

S01

## Connectivity and function in the temporal lobe

- Naming and functional connectivity in the Ventral Temporal Cortex,  
*Louis Maillard, France*
- Plasticity and functional connectivity in the temporal lobe,  
*Agnes Trebuchon Dafonseca, France*
- Connectivity and Semantic function in the Temporal Lobe,  
*Matthew Lambon Ralph, United Kingdom*

In this session we will explore the relationship between function and connectivity within the temporal lobe and more specifically lexico-semantic information processing.

The first lecture will explore in what extent functional connectivity may contribute to the understanding of clinical effects especially anomia, evoked by high frequency electrical stimulation.

The second lecture will explore the neurophysiological mechanisms underlying functional recovery after language training.

The third lecture will show how studies of the white matter connectivity of the human temporal lobe provide unique insights into the mechanisms that underlie semantic information processing.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners

Key words: connectivity, function, temporal lobe

S02

## **New insight in clinical neurophysiology of movement disorders and dementia**

- Clinical neurophysiology in analysis of myoclonus, *Ivan Rektor, Czech Republic*
- EEG in neurodegenerative dementia, *Laura Bonanni, Italy*
- New insights on the role of neurophysiological data to better shape DBS for movement disorders, *Eleonora Moro, France*

Electrophysiology provides a real-time readout of neural functions and network capability in different brain states, on temporal (fractions of milliseconds) and spatial (micro, meso, and macro) scales unmet by other methodologies. EEG techniques applied to dementia patients probe the effects of different dementia pathophysiological mechanisms on neurophysiological measures underpinning neural excitation/inhibition and neurotransmission as well as brain network dynamics, synchronization, and functional connectivity reflecting thalamocortical and cortico-cortical residual capacity.

Clinical neurophysiology can identify the origin (generator) of myoclonus. Simultaneous recording of the surface EMG from multiple muscles (polyEMG) is the most essential test for identifying basic features of myoclonus : positive/negative, distribution, speed, rhythmicity. Simultaneous EEG/EMG recording with jerk-locked back averaging, giant SSEP and C-reflex may confirm the cortical origin of myoclonus. Bereitschaftspotential preceding the jerk suggests psychogenic or intentional origin.

Adaptive stimulation is currently the most fashionable feature of the new DBS devices. Physicians need to better understand these new possibilities based on neurophysiological information coming from the basal ganglia in order to improve DBS patients management.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: Clinical neurophysiology in analysis of myoclonus, Multichannel EMG, Back-averaged EEG

S03

## Laser evoked potentials: their interpretation from bench to bedside

- The role of LEPs in the diagnosis of neuropathic pain, *Massimiliano Valeriani, Italy*
- LEPs and Near Infrared Spectroscopy in the investigation of pain-motor interaction, *Marina de Tommaso, Italy*
- Do gamma bands truly correspond to pain sensation ?  
*Ulf Baumgartner, Germany*

Laser evoked potentials (LEPs) have been introduced in the '70s of the last century. The initial clinical application come back to the following decades and they are based on the main property of the brain responses to heat laser stimuli, that is their origin from a pure nociceptive input. LEPs have been used also to investigate the cerebral areas mainly involved in pain processing and contributed to draw the so-called "pain matrix".

However, the specificity of LEPs for pain has been questioned when it was shown that the cerebral topographic distribution of LEPs does not differ from that of the brain responses to stimuli of other sensory modalities with the same saliency of the painful ones (Mouraux and Iannetti, 2009). Other findings challenged the interpretation of LEPs as a useful tool for the investigation of the cerebral mechanisms of pain.

The present symposium will have the main aim to clarify what we can expect from the clinic and scientific use of LEPs. To reach this purpose, we will show how LEPs contributed to increase our diagnostic power in neuropathic pain conditions. We will discuss how LEPs, together with other neuroimaging techniques, such as near infrared spectroscopy, were useful in characterizing the relationship between pain and the motor system. Lastly, we will explore the still hot topic of gamma bands, which have been thought to represent the genuine correlate of the pain sensation.

Recommended audience: Clinical academicians, Students / Residents / Trainees

Key words: Pain, Laser Evoked Potentials, Neurophysiology

S04

## How to find lesion in non-lesional focal epilepsies?

- How to find a lesion in non-lesional epilepsies, *Ivan Rektor*, Czech Republic
- EEG Source Imaging in presurgical evaluation in MR negative epilepsies, *Sándor Beniczky*, Denmark
- What can we gain with ultra-high field MRI?, *Maxime Guye*, France

The treatment of pharmaco-resistant MR negative epilepsy is a major problem in epileptology. The session will be focused on diagnostic of the epileptogenic zone with novel approaches in EEG and multimodal imaging.

