. In both versions, subjects were required to make a same/different judgment concerning the similarity of two geometrical objects, one of which was presented to the left and one to the right visual field. The task is easily performed under free-vision, and shows faster responses in right-handers ($n=29$) when stable (upright) objects are presented to the left visual field and askew objects are presented to the right visual field. The reverse result was obtained in 13 left-handers. We have previously speculated that this is a result of a preference for the "manipulation" of information in the left hemisphere of right-handers, while the right hemisphere holds "reference" information (and vice versa for left-handers). To test this idea in a controlled visual field design, we presented the same complex objects drawn in white at 150 msec in a dark room on a dark screen - thus allowing subjects sustained "viewing" of the retinal after-image. The influence of handedness, gender, visual field and direction of rotation will be reported. The split-field technique with relevant information presented to both visual fields is of interest because a correct response requires hemispheric cooperation - presumably over the corpus callosum. With both hemispheres actively involved in the task, hemisphere differences can be detected by manipulating the nature of the information that each hemisphere initially receives. In this case, the geometrical objects were presented either as gravitationally-stable, upright objects that required no rotation for comparison with another object, or they were presented in a gravitationally-unstable view with enough occlusion of the object that mental rotation was natural and desirable in order to make the comparison.

CREATIVITY AND DELUSIONS: LATERALITY ASPECTS

L6

P. Brugger

*Department of Neurology, University Hospital Zurich, CH-8091
Zurich, Switzerland (pbrugger@npsy.unizh.ch)*

We attempt to integrate findings from two different areas of neuropsychological and neuropsychiatric research. (1) Laterality studies in patients with schizophrenia have indicated absence of a left hemisphere dominance for language, (2) Priming studies in normal subjects described a relative dominance of the right hemisphere for establishing specifically "remote" associations. Taken together, these two findings imply that delusions (specifically ideas of reference) may arise from an overreliance on unfocused, right hemisphere semantic processing characteristics. We propose that, if expressed to a moderate degree, reliance on these characteristics will allow a creative style of thinking; verbal creativity can be defined as the establishment of non-standard, "indirect" associations. We present data from divided visual field tasks with normal subjects differing in their inclinedness to endorse delusion-like beliefs ("schizotypy"). High schizotypy scores were found to be associated with a more pronounced right hemisphere language participation and a preference for remote over close associations.

WHAT ARE VISUO-SPATIAL NEGLECT ?

L8

J.C. Marshall

*Neuropsychology Unit, University Department of Clinical
Neurology, Radcliffe Infirmary, Oxford OX2 6HE, UK*

The title is not a typographical error: this paper will discuss whether unilateral left neglect really is a syndrome (albeit a highly variable one), or whether it is a simply convenient label for a miscellaneous collection of signs that have little or nothing to do with each other (other than being consequences of large right hemisphere lesions).

I shall argue that the question can only be answered on theoretical grounds: namely, is there a well-defined normal cognitive system that, when lesioned, would give rise to the signs traditionally associated with the term 'visuo-spatial neglect'. Evidence will be presented from studies of normal spatial cognition, from patients with unilateral lesions, and from functional brain imaging (PET and fMRI).

L9 Pathways of interhemispheric transfer in normal and callosal-sectioned human subjects: Evidence from functional brain imaging. C.A. Marzi¹, D. Perani², G. Tassinari¹, A. Colleluori¹, A. Maravita¹, C. Miniussi^{1,4}, E. Paulesu³, and F. Fazio^{2,3,5}. ¹Dept. of Neurological and Visual Sciences, Univ. of Verona, Italy. ²Inst. Neurosci. and Brain Imaging, CNR, Milan, Italy. ³IRCCS H. San Raffaele, Milan. ⁴Dept. of Exp. Psychology, Oxford Univ., UK. ⁵Dept. of Nuclear Medicine, Univ. of Milan.

We studied with PET the intra- and interhemispheric pathways subserving a simple manual visual reaction time task, using the well known Poffenberger's paradigm. Normal subjects and one patient with a complete section of the corpus callosum underwent rCBF measurements under conditions of lateralized tachistoscopic visual presentations. We found that on average crossed hand/hemifield conditions, i.e. those requiring an interhemispheric transfer of information, yielded a longer RT than uncrossed conditions and that this difference was dramatically larger in the callosal-sectioned patient. In normal subjects the cortical areas selectively activated in conditions requiring an interhemispheric transfer were different from those requiring only an intra-hemispheric route. In the former, most activation foci were anterior to the VCA plane, whereas in the latter there was a prevalent parietal and occipital activation. This shows that a simple model whereby the cortical pathways are similar in the intra- and the interhemispheric condition with an additional callosal route for the latter is probably wrong. Moreover, these results show that the interhemispheric exchange of information necessary for a simple visual RT takes place through the callosal connections between the parietal cortices of the two hemispheres. The pattern of activation related to the uncrossed and crossed conditions was markedly different in the split-brain subject in whom interhemispheric transfer might have taken place via his intact anterior commissure. At present a similar paradigm is being studied with functional MRI.

L11 Role of feedback connections in figure/ground discrimination
J. Bullier, J.-M. Hupé, P. Girard and A.C. James, *Cerveau et Vision IN-SERM 371*, 18 avenue du Doyen Lépine, 69675 Bron Cedex France

The monkey visual cortex is composed of many reciprocally connected areas. Connections between these areas can be classified as feed-forward and feedback by anatomical methods. We addressed the question of the functional role of feedback connections. To understand the role of feedback connections from area MT/V5 to lower areas of the monkey visual cortex, we inactivated this area by cooling with cryoprobes inserted in the superior temporal sulcus of anesthetized and paralyzed macaque monkeys. Single units were recorded in areas V1, V2 and V3. The responses of neurons to a light bar moving on a textured background was decreased by MT inactivation. This effect was strongest when the contrasts of the bar and background were similar. Inactivating MT also decreased the suppressing effect of a moving background on the response to the bar. This effect was only observed for low visibility stimuli. These results suggest that feedback connections serve to amplify and focus activity of neurons in lower order areas and that they are important in the differentiation of figure from ground, particularly in the case of low visibility stimuli. We also reversibly inactivated with pressure ejections of 100 mM GABA a small region of V2 in anesthetized and paralyzed macaque monkeys. Extracellular recordings of neurons were performed in the region of V1 in retinotopic correspondence with the inactivated region in V2. We measured the responses of V1 neurons to flashing bars displayed in the center and the surround of their receptive fields. We also recorded the latencies of the responses to these stimuli. To our surprise, the latency was delayed for some V1 neurons when V2 was inactivated. Response decreases were also observed in the first 50 ms. A similar effect was observed for V1-V2-V3 neurons tested with a bar flashed in their receptive field when MT was inactivated. These results suggest that feedback connections are recruited very early for the treatment of visual information, probably through a fast (magnocellular) pathway. This fast feedback may play an important role in the context of local/global comparisons. Neurons in area V1, which are activated early, have very small receptive fields, allowing high spatial precision discriminations. Data from psychophysics show that global information can be treated before or at the same time as local information. Higher visual areas, with their larger receptive fields, have access to more global information. We suggest that these areas provide early global information to V1 neurons through feedback connections.

L10 STRUCTURAL PLASTICITY AND FUNCTIONAL RECOVERY IN THE ADULT CNS AFTER NEUTRALIZATION OF MYELIN-ASSOCIATED NEURITE GROWTH INHIBITORS

M. Thallmair, G.A.S. Metz, W.J. Z'Graggen, Ch. Wenk, A.G. Iania and M.E. Schwab.
Brain Research Institute, University of Zurich and Swiss Federal Institute of Technology Zurich, Winterthurerstr. 190, CH-8057 Zurich, Switzerland.

The monoclonal antibody IN-1 neutralizes the myelin-associated neurite growth inhibitors NI-35/250 (Nogo A) and promotes regeneration in the adult mammalian CNS. The role of these inhibitors in structural plasticity, however, is less clear. Here we investigated whether mAb IN-1 can enhance lesion-induced sprouting of the corticospinal tract (CST) after either a unilateral pyramidotomy (exp. 1) or a unilateral cortical lesion in adult rats (exp. 2). At the time of the lesion, antibody-producing hybridoma cells were implanted into the cortex. The unlesioned and the lesioned CST (exp. 1) or the remaining CST (exp. 2) were examined in the brainstem and the spinal cord using the anterograde tracer biotin dextran amine. Animals treated with control antibodies showed only little plasticity, whereas IN-1 treatment significantly increased sprouting of the unlesioned CST fibers into the denervated half of the spinal cord and resulted in a bilateral projection to the red nucleus and pons. The new projections are anatomically specific. Further, we investigated functional recovery using specific behavioral test (food pellet reaching, rope climbing, gridwalk, sticky paper test). We show that the anatomical plasticity is paralleled by a high amount of functional recovery. Such a high degree of lesion-induced plasticity and behavioral recovery is normally only found following lesions in the immature CNS.

L12 MULTIPLE INTERHEMISPHERIC PATHWAYS IN MAN
S. Clarke

Division de Neuropsychologie & Institut de Physiologie, University of Lausanne, Switzerland

Recent evidence from human tracing studies suggests that heterotopic interhemispheric connections are numerous and widespread. Monosynaptic interhemispheric input has been demonstrated from the right inferior temporal cortex to Wernicke's and Broca's areas (Di Virgilio and Clarke 1997) and from the right calcarine region to posterior parts of the temporal and parietal cortex, including the angular gyrus (Clarke et al. 1995). These findings speak in favour of parallel interhemispheric pathways involved in visuo-verbal processing.

The human anterior commissure is believed, by extrapolation from data obtained in macaque monkeys, to convey axons from the temporal and orbitofrontal cortex. Tracing studies in 6 adult cases confirmed this origin, but showed that axons from the occipital convexity and possibly central fissure and prefrontal convexity cross the midsagittal plane in the anterior commissure (Di Virgilio et al. 1998).

The presence of multiple interhemispheric pathways may account for partial interhemispheric transfer following callosotomy. A 23 year old right-handed man with a lesion of the posterior corpus callosum half was presented with stimuli within his left hemifield; he was greatly impaired to read letters, or to name pictures or colours (tachistoscopic presentation), but reported accurately on coherent dot motion (controlled eye movements). The activation pattern to apparent motion stimuli was studied with fMRI in this patient and was found similar to that of 20 age-matched normal controls. Apparent motion stimuli activated strongly striate and extrastriate cortex. When apparent motion stimuli were presented to one hemifield only, the calcarine region was activated only contralaterally whereas the regions on the occipital convexity bilaterally.

