KEYNOTE ABSTRACTS

SUNDAY 27 JULY 2014

KEY001: Eye Movements And Visual Stability

Keynote Speaker: **Professor Jason Mattingley**, The University of Queensland, Australia

Overview

Humans, like many animals, use eye movements to selectively sample the visual environment, bringing objects of interest onto the fovea for fine-grained analysis. Each time a saccade is made, the retinal image is abruptly displaced. The challenge for the visual system is to maintain perceptual stability in the face of such displacements. One way in which stability might be achieved is by using information about the direction and extent of an impending saccade to update internal representations of the locations and features of objects in the visual world. Neurons at various levels of the visual system, including the midbrain, parietal and prefrontal cortices, alter their responses if an impending saccade will bring a stimulus into their receptive field. Such changes in neural activity provide a potential mechanism for ensuring visual stability across saccades. In this talk I will discuss work in which we have examined the contribution of parietal cortex to visual updating across saccades. I will also present results from a series of psychophysical studies showing that object perception in peripheral vision is enhanced at the goal of an intended saccade, and that presaccadic updating preserves the elementary features of objects at their predicted postsaccadic locations. Our findings suggest a mechanism by which object recognition might be enhanced in the periphery during active search of visually cluttered environments.

MONDAY 28 JULY 2014

KEY002: Towards A Personalized Cognitive Neuroscience: The MyConnectome Project

Keynote Speaker: **Professor Russell A Poldrack,** University of Texas at Austin, USA

Overview

Cognitive neuroscience has focused heavily on characterizing those functions that are consistent across individuals, and to a lesser degree on variability between individuals. In my talk I will outline an alternative approach that begins to characterize the variability within individuals over time, which is crucial to an understanding of psychiatric disorders defined by extreme variability in emotional or cognitive function. I will discuss the MyConnectome project, which has collected a broad range of phenotypes (including imaging and -omics) on a single healthy individual over the course of 18 months, in an attempt to characterize the nature of variability in brain function and its relation to ongoing metabolic changes. This work suggests a new approach to understanding neurocognitive variability as a phenotypic feature of interest.

KEY003: The Wandering Mind: Mental Time Travel, Theory Of Mind, And Language

Keynote Speaker: **Professor Michael C. Corballis,** University of Auckland, New Zealand

Overview

About half the time, the mind wanders away from on-going tasks, and from the present. This includes mental time travel into past and possible future events, and into the minds of others. Spontaneous activity of the brain is also revealed in dreams and hallucinations, and may well be responsible for creative thinking, the discovery of new and unusual combinations of ideas. It has been argued mind wandering, at least in the form of mental time travel, is unique to humans, but I will summarize data from hippocampal recording suggesting that even rats appear to “play back” earlier experiences, and even “preplay” new ones. Behavioral evidence from birds and great apes increasingly shows evidence of episodic-like memory and episodic prospection. What is unique to humans is language, which is an adaptation allowing us to relay to others events and information removed from the present with a high degree of precision. Through stories, soap operas, gossip, and even conference presentations, language enables us to share our mind wanderings, understand other minds, and generate social cohesion and culture in the form of folklore, creation myths, and religions. But language is also a barrier; the 7,000 languages of the world are for the most part mutually unintelligible, serving as much to keep groups apart as to unite people within them.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S01: Frontal-Striatal Interaction In Reward-Guided Decision Making

Chair & Speaker: **Matthew Rushworth**, University of Oxford, UK
Bernard Balleine, University of Sydney, Australia
Rob Hester, University of Melbourne, Australia
Rei Akaishi, Tokyo Metropolitan Institute of Medical Science, Japan