A lecture will give a review on the state of the art of ESI (Electrical Source Imaging) in presurgical evaluation, emphasizing its clinical utility and limitations. Four studies published in 2021 indicate novel approaches in imaging in MR negative epilepsies (Gajdoš et al.- ASL; Kojan et al. – comparison of ASL and PET; Bartonová et al. DTI/DKI, Marecek et al. Automatic fusion of data; other papers are being prepared).

The optimal techniques for visualization of seizure onset zone in MR negative epilepsies will be presented. By providing better image contrast and higher spatial resolution structural MRI at 7 Tesla (7T) can lead to lesion detection in about 25% of MRI-negative patients at lower fields. The advantages but also the technical challenges of 7T MRI in practice will be presented.

We aim to encourage the neurologists to introduce novel techniques leading to successful neurosurgical therapy of non-lesional epilepsies.

S05

## **The role of clinical neurophysiology in the diagnosis, follow up and treatment of neurodegenerative diseases with cognitive decline**

- Epilepsy and its diagnosis in dementia (Anita Kamondi),  
*Saša Filipović, Serbia*
- Autonomic dysfunction in the diagnosis and follow-up of dementia (Mario Habek)  
*Anita Kamondi, Hungary*
- Non-invasive brain stimulation for memory enhancement (Saša Filipović),  
*Mario Habek, Croatia*

Clinical neurophysiology techniques can provide useful insights into the background of symptoms of dementia and related neurodegenerative diseases (ND) and help in their management and treatment. Epilepsy is recently identified as one of the potentially modifiable risk factors in Alzheimer's disease (AD). Not only overt epilepsy but also subclinical epileptiform activity can contribute to cognitive deterioration in AD and in other ND. EEG, especially long-term (24-hour) recordings, can be used to detect epileptiform activity already in the early phase of the neurodegenerative process allowing for timely diagnosis and early treatment.

Autonomic dysfunction has been shown in AD and Lewy body dementias. Common symptoms include orthostatic dizziness, syncope, falls, urinary tract symptoms and constipation. They contribute considerably to a decline in activities of daily living, institutionalisation, and mortality. Furthermore, they can help in distinguishing different forms of dementia, even in the prodromal stages of the disease. Impairments of memory are a core symptom of AD and other dementias.

Noninvasive brain stimulation (NIBS) techniques have shown promising results in clinical studies. Recent developments in the understanding of the physiology of cortico-hippocampal networks and their role in memory functioning allow for the development of more targeted and personalised NIBS protocols able to induce enhancement of memory functions with clear potential for clinical use.

Recommended audience: Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: electroencephalography, autonomic system testing, noninvasive brain stimulation

S06

## **New insights in the neurophysiology of language**

- Differential auditory-motor processing in the two cerebral hemispheres during speech production, *Christian Kell*, Germany
- Memory retrieval for spoken word production and its lateralisation, *Vitória Piai*, Netherlands
- Neural dynamics underlying acoustic and linguistic processing in the two cerebral hemispheres, *Benjamin Morillon*, France

The aim of this symposium is to provide a state of the art of research investigating the neural processing streams supporting language processing. Language processing necessitates the close communication between perception, production and memory functions and is characterized by functional asymmetry between the cerebral hemispheres.

Linking recent theoretical cognitive and linguistic models and neurophysiological data, we will describe our current understanding of the mechanisms and constraints governing language processing and its lateralization. We will also discuss the clinical impact of these new approaches, in particular for the cartography of language function in epileptic patients.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: neurophysiology, language, hemispheric asymmetry

S07 - Pending

**MEG in Clinical practice: towards routine clinical use?**

## Clinical Neurophysiology & Covid in 2023

- Usefulness of EEG in the assessment of neurologic manifestations of CoViD-19, *Letizia Leocani, Italy*
- Post-Covid fatigue: central, peripheral, or both? *Geoffroy Vellieux, France*
- How Covid-19 has modified the practice of Clinical Neurophysiology, *Hatice Tankisi, Denmark*

Since its onset, the SARS-Cov-2 disease (CoViD-19) pandemic has strongly affected all areas of our health systems, including the practice of clinical neurophysiology. Neurophysiological examinations of people with neurological conditions had been initially postponed due to restrictions on access to the hospital and possibly the fear of patients getting infected. This has greatly promoted the development of tele-neurophysiology that is meant to stay as it overcomes several other barriers independent of the pandemics.