L13 **ANATOMICAL INVESTIGATION OF THE NEURAL SUBSTRATES OF RESIDUAL VISION IN THE HEMISPHERECTOMIZED MONKEY**

Maurice Ptito

Université de Montréal, Canada and University of Aarhus, Denmark

Hemispherectomized patients still demonstrate residual visual functions in their blind hemifield that have been ascribed to extrageniculostriate pathways. We used the vervet monkey as a model for human hemispherectomy in order to characterize anatomically the neural substrates underlying this residual vision. We examined the retina of monkeys who underwent a total hemispherectomy at various post-natal ages with a survival period of four years. Our results showed that transneuronal retrograde degeneration in the retina is inversely correlated with age at the time of the lesion, the cell loss being maximal (70%) when the lesion is induced within the first 4-6 months of life. This cell loss is confined to the central retina and soma size measurements indicate that medium size retinal ganglion cells (PB) are mostly affected. The Lateral Geniculate Nucleus ipsilateral to the lesion undergoes severe retrograde degeneration although still present. It is largely reduced in volume and layers are still visible. Terminals, following intraocular injections of neural tracers, are found in the appropriate layers, which show very little projection neurons and heavy gliosis. The ipsilateral Superior Colliculus however is remarkably well preserved showing a very slight reduction in volume, a minimal cell loss and little gliosis. These results support our recent Brain Imaging studies (PET and fMRI) on hemispherectomized patients which suggest the contribution of the remaining hemisphere to residual vision in the blind field probably via the colliculo-pulvinar route.

L15 **Learning, brain plasticity and recovery of function**

Cornelius Weiller

Klinik für Neurologie, FSU Jena, Germany

Brain functions are localised either in distinct brain regions or in extended, connected, overlapping and highly parallel processing networks, the modular parts of which may substitute each other. Localisation is not unchangeable, even the adult human brain retains a "plastic" potential. These plastic changes represent a uniform reaction pattern of the brain and are either the result of an active learning process mediated by use or represent a passive adaptation to environmental stimuli, without any obvious teleological reason or without any improvement of function.

We can differentiate between learning effects resulting in changes in the anatomical somatopy of the primary cortices within one or across extremities and functional effects in higher order cortices within or across modalities. E.g. movement programmes for the hand can be used by the foot and can be learned by the other hand, which gradually builds up its own representation.

Such learning processes are the basis of the pattern of reorganisation occurring after brain injury. Recent studies showed a correlation between learning induced reorganisation and improvement of altered function. This reorganisation can be influenced by a psychological-behavioural motor therapy, by repetitive proprioceptive stimulation, by logopedic training or by drug intervention.

SPEECH, MOTOR AND SENSORY REORGANIZATION IN HEMISPHERECTOMIZED PATIENTS.

Jean-Guy Villemure,

Service de Neurochirurgie, CHUV, Lausanne, Switzerland.

Hemispherectomized patients offer an opportunity to study brain plasticity. Despite hemispherectomy, these patients benefit from a potential for speech improvement and useful motor and sensory function of the affected limbs. Clinical observations, PET scan activation, magnetic stimulation studies have shed some understanding on the underlying mechanisms allowing these functions. We report the following observations based on our experience with hemispherectomy in 66 patients. Speech (center) may transfer from one hemisphere to the other in cases of acquired pathology occurring at different age. It is commonly recognized that the earlier the transfer occurs, the better will the quality of speech be. We have observed, from patients suffering from Rasmussens' encephalitis, operated at 11 and 14 years old, that the potential for speech transfer existed even at these ages. Speech improvement can also be observed after hemispherectomy in congenital conditions, as a result of the control of contralateral epilepsy which interfere by homotopic inhibition, the development of speech. Motor and sensory functions after hemispherectomy are subserved by secondary motor and sensory cortical and sub-cortical areas located contralaterally to the diseased hemisphere. The presence of voluntary motor movements of the fingers and hand appears to be related to the time at which the brain insult occurs; a congenital etiology for the brain pathology is usually identified and reflects the early injury occurring prior to the final synaptic organization of the motor system. The time during brain development at which the insult to the hemisphere occurs appears to be primordial in potential recovery of speech and motor function.

PATTERNS OF RECOVERY OF SPATIAL HEMINEGLECT AFTER RIGHT HEMISPHERE DAMAGE

G. Vallar

Università degli Studi di Milano-Bicocca, Facoltà di Psicologia, Milano, and IRCCS, S. Lucia, Roma, Italy

In recent years, a number of different, though related, sources of evidence have shown that spatial hemineglect, a multi-faceted cognitive disorder, more frequent and severe after damage to the right cerebral hemisphere, is on the one hand a long-lasting disability, which may persist for months and even years after the acute stage of the cerebral accident, but may be ameliorated, on the other hand, by a variety of procedures. These include specific and lateralised short-lasting (typically in the range of minutes) stimulations of different sensory systems (vestibular, proprioceptive-somatosensory, optokinetic), which have temporary effects on many manifestations of the neglect syndrome, and long-lasting (typically in the range of weeks) specific rehabilitation procedures. The functional and neural bases of these different treatments, their effects of spatial reference frames and the patients' strategies, and their interactions with patterns of spontaneous recovery are discussed.

General references:

Vallar, G., Guariglia, C., & Rusconi, M. L. (1997). Modulation of the neglect syndrome by sensory stimulation. In P. Thier & H.-O. Karnath (Eds.), *Parietal lobe contributions to orientation in 3D space* (pp. 555-578). Heidelberg: Springer-Verlag.
Zoccolotti, P. (1999). Visual, visuospatial and attentional disorders. In G. Denes & L. Pizzamiglio (Eds.), *Handbook of clinical and experimental neuropsychology* (pp. 875-885). Hove, East Sussex: Psychology Press.

L14

L16

L17 COMPENSATORY PATHWAYS AFTER LEFT FRONTAL DAMAGE: BEHAVIORAL, ANATOMICAL, AND FUNCTIONAL IMAGING (PET, FMRI) STUDIES

Howard Rosen and Maurizio Corbetta

Department of Neurology, Radiology, Anatomy and Neurobiology, Washington University School of Medicine, St. Louis

Clinical observations and previous neuroimaging studies have suggested that areas of the right hemisphere may be important for the recovery of aphasia. Other data, however, have indicated that recovery may be mediated by restoration of normal metabolic activity in language centers of the left hemisphere. Our approach to the issue of recovery of function and neuronal plasticity after brain injury has been driven by physiological results in normal subjects indicating that several word retrieval/generation tasks activate the left frontal operculum (including Brodman 44 and 45). We have therefore used the same tasks to probe for potential compensatory language pathways in patients with lesions confined to the frontal operculum. **Methods:** A group (n=6) of chronic (at least 6 mos post-stroke) expressive aphasics, whose lesions were confined to the left frontal operculum, were scanned with PET and fMRI during Stem completion (generate a single word after being cued by the visual presentation of a 3-letter word stem, e.g. couple to COU) and fixation point. The task was performed overtly in the PET scanner and covertly in the MR scanner. Appropriate group of controls were also run. **Results:** Average and single subject analysis demonstrated in the aphasic group abnormally high (i.e. higher than normal) activity in the right frontal operculum during speech production. The two subjects with the best residual language function also showed some activity in the left frontal lobe. PET and fMRI data were in good agreement. Significant BOLD and blood flow responses were obtained from regions with decreased baseline blood flow (diaschisis) suggesting that this tissue is responsive to physiological stimulation. **Discussion:** The demonstration of abnormally high activity in the right frontal operculum of recovered aphasics is consistent with previous reports of right hemispheric switch during word generation in Wernicke's aphasics, and clinical observations. However, a role for the right hemisphere in behavioral recovery remains to be demonstrated.

POSTERS

PA1 INTRA- AND INTERHEMISPHERIC DISSOCIATION OF LANGUAGE COMPONENTS IN FUNCTIONAL MAGNETIC RESONANCE IMAGING

A. Schnider^{1,3}, K. Gutbrod¹, A.C. Nirrko¹, C. Ozdoba², N. Degonda¹, D. Heinemann¹, G. Schroth²

^{1,2}University Department of Neurology and Neuroradiology, CH-3010 Bern

³Clinique de Rééducation, Hôpital Cantonal Universitaire, CH-1211 Genève

Background: Although language functions were among the first to be ascribed a specific location in the human brain, there is a debate to recent cognitive neuroscience which of the language regions are linked to which language components. In this study, the specific role of Broca's and Wernicke's area in phonological, semantic, and syntactical information processing was assessed

Method: We studied healthy, right (N=14) and left-handed (N=9) subjects. Four distinct language tasks of phonological, semantic and syntactical processing were tested using functional magnetic resonance imaging.

Results: (1) Increasing complexity of the language task was associated with increasing areas of brain activation. The most complex task (sentence) led to activation of both Broca's and Wernicke's area; (2) In 13/14 right-handers there was almost exclusive left-hemispheric activation. In left handers, activation was either left-hemispheric (6 subjects), right-hemispheric (2 subjects), or bilateral (1 subject); (3) Phonological processing activated Broca's area, semantic processing activated Wernicke's, and syntactical processing activated both Broca's and Wernicke's area; (4) In a strictly right-handed subject we found a partially crossed language dominance: phonological and semantic processing led to left hemispheric activation, syntactical processing led to right hemispheric activation.

Conclusion: Our data show that in the individual, different language components can be dissociated with respect to localization and intensity of activation within the language dominant hemisphere. Furthermore, in some individuals language components may even be anatomically segregated between the hemispheres.

Supported by Swiss National Science Foundation, Grant # 40038-044052/1.