Overview

We know that the frontal lobes are important for reward-guided decision-making but the mechanisms that underlie this role are currently a topic of investigation. The aim of this symposium is to bring together a group of researchers using disparate approaches (single neuron recording, experimental lesions, neuroimaging, computational neuroscience, and learning theory) but with a common focus on determining how several areas in the frontal cortex, including the medial frontal cortex and anterior cingulate cortex, come to have a critical role in reward-guided decision-making. As well as attempting to understand the neural mechanisms in these areas another common interest shared by the speakers is the understanding of the interactions between these brain regions and the striatum during decision-making. Using a variety of rodent models Bernard Balleine will explain the key circuits on which goal-based decision-making depends. Using a combination of model-based analysis, fMRI & TMS-EEG, Rei Akaishi will propose a mechanism for mediating learning and decision making. Matthew Rushworth will summarize recent fMRI and lesion experiments showing how these mechanisms operate when multiple choices are available simultaneously. Rob Hester will examine the role of these areas in error-based learning and cognitive control processes.

SO1 001: Making Decisions Between Multiple Options

Matthew Rushworth, University of Oxford, UK

There has been considerable interest in how the brain makes decisions but most investigations of the neural mechanisms of decision making have entailed giving animals or people only a limited numbers of options to choose between. Typically all the options are presented at the same time. In the real world, however, choices can be made between several options and foraging animals' choices are made in in the context of sequences of encounters with prey/food in a quite distinct scenario to the one that is typically studied in the laboratory. I will describe how decision making when there are multiple options differs in important ways from binary decision making. Representations of potential choices in the ventromedial prefrontal cortex (vmPFC) interact in surprising ways even when there are three options. I also demonstrate that humans can alternate between two modes of choice, comparative decision-making and foraging, dependent on distinct neural mechanisms in vmPFC and anterior cingulate cortex (ACC) employing distinct reference frames; in ACC choice variables are represented in invariant reference to foraging/searching for alternatives. The cost of foraging is also represented in ACC. While vmPFC encodes values of specific well-defined options, ACC encodes the average value of the foraging environment and cost of foraging.

Biography

Matthew Rushworth is a Professorial Research Fellow in the Department of Experimental Psychology and Centre for Functional Magnetic Resonance Imaging of the Brain (FMRIB), University of Oxford, UK. He has previously worked in London and in Montreal.

His recent work has been concerned with the operation of neural circuits in prefrontal and cingulate cortex during decision making and social interaction. He is also interested in the understanding functional interactions between brain areas during decision making and the anatomical connections that mediate those functional interactions.

SO1 002: Dysexecutive Syndrome: The Cortical- And Thalamo-Striatal Pathways And Disorders Of Goal-Directed Action

Bernard Balleine, University of Sydney, Australia

The cortico-striatal pathway has long been known to play an important role in executive functions, particularly in decision-making involving goal-directed actions, and changes in this pathway have been linked to the cognitive symptoms associated with various forms of psychiatric disorder, neurodegenerative conditions and addiction. Recent research in animal models has established that this pathway is essential for striatal plasticity associated with the acquisition of new actions; damage to this pathway renders actions less deliberated and more impulsive or habitual. Furthermore, although the acquisition of new actions doesn't involve the thalamo-striatal pathway, its damage renders the learning process associated with such actions vulnerable to interference when environmental contingencies change resulting in the catastrophic loss of prior learning; i.e. what is usually called a memory impairment. Together, therefore, these pathways are necessary to encode and to retain goal-directed actions; for the development of new strategies and their integration with old solutions.

Biography

Professor Balleine is a Professor and Australian Laureate Fellow and head of the Behavioural Neuroscience laboratory, Sydney. His research aims to understand the neural bases of learning and motivational processes that control volitional, goal-directed action, an issue that has direct bearing on our understanding of executive functions and decision-making. Current research focuses include: [1] The prefrontal cortex-basal ganglia network and goal-directed learning in neurodegeneration, focal brain damage and addiction; [2] The amygdala and its interactions in regulating how the reward value of events is encoded; [3] The thalamo-striatal projection in the integration of cognitive and emotional processes for decision-making.