Another aspect of the CoViD-19 epidemic is to determine whether it is the cause of specific disorders of the central or peripheral nervous system (or both), associated or not with typical EEG, EMG or cortical excitability patterns. After the advent of vaccines, the mortality of CoVid-19 has been greatly reduced, as well as its acute life-threatening complication, leaving the scene to a much debated condition which is the post-covid fatigue. This Symposium addresses these different questions, all related to the dramatic impact of CoViD-19 on our daily practice of clinical neurophysiology.

Recommended audience: Clinical academicians, Practitioners, Students / Residents / Trainees, Non - physician Health Professionals

Key words: Covid-19, Tele-neurophysiology, Sensors

S09

## **Language and Communication: Neurophysiological basis, mapping and (intraoperative) monitoring**

- fMRI-informed tractography to guide the intraoperative mapping and monitoring of communicative functions during brain tumor resections, *Carolin Weiß Lucas, Germany*
- Functional hippocampo-cortical networks subserve verbal working memory, *Johannes Sarnthein, Switzerland*
- Intraoperative mapping and monitoring of language enhanced by the use of corticocortical potentials, *Francesco Vergani, United Kingdom*

Communication is an essential pre-requisite of daily activities, dependent on multiple cognitive domains, including language and verbal working memory. However, the integration of this broad functional domain spectrum into the intraoperative setting, e.g., the awake surgery of gliomas, is still far from being part of clinical routine procedures.

This symposium will span from cognitive research with invasive patient recordings to clinical applications of network models, providing a comprehensive and interdisciplinary overview of concepts and clinical techniques related to the functional networks relevant for communication.

Johannes Sarnthein, neurophysiologist at University Hospital Zurich, has studied the interaction between neuronal firing in the hippocampus, local field potentials, and the sources of scalp EEG while patients performed a verbal working memory task: rehearsing letter strings elicited information flow from the hippocampus to the auditory cortex.

Carolin Weiss Lucas, neurosurgeon at the University Hospital Cologne, will lecture about the localisation of communication network structures using tractography informed by task-related and resting-state fMRI on single-subject level in glioma patients. Finally, Francesco Vergani, neurosurgeon at the King's College Hospital in London, will talk about the recent advances in intra-operative neuromonitoring of language, including the use of cortico-cortical potentials induced by direct electrical stimulation.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees, Non - physician Health Professionals

S10 - Pending

**NIBS for parkinsonism: towards better understanding and modulation of difficult to-treat symptoms**

**S11** – Pending

**New perspectives of Therapeutic applications of  
Non Invasive Brain Stimulation**

S12

## Novel Neurophysiological Methods of Neuromuscular Junction Assessment

- Analysis of electrooculography signals for the detection of Myasthenia Gravis, *Hans Katzberg*, Canada
- Quantifying extra-ocular muscle fatigability through orthoptic measurements in Myasthenia Gravis, *Martijn Tannemaat*, Netherlands
- Vestibular myogenic evoked potentials in the assessment of Myasthenia Gravis patients, *Monica Alcantara*, Canada

Patients with myasthenia gravis (MG) usually present with extra-ocular muscle (EOM) dysfunction, which has a broad differential diagnosis. Common electrodiagnostic methods include SFEMG and RNS, which require significant expertise, are technically demanding and may lead to discomfort. Recently, there have been significant developments on alternative methods of neuromuscular junction testing, with a special focus on ocular symptoms. In this session we will discuss the technical aspects and applicability of electrooculography (EOG), ocular vestibular myogenic evoked potentials (oVEMPs) and orthoptic methods in MG.

### Lecture 1

EOG is a non-invasive method to detect signals originating in the EOMs routinely used in sleep studies. As in MG patients EOMs fatigue, the assessment of different eye movement patterns allows for differentiation of MG from other ocular disorders that may present with similar symptoms.

### Lecture 2

Orthoptic measurements are valuable to differentiate fatigable EOMs in MG patients from other causes of EOM dysfunction. Drift measurements during persistent gaze identify patients with MG among other diseases that present with limitations in eye motility.

### Lecture 3

This non-invasive method is traditionally used to test otolith function with vibration bursts on the skull. oVEMPs are recorded over the infraorbital margins with electrodes that detect surface EMG signals from neighboring muscles. Unique patterns are described in MG patients with EOM dysfunction.