H₂¹⁵O PET EVIDENCE OF SUBLIMINAL PERCEPTION AND UNCONSCIOUS RETRIEVAL

PA2

K. Henke, E. Turi Nagy, B. Weber, T. Berthold & A. Buck
Dept. of Neurology and PET Center, University Hospital Zürich, Switzerland

Do brain areas with a known specialization for some cognitive computation show activation when the same cognitive computation takes place outside the subjects' awareness? We recorded the performance and regional cerebral blood flow (rCBF) while subjects were encoding and retrieving material with or without their awareness. The cognitive processes studied were face encoding and retrieval, lexical and semantic word processing, establishing semantic associations between words and faces, and the retrieval of these semantic associations. At encoding, portraits of bald individuals were subliminally or supraliminally presented, either alone or with their written profession. For control, a subliminal phantom was presented. At retrieval, the previously supra- or subliminally shown faces (or new faces in the control condition) were presented with the instruction to guess the profession of the person (with key press responses). Subliminal presentations were below the objective awareness threshold, i.e. forced-choice responses after subliminal presentation were at chance and there was no behavioral indication of unconscious processing at any time. Nevertheless, the rCBF indicated that i) subjects had unconsciously processed the presented faces and words up to a semantic level, ii) that they unconsciously remembered the face-profession association at retrieval, and iii) that the same neocortical areas were active during unconscious as during conscious processing, yet at a lower level of activation.

PA3 Brain mapping of bilateral visual interactions in children

J. Steger, K. Imhof, R. D. Pascual-Marqui (1) H-Ch. Steinhausen and D. Brandeis

Department of Child and Adolescent Psychiatry, University of Zurich, Switzerland, (1) The KEY Institute, Zurich

Interactions between the cerebral hemispheres were studied with functional brain mapping of unilateral and bilateral visual stimulus processing. We examined sixteen children for distinct forms of interhemispheric interactions in a reaction time tasks with unilateral and bilateral go and no-go trials. Brain mapping of event-related potentials (32 channel ERPs) was combined with continuous force measurements. The visual evoked potential (VEP) maps were tested for bilateral interactions of latency and amplitude. In addition, interhemispheric transfer was studied using VEP source localisation with dipole and LORETA models. Bilateral stimulation in children yielded longer RTs but shorter VEP map latencies than the unilateral conditions, indicating that bilateral speeding of VEP latencies occurs despite bilateral slowing of performance. The VEP maps during unilateral and bilateral stimuli presentation revealed several forms of interhemispheric interactions in the same, early time range. Topographic source analysis of the unilateral VEPs indicated a transition from contralateral to ipsilateral visual cortex activation between the P1a and P1b microstate, consistent with interhemispheric transfer at around 100 ms. Bilateral VEPs were smaller than the summed unilateral VEPs in the P1a, P1b and N1 microstate, indicating that inhibitory interhemispheric interactions both precede and follow interhemispheric transfer.

Supported by the Swiss Nat. Sci. Found. (31-43790.95)

PA5 CENTRAL SULCI ASYMMETRY IN PAIRS OF MZ TWINS

A.M. Argenti¹, I. Bonan², G. Le Goualher^{3,4}, C. Barrillot⁴, A. Zouaoui¹, D. Hasboun^{2,5}, C. Marsault², A. Evans³, M. Duyme¹.

¹Department of Genetic Epidemiology, INSERM U155, University of Paris 7, Case 7041, 75005 Paris, France. ²Department of Neuroradiology, ³Department of Neurology, Pitié-Salpêtrière Hospital, University of Paris 6, 91 Bd de l'hôpital, 75013 Paris, France. ⁴McConnel Brain Imaging Center, MNI WB-2B, McGill University, Montréal, Canada, H3A 2B8. ⁵Department Signals and Images in Medicine, University of Rennes I, 35043 Rennes, France.

The cerebral central sulci, seats of the sensori-motor cortex, are localized on both sides of the longitudinal fissure. Although they are facing one with each other in a symmetric way, they present a non identical morphometry. A measurement technique on MR images of brains using a 3 D software was developed to quantify the central sulci lengths at the surface and in-depth. This technique was applied by 2 different operators in MZ twins in order to evaluate the influence of environmental factors on morphometry and asymmetry of these sulci. The data analysis gave high Interoperator Correlation Coefficients (ICC) for the surface lengths (mean value of 0.94). A weak but significant ICC (from 0.57 to 0.73 for raw data) was found between homologous sulci in pairs of twins. On the contrary, the ICC for asymmetry indices (equal to $(\text{Right-Left Lengths})/[(\text{Right-Left Lengths})/2]$) were not significant. Hence, if the central sulcus morphometry is in part genetically influenced, the results show that non genetic factors are nonetheless important in their development. To improve our research, we used a software developed at the MNI (SEAL: Sulcal Extraction and Assisted Labelling) to extract a parametric representation of the central sulci on the same MR images. A modal analysis was applied on these data. It gave coherent results with the first study. In addition, this second work assessed the performance of both the measurement techniques.

HEMISPHERIC ASYMMETRY AND CORPUS CALLOSUM

A. Dorion¹, M. Chantôme¹, A. Zouaoui², C. Marsault², M. Duyme¹, C. Capron¹.

¹INSERM U155, Laboratoire d'Epidémiologie Génétique, Université Paris VII, Tour 16, Case 7041, 2 place Jussieu, 75005 Paris, France. ²Département de Neuroradiologie, Université Paris VI, Hôpital Pitié-Salpêtrière, 91 Bd de l'hôpital, 75013 Paris, France.

Previous *post-mortem* studies (Aboitiz et al., 1992a, 1992b) have shown an inverse link between asymmetry in perisylvian areas and the size of a specific segment of the Corpus Callosum (CC): the isthmus of males. The purpose of this research was to study *in vivo* the link between hemispheric asymmetry and the size of the total CC in 35 right-handed subjects (16 males, 19 females; mean age: 24.9 ± 3.9). MRI was performed for each subject on a 1.5 T signa unit (General Electric). The volumetric acquisitions were obtained with a spoiled gradient recalled acquisition at the steady state sequence (GRASS). Parameters of the sequence were 23/5/35/1; field of view was 22 cm and the matrix size was 256x192. Area of right (RH) and left hemispheres (LH) were obtained on sagittal plan and area of the CC was obtained on a mid-sagittal plan. Index of hemispheric asymmetry was $|(LH-RH)/[(LH+RH)/2]|$. There was a negative correlation between the absolute value of hemispheric asymmetry and the size of the CC in males ($r=-0.55$, $p=0.03$) but not in females ($r=-0.20$, $p=0.42$). As Aboitiz et al. (1992b) these finding suggest a sex dependent decrease in interhemispheric connectivity with increasing lateralization.

Aboitiz, F., Scheidel, A.B., Fisher, A.B., Zaidel, E. (1992a). Individual differences in brain asymmetries and fiber composition in the human corpus callosum. *Brain Research*, 598, 154-161.

Aboitiz, F., Scheidel, A.B., Zaidel, E. (1992b). Morphometry of the sylvian fissure and the corpus callosum, with emphasis on sex differences. *Brain*, 115, 1521-1541.

Epigenetic constraints for the evolution of hemispheric asymmetry

Markus Fritzsche M.D., Soodstr. 13, 8134 Adliswil, Switzerland

By setting us apart from our closest relative, the chimpanzee, biased mother-child interaction appears to play a central role in the evolution of human brain asymmetry. This field-study on lateralized mammation shows a natural preference for the left breast in eight right-handed mothers belonging to the San in Eastern Namibia. Sustained ocular countertorsion represents a crucial mechanism for the stability of the infant's gaze relative to the mother's facial contour, whereby the mother's face in the foreground tends to screen off the infant's right visual background. As a result, the infant's visual field is split into a left-sided background flow and a right-sided fixed foreground once it feeds on the left. In this study a total of 187 observations of 8 right handed mothers show a left-sided breast-feeding preference of 71%. In infants the waking periods usually coincide with breast-feeding. As a consequence, the salient stimuli of background optical flow are consistently biased to the infant's left visual field. In addition, trend analysis shows an inverse correlation between the infant's age and breast preference. Thus, the younger the infant, the more often it feeds on the left. This occurs at a critical stage of neuronal plasticity during which the infant's immature optical system transmits lower spatial frequencies. During breast-feeding, the optical flow might, therefore, account for the priming and preference for lower-frequency processing of the right hemisphere. Once grown up, the offspring would also tend to cradle on their left due to the acquired right hemispheric preference for lower frequencies, posture, positioning, and visuo-spatial attention to the left, thus transmitting lateralized behaviour across generations. Freed from these spatial constraints the developing left hemisphere might subsequently process information preferentially in one dimension generating categorial information and speech.

PA7 **Are there different semantic systems in the left and the right brain? Evidence from ERPs in lateralized semantic priming.**

J.M. Annoni*, A. Khateb*, C. Michel, and T. Landis. Functional Brain Mapping Laboratory and *Neuropsychology Unit. Clinic of Neurology. University Hospital. CH-1211 Geneva.

We have recently shown using a categorical judgment task of word pairs presented tachistoscopically to the left (LVF) and to the right visual field (RVF) that semantic facilitation could be occur via both hemispheres. However, it is not known if such facilitation involves different networks depending on the visual field of presentation. In this study, our aim was to determine the time course of semantic processing by means of event-related potentials (ERPs) using a semantic judgment task of words pairs in lateralized presentations. Multi-channel ERPs were recorded from 15 healthy subjects while judging mentally whether words were categorically related or not. The results show that following a differential activation (for ERPs to related and unrelated pairs) as a function of the visual field up to ~ 400 ms, the pattern of activation became similar between the two visual fields but difference is then observed between related and unrelated conditions. The two potential maps characterizing this later period were present in all conditions. However, their time course of occurrence differentiated both conditions (related-unrelated) and visual fields. These results suggests that semantic categorization involves the same neural network in LH and RH presentation. This offers an argument against a different semantic organization in both hemispheres and suggest rather a difference in the time course of activation of a single "semantic system".

