Switzerland: summary of presentation

D. Brandeis, PhD, PD, Zürich
Andreas Müller, PhD, Chur

Networking in Switzerland, activities and planed projects:

- Dr. Lutz Jaencke, Professor and Head of Neuropsychology, University of Zurich is succeeding Dr. Michaela Esslen as the 2nd Swiss COST B27 representative (April 2006)
- Dr. Andreas Müller has applied for Swiss funding for his project "EEG defined subtypes in ADHD"
- A local COST B27 startup meeting was held on Jan 26, 2006 at the Department of Child and Adolescent Psychiatry in Zurich. We exchanged plans (including grant applications) and ideas for further cooperation. Four groups participated; the one from Chur with Gian Candrian representing Dr. Müllers group, and three groups from Zurich groups with Dr. Hilfiker from the Epilepsy Center, Michaela Esslen from the Neuropsychology Department, and Renate Drechsler plus Daniel Brandeis from the Department of Child and Adolescent Psychiatry in Zurich.
- The Departments of Child and Adolescent Psychiatry (Renate Drechsler, Daniel Brandeis) and of Neuropsychology (Lutz Jaencke) the University of Zurich plan to apply jointly for Swiss Funding for an advanced controlled neurofeedback study focusing on children and adults with ADHD (submission June 1st 2006). Both departments are currently analyzing their ongoing neurofeedback and ADHD studies in order to optimize this study's design.
- There is continued close cooperation between the COST B27 members from Child and Adolescent Psychiatry in Munich, Göttingen, and Zürich. This concerns an ongoing multicenter neurophysiological study with ADHD sib pairs and their families, and ongoing controlled neurofeedback study with ADHD .

Study:

EEG-defined subtypes of ADHD in adults (A. Müller)

Attention-deficit hyperactivity disorder (ADHD) is a clinically heterogeneous disorder that is associated with tremendous financial costs, stress to families, adverse academic and occupational outcomes (Biederman, 2005, 2006). The DSM-IV (APA, 1994) estimates the prevalence of ADHD at approximately three to five percent of school-age children. It is estimated that up to more than one half of ADHD children continue to manifest symptoms in adulthood (Biederman, 2005; 2006; Wilens & Dodson, 2004).

In the past decades, electroencephalography has been used both in research to describe and quantify the underlying neurophysiology of ADHD, as well as clinically in the assessment, diagnosis, and treatment of ADHD (Loo & Barkley, 2005). Recent advances in technology have made it possible to transform EEG activity into accurate numerical values by computation of amplitude and power for specific frequency bands of activity. This approach to EEG analysis is termed quantitative EEG (qEEG). qEEG is found to be a sensitive indicator of cortical dysfunction in psychiatric disorders, which provides objective, physiologically based data to supplement clinical assessment (Chabot et al., 2005; Hughes & John, 1999). Several researchers emphasize the important role qEEG can play especially in the evaluation and treatment of attention deficit disorders (Barry et al., 2003; Chabot et al., 2005, 2001; Hughes & John, 1999).

Over the past thirty years, electrophysiologic research has produced a great amount of qEEG information about children and adolescents with ADHD. These research findings show that there are consistent EEG group differences between children with and without ADHD. The most robust finding consists in ADHD children showing an increased relative theta power (Barry et al., 2003).

One limitation of many of these ADHD studies is that the clinical population is conceptualised as being homogenous, although there is considerable evidence to the contrary (Clarke & Barry, 2004). In recent years, several studies have identified subgroups of ADHD children with distinct EEG profiles (Chabot et al., 2001; Chabot & Serfontein, 1996; Clarke et al., 2001a,b). Furthermore, Kropotov (2005) reported different subtypes of ERP abnormalities in an ADHD sample. These studies suggest that children with a diagnosis of ADHD may constitute a heterogeneous group with different underlying electrophysiological abnormalities, which is of considerable interest with respect to different medication responses and developmental pathways found in the ADHD population (Clarke & Barry, 2004).
To our knowledge, there have been no studies reporting EEG or ERP subgroups of adults with ADHD. Therefore, within the framework of COST Action B27, our study is aimed to investigate the presence of EEG and ERP clusters within a sample of adults with attention-deficit hyperactivity disorder. The identification of distinct EEG-defined subgroups of adults with ADHD would have considerable implications for the use of EEG in the assessment and diagnosis of ADHD. Furthermore, variability within the ADHD population would have implications for taking therapeutical measures, among other things for the selection and development of neurofeedback treatment protocols.
Besides the acquisition of EEG data, first, a series of psychometric tests will be administered to the subjects. The EEG will be recorded in an eyes-closed and in an eyes-open resting condition for at least four minutes each time, using an electrode cap with 19 electrodes placed according to the international 10/20 system. In addition, subjects will perform both a standardized visual and auditory continuous performance test.
The digital EEG recording will be analysed in four frequency bands, delta (1.5-4 Hz), theta (4-8 Hz), alpha (8-13 Hz), and beta (13-30 Hz), using Fast Fourier Transform. ERP measures collected in the continuous performance tasks will be analysed using the method of individual component analysis. Clinical subjects will be grouped by means of cluster analysis. Finally, ADHD subgroups as well as the total ADHD group will be compared to the control group using independent sample t-tests.