Recommended audience: Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: Myasthenia Gravis, Neuromuscular junction, Ocular

S13

## **Clinical neurophysiology of falsehood: from simulation to dissociative symptoms**

- Neuropsychology of lying, *Xavier Seron*, Belgium
- Clinical neurophysiology of functional motor impairment, *Mark Hallett*, USA
- Nonorganic sensory symptoms: malingering, factitious or conversive?  
*Luis Garcia-Larrea*, France

The advice of clinical neurophysiologists is often sought in the context of so called 'functional neurologic disorders', including dissociative conditions, somatization, factitious disorders or simple malingering. In this symposium we will try to provide clues about the general frame of falsehood and its boundaries, and the approaches that clinical neurophysiology may offer to disentangle complex clinical presentations.

After a short general introduction, the first lecture will explore the neuropsychological aspects underlying the extraordinary capacity of humans to lie and deceive, and the different modalities and mechanisms underlying it (Xavier Seron, Belgium). This will be followed by two practical lectures focused on (i) the clinical neurophysiology of functional motor disorders (Mark Hallett, USA) and (ii) of somatosensation and pain (Luis Garcia-Larrea, France). Ample time for a general discussion with the panel will be given after the 3 presentations.

Recommended audience: Practitioners, Students / Residents / Trainees, Non - physician Health Professionals, Other

Key words: lies, deception, neuropsychology

S14

## **The Genesis of seizures: from animal models to human recordings**

- From seizure genesis to ictal semiology, *Aileen McGonigal*, Australia
- Quantification and modelling of the epileptogenic zone, *Fabrice Bartolomei*, France
- Genesis of focal seizures: mechanisms and patterns, *Marco De Curtis*, Italy

Focal seizures are characterized by the emergence of abnormal oscillatory activity from hyperexcitable brain regions. In humans, their analysis is a crucial element in the diagnosis and pre-surgical management of drug-resistant epilepsy. Methods based on intracerebral signal processing have been proposed to better describe and localize these phenomena.

The recent contribution of large-scale modelling may also lead to new ways of understanding and better treating these diseases. Animal data are crucial to a better understanding of seizure patterns and genesis mechanisms of rapid oscillations and to feed physiopathological hypotheses. This symposium will address different aspects of these problems, from a clinical and research point of view, in a multi-scale perspective.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees Apologies for error in order of speakers. We would plan to have 1st talk by Prof Bartolomei, 2nd talk by Prof De Curtis, 3rd talk by Prof McGonigal

Key words: Seizures, Mechanisms of oscillations, SEEG

S15

## ICU-ACQUIRED WEAKNESS: CLINICAL AND ELECTROPHYSIOLOGICAL ASPECTS

- ICU-acquired weakness: Overview, *Mamede de Carvalho*, Portugal
- Experimental and Clinical studies on Critical Illness Myopathy, *Lars Larsson*, Sweden
- Critical illness myopathy: Conventional and novel electrophysiological approaches, *Werner Z'Graggen*, SWITZERLAND

Intensive care unit (ICU) acquired weakness (ICUAW) is a common disabling condition in patients admitted to ICUs. ICUAW refers to weaning failure from mechanical ventilator or muscle weakness in extremities. As a consequence of the distinctive feature of COVID-19 requiring long-term ventilatory therapy, ICUAW has gained special attention during the pandemic.

Critical illness myopathy (CIM) and critical illness polyneuropathy (CIP) are very frequent causes of ICUAW, and diagnosis and differentiation are only possible with electrophysiological testing and muscle biopsy.

This symposium will cover the clinical and electrophysiological aspects of ICUAW. Clinical features, risk factors, incidence, pathophysiology, histopathology, diagnostic criteria and differential diagnosis of CIM and CIP will be discussed. The electrodiagnosis of CIM and CIP using conventional methods will be summarized, and novel electrophysiological methods including muscle excitability testing, so-called muscle velocity recovery cycles will be presented in CIM.

Recommended audience: Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: Intensive care unit, Acquired weakness, Myopathy

S16

## **New neurophysiological methods in research and the clinic**

- In vivo MR imaging of human motor units, *Roger Whittaker, UK*
- New tools in pain neurophysiology, *Caterina Leone, Italy*
- Applying Raman spectroscopy to neuromuscular disease, *James Alix, UK*

Although genetics has attracted considerable interest in the diagnosis of central and peripheral nervous system disorders in recent years, these methods do not provide information on function, and neurophysiological methods have still an irreplaceable role. However, conventional methods have some limitations, and ongoing methodological developments are crucial for the best practice in clinical neurophysiology. This symposium will summarize some of the areas in which methodological developments have been achieved.

The 1st talk will cover recent advances using diffusion -weighted MRI to describe 2D and 3D imaging of human motor units.

