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Program and Abstracts for the 5th annual meeting of the

Clinical Neuroscience Bern

1st December 2009

Conference location:
University Hospital
of Psychiatry, Bern

Campus: Waldau

http://www.kas.unibe.ch/neuro09/

Dear participants,

On the occasion of the 5th anniversary of the Clinical Neuroscience Network Bern, we are glad to welcome you to the annual meeting 2009. This year was important for the interfaculty network since we achieved a legal status acknowledged both by the medical and philosophic-humanistic faculty as well as by the executive board of the University of Bern. This means that Clinical Neuroscience Bern can easier act as a fundraiser, scientific partner etc. In this regard we would especially express our gratitude to Pascal Wurtz who has been significantly involved in the network these five years and in the preparation of the legal documents.
This year, we also have the novelty that an external speaker will give the main lecture. We are happy that Professor Richard Frackowiak from Lausanne will begin the meeting this year. Similar to previous years about 100 researchers from all different neuroscience-related disciplines will attend the meeting. This year we also have several national and international attendees, which we especially like to welcome to Bern. Besides the main lecture concerning neurodegenerative diseases there will be five selected presentations in the morning. During the extended lunch there will be an unguided postersession, however we would appreciate if one of the authors will be available at the poster during the session. In the afternoon four interesting parallel workshops are offered. This year again, due to a generous grant by the University Hospital of Neurology, we will be able to award three poster prices.

The meeting reflects the wide spectrum of research in clinical neuroscience in Bern and we hope it will further stimulate new joint research initiatives and provide an opportunity to have a fruitful and interesting discussion of ongoing projects. We are convinced that the now fifth consecutive meeting will further strengthen the interfacultary Clinical Neuroscience Network and provide an excellent occasion for a lively and interesting exchange of study results, experience and knowledge as well as offer the basis for the development of new interesting projects. We are looking forward to seeing you in „Waldau" and wish you a stimulating and enriching meeting. Finally we would like to express our gratitude to Lilo Badertscher and Pascal Wurtz for their important contributions in the organization of this year's meeting.

Prof. Dr. Thomas Dierks Prof. Dr. René Müri

Organization:
Lilo Badertscher (Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry Bern)
Thomas Dierks (Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry Bern)
René Müri (Dept. of Neurology, Inselspital Bern)
Pascal Wurtz (Dept. of Neurology, Inselspital Bern)

Sponsors:
- University Hospital of Psychiatry, Bern
- University Hospital of Neurology, Inselspital, Bern

Program 01.12.2009

08:00 – 09:00 **Poster attaching**

09:00 – 09:15 **Opening Adresses**

- Karl Studer CEO University Psychiatric Services (UPD) Bern
- Werner Strik, Director of the University Hospital of Psychiatry, Bern
- Christian W. Hess, Chairman of the Clinical Neuroscience, Bern

09:15 – 10:00 **Keynote Lecture**

- Richard Frackowiak (CHUV Lausanne):
  Imaging and the neurodegenerations - mechanistic and clinical aspects

10:00 – 10:30 **Coffee Break**

10:30 – 12:10 **Short presentations**

- **Andrea Federspiel**, Roland Wiest, Kay Jann, Jan Gralla, Heinrich Mattle, Thomas Dierks (Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry, University of Bern):
  Non-invasive assessment of cerebral blood flow using MR-Arterial Spin Labeling: a clinical perspective

- Oliver Markes, **Simone Duss**, Thomas Reber, Simon Ruch, Daniel Oppliger, Thomas König, Johannes Mathis, Corinne Roth, Katharina Henke (Dept. of Psychology, Division of Experimental Psychology and Neuropsychology, University of Bern):
  Memory Consolidation during a Daytime Nap

- **Martinus Hauf,** Roland Wiest, Kaspar Schindler, Jochen Kindler, Andrea Federspiel, Daniela Hubl (Institute for Diagnostic and Interventional Neuroradiology, Inselspital, University of Bern):
  Auditory Hallucination in Epilepsy - Electrographic and Perfusion Correlates in the Temporal Lobe

- **Dario Cazzoli**, René M Müri, Christian W Hess, Thomas Nyffeler (Perception and Eye Movement Laboratory, Depts. of Neurology and Clinical Research, Inselspital Bern and University of Bern):
  Long-lasting improvement of visual neglect after repeated parietal theta burst stimulation: effects on activities of daily living (ADLs) and neuropsychological testing

- **Christian Rummel**, Frederique Amor, Heidemarie Gast, Kaspar Schindler *(qEEG group, Department of Neurology, Inselspital, Bern)*: *Spatial dynamics of genuine cross-correlations in peri-ictal intracranial multi-channel EEG*

12:10 – 14:15 **Postersession and Lunch**

14:15 – 16:45 **Workshops**

- Workshop 1: *Measuring skin conductance response in cognitive neuroscience*
  Chairs: Nicolas Rothen & Beat Meier

- Workshop 2: *EEG and evoked potentials in practice*
  Chair: Thomas König

- Workshop 3: *Non-invasive brain stimulation techniques: Transcranial Magnetic Stimulation (TMS) and transcranial Direct Current Stimulation (tDCS)*
  Chairs: Thomas Nyffeler & Miranka Wirth

- Workshop 4: *Neuroimaging techniques*
  Chair: Andrea Federspiel

16:45 – 17:00 **Poster Award**

17:00 **End of the meeting**

Table of content

Abstracts by discipline

Neurophysiology (NP)

NP-01

Simultaneous eye tracking and fMRI: The effects of Theta Burst rTMS on angle discrimination

Silvia Chaves[1], Vannini Patrizia[2], Andrea Federspiel[3], Kay Jann[3], Roman von Wartburg[1], Pascal Wurtz[1], Thomas Nyffeler[1], Thomas Dierks[3], Christian W. Hess[1], René Müri[1]

[1]Depts. of Clinical Research and Neurology, University of Bern, 3010 Bern, Switzerland, [2]Gerontology Research Unit,Harvard Medical School,Boston, MA 02129,United States, [3]Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry, 3000 Bern 60, Switzerland

The aim of the present study was to determine the relationship between visual exploration (as measured by the number of fixations) and the neuronal activity (BOLD-signal change) during a visuo-spatial task in the healthy human brain. In order to investigate changes in this relationship, inhibitory Theta Burst rTMS was applied over the right Parietal Cortex, inducing a transient virtual lesion. Forty healthy subjects participated in the experiment, 20 subjects were assigned to the TMS group, the other 20 to the control group. Inside the 3T MR-Scanner subjects were asked to perform an angle discrimination task, in which they had to decide whether or not a given angle matched 60°. Eye movements were tracked inside the MR-scanner. To generate statistical parametric maps we used an extended general linear model, describing the dependency of the BOLD-signal change on subjects' visual exploration. Differences between groups were calculated using t-tests. A significant relationship was found between visual exploration and BOLD-signal change in regions of the visuo-spatial network in both groups. Furthermore, we found a reduced visual exploration in the TMS group compared to the control group. Furthermore, a significant decrement of the correlation between number of fixations and neuronal activity in areas of the visuo-spatial network was found. This study reveals brain regions mediating the connection between behaviour and the underlying neurophysiological processes during angle discrimination. Moreover, with the application of Theta Burst rTMS we disclosed functional brain alterations due to a virtual lesion and their consequences on visual exploration behaviour.

Neurophysiology (NP), Neuropsychology / Psychiatry (PSP)

Poster

NP-02

Spatial dynamics of genuine cross-correlations in peri-ictal intracranial multi-channel EEG

Christian Rummel[1], Frederique Amor[1], Heidemarie Gast[1], Kaspar Schindler[1]

[1]*qEEG group, Department of Neurology, Inselspital, Bern, Switzerland*

Objective
To better understand epileptic EEG by highlighting the evolution of genuine cross-correlation patterns in intracranial multi-channel EEG of epilepsy patients suffering from focal onset seizures.

Methods
The classic cross-correlation coefficient represents a mixture of random and non-random, system-specific contributions. Here a scalar measure is introduced that allows to quantify the genuine non-random cross-correlation strength (CCS) in the global multi-channel EEG [1]. CCS is developed further to matrices that allow analyzing spatial patterns of genuine local cross-correlation regardless of confounding influences [2].

Results
In contrast to the classic cross-correlation matrix epileptogenic brain areas can be delineated on the basis of the CCS matrix. During seizures a reproducible, patient specific rearrangement of correlation patterns is revealed.

Conclusion
Disentangling random from non-random cross-correlations is important for properly understanding seizure evolution in time and space and the mechanisms of seizure termination.

References:
[1] M. Müller, G. Baier, C. Rummel and K. Schindler, Estimating the strength of genuine and random correlations in non-stationary multivariate time series, Europhys. Lett. 84, 10009 (2008)
[2] C. Rummel, M. Müller, G. Baier, F. Amor and K. Schindler, Analyzing spatio-temporal patterns of genuine cross-correlations, submitted (2009)

Neurophysiology (NP)
epilepsy, EEG, correlation analysis

Talk

NP-03

Linking the Individual EEG Alpha Frequency to the Brain's Fibers

Kay Jann[1], Thomas Koenig[1], Thomas Dierks[1], Andrea Federspiel[1]

[1]*Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry, University of Bern, Bern, Switzerland*

Introduction:
The Individual EEG alpha frequency (IAF) correlates with subjects' performance in a diversity of cognitive tasks. However, the functional networks or the structural substrate underlying the inter-individual differences in IAF are largely unknown. Therefore, we conducted the present analysis to answer the question whether there are structural correlates in terms of white matter fiber trakts that are related to the subjects' IAFs.

Methods:
IAF was determined in 21 healthy young subjects based on 92 channel eyes closed resting state EEG. In the same subjects we acquired diffusion weighted structural MR data and computed the fractional anisotropy (FA) values for each voxel. FA is an index representing the restriction of free water diffusion within a voxel in white matter. Accordingly, a high FA value indicates highly restricted diffusion, which is assumed to be caused by stronger myelination of white matter fiber tracts. The subjects' IAF were then voxel-wise correlated to their FA values.

Results:
We found significant positive correlations along several fascicles, especially along the cingulum, the arcuate fascicle and the internal capsule. Interestingly, the correlations delineated fascicles that connect core regions of so called resting state networks (RSNs), in particular of the so called default mode network (DMN) and the Working Memory Network (WMN). Fiber-Tracking based on the diffusion tensors starting at the PCC of the DMN respectively the left inferior frontal gyrus (LIFG) of the WMN revealed the above mentioned fascicles, thus confirming a structural-functional association.

Conclusions:
Our findings revealed a positive structural correlate of IAF differences in the cingulum involved in the DMN and in the arcuate fascicle associated with the left-WMN. Subjects with higher IAF tend to be faster and perform better in various cognitive tasks, especially working memory tasks. High directionality (i.e. high FA values) in white matter represents faster nerve-conduction. Therefore, our observations suggest that structural connectivity among task relevant areas affects processing capacity. Further support for this hypothesis evolves from patient studies. E.g. schizophrenic patients often show deficits in working memory tasks and exhibit altered FA values in the arcuate fascicle as well as disturbed DMN connectivity. However, further investigation of such relationships is necessary.

(Financed by Swiss National Science Foundation grant 320000-108321/1.)

Neurophysiology (NP)
resting state, EEG IAF, DTI, fractional anisotropy

Poster

NP-04

fMRI BOLD correlates of Individual EEG Alpha Frequency reveal working memory and attention related Resting State Networks

Kay Jann[1], Andrea Federspiel[1], Thomas Dierks[1], Chris Boesch[2], Thomas Koenig[1]

[1]Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry, University of Bern, Bern, Switzerland, [2]Dept. of Clinical Research (AMSM), University of Bern, Bern, Switzerland

The individual EEG alpha frequency (IAF) is a potential marker for a person's cognitive abilities. Especially, it has been demonstrated that subjects with a higher IAF exhibit better performance in working memory tasks. However, little is known about the functional networks that underlie the IAF.
To approach this question, we performed simultaneous EEG-fMRI recordings in 20 healthy young subjects. This allowed us assessing slight IAF fluctuations over time in each subject and correlating it to fluctuations in the fMRI BOLD signal using a random effects general linear model. The correlation pattern we found resembled previously described fMRI Resting State Networks (RSNs). These networks have also been found to be involved in various task executions and were referred to as the Dorsal Attention Network (DAN), the left Working (LWMN) Memory Network and the right Working Memory Network (RWMN). Hence, we identified these three RSNs for our data sample and computed the spatial similarity between the IAF BOLD correlate and each RSN.
The results of our analyses highlighted a positive association of the IAF with specific functional networks involving brain areas important for attentional control (DAN) as well as working memory processes. Hence, all the networks underlying IAF differences are known to be of special importance for task solving. It is therefore plausible that increasing IAF improves task performance because the relevant networks are more active.

(Financed by Swiss National Science Foundation grant 320000-108321/1.)

Neurophysiology (NP)
resting state, EEG IAF, fMRI BOLD, attention, working memory

Poster

NP-05

Association of individual resting state EEG alpha frequency and regional cerebral blood flow

Kay Jann[1], Thomas Koenig[1], Thomas Dierks[1], Chris Boesch[2], Andrea Federspiel[1]

[1]Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry, University of Bern, Bern, Switzerland, [2]Dept. of Clinical Research (AMSM), University of Bern, Bern, Switzerland

Cognitive task performance differs considerably between individuals. Besides cognitive capacities, attention might be a source of such differences. The individual's EEG alpha frequency (IAF) is a putative marker of the subject's state of arousal and attention, and was found to be associated with task performance. However, little is known about the metabolic substrate (i.e. the network) underlying IAF. Here we identified this network. Correlation of IAF with regional Cerebral Blood Flow (rCBF) in fifteen young healthy subjects revealed a network associated with attention and preparedness for external input, which is relevant for task execution. We hypothesize that subjects with higher IAF have pre-activated task-relevant networks and thus are both more efficient in the task-execution, and show a reduced fMRI-BOLD response to the stimulus, not because the absolute amount of activation is smaller, but because the additional activation by processing of external input is limited due to the higher baseline.

(Financed by Swiss National Science Foundation grant 320000-108321/1.)