Management by
Brain and Trauma Foundation, Switzerland

- Andreas Müller, Untere Gasse 17, 7000 Chur
- Gian Candrian, Untere Gasse 17, 7000 Chur

Cooperation partners:
(Same research-projects will be done in the named places:)

- University of Trondheim, Prof. Dr. K. Hestad
- University of Skopje, Prof. Dr. med. Nada Pop-Jordanova
- A research group in UK is thinking about cooperation in this project

Costs:
Euro 110’000 for 3 Years (Switzerland onl
Start of project:
When grante

Switzerland:

Cost B 27 Networking
ADHD – Subtyps in QEEG and ERP
Andreas Müller, PhD

Cost - B27 Networking in Switzerland

December 2005:	Proposal of ADHD project for adults is submitted to Ministry of science and education Switzerland (Brain and Trauma foundation, Switzerland)
January 06:	Network meeting of different working groups in Zürich
March and April:	Discussions about networking from Universities of Zürich, Göttingen and Munich in a Neurofeedback Evaluation Project (Multicenter Study for ADHD Kids and their families
June 2006:	Proposal of advanced controlled Neurofeedback Study will be submitted to Ministry of science and education Switzerland (Brandeis, Jaencke)

Typology for ADHD in adults in QEEG and ERP's Overview

Based on the earlier study of AdHD-typology in kids (8-12 yo) the neurophysiology of ADHD in adults will be studied (QEEG, ERP's)

100 ADHD patients and 100 controls (matched by age and sex) will be tested with

- QEEG
- ERP's (cpt vis, cpt auditory, Mismatch Negativity)
- Working Memory (Cogmed testing Tool)
- Brief symptom inventory
- Questionnaire for early childhood trauma
- ADHD – Checklist from Barkley (Barkley 2006)

Typology for ADHD in adults in QEEG and ERP's Overview

Our group:
Andreas Mueller, Chur, PhD
Gian Candrian, Chur, Psychologist, scientist
Ivan Terentiev, Institute for human brain, St. Petersburg
Eric Thomann, Chur, MD
Bettina Bardill, Chur, MD

Expert:
Prof. Dr. Juri Kropotov, Institute of human brain, St. Petersburg

Cooperation partners (with own questions but with same methodology):
- University of Trondheim, Norway
- University of Skopje, Macdonia
- Brain and Trauma Foundation of Grison, Switzerland (our group)
- Other partners are wellcome

Duration of project
3 years (starting from grant)

Budget for Switzerland:
110'000 Euros

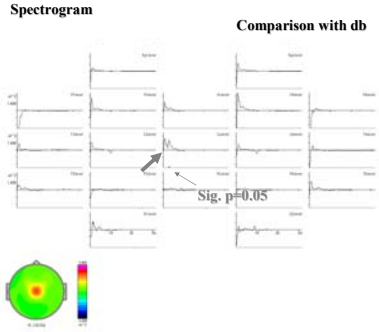
Typology of Neurophysiology for ADHD in kids Overview

Typ 1: Increased theta in frontal-central cortex (app. 30%)
Typ 2: Increased theta-beta-ratio in frontal-central cortex (app. 30%)

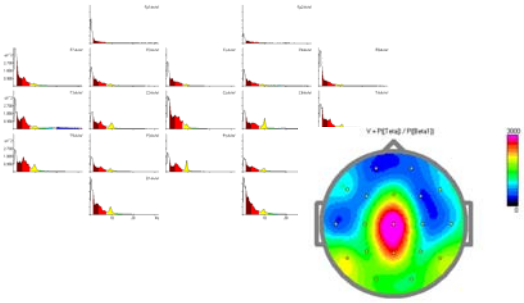
Typ 3: Increased frontal – midline theta (app. 4%)
Typ 4: overactivated frontal, central oder parietal cortex (18-26 Hz), (app. 4%)

Typ 5: alpha-excess, slow-alpha-excess (app. 30%)
Monkey Face (Mu-rhythm)
over whole cortex
in posterior temporal and/or temporal area

Typ 1: Increased theta in frontal-central cortex



Typ 2: Increased theta-beta ratio in frontal-central cortex



Typ 1 and Typ 2

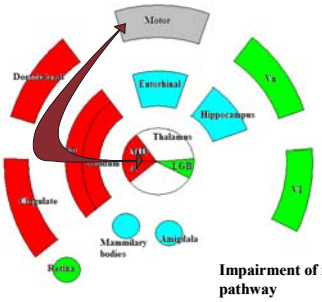
Frequency: **Together app. 70% of ADHD population**