PA9 **BRAIN LATERALITY: THE EFFECTS OF EMOTIONAL PRIMING ON LETTERS MENTAL ROTATION**

K. Karádi¹, J. Kállai², I. Bende¹, T. Szepesi¹, I. Szabó¹

¹Institute of Behavioral Sciences, Medical School of Pécs, Szigeti út 12.H-7623, Hungary; ²Department of Psychology, University of Art and Science, JPTE, Ifjúság u.6. H-7624, Hungary

The aim of the present work is to examine the interaction of emotional and spatial functions (mental rotation). 44 subjects were recruited (24 male and 20 female) from different faculties at the University of Pécs participating in the experiment. The mean age of the total sample was 22 years (range: 19-31 years). Subjects in the mental rotation test had to discriminate mirror images. They had to make decisions about printed letters F, G, P, L, R, rotated by computer in 0,30,50,90,120,150,180 degrees, by whether if there were the normal letters or their mirror pictures can be seen. The schedule consisted three experimental blocks. The first 70 trials were the practice period. In this period there was no emotional priming. The next experimental block was divided into two parts: in the first one a permanent negative emotional bias was created by a word which involved negative emotion (*death*). The word appeared in the middle of the screen for 800 milliseconds. The time between words was 3000 milliseconds. The consonant letter in different rotating degree appeared immediately after the priming word. The second part was the same as the first one but the emotional priming was different. In the second part, a permanent positive emotion was created with word "*happiness*". The program measured the reaction time to the alphanumeric characters and the number of mistakes in the emotional blocks. According to our assumption as a result of positive and negative emotional priming such selective lateral hemisphere functions can be mobilised that depending on the emotional priming intensity, help or prevent the processes of mental rotation of spatial information. The statistical analysis showed that the negative emotional priming causes significant deceleration in cognitive process at degrees 50,90,180 in the whole population. We did not get significant differences between two trials in case of male, whereas in the case of female the positive priming showed significant acceleration at 90 and 180 degrees. It can be seen from the results that the effect of emotional priming shows differences both in the whole population and in gender respect.

PATTERN LEARNING AND GENERALIZATION ACROSS THE VISUAL FIELD PA8

M. Jüttner, I. Rentschler

Institut für Medizinische Psychologie, Universität München, Goethestr. 31, D-80336 München

Learning and generalization behaviour of human observers with respect to compound Gabor signals was tested at foveal and extrafoveal retinal positions. Applying a supervised learning paradigm subjects were alternately trained and tested to assign 15 Compound Gabor signals into three predefined pattern classes. Training and testing occurred either at the same or different retinal sites. Classification performance was analyzed in terms of a probabilistic classification model (Rentschler, Jüttner and Caelli, 1994, *Vision Res.*, 34, 669-687) which allows inferences about structure and dimensionality of the internal representations acquired during learning. It was found that, for unfamiliar stimuli, there is a distinct asymmetry in performance with respect to the visual hemifield in which the signals were learned: Patterns presented in the left hemifield were much faster learned and better generalized to other retinal positions than those learned in the right hemifield. However, if the observers were familiarized with the patterns in foveal view before they switched to the extrafoveal conditions the lateralization effect was much less pronounced. Together these results indicate a functional hemispheric specialization concerning the formation of pattern classes underlying object recognition.

ATTENTIONAL FACTORS VERSUS DICHOTIC EXTINCTION IN A PATIENT WITH A PARTIAL CORPUS CALLOSUM LESION PA10

E. Mayer, & A. Pegna

Neuropsychological Unit, Geneva University Hospital, Switzerland.

The possible relation between verbal and musical extinction in dichotic tasks, and the role of attentional factors have been studied in a patient with a lesion localized in the posterior part of the trunk of the corpus callosum. Dichotic listening tests consisted of verbal and musical tasks, with or without a warning signal in one ear which served as an attentional cue. *Tasks without attentional cue*: The first dichotic verbal task (V1) was composed of pairs of 56 words, 10 trios of digits and 12 trisyllabic sentences. Subject was instructed to repeat the words he had identified in both ears. The first dichotic musical task (M1) was composed of melodies for children arranged in 24 pairs. The patient was asked to point to drawings representing each melody. In the second musical task (M2), two novel melodies were presented simultaneously to each ear, followed by a set of 4 binaural tunes. PD was asked to say which of the melodies had been heard previously. *Tasks with attentional cue*: 24 pairs of bisyllabic nouns selected from task V1 were used in V2. Following the binaural word, an auditory signal warned the patient which ear was to be attended to. The attended ear was presented with either the same word or a different one, whereas the other ear was always presented with a distractor. PD was asked to tell the examiner every time the same word reappeared. In M3, the same 8 melodies as in M2 were used in a procedure identical to V2. Using dichotic tests with or without attention orienting cues, results show: total extinction of the left ear for verbal stimuli and a right-ear advantage for musical stimuli; a disappearance of the lateralization effect for both types of stimuli when attention was oriented to a given ear. These results suggest that the corpus callosum plays an important role in allocating attention between hemispheres.

PA11 VERBAL AND GESTURAL APHASIA IN A DEAF PATIENT

J. Buttet Sovilla, S. Ohayon, G. Assal

Division autonome de Neuropsychologie, CHUV Lausanne, Suisse.

Studies of acquired aphasia in congenitally deaf patients are rare. We had the opportunity to examine and follow up the recovery of both verbal and gestural communication in a patient who presented a global aphasia due to a left parieto-temporal haemorrhage at the age of 54 years old. She was deaf since the age of 3 as a sequel to a meningo-encephalitis. Our data are consistent with the notion of a supramodal left hemisphere processing for language, as it is usually demonstrated in the literature. However little is known about the evolution of the different modalities and it was our privilege to be able to provide documents about recovery of both modalities at the same time.

DISTINCT ROLES OF THE RIGHT AND LEFT HEMISPHERES IN AUDITORY LOCALISATION: A STUDY ON 25 PATIENTS WITH UNILATERAL BRAIN DAMAGE

A. Bellmann^{1,2}, S. Clarke^{1,2} & G. Assal¹

¹Division Autonome de Neuropsychologie, Nestlé-CHUV, ²Institut de Physiologie, UNIL, Lausanne, Switzerland

Deficits in auditory localisation have been described after right as well as left unilateral lesions (or hemispherectomies). There is no consensus about eventual hemispheric specialisations for that function. Some authors observe similar deficits after right or left damage, while others emphasize the role of the right posterior regions.

We studied auditory localisation in the azimuthal plane with fused sound images generated by binaural stimuli delivered through earphones. Spatial positions were simulated with difference in interaural intensity (DII) or with interaural time difference (DIT).

Thirteen patients with a right hemispheric damage (RHD) and 12 with a left hemispheric damage (LHD) were tested. Three main findings emerge from this study:

- i) 50% of the RHD were severely impaired on the DIT test. Two patients located all the stimuli on the midline, 2 transposed left-sided stimuli to the right hemi-field, and 3 could not discriminate between positions within one hemi-field (left as well as right).
- ii) None of these profiles were found among the LHD group. Five patients had a mild deficit restricted to the right hemifield.
- iii) The DII test lead to results similar to the DIT test in the LHD group.

By contrast, the 'spectacular' profiles observed in RHD patients with the DIT procedure were not encountered when spatial positions were simulated with DII.

These results lead to 2 main conclusions: first, the left and the right hemispheres are differentially involved in auditory localisation; second, DIT and DII are processed by separate systems. The left hemisphere appears to process auditory stimuli located in the *controlateral hemi-field*, whatever cue (DIT or DII) is used to compute the spatial position. The right hemisphere would be *specialized in the DIT analysis* and process the auditory targets coming from *the whole azimuthal plane*.

PA12

PA13 Hemispheric asymmetries in episodic memory before and after selective amygdalohippocampectomy.

V. Treyer, B. Weber, H.G. Wieser and M. Regard
Dept. of Neurology, University Hospital Zurich, Switzerland

We report the results obtained from memory assessments of 97 patients who underwent unilateral selective amygdalohippocampectomy (AHE) as a surgical treatment of pharmacotherapy-resistant mesial temporal lobe epilepsy (MTLE). The Rey auditory verbal learning (AVLT) and Rey visual design learning (VDLT) tests were applied to assess the verbal and non-verbal aspects of episodic memory. Neuropsychological testing was carried out in the course of presurgical evaluation and three months after surgery.

Results: Presurgically, the patients suffering from left MTLE showed a significant decrease in performance only in the verbal free recall when compared with right MTLE patients. No differences between these two patient groups were observed in non-verbal recall as well as in verbal and non-verbal learning and recognition. Postsurgically, left MTLE patients showed a significant decrease in verbal learning and recall performance. No differences were observed in non-verbal memory scores. Right MTLE patients showed no significant change in verbal and non-verbal test performance.

Summary: Nonverbal memory performance (VDLT) discloses no differences between left and right MTLE patients as well as between pre- and postsurgical assessment. Postsurgically, only left MTLE patients show a significant decrease in verbal memory scores (AVLT). As shown in previous studies, verbal memory seems to be affected only in left MTLE patients after AHE. Furthermore, non-verbal memory does not decrease after right and left AHE.

CROSSED APHASIA - A CASE STUDY -

Mile G. Vuković

Faculty of Defectology, University of Belgrade, Yugoslavia

PA14

The term *crossed aphasia* was introduced by Bramwell (1899) in order to describe either aphasia in a left-handed person who suffered a left hemisphere lesion or aphasia in a right-handed person who suffered a right hemisphere lesion. These patients are rare, and incidence ranges from one to two percent of all aphasics. Some authors reported that it is difficult to classify the language symptoms in crossed aphasia into one of the classical syndromes.

This article presents detailed neuropsychological testing and CT brain scan in 24-year-old left-handed man with aphasia who suffered a left hemisphere lesion associated with brain injury. The results of language function examination have shown the classical type of conduction aphasia manifested by severely disturbed repetition, anomia, mild impairment of auditory comprehension and fluent but paraphasic speech. Besides, the patient had attention and problem solving deficits, as well as mild impairment of non-verbal memory. By contrast, general intellectual ability and visuospatial skills were intact. The paper deals with the nature of language and cognitive disorders in relation to the functional hemispheric asymmetry.