Neurophysiology (NP)
resting state, EEG, IAF, rCBF

Poster

NP-06

fMRI Resting State Networks and their topographic EEG spectra

Kay Jann[1], Mara Kottlow[1], Thomas Dierks[1], Chris Boesch[2], Thomas Koenig[1]

[1]Dept. of Psychiatric Neurophysiology, University Hospital of Psychiatry, University of Bern, Bern, Switzerland, [2]Dept. of Clinical Research (AMSM), University of Bern, Bern, Switzerland

The fMRI Resting State Networks (RSNs) have gained importance in the present fMRI literature. Although their functional role is unquestioned and their physiological origin is nowadays widely accepted, only little is known about their relationship to neuronal activity. The combined recording of EEG and fMRI allows the temporal comparison between fluctuations of the RSNs and the dynamics of EEG oscillations. So far only a relationship between several EEG frequency bands and some RSNs was demonstrated. However, there is no study that took the spatial distribution of the EEG oscillations into account. Therefore, in the present study we computed the covariance of the dynamics of ten RSNs with the spectral fluctuations at 92 EEG electrodes in 20 healthy young subjects. This approach yielded topographic maps (covariance and t-maps) for all RSNs indicating their specific effects on EEG spectra across the entire scalp. An additional K-means clustering of the RSN multichannel EEG spectral correlates across all RSNs resulted in eight clusters, representing the common standard EEG frequency bands.
Hence, for the first time we were able to demonstrate a specific topographic distribution of EEG oscillations for each investigated RSN. Moreover, these topographies represent the standard frequency bands described in the EEG literature. Therefore, our data substantiate on the one side the physiological and neuronal origin of the RSNs. On the other hand, it substantiates the assumption that the standard EEG frequency bands can be seen as fingerprints of underlying distributed neuronal networks and allows to associate local EEG spectral changes to specific RSNs.

(Financed by Swiss National Science Foundation grant 320000-108321/1.)

Neurophysiology (NP)
resting state networks, fMRI, EEG

Poster

NP-07

Type of sleepiness in idiopathic hypersomnia is different from that in narcolepsy

C Roth[1], BF Oswald[1], M Gugger[1], ChW Hess[1], W Schmitt[1], J Mathis[1]

[1]*Center for Sleep Medicine, Neurology and Pulmonology, University Hospital, Inselspital, Berne, Switzerland*

Differentiation between narcolepsy without (N) or with cataplexy (NC) and idiopathic hypersomnia (IH) is sometimes difficult and the multiple sleep latency test (MSLT) may occasionally not show unequivocal diagnostic characteristics such as multiple sleep onset REM periods (SOREMs). The aim of this pilot study was to analyze how much a combination of MSLT, maintenance of wakefulness test (MWT) and a simple performance test (Steer Clear [SC]) can add to the diagnostic accuracy.

We compared the results of the MSLT, SC, and MWT in patients with NC (N=68), with N (N=41), and with IH (N=40) respectively. 6 patients with IH, 11 with N and 15 with NC performed an MWT. All results are reported as medians.

The MSLT latency was significantly shorter in NC than in N and shorter in N than in IH (NC<N<IH, 2.9<4.1<7.2 Min.; $p<0.02$) and the MWT latency was shorter in both narcoleptic groups compared to IH (NC<IH: 9.5<24.5 Min; $p<0.06$ / N<IH: 10.4<24.5 Min.; $p<0.02$). During SC narcoleptics showed a greater mean error rate than patients with IH (NC>IH: 9>3%Hits; $p<0.001$ / N>IH: 5>3%Hits; $p<0.01$). A discriminate analysis was performed for narcolepsy (N and NC pooled) and IH. Using MSLT alone classified 74.5% of the patients correctly, while using MWT alone classified 84.4% correctly. Using the combination of MSLT and MWT yields the same results as using MWT alone, indicating that MWT has a greater influence on the discrimination than the MSLT. Adding SC to MSLT showed a minimal improvement compared to MSLT alone (74.8% correctly classified patients).

We conclude that the MWT latency is superior to MSLT latency in differentiating narcolepsy from IH. However, since SOREMs are required to diagnose narcolepsy without cataplexy, we suggest to combine both tests. A limitation of the study is the low number of IH patients with MWT.

Neurophysiology (NP)

Poster

NP-08

Investigating Transcranial magnetic stimulation (TMS) effects using Pulsed Arterial Spin Labeling (PASL)

Ariane Orosz[1], Andrea Federspiel[1], Kay Jann[1], Miranka Wirth[1], Matthias Grieder[1], Roland Wiest[2], Thomas Dierks[1]

[1]Department of Psychiatric Neurophysiology, University Hospital of Psychiatry Bern, [2]Department of Neuroradiology, University Hospital Bern

Transcranial magnetic stimulation (TMS) has been shown to transiently alter neural activity which can be measured in terms of behavioural changes (i.e. increased reaction time, enhanced error rates). For the understanding of the full potential of TMS, however, it may be useful to measure these changes more directly such as on the level of metabolic response. In the present pilot study we used TMS in combination with arterial spin labelling (ASL) in order to address the question of whether TMS stimulation has an effect on cerebral blood flow (CBF).
Two healthy subjects were stimulated using a theta burst TMS protocol over the left motor cortex at an intensity of 80% of the subjects' motor threshold. ASL was performed before (pre TMS) and immediately after the application of TMS (post TMS). During the ASL run, the subjects performed a block design task with alternating externally-paced bimanual finger-tapping and resting state control condition.
As expected, the pre TMS ASL revealed bilaterally increased CBF in the precentral gyrus (precG), i.e. the motor cortex during the finger tapping task. Post TMS the CBF signal was significantly reduced at both sides of the precG over the whole time course of the ASL run. In the left (stimulated) precG we observed a CBF signal reduction of 33.7%, whereas in the right precG, which was not directly affected by TMS stimulation, the CBF signal was attenuated by 41.7%. In contrast, the whole brain CBF values increased post TMS (64.3ml/100g/min) as compared to pre TMS (59.8 ml/100g/min). In order to exclude that the inter-session variations are the source for these differences, in one of the subjects resting state ASL was measured on an additional occasion several weeks after TMS treatment. The inter-session variation of the whole brain resting state CBF signal between the three (pre TMS, post TMS, several weeks after TMS) ranged from +3.3% to -5.5%, which is within the range of normal physiologic CBF fluctuations but much lower than the TMS effects (>30%). Thus, the regional reduction of the CBF signal post TMS may indicate that it is possible to 1) detect and 2) to map subtle TMS-induced behavioral effects using ASL. As the CBF signal shows only slight variation on the different ASL testing occasions, the significant regional CBF changes in the precG are attributed to TMS effects.

Neurophysiology (NP)

Poster

NP-09

Predicting one's own and others' action effects from observation: An fMRI study

Karen Zentgraf[1,4], Matthias Bischoff[2,4], Rudolf Stark[4], Jörn Munzert[3]

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Most of the time, we see other people acting around us, but only rarely, e.g., when we look in a mirror or when we see ourselves in videos, we observe ourselves moving. Although we are not very familiar with observing our own actions, Knoblich and Flach (2001) found an advantage in the accuracy of action effect prediction in darts when observing one's own compared to others' actions. The authors reasoned that when one observes and simulates own actions, the perceiving and the executing/planning system match perfectly so that accuracy in prediction increases. In this present fMRI study, we addressed the issue whether action observation for effect prediction of one's own and others' movements is based on differential recruitment of the action observation network, especially in the lateral premotor and the inferior parietal lobe (Cross et al., 2009; Calvo-Merino et al., 2006).
We scanned participants using fMRI while watching pointlight-displays (PLD) of one's own table tennis strokes and those of others. Specifically, participants observed the presentations under the instruction to predict whether the ball would travel longline or diagonal, without the ball being visible. Self-recognition was not part of the task. Participants, which were all novices but familiar with basic table tennis, were equally unfamiliar with observing one's own and others' PLDs of table tennis strokes.
Behavioral data revealed a significant advantage in ball direction judgment when observing one's own strikes (70.0% correct in the "own"-condition versus 63.7% correct in the "other"-condition; $T=2.37$, $p=.03$). Using a ROI approach for the inferior parietal lobe and the lateral premotor cortex, fMRI data showed that observing one's own PLD for effect prediction involved the left angular gyrus of the inferior parietal lobe (AG) more strongly compared to observing others' videos. No differences were found for the premotor cortex in this study. In a whole-brain analysis, the medial prefrontal cortex was more activated in the "own"-condition.
We suggest that when our participants observed actions which are familiar to them, the AG of the inferior parietal lobe codes for compatibility of the observed own action with the motor representation of the observer. This suggestion corresponds well with the notion that the AG plays an essential role in inverse mapping visual input to motor commands as has been suggested by Miall (2003). In addition, our data support the concept that actions are represented in an agent-neutral format in the core motor system as has been suggested by studies on mirror neurons (Rizzolatti et al., 1996).

Neurophysiology (NP)

Poster

NP-10

It's a face: Continuous face integration in combined EEG/fMRI

Mara Kottlow[1], Kay Jann[1], Thomas Dierks[1], Thomas Koenig[1]

[1]*Department of Psychiatric Neurophysiology, University Hospital of Psychiatry, University of Bern, 3000 Bern 60, Switzerland*

Perceiving a face requires the binding of facial components into face gestalt. A schematic face is sufficient to evoke activation within the distributed cortical network mediating face processing [1]. While EEG phase information enables us to measure the synchronicity and therefore the binding of remote areas in the brain, we can localize involved regions through fMRI. Meanwhile, only the combination of both methods will allow determining functional networks for face integration.
We therefore measured 14 healthy subjects with simultaneous EEG/fMRI [2] while watching randomly moving elements of a schematic face (condition NOFACE) which at some instants produced a facial percept (condition FACE), and were randomly interrupted by zero-conditions. We analyzed the differences between these conditions for global field synchronization (GFS) [3] in frequency domain EEG. On the fMRI data, two random-effects GLM analyses were conducted. The first used standard HRF convolved box-car functions. In the second, the box-car functions were additionally modulated with the GFS values for a correlation of GFS and BOLD responses.
We found a significant increase in gamma GFS during FACE compared to NOFACE. Increased BOLD-responses were seen in visual core areas for face processing with emphasis on the fusiform gyri bilaterally during FACE compared to baseline as well as during NOFACE compared to baseline. When directly comparing FACE to NOFACE, the conditions deferred only in intensity: FACE showed an increase in BOLD responses compared to NOFACE in the right fusiform face area and the right inferior parietal lobule. When correlating GFS and BOLD responses, two distinct networks were found for FACE and NOFACE respectively: FACE activated a network comprising the right fusiform face area and other core regions for face perception, while the network for NOFACE did not involve most of these core regions, but comprised frontal and parietal regions instead.
During FACE the bound face is perceived and within the core regions, invariant facial features are processed [4]. Further, the perception of the integrated face likely depends on binding across cortical regions represented by the synchronization EEG in the gamma range [5]. In contrast, the configural distortion of the spatial relationship between facial features in NOFACE may induce additional analytic processing activating frontal regions and areas responsible for spatial attention and movement. With the correlation of GFS and BOLD responses, our study introduces a method of choice for the detection of functional networks. Further, we attempt to give new insights into face processing and visual binding by providing the first study monitoring the continuous integration of facial parts into a whole facial percept.

[1] Miki K. et al. 2009. Effect of configural distortion on a face-related ERP evoked by random dots blinking. Exp Brain Res 193 (2), 255-65.
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[4] Fairhall S.L., Ishai A. 2007. Effective connectivity within the distributed cortical network for face perception. Cereb Cortex 17(10), 2400-6.
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Neurophysiology (NP), MR-Methodology (PSM)
Face perception, simultaneous EEG/fMRI, binding, phase synchronization

Poster

NP-11

Propagation pattern of epileptic activity in idiopathic generalized epilepsy

Olivier Scheidegger[1], Roland Wiest[1], Kay Jann[2], Thomas Koenig[2], **Martinus Hauf[1]**

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[2]Department of Psychiatric Neurophysiology, University Hospital of Psychiatry, 3000 Bern 60, Switzerland

Objective:
To analyze the temporal pattern of interictal epileptic activity in idiopathic generalized epilepsy (IGE) assessed by combined EEG/fMRI - A case study

Methods:
A combined EEG/fMRI recording was performed in a patient with IGE. An Independent Component Analysis (ICA)-based factor coding for time varying interictal epileptic discharges (IED) was convolved with a hemodynamic response function to predict the BOLD signal. Voxelwise correlations between the ICA-based predictor and the BOLD signal were computed. The temporal pattern of the BOLD correlates was analyzed by shifting the convoluted predictor in intervals of 1 s from 15 s before to 15 s after the IEDs.

Results:
Positive BOLD correlates were found 12 s prior to the IEDs in the midline brainstem structures, evolving to a bilateral positive thalamic BOLD response 8 s prior to the IEDs. Simultaneously to the IEDs and lasting for 10 s, a pattern of negative BOLD correlates in the mesiotemporal, pontine and association cortices of the frontal, temporal and parietal lobe were delineated.

Conclusions:
Temporally linked to brief interictal epileptic activity (<2s), a pattern of brain activity encompassing 30 s is depicted. In keeping with the pathophysiological concept of “centrocephalic” epileptic activity in IGE correlates involving a thalamoreticular network prior to the IED has been observed. Simultaneously to the IEDs, a widespread cortical deflection resembles the default mode network, suggesting a propagation pathway along physiological brain networks. Comprehensive analysis of EEG/fMRI is an evolving method leading to new insights in the pathophysiology of epilepsies and may contribute to clinical relevant issues as the classification in focal vs. generalized epilepsy syndromes.

Neurophysiology (NP)

Poster

NP-12

D-Wave assisted intraoperative decision making- a clinical case report

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Object: Surgery for intramedullar spinal cord tumours is challenging as resection is often associated with postoperative neurological deficit. Clinical value of intraoperative neurophysiological monitoring is limited as with dura opening or with continuous tumour resection SEP and also MEP deterioration or loss may occur without severe postoperative neurological deficit of the patients. Recently intraoperative D-Wave monitoring has become available for intramedullary spinal cord tumour surgery to predict motor recovery. We report of an intramedullary tumour surgery case and how intraoperative neuromonitoring supported intraoperative decision making and outcome prediction.
Methods: Muscle MEPs (mMEPs) were recorded by pairs of needle electrodes inserted in target muscles of the upper and lower limbs. Transcranial electrical stimulation was performed with trains of five stimuli, with pulse duration of 500µs within one pulse and an interstimulus interval of 4ms. The motor threshold was defined as the stimulation intensity which elicited mMEPs from the target muscle of a minimum of 30µV amplitude within four consecutive trails at a 0.5Hz repetition rate. Additionally epidural D-Waves were measured after being elicited by single-pulse stimulation technique.
Results: During resection there was a severe continuous increase of the motor threshold of the left lower limb with loss of MEP later in surgery. However, D-Wave was preserved all the time. Knowing that the D-Wave is preserved, surgery could be proceeded until gross total tumour resection. Postoperatively immediately after extubation the patient had a global M2 paresis of the left leg which recovered to a proximal M4 and distal M3 paresis one day after surgery. At discharge 9 days after surgery the motor deficit had resolved completely.
Conclusion: Intraoperative neuromonitoring increases patient safety and assists the surgeon in intraoperative decision making. Using D-Wave monitoring improvement of radicality and reduction of postoperative neurological deficits will be achieved at the same time.