The 2nd talk will cover the new tools in pain neurophysiology including cold stimulation and the interdigitated electrodes.

The 3rd talk will cover the fundamentals of Raman spectroscopy, including equipment requirements and data analysis approaches. Recent studies applying Raman spectroscopy to neuromuscular medicine will be used to highlight the potential of this emerging technique.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees, Non - physician Health Professionals

Key words: Motor unit, Neurodiagnostics, Imaging

S17

## **What intracerebral stimulation teaches us about SUDEP**

- Cortical stimulation mapping of cardiorespiratory, *Beate Diehl*, UK
- Hypoxemia induced by cortical stimulation, *Stephan Schuele*, USA
- Peri-ictal Apnea and SUDEP, *Sylvain Rheims*, France

The physiopathology of SUDEP will be the main topic of this symposium through the results of studies from intracerebral recordings. The mechanisms of ictal apnea, and the implication of cerebral networks will be discussed. The audience will learn about the hypothesis of the genesis of an ictal apnea induced by epileptic seizures and the risk of SUDEP.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: SEEG, Epilepsy, SUDEP

## Neurophysiological tests helping with the differential diagnosis in movement disorders

- Parkinsonisms, *Josep Valls-Sole*, España
- Tremors vs Myoclonus, *Marina AJ De Koning-Tijssen*, The Netherlands
- Hyperkinesias vs Functional Movement Disorders, *Francesca Morgante*, United Kingdom

Differential diagnosis may still be challenging in hyperkinetic movement disorders and among parkinsonisms. Neurophysiological tests may help by providing some clues. In many instances, neurophysiology may document and provide quantitative measures of what is already clinically evident. In some other instances, it may provide unique information derived from the specific pathophysiological mechanisms underlying the clinical manifestations. Our aim is to provide the attendants with an updated review of neurophysiological methods and tests to use in accordance with the clinical context.

In tremors vs myoclonus, neurophysiology may contribute to the diagnosis by measuring, among other aspects, rhythmicity, distribution, and duration of electromyographic bursts. In functional movement disorders, several neurophysiological tests may reveal absence of the abnormalities that would be accompanying the mimicked disorder, or the volitional nature of the movement. In parkinsonisms, neurophysiological documentation of the specific alterations expected according to the systems involved may help the clinician in the characterization of the disorder and in establishing prognosis.

Recommended audience: Clinical academicians, Students / Residents / Trainees

Key words: Movement disorders, Neurophysiological differential diagnosis, Diagnostic challenge

S19

## **Sleep and epilepsy: insight from intracranial recordings**

- Sleep, epilepsy and memory consolidation, *Isabelle Lambert*, France
- Sleep fragmentation and epileptic activities, *Laure Peter-Derex*, France
- Paroxysmal behaviours during sleep: parasomnias or epileptic seizures?  
*Lino Nobili*, Italy

Sleep and epilepsy interact in many ways with complex relationships. Increase of epileptic activities during sleep may have specific consequences on physiological processes occurring during sleep, such as memory consolidation. Furthermore, epileptic activities occurring during sleep may also be directly responsible for sleep fragmentation, which may have a negative impact on patient quality of life. At last, correct diagnosis of paroxysmal behaviours occurring during sleep may be challenging between epileptic seizures and sleep diseases such as non REM sleep parasomnias.

In these three situations, intracranial EEG recordings bring unique opportunity to understand physiological activities occurring during sleep, their disturbances by epileptic activities and offer a chance to better understand pathophysiology of NREM parasomnia. The aim of this symposium is to present in which ways intracranial EEG recordings open the way to a better understanding of the complex relationships between sleep and epilepsy.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: Sleep, Epilepsy, Memory

S20

## **Update in Epilepsy Syndromes of Early Childhood - Classification and EEG criteria**

- Epilepsy Syndromes in the Neonate, *Ronit Pressler*, UK
- Epilepsy Syndromes in Infancy, *Sushma Goyal*
- Epilepsy Syndromes in Early Childhood, *Alexander Datta*, CH

Epilepsy syndromes have been recognized for more than 50 years, as distinct electroclinical phenotypes with therapeutic and prognostic implications but only recently the ILAE has published consensus-based definitions and classifications of epilepsy syndromes according to the age of onset. In this symposium, we will present and discuss epilepsy syndromes with onset in neonates, infants, and early childhood. Three topics will be addressed for each age group.

Firstly, the new diagnostic criteria will be summarized according to the new classification and newest published data, including implications for clinical management.