SO1 003: Learning From Errors: The Role Of The Dorsal Cingulate In Feedback-Based Adaptive Behaviour

Rob Hester, University of Melbourne, Australia

One tenet of human learning that permeates society is the understanding that punishing an error will reduce the likelihood of it being repeated. Manipulating the level of punishment for an error has also been shown to result in corresponding levels of behavioural change, whereby larger penalties increase the likelihood of adaptive behavioural change. Models of error-related neural activity have argued for a relationship between outcome-related dorsal anterior cingulate (dACC) activity and adaptive changes in performance, via reinforcement learning mechanisms (e.g., Brown and Braver, 2005; Holroyd and Coles, 2002).

Recent evidence has highlighted an association between the magnitude of error-related dACC feedback activity and subsequent learning performance. However, existing data does not clarify whether the dACC activity is a monitoring signal reflecting outcomes that were worse than expected, or, the value of an outcome to subsequent adaptive behaviour. The latter is of particular interest due to the range of clinical conditions that feature poor decision-making that reflects a tendency to learn from positive, but not negative, feedback. To understand the influence of 'abnormal' reward sensitivity on behaviour in clinical conditions such as addiction, we have examined how experimental manipulation of both performance expectations (or prediction errors) and adaptive value has on dACC activity and its relationship to learning from errors. Our human fMRI data in healthy participants suggests that the dACC is more sensitive to the adaptive value of information rather than reflecting a prediction error, whereas the insular cortex and striatum show the opposite pattern.

Biography

Rob Hester is a Associate Professor in the School of Psychological Sciences, University of Melbourne, Australia, where he holds an ARC Future Fellowship. His research uses cognitive neuroscience methods (particularly fMRI) to examine the neural and behavioural mechanisms underlying cognitive control (e.g., impulse control) in healthy adults, as well as applying these methods to understanding disorders of control in clinical conditions such as drug dependence.

S01 004: Active Mechanisms of Learning and Decision-Making

Rei Akaishi, Tokyo Metropolitan Institute of Medical Science, Japan

Humans are known to actively interact with the environment. However, current models of learning and decision-making tend to treat human subjects as passive agents. In the first part of the talk, I will show that human subjects are actively making inferences about the external environment in a perceptual decision making task. Because there was no immediate feedback, this internal inference is unchecked and carried over to the subsequent trials. In the second part of the talk, I will describe how the internal inferences interact with the external feedback in tasks requiring learning of causal relationship between events. When the external feedback is delivered, subjects combine the internal and external information in a manner akin to hypothesis testing in science. Medial area 32 and 25 are specifically involved in confirmation of the internal hypothesis and lateral orbitofrontal cortex is involved in switching to an alternative hypothesis.

Biography

Rei Akaishi is a Post-Doctoral Research Fellow in the Tokyo Metropolitan Institute of Medical Science, Japan. He has previously worked in Oxford and Tokyo. His research has been concerned with how people learn and make decisions especially in the complex environment where knowledge of the structure of the environment is critical. He is especially interested in the spontaneous process in which people actively infer the structure of the surroundings and make use of these inferences in decision and learning. His research is also unusual in combining multiple techniques such as fMRI, TMS, EEG, combined TMS-EEG.

S02: Multi-Frequency Brain Network Dynamics In Human Memory

Arne Ekstrom, University of California Davis, USA
Chair & Speaker: Brett Foster, Stanford University, USA
Bernhard Staresina, Cambridge University, UK

Overview

A central challenge to understanding human memory is elucidating how the brain efficiently consolidates and retrieves the details of prior experience across distributed functional networks. While the medial temporal lobe (MTL) plays a well-established role in memory function, contemporary neuroscience has highlighted the importance of interactions between the MTL and distributed neocortical regions, both sensory and associative in function. Mechanisms for coordinating such distributed functional networks have progressively focused on long-range rhythmic synchrony between regions. While theta band oscillations have become synonymous with memory systems, a wide diversity of oscillatory motifs exists across the cerebral cortex. This symposium will present recent findings chiefly from human intracranial recordings that highlight the role of multi-frequency brain dynamics in facilitating memory network function. Specific topics covered include hippocampal oscillatory dynamics and memory behavior (Staresina); frequency specific hippocampal-neocortical oscillatory interactions and episodic memory content (Ekstrom) and parietal cortico-cortical oscillatory dynamics during autobiographical retrieval and resting-state (Foster). Collectively, these data suggest that multi-frequency brain dynamics provide important mechanisms for temporal coordination of distributed memory networks, and provide a wide repertoire of dynamical states that may accommodate the rich informational content of human memory.