Neurophysiology (NP)
D-Wave; Intraoperative neurophysiological monitoring; Intramedullary spinal cord tumour surgery; MEP

Poster

NP-13

Superfluous eye movements during angle discrimination

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Eye movements are necessary to position the eyes on different locations in space to get information about our environment. But are eye movements always necessary or is the visual exploration a superfluous habit in certain situations? The aim of this study was to examine the importance of eye movements during an angle discrimination task. 16 healthy young subjects participated in the study. Half of the subjects performed the task keeping the eyes fixated on the center of screen during the whole experiment (fixed group), the other half performed the task without restriction of eye movements (control group). The paradigm consisted of schematised clock images presented in the center of the screen. Subjects had to decide if the clock-hands of the stimulus matched a 60° angle or not. A t-test between both groups was calculated for the accuracy and the reaction time. Significant differences were found in reaction time but not for accuracy. Interestingly, the fixed group was faster. This pattern suggests that there is no need to move the eyes since the stimuli dimensions did not exceed perifoveal space. It may also be relevant that the more saccades were made, the less time we have to collect and process visuo-spatial information, which is only possible during the fixation. Moreover, during saccades the magnocellular pathway accounting for visual localization is suppressed. This constraint may lead to a deformation of the internal representation of space. To conclude, control subjects spend resources that are not necessary to properly discriminate the presented angles.

Neurophysiology (NP)

Poster

Neurobiology (PSB)

PNB-01

No anxiolytic effects after glucocorticoidadministration in healthy subjects exposed to social stress

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Background: Previous experiments in patients with phobia have shown that the administration of glucocorticoids reduces fear in phobic situations. Extensive evidence indicates that elevated glucocorticoid levels inhibit memory retrieval processes. In patients with phobia, exposure to a phobic stimulus provokes retrieval of stimulus-associated fear memory that leads to the fear response. It is therefore possible that glucocorticoids reduce phobic fear through an inhibition of fear memory retrieval. In contrast, in healthy subjects without any phobic fear memory, we hypothesized that glucocorticoids would not induce anxiolytic effects during exposure to a fearful situation. Method: In a double-blind, placebo-controlled study, 50 healthy subjects underwent the same socio-evaluative stress test as used in a previous study in patients with social phobia. One hour before the stress test, subjects received 25 mg cortisone or placebo orally. Psychological anxiety measures were repeatedly assessed. Results: Although the stress situation robustly increased fear in this population of healthy subjects, cortisone treatment did not reduce anxiety levels, physical discomfort or avoidance behavior when compared to placebo-treated subjects. Conclusion: Our findings show that glucocorticoids do not exert general anxiolytic effects in healthy subjects exposed to a fearful situation. This finding further supports the view that glucocorticoids reduce phobic fear through an inhibited retrieval of fear memory in patients with phobia.

Neurobiology (PSB)
cortisol, stress, glucocorticoids

Poster

PNB-02

Transcranial direct current stimulation affects local but not global blood flow: A case study measured with perfusion MRI

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Introduction
Transcranial direct current stimulation (tDCS) is a simple technique of noninvasive brain stimulation in which a weak DC current is applied into the brain for several minutes resulting in a polarity-dependent modulation of brain activity. After-effects are considered to be stable for up to 1 h if stimulation lasts sufficiently long. However, one important limitation of the technique is its low spatial focality caused by the relatively large tDCS electrodes (35 cm2). Consequently a relatively widespread change of cortical excitability was demonstrated in the respective projection areas. Here we test regional versus global alteration of blood flow.

Methods
In a case study two healthy subjects were measured with perfusion MRI before and after 20 minutes of 2 mA anodal stimulation over the left prefrontal cortex (F3 in the 10-20 EEG-System) and the cathodal reference electrode placed above the right orbita. Voxel-wise whole brain and mean global cerebral blood flow (CBF) statistics using t-tests were performed. The resulting t-maps were analyzed for overlapping clusters.

Results
One female and one male have been examined (n=2), both without reporting adverse effects. Blood-pressure and heart-rate have been measured before, during, and after stimulation without any significant changes. The mean global CBF did not change significantly between the assessments (Subject 1: preCBF=92.1 ml/100g/min, SD=14.2, postCBF=92.0 ml/100g/min, SD=13.3, p=0.9; Subject 2: preCBF=83.4 ml/100g/min, SD=7.6, postCBF=85.3 ml/100g/min, SD=10.6, p=0.3), whereas a region of interest (ROI) corresponding the left prefrontal area was identified in both subjects showing a significant unilateral CBF alteration (34 voxels, $p<0.01$).

Conclusion
Our findings indicate that tDCS can alter regional blood flow corresponding to the site of stimulation without changing the global blood flow. Regional blood flow alterations could be used to enhance spatial focality, especially in cognitive tasks, where monitoring spatial precision is difficult.

Neurobiology (PSB)
tDCS, perfusion MRI

Poster

PNB-03

Daptomycin plus ceftriaxone prevents brain damage and hearing loss in infant rat pneumococcal meningitis vs ceftriaxone monotherapy and vs rifampicin plus ceftriaxone

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Background: Exacerbation of the inflammatory response in cerebrospinal fluid (CSF) contributes to brain damage and the subsequent development of neurological sequelae in survivors of bacterial meningitis (BM). Lytic antibiotics for therapy of BM increase the release of proinflammatory bacterial compounds which, in turns, induce inflammation. Daptomycin, a non-lytic antibiotic acting on Gram-positive bacteria has been shown to decrease inflammation and brain injury vs. ceftriaxone in experimental pneumococcal meningitis.
Objectives: With a view on the clinical application for empiric therapy of pediatric bacterial meningitis we investigated, whether therapies combining daptomycin or rifampicin with ceftriaxone are beneficial when compared to ceftriaxone monotherapy in infant rat pneumococcal meningitis.
Methods: Eleven day old Wistar rats were infected by intracisternal injection of S. pneumoniae and animals were treated with daptomycin (10 mg/kg, s.c., daily) plus ceftriaxone (100 mg/kg, s.c., bid), rifampicin (20 mg/kg, i.p., bid) plus ceftriaxone or ceftriaxone alone. CSF was sampled at 6 h and 22 h after the initiation of therapy and assessed for concentrations of chemo- and cytokines (MCP-1, MIP-1alpha, IL-1beta, IL-6, IL-10; IL-18 and TNF-alpha). A subset of animals was sacrificed 40 h post infection (h pi) and brain damage quantified by histomorphometry. The remaining animals were treated for 3 d and were tested for hearing loss, by assessing the auditory brainstem response (ABR) at 3 weeks after infection.
Results: Compared to ceftriaxone alone, daptomycin plus ceftriaxone significantly ($p<0.04$) lowered CSF concentrations of MCP-1, MIP-1alpha and IL-6 at 6 h and MIP-1alpha and IL-1beta at 22 h after initiation of therapy, led to significantly ($p<0.01$) less apoptosis assessed at 40 h pi, and significantly ($p<0.01$) improved hearing capacity. While rifampicin plus ceftriaxone also led to lower CSF inflammation ($p<0.02$ for IL-6 at 6h), apoptosis and hearing capacity were not significantly different from the ceftriaxone group.
Conclusion: Compared to ceftriaxone monotherapy, daptomycin plus ceftriaxone lowers the level of pro-inflammatory mediators in the CSF and reduces hippocampal apoptosis and hearing loss in infant rat pneumococcal meningitis.

Neurobiology (PSB)
bacterial menigitis, brain damage, hearing loss, infection, antibiotics

Poster

PNB-04

Successful longterm propagation of rat inner ear stem cells from postmortem temporal bones.

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Background: Hearing loss is a common disorder, affecting and over 30% of individuals above 65 years of age. Although effective, present treatment options are expensive and not suitable for all patients. The inability of the cochlea to replace lost inner ear hair cells is the main cause of hearing loss permanence in humans. A potential cure is the transplantation of inner ear cells and in this context stem cells are currently assumed as primary candidates for hair cell regeneration or the regeneration of auditory neurons.
Purpose: To optimize isolation and culture techniques for long lasting propagation and differentiation of inner ear stem cells.
Methods: Postmortem inner ear tissues of neonatal rats were harvested from temporal bones to isolate stem/progenitor cells. Using previously established methods, the stem cells were propagated and differentiated into inner ear cell types such as hair cells, supporting cells and spiral ganglion neurons. Cultured inner ear cells were propagated in basal medium containing mitogens. For differentiation of spiral ganglion the cells were grown in absence or presence of BDNF, GDNF and creatine. Newly generated and differentiated cells were identified using immunohistochemistry for neuronal and glial markers.
Results: Sphere-forming cells were successfully isolated from postmortem utricles, organs of corti and spiral ganglions of newborn rats. For the first time we were able to long-term propagate organ of corti stem cells for up to 8 passages. Furthermore, we demonstrated that single spheres derived from passage 4 showed the potential to form new spheres. Importantly to note, we detected that yield of spheres decreased over time of propagations, while size of spheres did not significantly differ at passage 7 as compared to those from passage 1. Our preliminary data showed that neural differentiation of propagated spiral ganglion cells was increased in the presence of BDNF or creatine, while no effects were observed for GDNF.
Conclusion: Postmortem temporal bones are a new source for inner ear stem cells that can be expanded over considerable time periods. Notably, details of propagation and differentiation must be improved in order to generate substantial numbers of mature inner ear cell types.

Neurobiology (PSB)
hearing loss, stem cell, inner ear, cochlea, hair cell, auditory neuron

Poster

PNB-05

Cell replacement therapy for brain damage after bacterial meningitis: Neural precursor cells integrate and differentiate in organotypic hippocampal slices injured after challenge with Streptococcus pneumoniae

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Background: Bacterial meningitis (BM) causes life-long disabilities in up to 50% of the survivors. The underlying brain injury prominently affects the hippocampus, a brain region involved in learning and memory function. Hippocampal injury is characterized by apoptosis of developing neurons in the dentate gyrus (DG). Neural precursor cells (NPCs) are promising candidates for cell replacement therapies aimed at improving neurofunctional outcome after bacterial meningitis.
Objectives: To evaluate NPCs for their potential to survive, differentiate and integrate in hippocampal slice cultures that were challenged with live Streptococcus pneumoniae (SP) to induce tissue damage characteristic for bacterial meningitis.
Methods: An in vitro system combining long-term organotypic hippocampal slice cultures from postnatal rats with fetal NPCs from the hippocampus and the subventricular zone was established. To induce the brain damage characteristic for BM the slices were kept in partially nutrient-deprived medium and were exposed to live SP together with the antibiotics penicillin and streptomycin to cause bacterial killing and lysis. Precursor cells expressing green fluorescence protein (GFP) were expanded as neurospheres. Neurosphere derived cells were then grafted into the hilus region of the DG in injured hippocampal slice cultures after challenge with SP and in unchallenged slices. The survival and integration of grafted cells was examined on cryosections of the slice cultures and the differentiation stage was assessed by immunohistochemistry.
Results: Histomorphologic analysis revealed neurite outgrowth and integration of hippocampal and subventricular NPCs into hippocampal slices at the site of injury 7 days after engraftment. GFP-expressing neurosphere cells were able to differentiate and to mature into neurons.
Conclusion: Hippocampal and subventricular NPCs grafted into pneumococci-treated OHCs survive, differentiate and integrate into the host tissue. The transplantation of neurosphere derived NPCs may hold promise for regenerative therapies aimed at repair of apoptotic brain damage in the hippocampus of patients suffering from neurofunctional sequelae after bacterial meningitis.

Neurobiology (PSB)
bacterial meningitis, Streptococcus pneumoniae, organotypic hippocampal cultures, neural precursor cells, brain repair mechanism

Poster

PNB-06

The number of Fetal antigen-1 expressing neurons is increased in the striatum of 6-OHDA lesioned rats.

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Fetal antigen 1/delta-like (FA1/dlk) protein is a member of the epidermal growth factor superfamily. FA1/dlk has been proposed to be a growth and/or differentiation factor expressed in cells during development. Recently, FA1/dlk has been demonstrated to be expressed in the ventral mesencephalon and has been suggested as a potential alternative marker protein in dopaminergic neurons, which is of particular interest in relation to Parkinson's disease. The present study aimed at investigating the expression pattern of FA1-immunoreactive (-ir) cells in the 6-hydroxydopamine (6-OHDA) rat model of Parkinson's disease. For that purpose adult rats received an unilateral injection of 6-OHDA either into the ascending mesotelencephalic pathway or into the striatum. One month later the brains were processed for histological analyzes.
In line with our previous observations we found that FA1/dlk-ir cells were predominantly distributed in the substantia nigra pars compacta (SNc). Colocalization experiments revealed that a extensive number of tyrosine hydroxylase (TH)-ir neurons also expressed FA1/dlk in the SNc assuming that these cells are projection neurons. This latter assumptions was further substantiated by co-localization with retrogradely transported fluorogold. In contrast to the findings made for the ventral mesencephalon only a small number of FA1/dlk-ir cells were detected in the striatum. The unilateral 6-OHDA lesions resulted in a marked loss of both FA1/dlk-ir and TH-ir neurons in the SNc. Accordingly, innervation of TH-ir and FA1/dlk-ir fibers were severely reduced in the lesioned striatum. Importantly, we detected that the number of striatal FA1/dlk-ir cells in the denervated striatum was significantly increased (by 70%) as compared to the unlesioned side. Our preliminary observations revealed that these FA1/dlk-ir cells were not newly generated indicating that they may be up-regulated in already existing cells in response to the lesions.
In sum, our findings showing that FA1/dlk expression is differentially modulated in the nigrostriatal sytem in response to 6-OHDA lesions and indicate that FA1/dlk may play an important role in Parkinson disease.

Neurobiology (PSB)
Parkinson, rat model, immunohistochemistry,FA1/dlk

Poster

PNB-07

Clinical and neurobiological effects of transcranial magnetic stimulation on auditory verbal hallucinations

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Introduction:
Auditory verbal hallucinations (AVH) are a core symptom in schizophrenia. Approximately 1/3 of the patients are not responding to psychopharmacological treatment. In these patients, transcranial magnetic stimulation (TMS) is a promising new therapeutic approach. In an ongoing study, we apply this method and find positive effects on hallucination scores. From the neurobiological point of view, increases of BOLD signals during AVH in the auditory and language related brain regions are described. Here, we directly measured the cerebral blood flow (CBF) with MR-arterial spin labeling (ASL) before and after TMS treatment. We hypothesized an increase of CBF in the acute state of AVH in the auditory and language brain regions and expect a reduction in the respective regions parallel to clinically reduced AVH.