PA15 **Short-term memory and aphasia: implications for rehabilitation planning**

Krzysztof Jodzio*, Karolina Zacharczuk, Wioleta Taraszkiewicz
University of Gdansk, Institute of Psychology, Pomorska 68, 80-343 Gdansk (Poland), and Rehabilitation Center of Gdansk, Szpitalna 36, Dzierzazno, 83-300 Kartuzy (Poland)*

The aim of the study was to determine the nature of short-term memory decline in patients with aphasia during rehabilitation. Fourteen patients with left hemisphere damage and aphasia (LHD+), 11 patients with left hemisphere damage without aphasia (LHD-), and 15 persons with right hemisphere damage (RHD) participated in the study. Subjects accomplished an auditory-verbal memory task (list of words), as well as a series of visual memory tasks including graphic patterns, real objects and pictures. In each part of the examination the recognition memory paradigm was used. Presentation (acquisition) and recognition (recall) conditions in memory task for objects were different, while in the memory task for pictures were consistent. Both between-groups and between-tasks (memory for objects vs memory for pictures) comparisons were conducted. Results revealed that patients with LHD+ performed the auditory-verbal memory task much worse than those with LHD- and RHD. The groups did not differ with regard to any visual memory measurements. However, LHD subjects' performance profile in the visual tasks suggested, regardless of the presence of aphasia, a better memory for sensory rather than meaningful features of the stimulus. Thus, left hemisphere seems more conceptual than perceptual in the visual domain. The most prominent amnesic symptoms occurred following left fronto-cortical lesion of the brain. The contribution of memory assessment to the therapy of aphasia is discussed.

BATTERY OF NEUROPSYCHOLOGICAL TESTS FOR THE ASSESSMENTS OF LANGUAGE DISORDERS IN RIGHT-BRAIN-DAMAGED PATIENTS. PRELIMINARY RESULTS PA16

E. Lojek (1), M. Skotnicka (2), K.L. Bryan (3)
(1) Faculty of Psychology, University of Warsaw, Stawki5/7, Warsaw, Poland. (2) Central Hospital of the Medical Academy in Warsaw, Poland. (3) Crawley Hospital, West Green Drive, Crawley, West Sussex, Rh11 7DH, UK

The Right Hemisphere Language Battery (RHLB) by Bryan (1995) was adapted for designing a set of tests for the assessment of language disorders in right-hemisphere-damaged (RHD) individuals. The set comprises of the Metaphor Picture Test, the Written Metaphor Test, the Inferential Meaning Test, and the Lexical Semantic Test. Thirty-six RHD, 15 Left hemisphere damaged (LHD) without aphasia and 30 control (C) subjects took part in the investigation. All tests significantly differed between the RHD and C groups. No significant differences were noted between the LHD and C group, except for the Inferential Meaning Test. The quantitative performance of the tests was different in all the groups. Results of the study also indicated important role of the right frontal lobe for the appropriate appreciation of humour and making inferences.

PA17 **THE ASSESSMENT OF EMOTIONAL AND LINGUISTIC PROSODY IN RIGHT HEMISPHERE DAMAGED PATIENTS**

Emilia Lojek (1), Krystyna Rymarczyk(2)
(1)Faculty of Psychology, University of Warsaw, Stawki 5/7, Warsaw, Poland.(2) Nencki Institute of Experimental Biology, Polish Academy of Science Department of Neurophysiology, 3 Pasteur Street, 02-093 Warsaw, Poland.

Many authors have suggested that right hemisphere damage (RHD) can lead to two types of prosodic disturbance: emotional (affective) and linguistic. These components of speech were usually investigated separately, what yielded contradictory results. We present the first Polish experimental version of neuropsychological test battery for the estimation of both aspects of prosody in RHD patients. That battery consists of several tests requiring comprehension and expression of various aspects of affective and linguistic prosody.

1. Affective prosody comprehension tests: a/ Judgement of positive and negative intonation of semantically neutral sentences. b/ Estimation of adequacy of prosody with reference to semantic content. c/ Discrimination of sentences containing either the same or different emotional intonation. d/ Naming of emotions expressed by intonation.
2. Affective prosody expression tests: a/ Repetition. b/ Reading. Both tests contain expressions in which affective intonation is congruent with semantic content.
3. Linguistic prosody comprehension tests: a/ Discrimination of lexical stress (*Literature*, vs *literature*). b/ Discrimination of emphatic stress (*winter* starts in December, vs winter starts in **December**). c/ Discrimination of linguistic intonation (e.g. declarative vs interrogative sentences).
4. Linguistic prosody expression tests: a/ Repetition. b/ Reading. In both tests emphatic stress and linguistic intonation is assessed.

Results of a pilot study on RHD patients and control subjects will be presented.

SUSCEPTIBILITY TO THE SUBJECTIVE CONTOUR ILLUSION IN UNILATERALLY BRAIN DAMAGED PATIENTS. PA18

Anna Nowicka, Anna Grabowska
Nencki Institute of Experimental Biology, Department of Neurophysiology, Laboratory of Psychophysiology, 3 Pasteur Str., 02-093 Warsaw, Poland

Contours perceived in the absence of physical gradients of stimulation have been called subjective contours. The possible role of various brain regions in the formation of that illusion has been still unclear. The present research addressed that issue.

Twenty seven patients with the left hemisphere lesion, 23 patients with the right hemisphere lesion and 18 control subjects were presented with a series of subjective contour configurations of the Kanizsa type. The series consisted of 6 configurations for which the length of inducing elements, i. e., notches was gradually increased. In the first configuration notches were very short (either no or just a slight subjective contour illusion), in the last configuration they were pretty long (strong illusion). Subjects inspected each configuration just once and they were asked to describe all figures they could detect. The strength of illusion was determined as a number of configurations in the series which produced illusory perception. The results indicate that subjective contour illusion diminished due to brain lesions. That diminution did not depend on the localization of brain lesion: neither anterior vs. posterior nor frontal/temporal/parietal comparisons showed any significant differences. However, a lateral effect associated with subjects' gender was observed: in female patients, both left and right hemisphere lesions resulted in weaker subjective contour illusion whereas in male patients, only right hemisphere lesions resulted in lower susceptibility to that illusion. Our results suggest that: (i) subjective contour illusion is a complex phenomenon and many brain structures are involved in its formation (ii) the left and right hemisphere may play a differential role in the subjective contour illusion formation in the two sexes.

PA19 **OLFACTORY PROCESSING IN SCHIZOTYPY**
 C. Mohr(1), C. Röhrenbach(1), M. Laska(2) and P. Brugger(1)

- (1) Department of Neurology
 University Hospital Zurich
 CH-8091 Zurich, Switzerland
 (2) Department of Medical Psychology
 University of Munich Medical School
 D-80336 Munich, Germany

Impaired olfactory processing is a repeatedly described feature of neuropsychiatric disorders. We aimed to examine whether similar impairments can be observed as an early indicator of schizotypy. Lateralized olfactory detection thresholds and olfactory discrimination abilities were assessed in 38 healthy subjects who also filled in the Magical Ideation (MI) scale, a commonly used schizotypy inventory. Over both nostrils, subjects with high MI scores (above the median) had higher olfactory thresholds for n-butanol than those with low scores (below the median). In contrast to this effect in olfactory detection, the two MI groups did not differ in olfactory discrimination performance. Differences in the threshold task were exclusively due to the performance of the 20 men. These results suggest an association, at least in men, between schizotypy and olfactory detection deficits. The simultaneous absence of a similar deficit in odor discrimination indicates that early stages of olfactory processing may be more affected than later ones by the pathogenesis of schizophrenia and schizotypy.

PB21 **Failure to anticipate action constraints during prehensile movements**

Joachim Hermsdörfer, Georg Kerkhoff, Georg Goldenberg

EKN Clinical Neuropsychological Research Group, Hospital München-Bogenhausen, Dachauerstr. 164, 80992 Munich, Germany

Specification of the subsequent action may modulate the initial action. Rosenbaum et al. have shown that during prehensile movements the grasping of a bar (overhand or underhand grip) may depend on the action that had to be performed with the bar.

We tested the ability to modulate a prehensile movement according to action constraints in a patient with bilateral parietal lesions due to a focal degenerative process. The patient had to grasp a bar which had different spatial orientations and manipulate it in a predetermined manner. The patient performed well in elementary visual and perceptive visuospatial task, but had a severe constructional and ideomotor apraxia.

Prehensile movements of the patient were of normal duration, maximum velocity was within the normal range, and hand rotation was well coordinated with the anterior transport movement. However, in the majority of trials he performed in a stereotype manner neglecting the subsequent action, which lead to clear modulations in the performance of control subjects. Both hands exhibited similar performance characteristics. The results underline the role of the parietal cortex in the preplanning of visuo-spatial aspects of goal-directed movement while more elementary motor or perceptual abilities may be much less compromised. Deficits in preplanning of visuospatial aspects of goal-directed movements may precede more severe manifestations of degenerative posterior parietal damage such as optic ataxia.

PA20 **Perception of facial emotions and the brain's pattern of asymmetry in patients with paranoid schizophrenia**

Katarzyna Kucharska-Pietura, Marcelli Klimkowski

University Psychiatric Hospital of Lublin, Department of Psychological Medicine

A special role for the right cerebral hemisphere in the processing of emotional faces has been clarified among healthy and schizophrenic subjects. Happy-sad chimeric face drawings were viewed in free vision by 20 schizophrenic inpatients (S), mean age 21,9 SD2,8, with a short-lasting process (years: mean 1,31; SD1,38), 20 chronic schizophrenics (CS), mean age 41,2 SD 10,1, with long-lasting illness (mean 14,5 SD 7,5) and 40 healthy subjects (H), mean age 30,3 SD 8,4. All were classified as purely right handed (Annett 1970), 90% of the whole group were right-legged (Oldfield 1971; Piran 1982) and 75% were right-eyed (AsherTest, Gur 1977; Merrin 1984). Subjects rated their mood at the time of testing on a visual analogue scale (the range 0-100; the most sad-the happiest): S: 59,5 SD23,5; CS: 57,2 SD23,8; H: 59,8 SD20,6. All clinical subjects were diagnosed as paranoid schizophrenics according to DSM-IV criteria and were scored on the PANSS scale (positive symptoms scale: S: 12,2 SD 3,3; CS: 11,7 SD 3,6; negative symp.sc.: S: 24,7 SD 6,3; CS: 26,1 SD5,9; gen.psychopath.sc.: S: 35,2 SD7,0; CS: 35,0 SD7,6) after four weeks of neuroleptic treatment. A perceiver bias towards the left hemiface of the chimeric drawings was scored in all subjects (the possible range +48 to -48). The schizophrenics (S: 0 SD 8,5; CS: -2,3 SD 9,3) showed significantly weaker ($p < 0,001$) left-sided bias compared with healthy subjects (H: 9,8 SD 9,8), which elicits an RH dysfunction in spatial organization. There was no correlation of left perceptual bias with clinical ratings: PANSS scale, duration of illness and mood. Our findings do not confirm the hypothesis that right-hemisphere dysfunction in schizophrenia is related to negative symptoms according to recent assumption concerning right-hemisphere dysfunction particularly in Type II schizophrenia with preponderance of negative symptoms. Mood has revealed no significant influence on left hemifacial bias, which suggests stable properties of hemispheric lateralization.