Secondly, EEG findings will be presented in more detail with emphasis on mandatory, typical and exclusionary patterns.

Thirdly, the most relevant syndromes cases with videos and EEG will be presented.

The learning objectives are as follows: As a result of this symposium, participants will be able to describe the approach to definition and syndrome classification for the epilepsy syndromes in early childhood and able to recognise and describe typical and mandatory EEG findings for each syndrome. The organizers and speakers for this symposium are leading experts in the field who were selected based on their excellent track record of clinical research and teaching skills.

Recommended audience: Clinical academicians, Practitioners, Students / Residents / Trainees, Non - physician Health Professionals

Key words: Epilepsy syndormes, Childhood, EEG

S21

## **Simultaneous recordings of EEG/MEG and intracranial EEG : new windows on epileptic and cognitive networks**

- Visual ventral stream investigation using simultaneous EEG-SEEG, *Laurent KOESSLER, FRANCE*
- Simultaneous EEG-SEEG during electrical cortical stimulation, *Andrei BARBORICA, ROMANIA*
- No interictal spike on the scalp: is this normal brain activity? *Serge VULLIEMOZ, SWITZERLAND*

The interpretation of scalp EEG is tricky and requires a specific training. The brain source detection is difficult due to several factors like the fluctuating signal to noise ratio, the low spatial sampling, the co-activation of several sources or the volume conduction effect. Recently and contrary to common assumptions, it has been demonstrated that some deep brain sources are detectable in scalp EEG whereas some superficial brain sources can remain undetectable (e.g. basal temporal lobe).

These findings relies on precious simultaneous scalp and intracranial EEG recordings. In this symposium, we propose to show, using different methodological aspect (cortical electrical stimulations, visual periodic stimulations, MEG, ...), different situations where biomarkers are visible and not on the scalp EEG. We will use illustrative examples in epilepsy and cognitive neurosciences, and also show electrical source imaging and connectivity that can map the epileptic and connective networks from scalp EEG.

Recommended audience: Clinical academicians

Key words: Multi-scale M-EEG & SEEG, Epilepsy, Cognition

S22

## **Personalized therapeutic perspectives of Non-Invasive Brain Stimulation**

- Personalizing NIBS according to spatial features (“network connectivity”),  
*Jean-Pascal LEFAUCHEUR*, France
- Personalizing NIBS according to cortical excitability (“brain state”),  
*Andrea ANTAL*, Germany
- Personalizing NIBS according to temporal features (“closing the loop”),  
*Ulf ZIEMANN*, Germany

Non-invasive brain stimulation techniques have generated considerable interest in their therapeutic potential. In this symposium, we present new perspectives to optimize this potential by a personalized approach based on the individual assessment of cortical excitability, the synchronization of electroencephalographic activities and guidance on cerebral connectivity.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees, Non - physician Health Professionals

Key words: Brain Stimulation, Neuroplasticity, Connectivity

S23

## **A Neurophysiology Approach to Non-ordinary States of Consciousness: Meditation, Hypnosis, Trance, and Psychedelics**

- Neurophysiology of non ordinary state of consciousness, interest of use of psychedelics, *Christopher Timmermann*, UK
- Meditation and neurophysiology : a neurocomputational approach, *Arnaud Poublan*, France
- Neurophysiology of trance and hypnosis states, *Audrey Vanhauzenhuyse*, Belgium

The last decades have seen a societal and scientific interest in meditation, hypnosis, trance, and psychedelics. These may be referred to as non-ordinary states of consciousness (NSCs). NSCs are characterised by shifts in experiential contents (what appears to the experiencer) and/or structure (how it appears to the experiencer). This in turn can allow the experiencer to become conscious of content and/or structure of experience as a cognitive process. NSCs thus present a unique approach to investigating the nature of experience from a multiscale perspective, which includes mind, brain, body and context.

No contemporary unifying framework has however been provided yet for the study of these NSCs. We propose a neurophysiological approach combined to neurophenomenology to the study of NSCs allowing for further gains in using the NSCs as catalysts of change and transformation in clinical practice, and helping to refine our understanding of the relationships between experiential (subjective) and neural dynamics. The framework will focus specifically on four NSCs: meditation, hypnosis, trance, and psychedelics. These fields have mostly been studied separately until now, and their respective research practices have consequently developed in different ways, but we believe it is time for reconciliation and bridging these domains together.