Methods:
We investigated seven schizophrenic patients before and after a 10 day TMS treatment to left temporoparietal cortex with MR-ASL. The exact location for the stimulation was chosen according to an individually determined language region by an fMRI language paradigm. TMS stimulation parameters followed either a low frequency 1Hz protocol or a patterned Theta Burst stimulation (30Hz) protocol, each at 90% motor threshold. AVHs were measured by an independent, blinded rater with standardized clinical instruments. Scans were performed at a 3 T MR scanner (Siemens Magnetom TRIO). ASL data analysis was performed using Matlab®, statistical parametric mapping (SPM) and inhouse software (AF). For statistical analysis, paired t-tests were calculated.

Results:
On the clinical level, patients showed positive effects as indicated by a reduction in AVH scores after TMS therapy. On the biological level, blood perfusion decreased in primary auditory cortex of the stimulated hemisphere after successful TMS.

Discussion:
Our data provide first evidence of a direct biological effect of TMS on AVH by a reduction of blood perfusion in the primary auditory cortex. The clinical findings are in agreement to former clinical trials with improvements of AVH in medication resistant schizophrenia patients after TMS therapy. Further we find evidence for increased CBF in the auditory cortex in the state of acute hallucinations as measured with ASL. With decreases of AVH the CBF decreases in the primary auditory regions of the dominant hemisphere, supporting its crucial role in the perception of AVH.

Neurobiology (PSB), MR-Methodology (PSM), Neuropsychology / Psychiatry (PSP)
Transcranial magnetic stimulation

Poster

PNB-08

Cholinergic neurons in the adult rat forebrain express the creatine transporter but not GAMT required for creatine synthesis

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The creatine kinase / phosphocreatine system plays a key role in cellular energy buffering and energy transport, particularly in cells with high and fluctuating energy requirements like neurons. Creatine (Cr) is a substrate for mitochondrial (uMt-CK) and cytosolic brain-specific creatine kinases (BB-CK). Cr is synthesized by a two-step mechanism involving arginine:glycine amidinotransferase (AGAT) and guanidinoacetate methyltransferase (GAMT), and is taken up by cells through a specific Cr transporter, CRT1. In the present study, we investigated the expression of markers of the creatine system in the adult rat forebrain and spinal cord. For that purpose perfusion fixed adult rat CNS tissue was sectioned on a cryostat and immunohistochemically stained for AGAT, GAMT, CRT1 and the CK's. Cholinergic neurons were identified by immunochemistry for the specific marker choline acetyl transferase (ChAT). We detected that GAMT and AGAT are expressed in a large number of cells including neurons and glial cells in the forebrain. Similarly, both isoforms for CK's were found in distinct populations of cells. No co-localization, however, was found for GAMT and ChAT, while some of the cholinergic neurons also expressed CRT1, AGAT and the CK's. In contrast to the finding in the forebrain, a substantial number of ChAT-positive neurons in the ventral horn of the spinal cord expressed all markers of the creatine system including CRT1 and GAMT.
Taken together, our findings suggest that de novo synthesis of creatine as well as cellular Cr uptake is possible for cholinergic neurons of the spinal cord, while neurons in the forebrain seem to be dependent on exogenous Cr supplementation.

Neurobiology (PSB)
creatine, rat brain, cholinergic neurons, immunohistochemistry

Poster

PNB-09

Do elite athletes experience lower subjective stress during a psychologically challenging situation compared to non-athletes as revealed by cortisol analysies?

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Stress response can be considered a consequence of psychological threats or challenges to the human organism. A biological indicator of subjective stress represents elevated cortisol secretion. The extent of subjectively experienced stress depends on individual coping strategies or self-regulation skills. Because of their experience with competitive pressure, athletes might show less pronounced biological stress responses during stressful events compared to non-athletes. In the present study, the short version of the Berlin Intelligence Structure Test, a paper-pencil intelligence test, was used as an experimental stressor. Cortisol responses of 84 Swiss elite athletes and 92 non-athlete controls were compared. Salivary free cortisol responses were measured 15 minutes prior to as well as immediately before and after psychometric testing. In both groups, a significant effect of time was found: High cortisol levels prior to testing decreased significantly during the testing session. Furthermore, athletes exhibited reliably lower cortisol levels than non-athlete controls. No significant interaction effects could be observed. The overall pattern of results supports the idea, that elite athletes show a less pronounced cortisol-related stress response due to more efficient coping strategies.

Neurobiology (PSB)
cortisol, stress, athletes, non-athletes, coping

Poster

PNB-10

The Cyclical Thought-Action-Mood-Model of Mixed Bipolar Disorders: From Kraeplin's "Fig. 228" to Askland's Biaxial Model?

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We handle 3 dimensions plus time easily and need 3D-models like Weygandt's T-A-M-model (1899) to understand "bi"-polar affective disorders (BPAD). Kathleen Askland proposes the BPAD spectrum to be due to the interaction of also genetic alterations of transmitter-driven neurochemical "range" and channel-driven neuroelectrical "tonicity".

1.Using an own "3+time"-D-"cube" derived from Emil Kraepelin I argue for a preponderantly neuroelectrical modulation of capacitances of networks (Hodgkin-Huxley 1952) providing psychomotorical higher-D "Action"-knowing how computation on "A-Axis." Determination of 4-D-"Thought"-knowing that on "T-Axis" is "driven" via neurochemical inductances. In an AC-LRC-circuit-model this will be reflected in the properties of the scaffolded serial and parallel summations of inductive and capacitive reactances encountered in the respective types of neural networks.

2.The vectors Thought, Action, Mood span a "3+time"-D-"cube". At its corners twice three classical mixed states (Manic stupor etc.) are generated, which are by a single inverted value "away" from the extremes of "Activation" (Depression è Mania). This cube generates the two (of 6) phase-lagged triple T-A-M-sinus curves in Kraepelin (1913) "Fig.228" when a cycle is inserted into it. This loop consists of an approach wave closed to form a perception-action-cycle (…quietnessè needè appetitive planning "Thought"è ecologic encounter by "Action"è consumptionè…). This cycle, when tilted, "generates" one of 6 sequences of triple sinus curves (Lissajou). The model predicts that the psychomotoric "parietal motor brain" systems (A) provides high-D computing and is "governed" by ion channels ("inductance"). The 4-D-time-symbolic search systems (T) instead is "dominated" by transmitters.

3.Deformed cycles depict the temperaments of Plato's State, better modeled by elongation of spring-pendulum by a mass "of THOUGHT T". MASS (inductance) is analogous to mental incitation (T), the spring's STIFFNESS (Hooke's k or reciprocal of capacitance or ACTION; 1/C) is a brake to elongation. Choleric "soldiers" persue certainty and use timely frugal models (T(-)) for ongoing affairs: they act impulsively when their light "T(-)-mass" bounces up on a rapid strong "A(+)-spring". Sanguinic "philosophers" resolve uncertainty without resolve: a heavy "T(+)-mass" on a slow soft "A(-)-spring"; they search for truthful, but too untimely models of the future. Melancholics can't move a stiff "A(+)-spring" with a light "T(-)-mass": no plans for the future, no action. Phlegmatics, the maniform "entrepreneurial usurers", have a soft "A(-)-spring" and a heavy "T(+)-mass". At least the Platonic Banausas are normals in T-A-equilibrium.

4. A graphical synopsis of the model and present interdisciplinary evidence are shown.

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Neurobiology (PSB)
Bipolar disorder - Circular pathways-based genetic analysis model

Poster

MR-Methodology (PSM)

PSM-01

Dynamic Causal Modeling: the impact of initial state configuration on model selection

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Objective
Dynamic Causal Modeling (DCM) [1] represents a powerful technique to analyze the effective and functional brain connectivity. In contrast to the Granger causality it is a sophisticated model based approach and enables to compare different experimental designs according to Bayes factors. However DCM strongly depends on the experience of the neurologist and the design of the experiment (paradigm). In this sense, the initial user defined configuration of the associated system matrices (A-D) plays the crucial role with respect to the convergence of the DCM. In this study it is examined, to which degree the initialization of the context dependent modulations (B) with Granger causality functional connectivity values has any impact on the convergence and the outcome of DCM compared to an estimated initial guess of B.

Methods
The simulations were performed using the example data available from http://www.fil.ion.ucl.ac.uk/spm/data/attention/: Attentional modulation of effective connectivity using functional magnetic resonance imaging (fMRI). Three subjects were scanned under identical stimulus conditions (visual motion) while varying only the attentional component of the task. Haemodynamic responses defined an occipito-parieto-frontal network, including the, primary visual cortex (V1), V5 and PPC and PFC. Two DCM models were defined, one (model 1) by choosing the parameters according to the description of the authors and the second (model 2) by using the Granger causality values as the initial settings for the modulation matrix B. Both models were compared and the Bayes factors (model evidence) were calculated

Results
The best results were achieved using the Granger pre-configuration of B: consistent evidence is in favour of model 2 – Bayes factor >= 6.21.

Conclusion
The presented technical optimizations are essential with respect to more robust convergence behavior of DCM simulations. Whereas the structural information in A is mainly dominated by anatomical knowledge of the user and by measured data (e.g. diffusion tensor), the context dependent modulations (B) are more difficult to estimate. The new approach helps to simplify the handling of DCM by initializing B with the Granger causality matrix for specific regions prior to DCM parameter estimation.

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MR-Methodology (PSM)
DCM

Poster

PSM-02

Non-invasive assessment of cerebral blood flow using MR-Arterial Spin Labeling: a clinical perspective

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The assessment of cerebral blood flow (CBF) using non-invasive MR methods may increase the insight of the pathophysiological mechanism that leads to disease as well as to the understanding of the development of diseases. Arterial Spin Labeling (ASL) is a fast developing technique with a wide range of applications in the fileds of pediatry, gerontopsychiatry, psychiatry, psychology, neuroscience, neurosurgery, neuroradiology and neurology. That this method is so widespread is based on simple and reliable facts: it is fast, it is precise in spatial resolution and it provides basic quantities in units of ml/100g/min. Recent advances in ASL have permitted non-invasive evaluation even of vascular territories.
Imaging was performed on a Siemens 3T Trio scanner (Siemens, Erlangen, Germany). Two patients and 2 healthy subjects were measured using a commercial eight-channel head RF coil array and the body coil for RF transmission. The FOV was 230 cm × 230 cm, matrix size 128 x 128, 5 slices of 8 mm thickness with a 2-mm gap between slices. Tagging duration was 1375 ms for the tagging pulse train. Two nonselective adiabatic inversion pulses were applied 950 ms and 300 ms prior to image acquisition for background suppression. The postlabeling delay was 1000 ms and TR/TE was 3000 ms/52ms. A total of 20 images were acquired for a set of six cycle. Total scanning time was 6 min for three-vessel encoding. Analysis and computation of selective ASL maps were performed using self written (A.F.) Matlab programs (MATLAB version 7, release 14; The MathWorks, Inc., Natick, USA).
We discuss the potential benefit of these non-invasive methods in the clinical settings and present case reports, in which we quantitatively assess mixing of internal carotid and basilar artery blood through cerebrovascular anastomoses using vessel-encoded arterial spin labelling. The method is paralleled with images of MR angiography. Vascular territories obtained with vessel-encoded ASL labeling match with cerebrovascular anatomy and allow quantitative assessment of mixed territorial supply in subjects with and without pathology.
In patient 1, vessel-encoded ASL labelling was used to detect cross-flow from left to right in a patient with a right-sided ICA stenosis. In patient 2, ASL revealed cross flow from the right internal carotid artery via the right ramus communicans posterior. In two healthy volunteers, vessel-encoded ASL detected the physiological vascular territories. The results of the ASL were confirmed either by MR- or digital subtraction angiography.
Conclusion: Vessel-encoded ASL labelling may be used to map cerebrovascular territories in healthy volunteers and patients with vessel occlusions or stenosis non-inasively and repetitively and to aid in the planning of therapeutic procedures of revascularisation.

MR-Methodology (PSM), Neurology (PSN), Neuropsychology / Psychiatry (PSP)
Cerebral Blood Perfusion (CBF); Arterial Spin Labeling (ASL); Vascular Territory

Talk

PSM-03

Interactive Tool for Computer Aided Multiple Sclerosis-Lesion Counting in MR-images and Volumetry

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Introduction - MRI is the technique of choice for the diagnosis and monitoring of multiple sclerosis. MRI not only allows the detection of the totally affected brain tissue from T2-weighted MR-images, but also allows the discrimination of old lesions from new active lesions from contrast enhanced MR-images.
Traditionally the number of MS-lesions is used as indicator of disease progression, which are „manually" counted by the neuroradiologist. Manual lesion counting may seem to be a very straightforward and simple procedure, but in practice, this turns out to be not the case; especially lesion counting from T2-weighted images. There are several reasons for this. The first reason is that there are no clear rules on how to count the MS-lesions exactly. More specifically: what is the minimum size of a MS-lesion to be counted?; how to count multiple small lesions which are closely together? Also highly problematic are MS-lesions which are visible in more than one adjacent images, especially in the case of multiple closely together located lesions. These questions will be answered by every neuroradiologist in a different fashion.

Method - The aim of the study was to develop an algorithm for computer aided MS-lesion counting and volumetry. The application was completely written in JAVA and allows for the analysis of image data in the DICOM format. The evaluation takes the following steps.
1. Image data loading.
2. Graphical definition of prototype lesion tissue by the neuroradiologist, i.e. the neuroradiologist simply marks one or more lesions.
3. Automatic segmentation based on the defined prototype MS-lesion tissue (mouse click).
4. Refinement step: manual sub-selection of found lesions (if necessary) by means of mouse-clicking on those image sub-segments.
5. Automatic lesion number counting and volumetry by one single mouse click.
6. Storage of total lesion count and volumetry.

Results - A fully working application has been developed and the method was tested on a collective of 64 patients. The application counts connected lesions visible in multiple adjacent slices correctly. Lesion volume values obtained from MS-patients are very realistic, statistical tests passed successfully. Due to the fact that no minimum lesion volume can be defined, the number of lesions obtained by the application is larger than the manually obtained lesion counts. Improvements in the lesion counting algorithms are currently under investigation.

Conclusion - The study showed that computer aided MS-lesion counting and volumetry is feasible and will help to improve the quality of monitoring MS-disease progression in future.