S02 001: A Graph Theory Approach To Human Episodic Memory: Outlining The Spectrotemporal Basis Of Episodic Memory Retrieval

Arne Ekstrom, University of California Davis, USA

The neural basis of episodic memory is often thought to hinge critically on key brain regions within the medial temporal lobe such as the hippocampus. Yet several prominent models of episodic memory also posit key roles for hippocampal-cortical and cortical-cortical interactions in mediating episodic memory. Employing graph theory, pairwise phase consistency (PPC), and multilobular intracranial EEG recordings, our findings suggest that successful episodic memory retrieval involves increased connectivity across multiple medial temporal and cortical locations. We also find that successful memory retrieval involves increased functional connectivity, as indexed using PPC, specifically between the medial temporal lobes and parietal and frontal brain areas. These findings suggest that the medial temporal lobes act as a hub for successful memory retrieval. Finally, we show that retrieving spatial layout vs. temporal order details of recently experienced events results in distinct differences in the frequencies at which the networks resonate rather than specific anatomically-mediated interactions. Employing a similar data set collected in human participants using fMRI and functional connectivity analyses, we present further evidence for the hippocampus acting as a hub for correct episodic memory retrieval. Together, these findings present a new perspective on human episodic memory, emphasizing interactions between multiple cortical areas at different spectral frequencies as important to successful episodic memory retrieval.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S02: Multi-Frequency Brain Network Dynamics In Human Memory cont'd

Biography

Arne Ekstrom is an assistant professor at UC-Davis Center for Neuroscience. His research focuses on addressing the neural basis of human episodic memory. One particular focus of the lab regards the neural basis of how we construct the rich spatiotemporal context that often accompanies vivid event recall. Analytic approaches to this issue involve high-resolution functional magnetic imaging coupled with multivariate pattern voxel techniques and multilobular intracranial EEG coupled with graph theory.

S02 002: Oscillatory Dynamics Of The Medial And Lateral Parietal Lobe During Episodic Retrieval And Resting-State

Brett Foster, Stanford University, USA

Although historically associated with visuo-spatial sensory-motor behavior, the human parietal lobe has more recently been shown to play an important role in episodic memory retrieval. This talk will summarize recent work studying the electrophysiological dynamics within and between medial and lateral parietal cortex during episodic retrieval and the resting-state. Consistent with our previous work, the posterior cingulate cortex (PCC) and retrosplenial cortex (RSC) display increased high-frequency broadband (HFB) power during autobiographical retrieval, and active HFB suppression during working memory (arithmetic calculation). Strikingly, the temporal profile of these responses is closely matched by HFB activity in the angular gyrus (AG). Furthermore, during suppression of the PCC/RSC and AG, more dorsal parietal regions display pronounced increases in HFB power. Subsequently, resting-state connectivity analysis showed that slow modulations (< 1 Hz) of HFB amplitude were highly correlated between the same PCC/RSC and AG electrodes. Indeed, the strength of these resting-state correlations positively correlated with the degree of task-related response within activated parietal subregions. Further analysis reveals that resting-state HFB correlations are mediated distally by theta band phase-phase synchrony and locally by theta-HFB phase-amplitude coupling. These findings provide important and complementary data for further understanding the cortical networks supporting episodic retrieval, and more generally the electrophysiological basis of resting-state network activity.