PB22 **DISTRIBUTION OF CORTICO-THALAMIC CONNECTIONS OF THE HUMAN FUSIFORM GYRUS**
 E. Tardif¹, S. Clarke^{1,2}, S. Riahi-Arya¹, A.-C. Cottier Eskenasy¹, A. Probst³

¹Institut de Physiologie, Université de Lausanne, rue du Bugnon 7, 1005 Lausanne; ²Division de Neuropsychologie, CHUV, 1011 Lausanne; ³Pathologisches Institut, Universität Basel, 3041 Basel, Switzerland

Previous retrograde degeneration studies showed that human extrastriate visual cortex receives projections from the pulvinar, but their precise topographical organisation remains unknown. In the present study, the distribution of thalamic projections originating in the fusiform gyrus is described using the Nauta method for anterogradely degenerating axons in a case of right fusiform gyrus infarction. Ipsilaterally to the lesion, a high density of afferents was found in the inferior pulvinar nucleus and a low density in the medial pulvinar nucleus as well as in the postero-inferior part of the reticular nucleus. No degenerating fibers were found in the lateral geniculate body. Degenerating axons were completely absent in the contralateral thalamus. Thus, there is a precise topographic relationship between parts of the extrastriate cortex and the pulvinar, suggesting segregated thalamo-cortical pathways for different parts of the extrastriate cortex. Taken together with previous studies of human cortical connectivity, the results presented here suggest that, unlike the cortico-cortical projections, callosal in particular, which may be more widely spread in human than in non-human primates, cortico-thalamic projections may not.

PB23 VIEWS ON HUMAN PRIMARY MOTOR AND SOMATOSENSORY CORTEX THROUGH CYTOCHROME OXIDASE, ACETYLCHOLINESTERASE AND NADPH-DIAPHORASE ENZYMOHISTOCHEMISTRY.

AC. Cottier Eskenasy, S. Clarke
Institut de Physiologie, Université de Lausanne.

Distinct cortical areas could be shown using cytochrome oxidase (COX), acetylcholinesterase (AChE) and NADPH-diaphorase (NADPH-d) enzymohistochemistry on human visual, auditory and polysensory posterior parietal cerebral cortex (Clarke '94; Rivier and Clarke '97; Cottier Eskenasy et al '97). We have been applying the same enzymatic reactions to the primary motor (MI) and somatosensory (SI) areas of 4 normal human hemispheres. COX was revealed in individual cortical neurons and neuropil; intensity of staining varied tangentially and laminarly. In MI, a dense band of predominantly neuropil staining in layer III and a band of darkly stained Betz's cells in lower layer V were found; in SI, a single midcortical dense band was present, centred on layers III-IV in areas 3a and 3b, and on layer III(II) in areas 1 and 2, layer IV in these last 2 areas thus being lighter than III. AChE reaction showed a rich fiber pattern and darkly stained pyramidal cells; the latter in SI were more numerous in areas 1 and 2 than in 3a and 3b. Taken together with previous studies, the COX and AChE staining patterns found in SI speak for areas 1 and 2 as being hierarchically higher than 3a and 3b. Using NADPH-d, the distribution of stained neurons appears to vary between areas; in addition to the Golgi-like staining of some non-pyramidal neurons, another type of staining we called "Nissl-like", more or less pronounced, was detected in other neurons, pyramidal and non-pyramidal; a positive enzymatic reaction was also seen in arteriolar walls and in glial cells.

ERP RESPONSE PATTERNS DURING VISUOMOTOR INTEGRATION STUDIED WITH INTRACRANIAL RECORDINGS

G Thut¹, CA Hauert², O Blanke², S Morand², M Seeck², SL Gonzalez², R Grave de Peralta², L Spinelli², T Landis², CM Michel^{1,2}
¹Plurifaculty Program of Cognitive Neuroscience, ²Dep. of Neurology, University Hospital, 1211 Geneva and ³Faculty of Psychology, University of Geneva, 1227 Carouge, Switzerland

We recorded intracranial evoked potentials (ERPs) during the execution of a simple visuomotor reaction time task in a right-handed patient undergoing presurgical epilepsy investigations. The task involves unimanual index finger responses to stimuli presented either to the left or right visual field and requires interhemispheric transfer when stimulus position and side of the responding hand are crossed. ERPs were obtained from 100 subdural electrodes placed on the left hemisphere. 9 electrodes were situated over visual and 5 electrodes over right hand motor areas as determined by electrical cortical stimulation. Visual and motor areas were localized at occipital and precentral sites respectively. Strongest ERP responses occurred over these areas. Occipital areas showed two response patterns. Some areas responded only when the stimulus was delivered to the contralateral visual field. Other areas showed delayed ERP responses for ipsi- as compared to contralateral stimulus presentation, probably reflecting interhemispheric transfer. Precentral areas showed movement-related potentials late in time around the motor response with stronger potentials for contralateral than ipsilateral movements. We also found a visual field effect over the precentral area at early time points. Around 100 ms after stimulus onset, an ERP response was observed which appeared later for ipsilateral than contralateral visual field stimulation. This 'visual' potential over precentral areas seems to be associated with visuomotor integration, since not present when no motor response is required (lateralized checkerboard presentation). This suggests that the frontal 'motor' cortex shows early, action-oriented 'visual' potentials and indicates that interhemispheric 'visual'-level transfer might also occur at frontal sites.

PB25 SHORT-TERM MEMORY FOR SOUND LOCALIZATION AND SOUND RECOGNITION: DIFFERENTIAL EFFECTS OF INTERFERENCE TASKS.

M. Adriani, A. Bellmann, S. Clarke
Division de Neuropsychologie, Centre Hospitalier Universitaire Vaudois, 1011 Lausanne, Switzerland

To investigate short-term memory for sound content and sound localization in normal subjects, we studied the effects of different interference tasks in retention of sound stimuli. The same/different comparison of two sound stimuli separated by an 8-seconds interval was used and auditory or visual interference tasks requiring recognition or spatial judgements were introduced in the interval. The interference tasks affected differentially short-term memory for sound content and for sound location. Auditory interference task, and particularly auditory recognition task, reduced significantly both memory for sound content and memory for sound location. Memory for sound content was significantly more reduced by auditory recognition than by auditory spatial interference tasks. Visual interference tasks affected memory for sound locations but not for content. This observation is compatible with shared visuo-auditory spatial representation, but separate semantic systems and this suggests that short-term memory for sound content and short-term memory for sound localization involve at least partially distinct neuronal processing.

DIFFERENTIAL INFLUENCE OF HEMISPHERIC DOMINANCE ON PRIMARY AND SECONDARY SENSORIMOTOR CORTEX

A.C.Nirkko, C.Ozdoba, C.W.Hess, G.Schroth, M.Wiesendanger

Neurology and Neuroradiology, University Hospital, CH-3010 Bern, Switzerland

Purpose: Imaging studies have shown that in right-handers, ipsilateral activation of sensorimotor cortex is greater during left hand tasks than during right hand tasks, consistent with a component attributable to left hemispheric dominance. Anatomically and functionally, interhemispheric connections exist mainly for proximal, less for distal muscles. We used high resolution whole brain fMRI to assess differential influence of hemispheric dominance on proximal and distal movements on primary and secondary sensorimotor cortex.

Results: In purely distal movements, there was no significant ipsilateral activation of primary sensorimotor cortex. Rather, the ipsilateral effects could be attributed mainly to secondary, premotor and posterior parietal, areas. However, in purely proximal movements, significant ipsilateral activation was found in both primary and secondary areas.

Conclusion: Our results suggest that, for distal movements, activation effects due to hemispheric dominance are restricted to secondary areas. The almost exclusively contralateral activation of primary sensorimotor cortex for distal, but not proximal movements, is consistent with anatomical and physiological data and might be explained by a requirement for proximal postural interlimb coordination, but not excluding distal asymmetric or even bilaterally independent manipulation.

Supported by NFP-38.

PB27 **HEMISPHERIC INTERACTIONS AT TRAINING AND UNDER NON-SPECIFIC ELECTROMAGNETIC INFLUENCE**

G.A. Kuraev, G.I. Morozova

Rostov State University, 105 B.Sadovaya St., Rostov-on-Don, 344006, Russia

There has been investigated the way symmetric brain areas are affected by non-specific (electromagnetic) and specific (formation of a conditional reflex) influences in order to identify some compensatory mechanisms developing in cases of cortical structures dysfunctions.

It was originally believed that the function of those damaged structures may be compensated on an account of other areas, but to achieve this the structure should be trained to perform a function never attributed to it under normal conditions.

For the purpose of compensation mechanisms revealing impulse, focal, and resulting cortex activities have been registered while developing the conditional defensive reflex. We have discovered that conditional visual stimuli may equally activate symmetrical brain areas except visual ones. A supporting stimulus - a minor skin irritation caused by electric current - may equally activate symmetrical brain areas, excluding sensorymotor ones.

At the early stages of reflex formation combined conditional and supporting stimuli may trigger some highly similar activity in every symmetrical cortical areas. Presenting a conditioned stimulus while a reinforced reflex causing may evolve asymmetrical activity in the visual lobes of the brain.

It could be concluded that by specifically affecting a brain structure (by conditional stimulus choosing) it is possible to train it to perform a function never attributed to it before, which may be indispensable in compensating dysfunctions due to brain damages of different origin.