MR-Methodology (PSM)
MRI; Multiple Sclerosis; Volumetry; Lesion Counting; Algorithms

Poster

PSM-04

Musical training induces functional plasticity in human hippocampus

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Training can change functional and structural organization of the brain, and animal models demonstrate that the hippocampus formation is particularly susceptible to training-related neuroplasticity. In humans, however, direct evidence for functional plasticity of the adult hippocampus induced by training is still missing. Here, we used musicians' brains as a model to test for the plastic capabilities of the adult human hippocampus. By using functional magnetic resonance imaging optimized for the investigation of auditory processing, we examined brain responses induced by temporal novelty in otherwise isochronous sound patterns in musicians and musical laypersons, since the hippocampus has been suggested previously to be crucially involved in various forms of novelty detection. In the first cross-sectional experiment, we identified enhanced neural responses to temporal novelty in the anterior left hippocampus of professional musicians, which were correlated with rhythmic musical aptitude, pointing to expertise-related differences in hippocampal processing. In the second experiment, we evaluated neural responses to acoustic temporal novelty in a longitudinal approach to disentangle training-related changes from predispositional factors. For this purpose, we examined an independent sample of music academy students before and after two semesters of intensive aural skills training. After this training period, hippocampal responses to temporal novelty in sounds were enhanced in musical students, and statistical interaction analyses of brain activity changes over time suggest training rather than predisposition effects. Thus, our results provide direct evidence for training-related functional changes of the adult hippocampus in humans, and, in addition, strengthen the notion of music as a neuroplastic agent.

MR-Methodology (PSM)
neuplasticity, musicians, fMRI

Poster

Neurology (PSN)

PSN-01

Bilateral neglect after two sequential strokes: a single case report

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Hemispatial neglect is defined as the pathological inattention to the contralesional side of space, which cannot be explained by an elementary sensory impairment. Interhemispheric inhibition has been shown to play a fundamental role in hemispatial neglect. The lesioned hemisphere cannot inhibit its intact, contralateral homologue anymore, resulting in a pathological hyperactivity of the latter and in an ipsilesional attentional bias. Reduction of the pathological hyperactivity of the intact hemisphere should thus restore the interhemispheric inhibition balance and lead to neglect symptoms improvement. Evidence for interhemispheric balance of attention as a potential mechanism underlying neglect comes from a seminal single case report (Vuilleumier et al., 1996, Neurology), who described a patient with neglect who suffered two sequential strokes. A first, right parietal stroke resulted in a left-sided neglect, which disappeared after a second, left frontal stroke. In the present single case report, we describe another patient who displayed left sided neglect following a subcortical stroke in the territory of the right middle cerebral artery (MCA) and, within 24 hours, suffered from a subsequent, cortical stroke in the territory of the left MCA. In contrast to the above mentioned case report, our patient did not recover from neglect after the second stroke, but displayed neglect to both the left and right side of space. To account for differences between the outcomes of the two cases, three explanatory hypotheses are proposed. First, the very short delay between the two sequential lesions may have had different influences on interhemispheric mechanisms. Second, the neuroanatomical location of the lesions is different. Third, differences may be explained by some additional diagnostic instruments we used, which may be more sensitive than paper-pencil tests.

Neurology (PSN), Neuropsychology / Psychiatry (PSP), Rehabilitation (PSR)

Poster

PSN-02

Diagnostic of mitochondrial disorders at the University Hospital of Berne

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Introduction: Mitochondrial disorders are a heterogenous group of diseases. They may affect a single organ, or present as a multisystemic disorder. Disease onset varies from neonatal to childhood to adult life, with patterns of inheritance that can be Mendelian or maternal. The diagnostic process starting with the suspicion of a mitochondriopathy to the definitive biochemical and genetic diagnosis is very complex and remains a challenge. It requires an interdisciplinary approach, by combining clinical symptoms, routine laboratory diagnostics, functional assays, neuro-imaging, histology, genetics and biochemistry.
Objective: To organize an interdisciplinary team consisting of specialists in genetics, paediatric and adult neurology, inborn errors of metabolism and biochemistry to obtain the molecular diagnosis of a mitochondrial disorder.
Methods: We established a wide spectrum of assays that can be applied as a comprehensive diagnostic tool. This includes at biochemical level: Spectrophotometric measurements of the respiratory chain complexes, polarographic methods to study the mitochondrial oxygen consumption, staining methods to detect the enzymatic activities of complexes I, II, IV and V in blue native gels, immunodetection of subunits separated by SDS-gels or one- and two-dimensional blue native gels with specific antibodies. Genetically we offer molecular genetic testing of the entire mitochondrial genome as well as broad variety of nuclear genes involved in mitochondrial biogenesis. Histologically we provide state of the art histochemical and immune-histochemical preparations as well as ultrastructural analysis of muscle tissue.
Results: We will present different biochemical and molecular analyses in patients, leading to the final diagnosis of a mitochondriopathy.
Summary: In 2005 we founded a “Mito-Group” at the University Hospital of Berne. Our work is focused on the selective investigation of patients suspected for a mitochondrial disorder. We meet regularly, discussing the medical history of the patients and planning the necessary interdisciplinary investigations to achieve a conclusive result.
The analytical procedures have developed and improved substantially. So far, in 2009 18 patients out of 53 (34 %) were diagnosed with a mitochondriopathy.

Neurology (PSN)

Poster

PSN-03

Auditory Hallucination in Epilepsy – Electrographic and Perfusion Correlates in the Temporal Lobe

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Purpose: Acoustic hallucinations can occur in various neurological and psychiatric disorders. In psychosis pathological BOLD activations in the primary auditory cortex (PAC) as well as in language areas contribute to hallucinations. Here, we present perfusion studies and EEG findings in epileptic patients presenting a semiology of acoustic hallucinations.

Methods: Four patients, two with symptomatic temporal lobe epilepsy (TLE; post haemorrhage left fronto-temporal, glioma right fronto-temporal, respectively), two with refractory cryptogenic right TLE have been examined. Cerebral perfusion has been assessed by arterial spin labeling and resting state BOLD fMRI in three patients, by CT perfusion in one patient. EEG was performed immediately after imaging.

Results: Three patients reported acoustic phenomena when examined. Complex partial status epilepticus (CPSE) with temporal predominance was present on EEG. Perfusion imaging revealed hyperperfusion in the temporal lobe, covering the respective PAC. The fourth patient did not perceive his habitual voices during scanning. Decreased perfusion was observed in the right superior temporal gyrus, matching the irritative zone as assessed by combined EEG/fMRI.

Conclusion: Perfusion changes in the PAC occurred in all four cases which co-localised to the epileptic generator as assessed by EEG. In patients with ongoing acoustic hallucinations in CPSE increased perfusion was delineated. Our perfusion data support the hypothesis of PAC being a constituting element in the genesis of auditory hallucinations independent of their aetiology.

Neurology (PSN)

Talk

PSN-04

Cerebrovascular Reserve Capacity (CVR) measurements using Arterial Spin Labeling (ASL) in intracranial arterial stenosis

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Purpose:
The estimation of CVR is currently mainly performed by Transcranial Doppler Ultrasound (TCD). Hence TCD provides limited information about brain hemodynamics due to the inability to quantify cerebral perfusion and to the lack of regional resolution. Positron emission tomography, the gold standard of brain perfusion measurements, is expensive, not routinely available in clinical practise and carries radiation exposure. ASL provides the opportunity to perform a high resolution, whole brain perfusion measurement and therefore is a promising method to assess non-invasively the CVR in cerebrovascular disease.

Methods:
Two male patients (25 and 36 yrs respectively) presenting with a high grade stenosis of the proximal segment (M1) of the middle cerebral artery (MCD) were examined. We used pulsed ASL for the measurement of cerebral blood flow (CBF) (TR 3000ms, 14 slices, label time 2s, postlabeling delay 1.2 s) at rest and under a vasodilatory stimulus of inhalative 5% CO2. CBF maps were calculated using a self-written MATLAB program. The respective CBF maps of rest and stimulation as well as the subtractions maps were visually and semiquantitatively analyzed. The measurements were repeated after Percutaneous Transluminal Angioplasty (PTA) and the results compared to the degree of stenosis as assessed by the MR Time of flight (TOF) angiography.

Results:
In the first patient the CBF values in the MCA territories were symmetrical at rest. Under stimulation an increase of CBF on the asymptomatic side (+ 8%) was depicted, on the symptomatic side CBF values were decreased (-10%). These findings correlate with a reduction of flow signal in the TOF-Angiography in the ipsilateral peripheral MCA segments. After PTA CBF values under stimulation showed symmetrical values. In the second patient CBF values were symmetrically at rest and showed a symmetrical increase of 15% in both MCA territories. No Flow reduction in the peripheral MCA segments was present on TOF-Angiography and no changes in the CBF maps were depicted after PTA.

Conclusion:
Preliminary data show the feasibility of CVR measurements using ASL in cerebrovascular disease. The observed CVR results correlate with the flow signal reduction in the peripheral segments of the intracranial vessel. Implementation of ASL in the measurements of CVR may provide non-invasively a high resolution whole brain map of CVR and therefore qualify as routine measurement in the diagnostic workup of cerebrovascular disease. Further studies evaluating the quantitative influence of turbulent and slower flow in the stenosed vessel are underway.

Neurology (PSN)

Poster

PSN-05

Right hemispheric lateralization during somatosensory discrimination of shape

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Somatosensory discrimination (SSD) of shape by manual exploration engages extended fronto-parietal networks whose activity and hemispheric topography is task-dependend and reflects different stages of somatosensory processing. We used functional magnetic resonance imaging (fMRI) to test the hypothesis that explicit SSD with the left hand (LH) shows the same asymmetric involvement of parietal and possibly frontal areas. Indeed, during a two-alternative forced choice haptic task, right dorsolateral prefrontal cortical (dlPFC) and right dorsal intraparietal (dIPS) areas were active in explicit shape discrimination for both RH and LH.Voxel-based lateralization indices increased with left hand use, indicating that the right hemisphere is predominatly active in this process. In contrast to motor areas, averaged BOLD responses from dlPFC and dIPS showed activity during shape information maintenanc, further supporting their role in haptic working memory and shape discrimination.

Neurology (PSN)
fMRI, shape discrimination, lateralization

Poster

PSN-06

Properties of the frontal eye field in visual vector inversion

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In the memory antisaccade task, a saccade must be triggered precisely towards the opposite side of a peripheral visual stimulus presented short time previously. To perform this task accurately, the visual vector, i.e., the distance between a central fixation point and the peripheral stimulus, must be inverted from one visual hemifield to the other. Results from recent studies suggest that not only the posterior parietal cortex (PPC) but also the frontal eye field (FEF) might play an important role in this visual vector inversion. We investigated the role of the FEF in the memory antisaccade task using an inhibitory transcranial magnetic stimulation routine with theta burst stimulation (TBS). In 10 healthy subjects, one continuous train of TBS was applied over the right FEF prior to a memory antisaccade task. In comparison to the performance without stimulation and with sham stimulation, TBS over the right FEF provoked a hypometric saccade gain for rightward antisaccades, i.e., when the visual target was presented in the left screen half. If the target was presented on the right side, there was no stimulation effect. These results suggest that visual vector inversion is effectuated by a fronto-parietal network, including both the PPC and the FEF.

Neurology (PSN)
Visual vector inversion, frontal eye field, theta burst stimulation

Poster

Neuropsychology / Psychiatry (PSP)

PSP-01

Thoughtful rest: Anatomical and functional convergence of semantic memory and the default mode system

Miranka Wirth[1], Kay Jann[1], Andrea Federspiel[1], Ariane Orosz[1], Helge Horn[1], Thomas Dierks[1]

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Previous functional neuroimaging resonance (fMRI) findings demonstrate that semantic memory is inquired during the resting state mode. The neural correlate of such internal (task-unrelated) cognitions is the Default Mode Network (DMN), yet anatomical and functional convergence of the semantic system with this higher-order resting state network remains elusive. Using state-of-the-art Independent Component Analysis (ICA), we examined spatial and functional links regarding the DMN and fMRI-correlates evoked by three cognitive tasks, i.e., semantic, phonological and perceptual decisions to visually-presented words, in contrast to a neural network comprising phonological regions. Our findings show selective spatial overlap between the DMN and semantic activations within left-hemispheric hetero-modal brain regions, that is, lateral parietal, temporal, medial frontal, inferior frontal and posterior cingulate areas. Correspondingly, semantic retrieval induced less deactivation in the global DMN and these local overlapping regions compared to phonological and perceptual processing. Further, the anatomical and functional patterns of convergence were dissociated within the task-positive phonological network, yielding pronounced intersections with phonological fMRI-signals together with enhanced network activations during phonological compared to semantic and perceptual decisions. As such, we provide evidence that semantic memory constitutes an integral component of the DMN. In particular, the DMN comprises association cortices involved in semantic processing, potentially representing associative hubs between internally- and externally-generated semantic operations. Overall, our findings substantiate views that the default cognitive mode as mediated by the DMN incorporates memory systems.

Neuropsychology / Psychiatry (PSP)
Memory, language, default mode, fMRI

Poster

PSP-02

Generalizations over temporally distinct ‚non-conscious episodes' engage the hippocampus during learning and retrieval

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Whether inferring over partially overlapping episodes (A – B, B – C) is subserved by conscious mnemonic strategies during generalization (A – C) or memory representations formed during encoding already integrate previous experience in an automatic and therefore implicit fashion is still a matter of debate. In order to address this issue, we conducted a transitive inference paradigm which assures a full exclusion of conscious access to learned premise word pairs due to very short (17 ms) and pattern masked multiple presentations of a pair within a six second time frame (referred to as one 'non-conscious episode'). Behavioral results indicated that conscious access to premise pairs (A – B, B – C) is not a necessary prerequisite for generalization to occur. Further, functional magnetic resonance imaging revealed hippocampal and midbrain involvement during the encoding of subliminal overlapping premise pairs as well as hippocampal recruitment during generalization. We conclude that generalization occurs through integration of overlapping events into flexible memory representations already during encoding of premise pairs. Most importantly, this form of learning can occur outside conscious awareness but nevertheless engages the hippocampus. These findings disagree with the notion that the medial temporal memory system discriminates on consciousness.

Neuropsychology / Psychiatry (PSP)
medial temporal lobe memory

Poster

PSP-03

Do children and adolescents show cognitive long-term sequelae after acquired isolated cerebellar lesions?

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Introduction

The importance of the cerebellum in mediating motor functions is indisputable. In contrast, its contribution to developing cognitive functions remains rather elusive and is therefore a topic of current interest in contemporary clinical neuropsychology. The aim of this study was to obtain detailed records of individual cognitive long-term sequelae after acquired non-neoplastic isolated cerebellar lesions during childhood and adolescents.

Subjects and Methods

Eight patients 11 to 21 years (mean age 16y 6mo; SD 3y 2mo) after acquired non-neoplastic isolated cerebellar lesions have participated in the present study. To assess long-term sequelae a general cognitive assessment, an extensive neuropsychological test battery and motor function tests have been performed at least two years after injury.

Results

Our data show that individual neuropsychological dysfunctions may be present in patients undergoing a profound examination. Particularly aspects of executive functions, verbal fluency and attentional processes seem to be vulnerable after acquired cerebellar lesions during childhood. However, none of our patients had general intellectual impairments.