Biography

Brett Foster is a senior postdoctoral research fellow at Stanford University in the Laboratory for Behavioral and Cognitive Neurology. His research focuses on using intracranial recordings and stimulation in human neurosurgical patients to study human cognitive neurophysiology. His current work specifically focuses on the cognitive functions of the medial parietal cortex, particularly with regards to episodic memory retrieval.

S02 003: Oscillatory Memory Signals In The Hippocampus During Encoding, Retrieval And Sleep

Bernhard Staresina, Cambridge University, UK

While neuropsychological findings and functional imaging in healthy participants have intimately linked the human hippocampus to learning and memory, little is known about the oscillatory mechanisms underlying hippocampal functions. The first set of findings reported here examined hippocampal oscillations during successful associative encoding and retrieval. Interestingly, the same frequency patterns distinguished successful from unsuccessful performance during both stages – an increase in gamma power and a concomitant decrease in alpha power.

This raised the question whether and how hippocampal mechanisms would differ between the modes of encoding (pattern separation) and retrieval (pattern completion). Consistent with computational models, we found that the phase of a slow delta/theta oscillation around stimulus onset systematically differed between encoding and retrieval, suggesting that ongoing phase is used to code different mnemonic states in the hippocampus. The second part of the talk describes hippocampal oscillations during sleep. The most prominent electrophysiological signatures related to consolidation processes during sleep are slow oscillations, spindles and high gamma bursts/ripples. Here we used cross-frequency-coupling analyses to assess whether and how these phenomena exist and interact in the hippocampus during different sleep stages. We found that during slow-wave-sleep, the phase of the slow oscillation systematically grouped and modulated spindles and gamma bursts. The relation of these mechanisms to episodic memory performance will be discussed.

Biography

Bernhard Staresina is a Sir Henry Wellcome Postdoctoral Fellow at Stanford University, Cambridge University and the University of Bonn. His research aims to elucidate the role of the Medial Temporal Lobe (MTL) in episodic memory. Combining fMRI in healthy participants and iEEG in epilepsy patients, his recent work has focused on multivariate and oscillatory phenomena underlying the encoding and retrieval of memories.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S03: Implications Of Age-Related Cerebrovascular Changes On Brain Structure And Function

Chair & Speaker: Monica Fabiani, University of Illinois at Urbana-Champaign, USA
Leeanne Carey, Florey Institute of Neuroscience and Mental Health, Australia
Kaarin Anstey, Australian National University, Australia
Todd Jolly, University of Newcastle, Australia

Overview

It is well established that aging is associated with structural brain changes and cognitive decline. However, the extent to which these age-related changes can be explained by cerebrovascular changes is yet to be determined. Monica Fabiani and Todd Jolly co-chair this symposium on cerebrovascular health in ageing, its association with brain structure and function and implications for age-related cognitive decline. Leeanne Carey will present findings on the changes to limbic-cortical networks and associated grey matter regions at 3 and 12 months post-stroke and how these changes provide insights into post-stroke depression. Kaarin Anstey will cover work that provides evidence of the importance of postural hypotension as a cardiovascular risk factor and its implications on cognitive aging. Monica Fabiani will show how lifestyle factors affect the cerebrovascular system and how this relationship impacts on age-related changes in brain structure and function. Todd Jolly will provide evidence for a link between intracranial arterial pulsatility and white matter microstructure and how they affect age-related deficits in cognitive control.

S03 001: Cerebrovascular Influences On Cognitive And Brain Aging

Monica Fabiani, University of Illinois at Urbana-Champaign, USA

Normal aging is characterized by changes in a number of cognitive processes, including aspects of sensory and working memory. These age-related changes in cognitive functions are accompanied by changes in the underlying brain anatomy, as well as by changes in cerebrovascular health. In turn, the status of the cerebrovascular system is heavily influenced by lifestyle factors, such as cardiorespiratory fitness (CRF). In my talk I will review some recent research from our laboratory aimed at examining the interrelationships between CRF, arterial elasticity (arteriosclerosis) and blood flow within the brain, age-related changes in brain anatomy and function and neuropsychological tests of working-memory.