PB29 **NEURAL MODULATION OF THE EXPRESSION OF VISUOSPATIAL NEGLECT. A FOLLOW-UP CASE STUDY.**

C. Lafosse¹, C. Plets², S. Geeraerts¹ & E. Vandenbussche¹.

¹Laboratorium voor Neuropsychologie, ²Afdeling Neurochirurgie, U.Z. Gasthuisberg, Herestraat 49, B-3000 Leuven, Belgium

Introduction: We report a follow-up case study emphasizing neural modulation of the expression of neglect in a patient with a fast growing right parietal tumor extending progressively to the callosal fibers. **Method:** The expression of neglect was measured weekly using horizontal and radial line bisection tasks for a period of 6 months after removal of the tumor. The extend and progression of the tumorrest was evaluated by CT scans. **Results:** Within this patient the behavioral manifestation of his visual neglect developed a change over time that can be divided in 4 phases whether associated or not with neuroanatomical changes. 1) First, he showed an unilateral left neglect. 2) Second, he showed a bilateral neglect that gradually decreases in severity. This decrease persisted even in the absence of neuroanatomical changes. 3) With the onset of a new tumor there was again an increase of his contralateral neglect however, at behavioral level, it never reached the same severity of bisection deviation as before. 4) Finally, his neglect switches to a pure ipsilateral neglect. **Conclusion:** The results demonstrate a change in the expression of neglect that can decrease or switch contralaterally even after a period of unvarying lesionsite. These results showed an analogy with studies of visual neglect induced by cooling of the LS sulcus in the cat (Geeraerts & Vandenbussche, *Restorative Neurology and Neuroscience*, 12, 1998). They also indicate that brain structures, in which lesions results in visual neglect, continuously try to compensate for lesion induced imbalances.

^{99m}Tc-HMPAO SPECT activation in Alzheimer disease: Patterns of rCBF changes induced by a verbal fluency task

D.O. Slosman¹, C. Ludwig¹, C. Chicherio¹, A. de Ribaupierre², J.-M. Annoni¹, E. Giacobini¹, P. Magistretti³

¹HUG, Geneva (CH), ²FPSE Geneva (CH), ³CHUV Lausanne (CH).

Purpose: This experiment is part of a research (NRP38, supported by FNRS grant n°4038-044074) focusing on early determinants of dementia of the Alzheimer type (DAT). The purpose of the work presented here is to evaluate patterns of rCBF changes induced by a neuropsychological activation in DAT patients compared to healthy elderly subjects.

Material and Method: Subjects underwent HMPAO brain SPECT in standardized basal state (non word repetition) and during activation (phonological verbal fluency) following a split-dose protocol (i/v injection of 7 and 28 mCi ^{99m}Tc-HMPAO with proportional time acquisition) with a fan beam 3-heads Toshiba GCA-9300 camera. The population sample consisted in 10 normal elderly aging 75.2±7.4 yrs (m±sd) and 9 mild Alzheimer (DAT) patients (70.9±8.5 yrs). SPECT images data were individually normalized on cerebellar activity and thereafter analyzed using Statistical Parametric Mapping (SPM'96), applying the proportional scaling procedure. For all major analyses, we used a significance threshold at p<0.005.

Results: In the control group, activation induced a significant rCBF increase in the right superior frontal gyrus (BA 9/10), left median frontal gyrus (BA10) and in the posterior regions (BA18 bilaterally and right BA17). In DAT, no significant rCBF change was observed when contrasting activation and baseline conditions. Between group analyses revealed no significant rCBF differences. However, Group x Condition Interaction showed differences in bilateral pre-frontal (BA 46,47), right pre-motor (BA 4) and left parieto-temporal (BA 19, 21) regions (p<.010, uncorrected).

Conclusion: Verbal fluency task induces different patterns of rCBF changes in DAT compared to healthy control subjects. We suggest that the same regions are involved during the task in both groups, but that they are less effective in the DAT.

SYNDROME-SPECIFIC CHANGES OF BRAIN ACTIVITY AFTER STROKE

T. Platz*, H. Pintschovius, T. Winter, I.-H. Kim, K.-H. Mauritz
Abteilung für neurologische Rehabilitation am UKBF der Freien Universität, Klinik Berlin, Berlin, Germany

Hypothesis: Syndrome-specific functional disruptions after stroke, such as paresis, deafferentation, or ideomotor apraxia are related to specific changes of cortical activity during movement. **Methods:** Functional cortical changes are documented by means of movement related DC potentials (MRP & dipole reconstruction) [EEG], event related desynchronization (ERD) of alpha and beta band activity [EEG], and motor cortex mapping [TMS]. **Results:** Motor efference disruption (paresis) can induce increased MRP at frontal electrodes and widespread increase of ERD-alpha; type of reorganization could depend on severity of pyramidal damage. Somatosensory deafferentation can be associated with reduced MRP and ERD-alpha recorded over the primary sensorimotor cortex. Praxis production disruption (ideomotor apraxia) can be related to increased MRP and ERD-alpha at frontomesial (or frontolateral) recording sites as well as reduced ERD-beta over the left hemisphere.

Conclusion: Recording both MRP(DC) and sensorimotor rhythms (ERD-alpha or -beta) reveals differential information about movement-related electric brain activity. Clinical syndromes after stroke are related to differential pattern of functional cortical reorganisation as assessed by movement-related electric brain activity; as a function of the disrupted functional system, both syndrome-specific focal and more global changes do occur.

PB28

PB30

PB31 UNILATERAL INACTIVATION OF MAIN VTA TRANSMITTER SYSTEMS/ FACILITATE BEHAVIORS EVOKED BY CONTRALATERAL VTA STIMULATION

W.Trojnar, I.Klejbor, M.Maliszewska-Scislo and J.Tokarski. Dept. Animal Physiology, University of Gdańsk, Kładki 24, 80-822 Gdańsk, Poland

We found previously that unilateral electrolytic lesioning of the ventral tegmental area (VTA) caused facilitation of behavioral responses (feeding and exploratory reaction) evoked by electrical stimulation of the contralateral VTA. The present experiment was aimed to study a possible neurotransmitter mechanism of this „contralateral facilitation” effect.

In male Wistar rats implanted with unilateral VTA electrode and contralateral VTA cannula, feeding or locomotor responses to electrical VTA stimulation were tested in a latency-frequency paradigm. In separate groups of rats the effects of unilateral 6-OHDA (8 µg) lesion or blockade of D1 (SCH 23-390: 0, 0.1, 1.0 µg) and D2 (sulpiride: 0, 1.25, 2.5 µg) receptors as well as blockade of GABA_A (bicuculline: 0, 0.5, 5.0 ng), NMDA (MK-801: 0, 1.25, 2.5 µg) and adenosine A₂ (CGS-15943: 0, 5.0, 10.0 nmol), A₁ (DPCOX: 5.0, 10.0 nmol) and P₂ (suramin: 2.0, 5.0 nmol) receptors were tested. Suppression of DA, GABA, glutamate and adenosine P₂ transmission in one hemisphere resulted in a decrease of threshold and a leftward shift of the latency-frequency curves for both feeding and locomotion evoked from the other hemisphere, thus mimicking the effects of the electrolytic lesions. Adenosine A₁ and A₂ receptors blockade caused either an impairment or exerted no effect on VTA-elicited behaviors.

The results indicate that „contralateral facilitation” can be related to destruction of VTA dopamine neurons or their regulatory inputs. It may reflect an important, not yet explored compensatory mechanism after acute, unilateral brain injury.

PB32 EFFECTS OF EXCITOTOXIC THALAMIC LESION UPON ¹⁴C-2-DEOXYGLUCOSE (DG) UPTAKE IN THE SOMATOSENSORY CORTEX OF THE ADULT MOUSE.

Alexandre Croquelois, Gilles Bronchti, and Egbert Welker.

Institut de Biologie Cellulaire et de Morphologie, Université de Lausanne, Lausanne, Switzerland.

To study the effect of the loss of sensory input on metabolic activity in the somatosensory cortex (SI) of adult mice, we made limited lesions with quinolinic acid in the ventro-basal thalamic nucleus. One week later, the extent and position of the lesion were checked by mapping electrophysiologically SI of experimental animals. At various post-lesion times (2 days, 10 days, 3 weeks and 5 weeks), DG experiments were performed in a total of 20 animals that explored a stimulus-rich cage. Coronal sections through SI were used to measure the relative DG-uptake in the different cortical layers, measurements in the contra-lateral non-lesioned hemisphere served as controls. At 2 days, thalamic lesion affects DG-uptake in all layers, with a maximal drop in layer IV, where remaining metabolic activity is 30% of control values. 10 days after the lesion, there is an increase in uptake in all layers. At longer survival times, no further increase in DG-uptake was found except for layer IV, where a progressive increase in metabolic activity led to a 55% value at 5 weeks. Using motor cortex as a reference value, no difference was found between non-lesioned hemisphere of lesioned animals and non-lesioned control animals at all post-lesion times. We conclude that the recovery of the metabolic cortical activity in the lesioned hemisphere occurs in two stages, a first rapid step that affects all layers, then a slower increase in uptake only marked in layer IV. We here formulate the question whether this metabolic recuperation is dependent on peripheral sensory activity. Swiss NSF: 31-51036.97.

PB33 Neck muscle vibration and visual exploration training - a cross-over study on neglect rehabilitation

I. Schindler¹, G. Kerkhoff¹, H.O. Karnath², J. Keller³ and G. Goldenberg¹. ⁽¹⁾EKN-Clinical Neuropsychology Research Group, Department of Neuropsychology, City Hospital Bogenhausen, Dachauer Str. 164, D-80992 Munich, Germany & ⁽²⁾Department of Neurology, University of Tübingen, Germany & ⁽³⁾Neurological Rehabilitation Center, Bad Aibling, Germany

Recent studies revealed an amelioration of visual exploration in neglect during vibration of the contralesional neck muscles. It has been suggested, that vibration leads to a compensation of a supramodally distorted egocentric coordinate system. The present cross-over study investigated the therapeutic potentials of vibration by comparing an established visual exploration treatment with the combination of this treatment and neck muscle vibration in a group of 16 patients.

In the first treatment phase one half of the patients received 15 sessions of specific visual exploration training. In the second phase (15 sessions) this training was combined with neck muscle vibration. The other half of the patients received both treatments in the reverse order. Performance was measured for six times: Three baseline measurements across three weeks before treatment onset, two posttreatment measurements and one follow-up after two months.

The results revealed significant and stable improvements after standard treatment in different visual exploration tasks (cancellation, PC-based search task, reading). After the combination treatment a significant additive improvement was found in both patient groups. None of the therapeutic methods led to improvements in search time and size distortion in a visual size estimation task.

The present data suggest a considerable additional potential for the improvement of neglect-related deficits by a combination of standard treatment with neck muscle vibration. The vibration method seems to be a specific intervention influencing spatial reference systems responsible for adequate behaviour in space.