Conclusion

Summing up our results, it looks like the cerebellum of children and adolescents is generally quite resilient for cognitive long-term sequelae. Cognitive impairments after cerebellar lesions seem to be mild, mostly subclinical and clearly less frequent and severe compared to impairments after cortical damages. Probably the exact lesion site as well as its afferent and efferent connections are essential for the manifestation of neuropsychological dysfunctions.

Neuropsychology / Psychiatry (PSP)
cerebellum, cognition, dysfunction, neuropsychology

Poster

PSP-04

Duchenne muscular dystrophy: The impact of the dystrophin isoform Dp140 on cognitive functions

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Introduction:
Duchenne muscular dystrophy (DMD) has long been recognized as a cause of mental retardation. However, there is tremendous individual variation in intellectual functioning across affected boys. Therefore, a comprehensive neuropsychological assessment has been conducted to emphasize possible cognitive impairments among these patients. Moreover, a genetic evaluation has been accomplished to detect individual gene mutations.

Methods and Subjects:
General cognitive abilities were evaluated with age-scaled tests in a group of 25 boys with genetically confirmed DMD aged 3 to 20 years. Furthermore, 16 boys accomplished an additional detailed neuropsychological assessment. The performance of the DMD group was compared with data of the healthy population (Wilcoxon signed-rank test). Moreover, the individual cognitive profiles were put in relation to the site of the gene mutations.

Results:
In the present cross-sectional study, neither the age nor the stage of the muscle disease correlated with the mental impairment of affected boys. General cognitive abilities showed a mean IQ of 88 with broad individual variation (IQ between 52 and 120). Most patients performed poorly on specific attention tasks, arithmetic and on digit span tests, particularly. No simple relationship between gene mutations and cognitive functioning could be detected. However, patients without the dystrophin isoform Dp140 performed significantly poorer than patients having this isoform.

Conclusion:
A very broad range of intellectual abilities with individual cognitive strengths and weaknesses seems to characterize DMD. However, mutations in the dystrophin gene have impacts on cognitive functions. Our data show, that mutations which cause an alteration of the dystrophin isoform Dp140 are associated with a significant decline in general cognitive functioning. Moreover, auditory short-term memory, verbal aspects of executive functions as well as visuo-spatial long-term memory are most likely impaired among boys suffering from DMD.

Neuropsychology / Psychiatry (PSP)
duchenne muscular dystrophy, cognition, gene, impairment

Poster

PSP-05

Controlled stimulus material for neurophysiologic research in alcohol addiction: a behavioral rating study

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Combining cognitive tasks with neurophysiologic methods like functional magnetic resonance imaging (fMRI) or Electroencephalography (EEG) is an interesting option to advance our understanding of the addicted brain's functioning. In particular, tasks using addiction-specific stimuli, like alcohol-related pictures, may be of interest.
However, the extraction of meaningful results from EEG or fMRI data relies on a sufficient number of trials for event-related averaging. Neurophysiologic research in addiction thus draws upon a substantial amount of stimulus material, especially if repetition-artifacts should be minimized.
The present poster reports on the development of such a large stimulus data base: 457 pictures of alcoholic beverages and 398 pictures of neural objects were viewed by 20 alcoholic patient and 20 healthy controls. Participants rated the pictures regarding arousal, valence, alcohol-relatedness and craving. Arousal and valence were rated using the SAM-scale, alcohol-relatedness and craving were rated on a 11-stage Likert Scale. The rating-results were then used to create 5 sets of stimuli that do not differ in arousal, valence, alcohol-relatedness and craving.

Neuropsychology / Psychiatry (PSP)

Poster

PSP-06

Resting perfusion and motor activity in schizophrenia.

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Schizophrenia is frequently associated with motor disturbances. Previously, we have demonstrated that quantitative motor activity is related to psychopathological features and subtypes of schizophrenia. To investigate neural correlates of motor activity, we applied MR-based arterial spin labeling (ASL) and wrist actigraphy on the same day to 14 patients with schizophrenia (8 men, 6 women). Mean PANSS score was 58.43, mean age 34.64 years, mean duration of illness was 9.23 and 93% were smokers. All participants received antipsychotic treatment and were inpatients at the time of assessment. Clusters of correlation between rCBF and activity level (counts/h) were corrected for multiple comparisons using a clustersize threshold of 150 voxels. Significant correlations were detected in the anterior and posterior midcingulate cortex, bilateral DLPFC, right precentral and postcentral gyrus, right insula as well as left parietal areas. Behavioral measures of motor activity were therefore related to resting perfusion in areas suggested to be involved in motivational aspects of motor activity. Motor output and the level of activity may depend on the resting perfusion in destinct motor areas. We suggest this phenomenon to be a neural correlate of motor behavior in schizophrenia.

Neurobiology (PSB), Neuropsychology / Psychiatry (PSP)
schizophrenia

Poster

PSP-07

Bilateral SMA resting perfusion correlates with volitional motor activity of the same day.

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The neural correlates of volitional behavior are not yet understood. The dopaminergic system is thought to be involved in the generation of motor drive. While experimental studies have indicated the supplementary motor areas (SMA), prefrontal cortex (PFC) and cingulate motor areas (CMA) to be responsible for volitional motor control. However, the neurobiology of real life behavior remains unclear. Our study aimed at the association of resting perfusion and motor activity outside the scanner. In 14 healthy righthanded subjects we correlated cerebral blood flow (CBF) acquired with arterial spin labeling (ASL) with the activity level as assessed by wrist actigraphy on the same day. To reduce the impact of externally directed goals on the observed behavior, we recorded on Sundays.
CBF in bilateral pre-SMA and SMA proper was highly correlated with activity levels outside the scanner ($p < 0.001$). This is the first study to demonstrate that volitional motor behavior is related to the resting perfusion of premotor areas involved in the planning and execution of movements. The correlation of behavior outside the scanner with resting state CBF might become a valuable tool to investigate the neural basis of real life performance.

Neurobiology (PSB), Neuropsychology / Psychiatry (PSP)

Poster

PSP-08

Exploring deviant Resting State Networks in Schizophrenia Patients

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We present preliminary data from a study that aims to identify deviant fMRI BOLD Resting State Networks (RSNs). Several RSNs were so far described in healthy subjects and some of them also in schizophrenic patients. Our specific interest applies to three functionally relevant RSNs: the so called default mode network (DMN), the left working memory network (involving language areas) (LWMN) and the somatomotor network (SMN). These networks are thought to be associated with specific symptom clusters of schizophrenia. First, we identified these RSNs and compared them to a group RSN from 20 healthy controls using a similarity index. Secondly, we correlated the individuals' RSN similarity index with psychopathology rating scales.
Up to date, we acquired data in three schizophrenic patients. Decomposition of the fMRI BOLD signal by independent component analysis (ICA) revealed networks of distributed brain areas that exhibit synchronous activity. Among these networks we were able to identify for each patient the DMN, LWMN and the SMN. The similarity index points towards a relationship of the DMN with positive PANSS scores, in particular with the item Conceptual Disorganization. Furthermore, the LWMN shows a relationship with negative PANSS scores, especially the item Difficulty in Abstract Thinking. Both, conceptual disorganization, as well as difficulty in abstract thinking are relevant in thought disorder in schizophrenia. Therefore, our results might indicate an association between the dissimilarity of the DMN and LWMN with the disturbance of thinking in schizophrenia.
However, these are preliminary results that have to be cautiously interpreted. Nevertheless, they demonstrate the feasibility and potential of the approach to explore the relationship between psychopathology rating scales and disturbances in functional networks.

Neuropsychology / Psychiatry (PSP)
Resting State Networks, fMRI, Schizophrenia, Psychopathological rating scales

Poster

PSP-09

Hippocampus engages in the unconscious associative encoding and retrieval of new conceptual associations

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Prominent models of human long-term memory systems do not account for an unconscious form of rapid associative learning. Recent functional magnetic resonance imaging experiments, however, suggest that it is humanly possible to form and later retrieve new conceptual associations in just one learning trial outside conscious awareness.
Here, we present new evidence for the successful associative encoding of subliminal pairs composed of unknown faces and written occupations (actor or politician). The unconsciously encoded face-actor and face-politician associations were retained over at least 5 minutes, because after this time, these associations affected performance in a semantic categorisation task. In this task, subjects were required to categorize the faces of famous actors and famous politicians into the two categories movie-star and political star. Categorization was faster when the presentation of a famous face was preceded by a flash of a face previously associated with a congruent (actor – movie-star and politician – political star) rather than incongruent profession. About 71% of all subjects showed this effect of unconscious associative encoding. The functional magnetic resonance imaging results indicated that the hippocampus and rhinal cortex are involved in forming and retrieving of new conceptual associations independently of conscious awareness of encoding and retrieval.

Neuropsychology / Psychiatry (PSP)
declarative memory, unconscious, hippocampus, fMRI

Poster

PSP-10

Specific patterns of gray matter atrophy and elevated cerebral blood flow within left sided language regions connected to formal thought disorder.

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Purpose of the study: Formal thought disorder is a central feature of schizophrenia, but its neural foundation still remains unclear. The understanding of the neural foundation of this important symptom is essential to find specific treatments without unnecessary side effects.
Methods: Thirteen right-handed schizophrenic patients with different severity of formal thought disorder and thirteen matched healthy controls were investigated by voxel based morphometry and MRI perfusion measurement with Arterial Spin Labeling (ASL).
Results: We found hyperperfusion to be linked to the severity of formal thought disorder in the left sided language system involving frontal, temporal and parietal areas. Gray matter atrophy was linked with the severity of formal thought disorder bilateral in the superior temporal sulcus, the angular gyrus, the anterior cingulate gyrus and the inferior temporal gyrus. For the left hemisphere the posterior superior temporal gyrus and the supramarginal gyrus and for the right hemisphere the precuneus showed gray matter reduction with increasing formal thought disorder. The results for perfusion and volume mainly involve frontal, brain areas strongly connected to language.
Conclusion: In formal thought disorder the specific gray matter atrophy in temporo-parietal regions may be understood as a risk factor for decompensation of the left sided language system leading to a transient hyperperfusion of the Broca and Wernicke area as a sign of state related dysfunction.

Neurophysiology (NP), Neurobiology (PSB), Neuropsychology / Psychiatry (PSP)
ASL; VBM; schizophrenia; language; thought disorder

Poster

PSP-11

Recognition memory in frontal lobe patients: Estimates of familiarity and recollection

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The frontal lobes are assumed to play an important role in recognition memory. However, few studies have examined the effect of frontal lobe lesions on the two processes underlying recognition memory, namely, recollection and familiarity. Recollection may be defined as the mental reinstatement of prior experiences, associated with vivid memory for an item and its contextual details; familiarity reflects some kind of mental awareness that an event has been experienced without mental reinstatement. The purpose of the present study was to explore whether recollection and familiarity are differentially affected by frontal lobe lesions. The contribution of these two processes to verbal recognition memory performance was investigated in eight participants with circumscribed dorsolateral prefrontal lesions and a matched healthy control group. Two different methods were used: (i) the word-frequency mirror effect, and (ii) Remember/ Know judgments. Overall, the patients showed intact recognition memory. The word-frequency mirror effect was observed in both patients and controls: Participants made more hits and less false alarms to low- than to high-frequency words, reflecting better discrimination of old and new low-frequency words compared to high-frequency words. Thus, the mirror effect procedure did not reveal any deficit, neither in familiarity nor in recollection. Likewise, the Remember/ Know procedure revealed intact estimates of both recollection and familiarity in the frontal lobe patients compared to the control group. These findings indicate that, despite the role of the frontal lobe in recognition memory, circumscribed dorsolateral prefrontal lesions do not affect verbal recognition memory and its underlying processes.

Neuropsychology / Psychiatry (PSP)
episodic memory, word-frequency mirror effect, Remember/ Know procedure

Poster

PSP-12

Memory Consolidation during a Daytime Nap

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A heatedly discussed issue in sleep research concerns the beneficial effects of sleep on the retention of information learned before sleep: is this effect due to active consolidation processes or due to the lack of interference during sleep? In our experiments, subjects incidentally learned either face-city combinations (American or Europe cities) or single faces before a daytime nap or a relaxation task (control). Subjects engaged in a retrieval task both before and after sleep/relaxation. For retrieval, faces were presented alone for the cued recall of the associated city and for recognition from new distracter faces. Sleep benefited the retention of both face-city associations and face discrimination as old or new faces (d'), because the relaxation group forgot more associations and was worse in discriminating old from new faces over the 90 minutes study-test interval than the sleep group. A median split revealed that only those within the nap group with long SWS duration (over 17 Minutes) showed no decline in recognition performance whereas those with the smaller amount of SWS (17 minutes and less SWS) did show a decline in retrieval performance. Total sleep duration did not correlate positively with any of the memory gains. Two properties of our findings speak in favor of an active consolidation process engaged during a day time nap:
1) Despite our very conservative, low-interference control condition, we found better memory retention in the nap group than the relaxation group and 2) only subjects who spent an essential amount of time in SWS avoided forgetting of information. At follow-up testing between three and six months after the experiment, the nap group still showed above chance retrieval performance.

Neurophysiology (NP), Neuropsychology / Psychiatry (PSP)
Memory, Learning, Consolidation, Sleep, Slow-wave sleep

Talk

PSP-13

Lack of bivalency effect in amnesic patients: Evidence for an episodic context binding

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The purpose of the present study was to investigate whether amnesic patients show the bivalency effect. This effect refers to the slowing on univalent stimuli that occurs when bivalent stimuli (e.g., Stroop-like stimuli) appear occasionally among them. We tested 16 amnesic patients and a matched healthy control group in a paradigm requiring predictable alternations between three simple cognitive tasks, with bivalent stimuli occasionally occurring on one of these tasks. The results revealed that, in contrast to the control group, amnesic patients showed no bivalency effect. This provides evidence that the bivalency effect stems from an episodic binding between the tasks and the context created by the rare occurrence of bivalent stimuli.