Biography

Prof. Fabiani is a cognitive neuroscientist with over 20 years of experience in the study cognitive and brain changes during adulthood and aging. In this research she uses a number of neuroimaging tools, including electrophysiology (ERP and EEG), functional and structural MRI, as well as behavioral and neuropsychological methods. In addition, she has contributed to the development of diffuse fast optical imaging methods (the even-related optical signal, EROS) and has applied optical and MRI-based techniques to a number of studies investigating, among others, issues related to neurovascular coupling and cerebrovascular health in aging.

S03 002: Imaging Associates of Post-Stroke Depression: A Longitudinal Cohort Study

Leeanne Carey, Florey Institute of Neuroscience and Mental Health, Australia

Stroke and post-stroke depression are common and have a profound and ongoing impact on an individual's quality of life. However, reliable biological correlates of post-stroke depression and functional outcome have not been well established. Our aim was to identify biological factors, molecular and imaging, associated with post-stroke depression and functional outcome. A prospective, longitudinal cohort of 200 stroke survivors, the START - STroke imAging pRevention and Treatment cohort were investigated on admission, 24-hours, 3-days, 3-months and 12-months post-stroke for blood-based biological associates and at Day 3-7, 3-months and 12-months for depression and functional outcomes. A subgroup (n=50) were investigated for functional and structural brain changes in putative depression-related brain networks based on changes in intrinsic functional connectivity and white matter fibre tractography at 3 and 12 months. In addition to depression and functional outcomes, these patients were also tested for cognition and activity participation outcomes. In this session I will characterise associations between post-stroke depression and functional and structural connectivity in limbic-cortical networks at 3 and 12-months post-stroke. Evidence of associations between depression and functional and structural brain changes will provide new insights for models of post-stroke depression.

Biography

Professor Leeanne Carey heads the Neurorehabilitation and Recovery research group in the Stroke Division, Florey Institute of Neuroscience and Mental Health and is an Australian Research Council Future Fellow. Dr Carey's research program focuses on stroke rehabilitation and recovery: in particular how the brain adapts and how we might try to harness that potential in rehabilitation. She uses tools such as MRI to investigate changes in the brain and how this knowledge may be used to better understand recovery and target rehabilitation most optimally to individual stroke survivors. Research includes the impact of depression and cognition on stroke recovery.

S03 003: Interrelationships Among Self-Reported Orthostatic Hypotension, White Matter Hyperintensities And Hippocampal Volume In An 8-Year Longitudinal Study Of A Young-Old Cohort

Kaarin Anstey, Australian National University, Australia

Background: We hypothesised that orthostatic hypotension (OH) would be associated with white matter hyperintensities (WMH), hippocampal volumes and that depression would moderate this effect. Method: The sample comprised the oldest cohort of the PATH Through Life Project, aged 60-64 at baseline (n = 1920). Self-reported OH was recorded at waves 2 and 3. Brain MRI data were collected at three time points, 4 years apart (n=478, n=407, n=360) and depressive symptoms were measured by the Goldberg scale at each wave. Those with a history of stroke, epilepsy, diagnosed with dementia were excluded. Results: OH was reported by 22% of the sample at Wave 2 and was associated with depression at waves 2 and 3 (p<001). There were no cross-sectional associations between OH or depression, or OH and WMH at wave 2, or between OH and hippocampal volumes at waves 2 or 3. Eight-year changes in hippocampal volumes were predicted by OH at wave 2 (left hippocampus: OH*time =42.40; p=0.13 OH*time2=-5.31; p=.014; right hippocampus OH*time=38.68; p=.021 OH*time2=-5.27; p=.013). These associations were attenuated after adjustment for depression and other relevant covariates over time.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S03: Implications Of Age-Related Cerebrovascular Changes On Brain Structure And Function cont'd

Depression was the strongest predictor of volumetric change in the hippocampus (left hippocampus: depression*time =17.24; p=.004 depression*time2=-2.0; p=.006; right hippocampus: depression*time=15.71; p=.013 depression*time2 =--1.90; p=.013) although smoking and diabetes also contributed significantly to models. Conclusions: OH needs to be considered when evaluating the contribution of blood pressure to brain changes in older-age. These findings yield insights into the complex relationships between cardiovascular risk, depression and brain ageing.