Recommended audience: Basic Scientists, Clinical academicians, Students / Residents / Trainees

Key words: Neurophysiology, Non ordinary state of consciousness, Meditation

S24

## Neonatal hypoxic-ischemic encephalopathy (HIE) and EEG

- Can EEG predict outcome in term neonates with hypoxic ischemic encephalopathy in therapeutic hypothermia, *Emilie Bourel-Ponchel*, France
- Can neonatal EEG in the first 6h help assess suitability for therapeutic hypothermia ? *Geraldine BOYLAN*, Ireland
- Electrophysiology at bedside in neonatal HEI: observed practices, concordance of interpretations from the Lytonepal Cohort, *Gauthier LORON*, France

Many academic societies and scientific evidences argue for the use of EEG in the diagnosis and prognosis of neonatal HIE. In this symposium, we will address the following questions: Can neonatal EEG in the first 6h help assess suitability for therapeutic hypothermia (TH)? (G. Boylan). The EEG of the newborns with mild to severe HIE within the first 6h of birth will be described using examples from multicentre studies. The most important features will be highlighted and EEG patterns that best support the instigation of TH will be described. The added value of quantitative neonatal EEG analysis will be discussed as well as the potential of machine learning.

Can EEG predict outcome in term neonates with HIE in TH (E. Bourel-Ponchel). The evolution of EEG background activity and seizure burden throughout TH will be described in full-term with mild to severe HIE. EEG prognostic biomarkers will be described to highlight the importance of EEG monitoring during TH to accurately predict outcome.

Electrophysiology at bedside in neonatal HEI: observed practices, concordance of interpretations from the Lytonepal Cohort (G Loron). By exploring data from the Lytonepal observational study, which included more than 700 term newborns, we will investigate actual practices in France, and the reproducibility of interpretations to highlight the current strengths and limitations of electrophysiology and provide material for reflection on the organisation of care and fields of research.

Recommended audience: Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: EEG, neonatology, prognosis

S25

## COMBINING TMS AND EEG - BRIDGING THE GAP FROM BASIC RESEARCH TO CLINICAL UTILITY

- Stratification of unresponsive wakefulness patients by the perturbational complexity index (PCI), *Silvia Casarotto*, Italy
- Sleep-like slow waves and the evolution of network interactions after motor stroke, *Caroline Tscherpel*, Germany
- Predicting the risk of post-stroke delirium using TMS-evoked EEG responses, *Annerose Mengel*, Germany

The combination of transcranial magnetic stimulation (TMS) with electroencephalography (EEG) has emerged as a powerful technique to non-invasively assess cortical properties comprising excitability and connectivity that has widely been used in basic research. Recently, this method has additionally gained importance in different clinical applications, enabling a comprehensive characterization of the underlying pathophysiology and the development of TMS-EEG markers holding predictive potential.

In this symposium, we aim at uniting researchers working on the application of TMS-EEG in different neurologic conditions. In three lectures we will systematically elaborate the topic by providing a technical and theoretical framework of the methodology, presenting the insights afforded by TMS-EEG, and discussing future directions in line with the potential of TMS-EEG as a clinical tool.

Dr. Casarotto will present how the combination of TMS and EEG has provided a synthetic index that can detect with high sensitivity the capacity for consciousness. Dr. Tscherpel will provide an extensive and longitudinal characterization of TMS-induced EEG signal alterations and electrophysiological mechanisms occurring in the motor system early after stroke and alongside neural reorganization enabling recovery. Finally Dr. Mengel will demonstrate a pilot study using TMS-EEG for estimating delirium risk in the acute phase after stroke.

Recommended audience: Clinical academicians

Key words: Pertubational complexity index, unresponisve wakefulness patients, TMS EEG

S26

## **Can we determine deep foci and the extension of the epileptogenic zone?**

- Foci without spikes in the scalp EEG: the role of semiology and complementary imaging, *Margitta Seeck*, Switzerland
- And if we use EEG-fMRI? *Serge Vuillemoz*, Switzerland
- How to estimate the extension of the epileptogenic zone with EEG  
*Christophe Grova*, Canada

There are still 2 holygrails in epileptic focus localization with EEG. Foci which are deep and characterize by few or ill localized discharges. The other one concerns the extension of the epileptogenic zone which is crucial before epilepsy surgery. In this symposium, we present approaches of how to overcome these two difficult constellations.