Neuropsychology / Psychiatry (PSP)
episodic binding, amnesia, bivalent stimuli, univalent stimuli, task switching

Poster

PSP-14

Increased prospective memory performance in patients with dense amnesia after repetitive feedback and after a delay of 24 hours

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Prospective memory refers to the ability to successfully retrieve a previously formed intention. Despite its great clinical relevance there's a lack of empirical studies investigating prospective memory in patients with amnesia. Hence the present study aimed to investigate whether an event-based prospective memory task can become habitual in patients with severe global amnesia and whether performance benefit can be found even 24 hours later. 14 densely amnesic patients and 14 age, sex and education matched control subjects were included in the study. All subjects were exposed to a perceptual ongoing task which contained 10 prospective memory targets. To allow the event-based prospective task to become habitual each failure was followed by a feedback reminding the subjects of the prospective memory task. In order to assess the effects of repeated target presentation on prospective memory performance after a delay of 24 hours no feedback followed for the first half of the trials. The results of the first day showed that both patients and control subjects performed better in the second than the first half of the prospective memory task. However, amnesic patients performed on a lower level compared to healthy controls. These findings argue for the event-based prospective memory task to have become habitual even in the patients with severe global amnesia. In the group of amnesics, this effect disappeared completely after a delay of 24 hours. Most interestingly, however, after the appearance of one reminder on the second day, the prospective memory performance of the patients substantially improved and even exceeded the performance level that they reached on the first day. Our findings highlight that with appropriate feedback an event-based prospective memory task can become habitual in patients with severe global amnesia. Moreover, the results suggest that the patients formed a mental representation of the intended action which persisted over a period of 24 hours. The findings of the present study provide encouraging insights for future rehabilitation and therapies for people suffering from global amnesia following brain damage.

Neuropsychology / Psychiatry (PSP)
prospective memory; dense amnesia

Poster

PSP-15

Deviation of eye and head orientation after TBS over the right parietal lobe

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In everyday activities movements of the eyes and the head allow for both flexibility and stability of gaze. Neglect patients show a marked deviation of spontaneous eye and head orientation towards the right which is positively correlated with neglect severity.
In the last two decades TMS has increasingly been used as a research tool in the field of clinical and cognitive neurosciences and recent studies induced transient neglect-like oculomotor behaviour in healthy subjects. The aim of the present study was to test whether TBS over the right parietal lobe also affects head orientation when subjects are allowed to freely move their head.
To this end fifteen healthy participants performed a search task with everyday objects distributed on a table. During the task both their eye movements (infrared oculography) and head movements (magnetic coil) were recorded without movement restriction. The two experimental conditions were either following Theta Burst Stimulation (TBS) over the right parietal cortex or – as a control condition – without stimulation.
Compared to the control condition, both eye and head orientation were deviated towards the right following TBS over the right parietal cortex. This finding suggests that TBS can not only influence motor behaviour directly, but is also suitable to interfere with head orientation in active everyday-like behaviour.

Neuropsychology / Psychiatry (PSP)

Poster

PSP-16

Looking at blurred pictures: Increased fixation durations and shorter saccade amplitudes are associated with reduced visual memory

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In this study eye movements of 57 healthy subjects were recorded while they were performing a picture learning and recognition task. The control group (n = 29) looked at pictures of landscapes. The experimental group (n = 28) looked at a low spatial frequency (LSF) version of the pictures, whose higher spatial information above 1 cycle/degree was eliminated. In the recognition task, the experimental group was provided with both previously learned and completely new LSF scenes. We found that LSF picture learning caused significantly longer fixation durations and shorter saccade amplitudes compared to the unfiltered scenes. In the picture recognition task the performance of the LSF group was significantly decreased compared to the control group. We conclude that longer fixation durations and shorter saccade amplitudes may be a marker of reduced visual information processing. It is interesting to note that our findings are consistent with clinically impaired eye movements, e.g. in schizophrenia.

Neuropsychology / Psychiatry (PSP)
Eye movements, spatial frequency, visual memory

Poster

PSP-17

Trail Making Performance after Theta Burst rTMS Over the rDLPFC and the MFC: An Eye Movement Study

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This study was aimed at investigating the effects of theta burst repetitive transcranial stimulation (rTMS) over the right dorsolateral prefrontal cortex (DLPFC) and the media frontal cortex (MFC) on eye movements during a computerized Trail Making Test (TMT) at various degrees of difficulty. Each subject performed the task twice, with and without TMS. To analyze test performance qualitatively and to observe the use of strategies “on line”, eye movements and mouse clicks were recorded simultaneously. Within subjects comparisons revealed that after rTMS over the MFC, subjects showed more regressive fixations and more anticipatory fixations, but less target fixations while processing a sequence of actions during the TMT. This was particularly pronounced in TMT-B trials. This viewing pattern was not observed after DLPFC stimulation, which had no effect on regressive or target fixations but reduced anticipatory fixations. These finding might be interpreted in terms of a specific sequence processing deficit after rTMS over the MFC.

Neuropsychology / Psychiatry (PSP)
TMS, executive functions, eye movements

Poster

PSP-18

Voyaging through the Brain - TMS Neuronavigation with Brainvoyager

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Neuronavigation systems enable individual and imaging-guided navigation of a TMS coil to functionally defined brain regions-of-interest. In a short lecture we will introduce the theoretical background of a stereotactic ultrasound- based neuronavigation System and then move on to a hands-on training session.

Neurology (PSN), Neuropsychology / Psychiatry (PSP)
Transcranial magnetic stimulation

Poster

PSP-19

Grapheme-colour synesthesia yields an ordinary rather than extraordinary memory advantage

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Some studies, most of them case-reports, suggest that synesthesia promotes superior memory abilities. But, not all of these results were replicated in studies with bigger samples. This may be the case because most of the synesthetes with extraordinary memory were selected because of their memory abilities and not because of their synesthesia. Additionally, most of these synesthetes were tested with highly specific tasks, especially constructed for testing the specific synesthete with his/her specific synaesthesia. Hence, the extent to which superior memory is a general characteristic of synaesthesia is still unknown. To further investigate whether synesthesia generally promotes superior memory abilities, in the present study, we tested a group of 44 synesthetes, who indicated to have colour experiences for either visually presented letters and numbers or orally presented letters and numbers. Moreover we applied a widely used standardized memory battery (WMS-R) with tasks not especially designed to test synesthetes. The results provide evidence for an ordinary, but not an extra-ordinary, performance advantage for grapheme-color synesthetes in episodic memory. We suggest that this advantage is related to their synesthetic experiences.

Neuropsychology / Psychiatry (PSP)
synesthesia, grapheme-color, episodic memory, group-study, WMS-R

Poster

PSP-20

Auditory verbal hallucinations and ego disturbances in acute and chronic psychosis: a progressive deficit in self monitoring

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Introduction
Self monitoring is the ability to maintain accurate and coherent self-referential processing over time. Thus, intact self monitoring guarantees distinguishing self generated from externally perceived information. Deficits in self monitoring might lead to psychotic symptoms like auditory verbal hallucinations (AVH; voices arguing and commenting) as well as ego disturbances (ED; audible thoughts, thought insertion and thought withdrawal). AVH consist of two components: an alien and an audible component. In ED however, the case is more complex: in audible thoughts (AT), patients hear their own thoughts aloud – knowing these are their own thoughts. In thought insertion and withdrawal (TI-W), patients have the feeling of alien influence without an auditory component, indicating a deficit in self monitoring that is not the case in AT.

Methods
In a retrospective case study all records of the year 2002 and 2007 of the university hospital of psychiatry Bern have been examined in respect of the occurrence of AVH and ED. Prevalence of AVH and ED has been evaluated in patients with acute (F23) and chronic psychosis (F20, F25).

Results
A total of 655 records (49 % women) has been examined. 411 patients suffered from chronic psychosis, 95 patients were diagnosed with acute psychosis. In the collapsed group of all patients, 37.2 % reported AVH; 21.6 % of them expressed ED. Both symptoms have been found in 12.6. %.
In the differential analysis of the ED we found AT in 12.4 % and TI-W in 40.3 %. In the collapsed group of all patients co-ocurrence of AVH and AT was 12.3 %, whereas AVH and TI-W together were found in 49.2 %; in acute psychosis we found 42.7 % with AVH and AT versus 57.1 % with AVH and TI-W; in chronic psychosis 7.6 % with AVH and AT versus 37.9 % with AVH and TI-W.

Conclusion
Our findings indicate that psychotic symptoms that might be considered as related to a deficit in self monitoring (AVH and TI-W) occur in fact more frequent together than those where self monitoring might or might not be faultless (AVH and AT). Considering acute and chronic psychosis, the deficit might be understood as a process of progressive breakup of self monitoring processes, maybe indicating a marker for chronification of psychosis.

Neuropsychology / Psychiatry (PSP)
ego-disturbances, auditory verbal hallucinations, psychosis, self-monitoring

Poster

PSP-21

Is pre-stimulus brain activity predicting later recollection related to sustained or to task switching attentional processes?

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Memory formation is thought to mainly rely on brain activity following an event, but previous research has challenged this assumption by showing that pre-stimulus ERP activity predicts later recollection (SME, subsequent memory effect). In the present experiment we analyzed the electrical activity elicited by the random presentation of two different cues presented before a target word: in one case, the cue induced an emotional decision task on the following target and in the other case, the cue induced a semantic decision task.
Since the mechanism through which pre-stimulus activity modulates memory encoding is still unknown, we intended to determine whether the effect is due to sustained attentional processes or to a reorientation of attentional processes, which occurs when switching between task sets.
Our preliminary results based on the subsequent memory paradigm suggest that the neural activity preceding the word presentation can be modulated by repeated or switched cue presentations and can differentially predict whether the word will be later recollected. Computing global statistics on the scalp electric fields, we found significant topographic differences in the interaction between the two conditions: this suggests the existence of different generators mediating the encoding of stimuli when cues were constantly switched between two different tasks, compared to the case when cues remained stable across trials. These different generators were identified with sLORETA and differences in activation levels were measured with the Global Field Power (GFP).
The found topographic effects may reflect differences in preparatory processes that precede efficient encoding into episodic memory. Furthermore, the differences between the two conditions could be interpreted as distinct neural markers associated with the recruitment of processing resources that lead to higher recollection performance. The outcome of this experiment highlights differences in learning efficiency when the task during encoding is switched vs. repeated.

Neuropsychology / Psychiatry (PSP)
pre-stimulus activity, sustained attention, task set, emotion, semantic

Poster

PSP-22

Facial configurations and features involve different hemispheres

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A wealth of knowledge shows that faces can be recognized on the basis of configural or featural information (Leder & Bruce, 1998; Cabeza & Kato, 2000; Lobmaier & Mast, 2007). Features are referred to as detailed information contained in individual facial parts (e.g., the shape of the mouth or the color of the eyes) whereas configurations concern spatial interrelationships between facial parts (e.g., the metric distance between the eyes and the mouth). In the present study, we analyzed whether featural and configural processing involves different hemispheres using a divided visual field methodology. In a same-different matching task, 18 right-handed participants had to match the identity of a cue face containing either featural (scrambled faces) or configural (blurred faces) information with an intact test face presented subsequently in either the left or right visual fields. Unilateral presentation was controlled by monitoring central gaze direction. D prime
analysis revealed that the visual field of test face presentation interacted with the information provided by the cue image ($F(1, 17) = 7.43$; $p < .05$), thus suggesting that featural and configural information is differently processed by the two hemispheres. Specifically, our findings show a left hemispheric superiority for featural processing and a right hemispheric superiority for configural processing (Rossion et al., 2000; Maurer et al., 2007). Our findings contribute to the growing body of evidence showing that the two hemispheres differ in the way they process global and local information. This project was funded by the Swiss NSF.

Neuropsychology / Psychiatry (PSP)
face perception; featural processing; configural processing; hemispheric asymmetries

Poster

PSP-23

Recollection and Familiarity in a Case of Developmental Amnesia

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Recognition memory is supported by two independent processes: hippocampus-related episodic recollection (vivid memories of item and context), and semantic familiarity (sense of having encountered the item before) supported by structures surrounding the hippocampus. Accordingly, recollection is thought to be impaired in patients who suffered early selective hippocampal damage (i.e., developmental amnesia, DA). However, in a recent case study by Colella et al. (2007) a DA patient showed the word-frequency mirror effect, that is, enhanced discrimination of newly and already presented low-frequency compared with high-frequency words, thus reflecting intact recollection. However, the false-alarm (FA) rate for high-frequency words which is thought to reflect familiarity was high. Therefore, the DA patient's decision might have been solely based on a feeling of familiarity while recollection was impaired. The present study aimed to give further support for these findings in the same DA patient (N = 1, age 42). The experiment therefore replicated and extended previous results by applying a second recognition test after 24 hrs. Supported by transient, less stable familiarity, the patient's performance was expected to be at chance after the delay. The controls' (N = 8, age M = 39.25, SD = 4.30) recollection-based performance was expected to decrease less. Overall, the controls performance decreased significantly. Surprisingly however, the patient's performance remained relatively stable. The results support the assumption of a pronounced use of baseline rather than transient familiarity, but impaired recollection. We conclude that very effective strategies for processing perceptual and conceptual information might enable this DA patient to boost performance. The data furthermore support dual-process theories of recognition, and hence the assumption that the hippocampus might selectively support recollection-based memory, while surrounding regions might support familiarity-based semantic memory.

Neuropsychology / Psychiatry (PSP)
Recognition performance

Poster

PSP-24

Limitations in human information processing. A lateralized readiness potential study to inspect the origin of the psychological refractory period effect.

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The psychological refractory period (PRP) represents a bottleneck in human information processing. In the PRP paradigm, a stimulus onset asynchrony (SOA) separates two stimuli (S1 and S2) which are presented in a rapid sequence. To both stimuli, speeded responses are required. Typically, the reaction time to the first stimulus remains unaffected while the one to the second stimulus is inversely related to the duration of the SOA. The present study further elucidates the origin of the PRP effect by analyzing the lateralized readiness potential (LRP) waveforms in 10 subjects while performing a PRP task. The LRP is an electroencephalographic correlate of response activation which provides differential information about motor and premotor stages accountable for the bottleneck in the information processing during the PRP task. More specifically, with the LRP premotor activities such as stimulus analysis, response preparation and response selection can be separated from central motor processes such as central initiation of the motor response. Both, premotor and central motor processes can also be separated from peripheral response execution. Therefore, the LRP may help decide on which specific stages of information processing capacity limitations of the human brain lead to the PRP effect.

Neuropsychology / Psychiatry (PSP)

Poster

PSP-25

Time, Space and the Posterior Parietal Cortex: A Transcranial Magnetic Stimulation Study

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Neglect patients demonstrate abnormal representations of space as well as abnormal temporal estimations. If and how time perception is related to space and what role the posterior parietal cortex (PPC) plays in time perception is not clear. The present study investigated whether Theta Burst Transcranial Magnetic Stimulation (TBS) of the right PPC can influence temporal judgements of static and dynamic stimuli in different locations in space. In the static task, participants were asked to reproduce the interval of a dot presented left, right or central for 700, 2200 or 3700ms. In the dynamic task, a dot circulated clock- or anticlockwise through the left and right space and disappeared at different positions. The task was to estimate the time that the dot needs (after its disappearance) to complete the circle. 42 healthy subjects performed a baseline session. In a second session, participants were equally allocated to the following conditions: TBS over right PPC (TBS-group), sham-stimulation over right PPC (sham-group), and no stimulation (control group). Comparing accuracy of temporal judgements in baseline and second session, only the TBS-group showed significant differences: In the static task, time reproduction of 700ms was overestimated in all locations, indicating that the PPC is involved in temporal judgements of short intervals irrespective of location in space. In the dynamic task, the estimation of time that the dot needs to complete the circle was underestimated in the left space compared to the right space, indicating that TBS over right PPC lead to distortion of spatial representation that influenced temporal judgement. Possible interpretations of these results are discussed.