PB34 MULTIMODAL DEVELOPMENTAL DYNAMIC MODEL IN REHABILITATION OF BRAIN INJURED PERSONS

D.Rapaić, J.Ivanuš, G.Nedović, N.J.Simić
University of Belgrade, Faculty of Defectology
Visokog Stevana 2, 11000 Belgrade, Yugoslavia

The subjects of this model are brain injured persons without plegia or paresis in extremities. Analyzing of structure of disorders, many similarities appears. For example, cognitive disorders as a psychological problem can produce movement disorders, activity daily living disorders, social disorders etc. We may analyze one function in different working context. The paradigm of this MDDM is that rehabilitation of cognitive and praxis functions (not separately but in the same time) could be reversible process and reconstitute basic functional units which could be competitive in different areas of human activities as a whole. Multimodal character of the MDDM means 4 or 5 different programs (depending of the result of assesment) with various modality of stimuli as: Program for attention development, Program for movement imitation development, Program for visomotor control development. The developing character of MDDM is based on chierarchical organization of cognitive and praxis functions. Each program has its initial level, one or more intermediate levels and final level. Dynamic of programs understand adjustment of premorbid personality, 4-5 different programs lasting 5.7 min. each, stimulate psychodynamic structure of personality.

PB35 The prevalence of residual sensory functioning (active touch) in stroke patients with sensory loss.

M. Peric-Valentini, Rehaklink Rheinfelden, Basel, Schweiz
 P.W. Halligan, Dept of Experimental Psychology, University of Oxford
 P.U. Rauchfleisch, Psychiatrische Universitätspoliklinik, Basel, Schweiz
 U. Kischka, Rivermead Rehabilitation Centre Oxford

Introduction: After stroke up to 65% patients suffer different forms of sensory loss involving the contralesional side (hemihyesthesia). Traditional clinical assessment for evaluating sensory performance is a passive procedure whereby the clinician stimulates the patient's affected side. Weiskrantz and Zhang (1987) described one patient who demonstrated impressive residual sensory functioning in her affected hand ('active touch') when required to touch it with her ipsilesional hand. The present study attempts to systematically examine the prevalence and characteristics of 'active touch' in a larger group of stroke patients.

Method: In order to assess for 'active touch' we tested all patients referred for rehabilitation who showed significant contralesional sensory loss. This was defined as detecting less than 40 out of 60 touches on the contralesional hand (while blindfolded) using a von Frey hair (11.7 gm/smm). Those patients who fulfilled the criteria of objective sensory loss were retested, this time using their ipsilesional hand (holding the von Frey hair) as the active touch stimulus.

Results: So far, we have examined 17 patients with unilateral stroke (mean age 62 years, SD 11) with hemihyesthesia. We defined 'active touch' as present when the patient detected at least 20% more stimulations with their ipsilesional hand than when touched by the examiner. Seven of the 17 patients with objective sensory loss showed 'active touch'. Five of these were right brain damaged.

Comment: The ability of some stroke patients to reliably detect significantly more touches on their contralesional limb when using their ipsilesional hand has been demonstrated in 41% of patients. This striking phenomenon - "active touch" - was found in both left and right brain damaged patients.

HEMISPACED EFFECTS DURING LEARNING BUT NOT RECALL

D. Bächtold, P. Brugger, M. Regard
*Neuropsychology Unit, University Hospital
 Frauenklinikstrasse 26, 8091-Zurich, Switzerland*

Traditionally, functional differences between the two hemispheres are investigated by presenting stimuli to the left or right sensory half field, with the receptor surface located in the corresponding hemispace, i.e., to the left or right of the midsagittal plane. In these experiments, the stimuli reach the contralateral hemisphere first. Results were interpreted with neuroanatomical access models. However, numerous studies demonstrated that irrespective of the receptor itself, the hemispace where the stimulus is perceived is also a critical factor for producing laterality effects ("hemispace effects").

In the present experiment subjects were instructed to memorise the relative spatial positions of six figures horizontally aligned on a presentation board. The presentation board was located either to the left, to the right or in front of the subjects (left, right and central learning positions). For recall each figure was presented in the center of a computer screen and subjects were required to indicate, by keypress, whether the figure had been located in the left half or right half of the presentation board. As in the learning phase, the computer screen was located to the left, the right or in front of the subjects (left, right and central recall positions). We found that the positions of the figures were faster recalled when they were initially memorised in the left rather than the right hemispace. The position of the computer screen during recall did not have any effect. These results are discussed with respect to hemispheric specialisation and hemispace theories.

PB37 Multiple Brain Systems and the Rehabilitation of Face Recognition

Jules Davidoff, Sue Letson, Jane Powell, & Tim Valentine
 Department of Psychology, Goldsmiths' College, University of London

Clinical wisdom asserts that face recognition difficulties after posterior brain damage are present in around 50% of cases especially if damage involves the right hemisphere. Objective data back up that claim (De Renzi & Spinnler, 1966). Its presence may sometimes go unmentioned upon because we now know that faces, like objects, are represented within multiple brain systems. However, the non-recognition of family members including spouses except by strategic devices becomes not just a mere social embarrassment but a real hindrance to motivation for both patient and carers. Multiple representations for faces in brain systems will allow us to develop a proper programme of rehabilitation based on advances in cognitive modelling of face recognition.

Three different rehabilitation procedures will be delivered in this pilot study. The first derives from the fact that familiar faces, instantiated within infero-temporal cortex, can be seen as represented in a multi-dimensional space (Valentine, 1991 a,b) in which memorability depends on faces being coded with respect to a face prototype. Thus, the first rehabilitation procedure will make use of the advantage achieved by making the (caricatured) face more distinctive within the multi-dimensional space.

The second rehabilitation procedure will make use of the fact that the representation of each familiar face is connected to a system of knowledge particular to it. The third procedure will assist the brain-injured individual to recognise family members through a part-face based procedure. It is the procedure that some prosopagnosics teach themselves (Davidoff, 1988) and could be important for all cases of face recognition impairment after the loss of configural coding skills. Funded by the James S. McDonnell Foundation

Authors' index

- Adriani M. 67
Annoni J.M. 63, 68
Argenti A.M. 62
Assal G. 64
- B**
Bächtold D. 70
Barrillot C. 62
Bellmann A. 64, 67
Bende I. 63
Berthold T. 61
Blanke O. 67
Bonan I. 62
Brandeis D. 62
Bronchti G. 69
Brugger P. 58, 66, 70
Bryan K.L. 65
Buck A. 61
Bullier J. 59
Buttet Sovilla J. 64
- Capron C. 62
Chantôme M. 62
Chicherio C. 68
Clarke S. 59, 64, 66, 67
Colleluori A. 59
Cook N.D. 58
- Corbetta M. 61
Cottier Eskenasy A.C. 66, 67
Croquelois A. 69
- D**
Davidoff J. 70
de Ribaupierre A. 68
Degonda N. 61
Dorion A. 62
Duyme M. 62
- E**
Evans A. 62
Fazio F. 59
Fritzsche M. 62
- G**
Geeraerts S. 68
Giacobini E. 68
Girard P. 59
Goldenberg G. 66, 69
Gonzalez S.L. 67
Grabowska A. 58, 65
Grave de Peralta R. 67
Gutbrod K. 61
- H**
Halligan P.W. 70
Hasboun D. 62
Hauert C.A. 67

- Heinemann D. 61
 Hellige J.B. 57
 Henke K. 61
 Hermsdörfer J. 66
 Hess C.W. 67
 Hupé J.M. 59

 Imhof K. 62
 Ivanuš J. 69

James A.C. 59
 Jodzio K. 65
 Jüttner M. 63

Kállai J. 63
 Karádi K. 63
 Karnath H.O. 69
 Keller I. 69
 Kerkhoff G. 66, 69
 Khateb A. 63
 Kim I.H. 68
 Kischka U. 70
 Klejbor I. 69
 Klimkowski M. 66
 Kucharska-Pietura K. 66
 Kuraev G.A. 68

Lafosse C. 68
 Landis T. 57, 63, 67
 Lania A.G. 59
 Laska M. 66
 Le Goualher G. 62
 Letson S. 70
 Leumann L. 58
 Lojek E. 65
 Ludwig C. 68

Magistretti P. 68
Maliszewska-Ścisło M. 69
 Maravita A. 59
 Marsault C. 62
 Marshall J.C. 58
 Marzi C.A. 59
 Mauritz K.H. 68
 Mayer E. 63
 Metz G.A.S. 59
 Michel C.M. 63, 67
 Miniussi C. 59
 Mohr C. 66
 Morand S. 67

 Morozova G.I. 68

Nedović G. 69
 Nirikko A.C. 61, 67
 Nowicka A. 65, 68

Ohayon S. 64
 Ozdoba C. 61, 67

Pascual-Marqui R.D. 62
 Paulesu E. 59
 Pegna A. 63
 Perani D. 59
 Peric-Valentini M. 70
 Pintschovius H. 68
 Platz T. 68
 Plets C. 68
 Powell J. 70
 Probst A. 66
 Ptito M. 60

Rapaić D. 69
 Rauchfleisch U. 70
 Regard M. 57, 64, 70
 Rentschler I. 63
 Riahi-Arya S. 66
 Röhrenbach C. 66
 Rosen H. 61
 Rymarczyk K. 65

Schindler I. 69
 Schnider A. 61
 Schroth G. 61, 67
 Schwab M.E. 59
 Seeck M. 67
 Simić N.J. 69
 Skotnicka M. 65
 Slosman D.O. 68
 Spinelli L. 67
 Steger J. 62
 Steinhausen H.C. 62
 Szabó I. 63
 Szepesi T. 63
 Szymańska O. 58

Taraszkiewicz W. 65
 Tardif E. 66
 Tassinari G. 59
 Thallmair M. 59
 Thut G. 67

Tokarski J. 69
Treyer V. 64
Trojnar W. 69
Tsuda S. 58
Turi Nagy E. 61

Valentine T. 70
Vallar G. 60
Vandenbussche E. 68
Villemure J.G. 60
Vuković M.G. 64

Weber B. 61, 64
Weiller C. 60
Welker E. 69
Wenk C. 59
Wiesendanger M. 57, 67
Wieser H.G. 64
Winter T. 68

Z'Graggen W.J. 59
Zacharczuk K. 65
Zouaoui A. 62