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees, Non - physician Health Professionals

Key words: EEG, Epilepsy, Epileptogenic zone

S27

## Demyelinating neuropathies

- Deeper into demyelination : neurophysiological considerations,  
*Yann PEREON, France*
- Inherited demyelinating neuropathies: is it so stereotypical?  
*Nazha BIROUK, Morocco*
- Acquired demyelinating neuropathies: focus on CIDP variants.,  
*Jean-Philippe CAMDESSANCHE, France*

Demyelinating neuropathies are a part of peripheral neuropathies. Demyelinating neuropathies may be inherited or acquired. In the second case, treatments are possible. After neurophysiological considerations about demyelination, we will present inherited and acquired situations to show that a clear clinical or neurophysiological cut off is sometimes difficult. We will illustrate with case analysis and propose decision tree to help clinicians in the daily practice.

Recommended audience: Practitioners, Students / Residents / Trainees

Key words: Demyelination, Neurophysiology, Electrodiagnostic

## **Cortical Overexcitation, Cognitive Deficits, and Productive Neuropsychiatric Symptoms in Pathological Aging: A window on Vigilance Regulation Systems**

- Pathogenetic role of brain arousal regulation in affective disorders and ADHD, *Ulrich Hegerl, Germany*
- Different Abnormalities of EEG markers in Quiet Wakefulness are Related to Visual Hallucinations and Systems in Patients with Parkinson's and Lewy Body Diseases, *Claudio Babiloni, Italy*
- Cortical excitability and Visual Hallucinations and Systems in Patients with Parkinson's Disease: Transcranial Magnetic Stimulation and Electrophysiological Correlates, *Bahar Güntekin, Turkey*

### BACKGROUND:

Cognitive deficits and neuropsychiatric symptoms including hallucinations, depression, apathy, and agitation frequently occur in patients with Major Depression, Alzheimers', Parkinson's, and Lewy Bodies diseases. Recent studies have found that dysfunctions in the general regulation of cortical excitability in wakefulness may be associated with some cognitive and neuropsychiatric symptoms in those patients. However, there is no consensus about a unifying clinical neurophysiological model.

### AIM OF THE SYMPOSIUM:

The present Symposium aims at showing and discussing recent transcranial magnetic stimulation (TMS) and EEG findings in patients with Attention Deficit and Hyperactivity Disorder (ADHD), Major Depression, Alzheimers', Parkinson's, and Lewy Bodies diseases to frame a better understanding of the neurophysiological models underpinning their dysfunctions in perceptions, cognition, mood, and behavior. Those findings may ground a neurophysiological model explaining different pathways and neuromodulatory systems underpinning over-excitation of cerebral cortex and abnormal functional connectivity networks at the basis of cognitive and neuropsychiatric symptoms in these brain disorders of pathological aging.

## New insight on REM sleep

- Sawtooth waves: new insights on ancient waves, *Laure Peter-Derex*, France
- REM Sleep Microstates in the Human Anterior Thalamus, *Péter Simor*, Hungary
- REM sleep remains paradoxical: sub-states defined by thalamo-cortical and cortico-cortical functional connectivity, *Hélène Bastuji*, France

Using SEEG/PSG in human, Laure Peter-Derex will show that Sawtooth waves (STW) involve the thalamus and almost all cortical areas. They represent brief temporal windows of increased thalamocortical functional connectivity, associated with widespread cortical increase in high-frequency activities. STW may be considered as phasic thalamo-cortical waves, equivalent of (ponto)-geniculo-occipital waves, and orchestrate internally-triggered synchronized reactivations of multifocal activities during REM sleep.

Based on sleep EEG and intrathalamic recordings of human, Péter Simor will show that phasic and tonic REM periods differ with respect to cortical activity indexing interoceptive processing, and thalamocortical synchronization. A distinctive approach to phasic and tonic REM microstates may shed new light on the mechanisms and functions of REM sleep, as well as on the dysfunctional patterns observed in pathological conditions affecting REM sleep.

In human paradoxical (REM) sleep, Hélène Bastuji will show that periods of slow rhythmic delta activity in the thalamus during paradoxical sleep were associated with decreased thalamo- and cortico-cortical functional connectivity, both relative to the waking state and the periods of 'rapid' paradoxical sleep. These fluctuations do not overlap with the classically defined 'tonic / phasic' periods and suggest an alternance of functional states in PS that may be relevant to understand aspects of mental activity during this sleep stage.

Recommended audience: Basic Scientists, Clinical academicians, Students / Residents / Trainees

Key words: REM, Sawtooth Wave, Gamma

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## **Deep brain recordings in Movement disorders: current and future applications**

- Electrophysiological biomarkers in Movement disorders,  
*Alexandre Eusebio, France, Gerd Tinkhauser, Marie Laure Welter*

Recommended audience: Basic Scientists, Clinical academicians, Practitioners, Students / Residents / Trainees

Key words: Parkinson, Local field potentials, Dbs