Neuropsychology / Psychiatry (PSP)
neglect, tms

Poster

PSP-26

When acute becomes chronic: Increased blood flow in frontal and cingulate brain regions in a 17-year old boy with a chronic derealisation phenomenon after having used cannabis twice

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Background
Depersonalisation/derealisation (DP/DR) phenomena are characterized by the subjective experiences of feeling unreal and detached from oneself as well as from the external world. These symptoms are relatively common in normal (1-2%) and psychiatric populations (up to 42-91% dependent on the underlying disorder). Beside severe stress and panic disorder cannabis (ab-)use is a well-known elicitor of DP/DR phenomena. after experimental cannabis administration, increased resting activity and activation of the frontal and anterior cingulate cortex were described, possibly being responsible for the subjective experience of the DP/DR. Here we investigate the cerebral blood flow (CBF) of a 17-year old boy with a chronic derealisation phenomenon after having used cannabis twice 2 years ago. His distressing symptomatology was characterized by feeling detached, like being in a dream, with 1-2 incidents per week of being uncertain whether or not he has actually experienced or dreamt a situation.

Method
CBF was assessed with MR-arterial spin labeling (ASL) in a 3 T MR scanner (Siemens Magnetom TRIO), once in a resting state, a second measurement under provocation of the DR phenomenon. Further, under activation of the DR phenomena, an fMRI block design paradigm was measured. Finally, a high resolution 3-D-MPR anatomy as well as clinical T2 axial scans were carried out. ASL data analysis was performed using Matlab®, statistical parametric mapping (SPM) and in-house software. fMRI analysis was realized using BrainVoyager QX® software.

Results
The structural data yielded normal findings. In using ASL, relative to other brain regions, we found increased regional CBF in the anterior cingulate gyrus as well as in the right inferior frontal gyrus (4-5/10 on a visual analogue scale for the subjective experience of DR). Under provocation (7-8/10), these increases were even more pronounced. The very same regions showed higher activations during the fMRI measurements under provocation (level 9/10) compared with a resting state (4/10).

Discussion
Little is known about neurobiological mechanisms of persistent DP/DR phenomena. Here, we found the pattern of increased local brain perfusion in the same cerebral regions previously described under experimental THC administration. With and without provocation of DR, we found CBF as well as the BOLD signal increases in these specific regions were even higher paralleling the patient's subjective experience.
Identifying localized brain regions with pathologically higher CBF resp. BOLD activations might yield target regions for inhibiting transcranial magnetic stimulation (TMS). TMS might offer a therapeutic alternative to the frequently unsuccessfull psychopharmacological treatment of DP/DR.

Neuropsychology / Psychiatry (PSP)
Derealisation

Poster

PSP-27

Measurement of eye and head coordination in two visual recognition tasks

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Eye movements are supported by head movements if the stimulus exceeds an eccentricity of 10 degrees from the center of the visual field. In this study eye and head movements of 10 subjects were simultaneously recorded while they were performing two visual recognition tasks presented at 55 degrees in the periphery. The first (easy) task was to recognize a previously seen color, the second (difficult) task to recognize a previously seen letter. We found that the slower head movements preceded the much faster eye saccades, and both systems reached their optimal position at the same point of time. Therefore eye and head movements are a highly coordinated mechanism to project the relevant stimulus to the fovea. Furthermore eye-head coordination was sensitive to the two types of recognition tasks. In color recognition eye and head amplitudes were generally smaller compared to letter recognition. These findings suggest that eye and head movements are amplified according to the complexity of the stimulus presented.

Neuropsychology / Psychiatry (PSP)
Eye movements, head movements, visual recognition

Poster

PSP-28

Mapping of language processing for pre-surgical planning with a multimodal fMRI protocol

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The goal of brain tumor resection is maximal excision with minimal risk of inducing neurological deficits in functionally eloquent brain areas. A reliable identification of language-related areas in brain tumor patients is an essential procedure in pre-surgical planning. We developed an fMRI-protocol that, unlike common pre-surgical protocols, comprises two multimodal language tasks known to assess different linguistic processing abilities. The picture/word matching task consisted of line drawings of common objects together with a presentation of printed or spoken word that was either the name of the object or the name of a semantically related object. The control task consisted of pairs of random line drawings, taken from Kimura's Recurring Figures Test. There were 60 stimulus items in each of these three conditions. The lexical decision task consisted of written or spoken one- or two-syllable words or pronounceable non-words. The control task comprised consonant strings with or without a "T". Each of these three conditions comprised 90 stimulus items. Accuracy of response and reaction times were measured. A control group of 16 healthy subjects performed the two tasks. Overlapping responses in perisylvian areas were obtained across tasks and input modality, but there were also notable differences, pointing to an input specific and task dependent representation of language. Application of the two tasks in 40 patients demonstrates that they are most suitable for pre-surgical planning: First, presentation of stimuli in two modalities results in a more differential benefit-risk evaluation as the protocol allows for a more comprehensive appraisal of language processing. Second, collected behavioural measures allow for a more reliable interpretation of the fMRI data. Third, assessing language comprehension rather than language production minimizes motion artefacts besides contributing to a more differentiated appraisal of language lateralization.

Neurology (PSN), Neuropsychology / Psychiatry (PSP)

Poster

PSP-29

Effects of tDCS on executive functions in acute stroke

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Introduction
In the present single case trial we investigated the effects of tDCS on executive functions in a 35-year old female patient with acute stroke. She received 10 daily sessions of anodal stimulation (20min, 1 mA) of the left motor cortex (M1) followed by 10 daily sessions of anodal stimulation of the left dorsolateral prefrontal cortex (LDLPFC) while she trained executive functions ("Braintwister": Auditive N-back, Animals). Executive functions (working memory WMS/TAP, cognitive flexibility, interference, verbal and figural fluency) and verbal/visual memory span were assessed before, after and in between the two stimulation periods.
We supposed that the combined cognitive training and stimulation of the LDLPFC would have a greater effect on specific executive functions (working memory, flexibility) than the combined training and stimulation of M1 and would have no or minor effects on the other functions.
Results
As expected we found a more pronounced effect on executive functions that are specifically connected with activation in the LDLPFC (working memory WMS, flexibility TAP) after LDLPFC stimulation. The effect on working memory (TAP) was not as clear as we had expected, as the performance declined during M1 stimulation and improved during LDLPFC stimulation. Interference and figural fluency improved continuously over time, verbal fluency and memory functions did not show a positive change.
In the subtest "Animals" the linear trend during stimulation of LDLPFC was steeper than the linear trend during stimulation of M1, which did not change at all over time. In the subtest "Auditive N-back" both trends did not indicate a performance change over time though during stimulation of LDLPFC the mean performance was higher.
Discussion
We could show that cognitive training combined with anodal tDCS of the LDLPFC had a specific effect on cognitive flexibility and working memory in a patient with acute stroke. The results were not as pronounced for one of the two working memory assessments. This may be partly due to the difference of the N-back tasks used during training and assessment (auditory and visual). As expected further executive functions and memory functions that are not specifically connected to LDLPFC activation improved continuously or did not change. Therefore we suggest that tDCS can lead to a more pronounced effect of executive function training. There are some limitations that warrant discussion. Patient and assessor were not blinded and long-term effects have not been investigated. However we also had to face some unforeseen pitfalls. The patient was discharged after M1 stimulation and the LDLPFC stimulation sessions could not be run at the same time of the day. Moreover the patient started to work and some other therapies were stopped completely during this period. Though this led to a temporary drop in performance in the training she nevertheless showed better results in the final cognitive assessment. Regarding technical issues it may be more effective to start stimulation before the training. Moreover the stimulation may not have been strong enough. Future studies should investigate whether the combined activation and inhibition of the affected and unaffected hemispheres lead to even more pronounced effects. Researchers should aim to find the ideal moment to start supporting the brain in its processes of spontaneous recovery and investigate the impact of tDCS on adaptive post-stroke neuroplasticity.

Neuropsychology / Psychiatry (PSP), Rehabilitation (PSR)
tDCS

Poster

Rehabilitation (PSR)

PSR-1

Long-lasting improvement of visual neglect after repeated parietal theta burst stimulation: effects on activities of daily living (ADLs) and neuropsychological testing

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Left unilateral neglect – generally defined as the failure to attend to the contralesional side of space – is a frequent neurological disease following right-hemispheric stroke and has a strong adverse influence on rehabilitation outcome. It is assumed that neglect severity is enhanced by an impaired interhemispheric inhibition from the affected toward the unaffected hemisphere, causing a pathological hyperactivity of the latter. Among rehabilitative approaches, transcranial magnetic stimulation (TMS) gains increasing attention. In a recent study, we applied Theta Burst TMS (TBS) – a TMS protocol which has been shown to exert inhibitory effects on cortical activity – in neglect patients. TBS on the contralesional posterior parietal cortex (PPC) reduced pathological hyperactivity and induced a long-lasting improvement of visual neglect as measured with a visual perception task. The aim of the present study is now to evaluate the effects of TBS in neglect patients on a more general level, such as activities of daily living (ADLs) and comprehensive neuropsychological testing. Patients included in the study undergo two experimental conditions (8 TBS trains or 8 sham stimulation trains over the contralesional PPC, in two daily sessions) in a crossover design. Neglect assessment is performed at four time points: at baseline (week 1), after the first intervention (week 2), after the second intervention (week 3), and at follow-up (week 4). Assessment includes two standardized observations forms quantifying several ADLs (Catherine Bergego Scale and „Beobachtungsbogen für räumliche Störungen“) and a battery of seven neuropsychological tests.
Preliminary data analysis shows that TBS over the contralesional PPC induces a substantial improvement of left unilateral neglect not only in neuropsychological tests, but also on the level of ADLs. These results suggest that TBS will probably be a new promising and viable approach in neglect rehabilitation.

Neurology (PSN), Neuropsychology / Psychiatry (PSP), Rehabilitation (PSR)

Talk

Workshops

Workshop 1: Measuring skin conductance response in cognitive neuroscience (Chair: Nicolas Rothen & Beat Meier)

In this workshop, we give a theoretical and practical introduction on how to use event related skin conductance responses (ER-SCRs) as a tool in cognitive neuroscience. After a brief theoretical introduction on the basics of measuring ER-SCRs, the main focus is on practical applications. We demonstrate how we have used ER-SCRs as the dependent variable in our work and we provide an input on how to analyse ER-SCR data. Finally, we will evaluate of the potentials and limitations of using ER-SCRs and we will have time to discuss potential applications in the research fields of the participants.

Workshop 2: EEG and evoked potentials in practice (*Chair: Thomas König & Mara Kottlow)*

In this workshop, we will give a practical introduction to working with EEG and evoked potentials. After a brief introduction into the theoretical background of EEG and evoked potentials, the analysis of sample datasets will be demonstrated. After this, we will hand out exercises that allow the participants to apply the acquired knowledge to concrete problems that might arise when dealing with EEG and evoked potential data. Finally, in order to allow an interaction with examples of the practical issues during research with EEG and evoked potentials, sample studies from the literature will be presented in a seminar form. At the end of the workshop, the participants should have obtained a approximate feeling of the potentials and limitations of the methodology, and be able to judge its usefulness in their own field of research.

Workshop 3: Non-invasive brain stimulation techniques: Transcranial Magnetic Stimulation (TMS) and transcranial Direct Current Stimulation (tDCS) *(Chair: Thomas Nyffeler & Miranka Wirth)*

Aim of the workshop: The workshop is designed to provide a comprehensive theoretical introduction to non-invasive electrical stimulation methods accompanied by hands-on training.

1. Introductory part: short introductory presentations (each 20min) **Single pulse TMS and on-line approach (René Müri)**
Abstract: The introductory presentation explains basic principles of TMS and safety aspects. Furthermore, hints and limits of the application of single pulse TMS outside the motor cortex are discussed. **Repetitive Transcranial Magnetic**

Stimulation - rTMS (Thomas Nyffeler)
Abstract:. Conventional and new paradigms of repetitive stimulation will be discussed (e.g., patterned repetitive TMS) and issues of risk and safety of rTMS protocols will be shortly reviewed. **tDCS Ð Basics and Safety Aspects (Miranka Wirth)**
Abstract: tDCS is a promising technique of brain stimulation found to be useful in the assessment of cortical functions in healthy subjects. The presentation will emphasise aspects of the neuro-modulatory effects of tDCS, focality and safety.

Voyaging through the Brain - TMS Neuronavigation with Brainvoyager (Jochen Kindler)
Abstract: Neuronavigation systems enable individual and imaging-guided navigation of a TMS coil to functionally defined brain regions-of-interest. In a short lecture we will introduce the theoretical background of a stereotactic ultrasound- based neuronavigation System and then move on to a hands-on training session.
Multiple Methods, Multiple Insights –
Combining TMS, fMRI, and EEG (Axel Kohler)
Abstract: Recent technical advances allow the concurrent application of TMS with measurements of brain activity using fMRI and EEG. The talk will highlight the promises and pitfalls of these method combinations.

2. Discussion: Participants are encouraged to ask questions and/or discuss their (practical) experiences.

3. Hands-On Demonstrations

- Demonstration of neuro-navigated TMS
- Demonstration of TMS-Effects: motor threshold, phosphene threshold
- Demonstration of tDCS

Workshop 4: Neuroimaging techniques *(Chair: Andrea Federspiel & Kay Jann)*

Several methods exist in the field of neurosciences that may be used to obtain specific information about the structure of the human brain and ist function. The large variety of techniques used to visualize the structures and the functional brain regions are summarized as Neuroimaging. The quantitative extraction of relevant parameters (e.g. Blood-oxygenation-level dependent activity, gray matter density, fractionalanisotropy, cortical thickness, cerebral blood flow, etc. etc.) is beside the aspect of visualization, an additional topic covered by Neuroimaging. During the Workshop ÒNeuroimaging techniques (fMRI, MRI)Ó we will present in brief basic methods (the tools) that are needed in order to conduct own fMRI and/or structural measurements. We present different acquisition schemes used in fMRI, different analysis techniques applied in fMRI experiments, new concepts addressed with diffusion tensor imaging, sophisticated applications of simultaneous EEG/fMRI recordings and latest developments in the field of MR morphometry. Moreover, all these methods are discussed in the context of basic neuroscience. As the workshop is basically intended for Students only a limited overview of its clinical application and their potential benefits as to the increase of insight of different pathophysiologies will be given.

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