Medication**: our experience: Methylphenidates work best**

Behaviour**: This is the "typical"-ADHD Typ.**

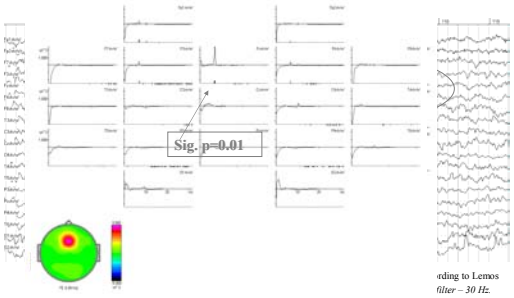
Impairment**: cortex-basalganglia-thalamus-cortex loop.**

Impairment of Typ 1 and 2



Impairment of inhibition-pathway

Typ 3: Increased frontal – midline theta



Typ 3

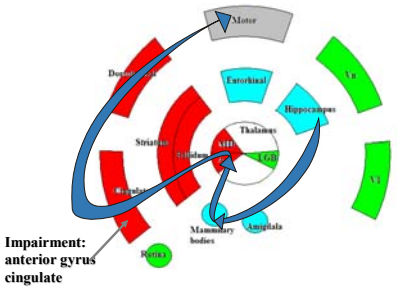
Frequency: **4% of ADHD population**

Medication: **our experience: Atomexetin work best (view cases)**

Behaviour**: no monitoring of behaviour, including no correction of errors. Fast forgetting of school contents.**

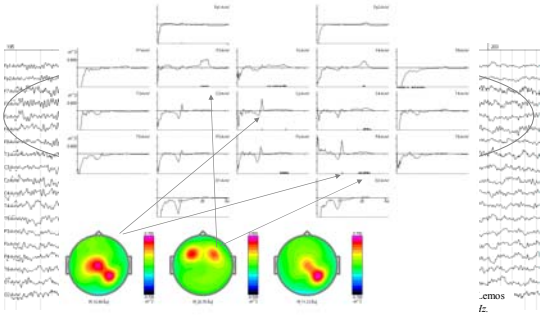
Impairment: **anterior gyrus cingulate**

Typ 3



Impairment: anterior gyrus cingulate

Typ 4: overactivated frontal, central oder parietal cortex



Typ 4

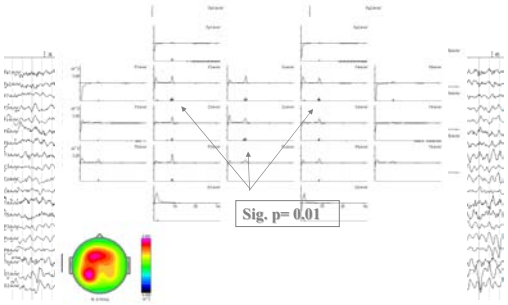
***Frequency*: 4% of ADHD population**

***Medication*: our experience: - (not Methylphenidates!!)**

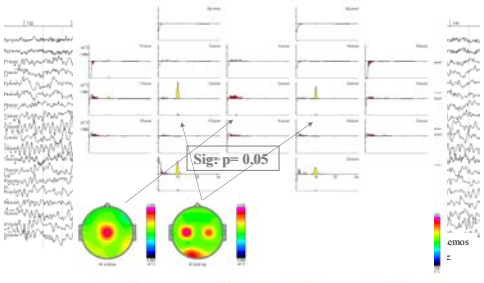
***Behaviour*: These children are fast blocked in their efficiency**

***Impairment*: allways a reaction of other impairment**

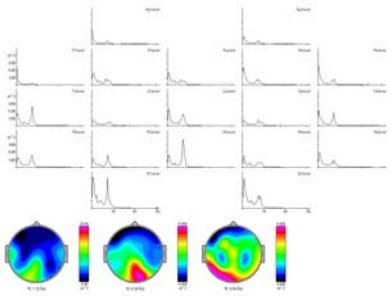
Typ 5: alpha-excess, slow-alpha-excess (over the whole cortex)



Typ 5: alpha-excess, slow-alpha-excess (in central cortex, Monkey Face)



Typ 5: alpha-excess, slow-alpha-excess (in temporal/parietal lobes)



Typ 5

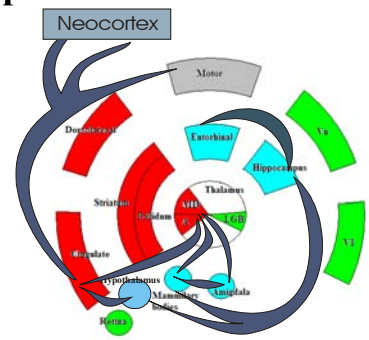
***Frequency:* 25-30% of ADHD Population**

***Medication:* our experience: Methylphenidates helps (but wrong), Atomexetin, d2-Amphetamine, SSRI**

***Behaviour:* always a lot of problems in regulation of emotions**

***Impairment:* Impairment of limbic system. Generators in the middle frontal cortex and anterior gyrus cingulus. This influences executive functions**

Typ 5


Neocortex
Motor
Entorhinal
Hippocampus
Thalamus
LGB
Striatum
Amigdala