Biography

Professor Kaarin Anstey is a Public Policy Fellow, Director of the Centre for Research on Ageing Health and Wellbeing, and the Dementia Collaborative Research Centre at the Australian National University. Her research interests include chronic disease and mental health, prevention of cognitive decline and dementia, life-span approaches to wellbeing, and impact of cognitive decline on productive ageing. She leads the PATH Through Life Project, an epidemiological study focussing on identifying risk and protective factors that influence mental health, cognitive decline and brain ageing from early to late adulthood, and an NHMRC Grant focussing on validating off-road tests for older drivers.

S03 004: The Role Of Arterial Pulsatility And White Matter Microstructure In Age-Related Cognitive Decline

Todd Jolly, University of Newcastle, Australia

Normal ageing is associated with a decline in many cognitive processes. However, it remains unclear whether age-related cognitive decline represents a normal maturation step or is mediated by subclinical pathological processes. We examined whether age-related decline in task switching performance can be explained by microstructural disruption within cerebral white matter and whether this white matter disruption may reflect perivascular damage occurring as a result of increased arterial blood flow pulsations. Seventy cognitively intact participants aged 43-87 years completed neuropsychological testing, a cued-trials task-switching paradigm with event-related potential recordings and MRI scanning (T1 structural, T2 weighted FLAIR sequence). Measures of blood flow were derived using a flow quantification phase-contrast sequence and microstructural white matter changes were calculated using DTI analyses on the diffusion-weighted imaging sequence. Findings suggest that age-related decline in task-switching performance is mediated by changes in white matter microstructure which, in turn, are influenced by the level of arterial pulsatility. We further examine whether the relationship between age-related decline in task-switching performance and white matter microstructure is specific to fronto-parietal and fronto-basal ganglia pathways associated with cognitive control.

Biography

Todd Jolly's research uses converging neuroimaging methodologies, including structural MRI, DTI and ERPs, to investigate the cognitive, vascular and structural brain changes associated with normal aging and mild ischaemic stroke. This is part of a collaborative, cross-disciplinary study between Psychology and Neurology researchers at the Priority Research Centre for Translational Neuroscience and Mental Health (CTNMH) at the University of Newcastle. His work is funded by the Hunter Institute of Medical Research and an Australian Postgraduate Award. Jolly is trained in FSL/freesurfer and completed the functional connectivity workshop at the Martinos Center at MGH in 2012.

S04: The Role of Brain Oscillations in Perception, Attention, and Memory

Chair & Speaker: Simon Hanslmayr, University of Birmingham, UK
Denes Szucs, University of Cambridge, UK
Nicholas Myers, University of Oxford, UK

Overview

There has been considerable interest in the past few years on the role played by neural oscillations throughout the cognitive processing spectrum, ranging across perception, attention, as well as short- and long- term memory. Experiments have examined the role of frequency, phase, and amplitude but also whether such oscillations arise naturally or from external entrainment, e.g., flicker, transcranial stimulation (magnetic and electrical). Our symposium will review a range of findings from a diverse set of approaches, suggesting that oscillations have a profound effect on human cognition. We will present evidence that entrainment at 10-16Hz (alpha, beta) has important implications for not only the complex attentional blink phenomenon but even on perception of a single target. Experiments using long-term memory paradigms will present convergent results from multi-modal imaging and rTMS studies demonstrating that decreases in beta oscillations causally mediate memory encoding. We will also show that the pre-stimulus oscillatory state of the brain including spontaneous fluctuations in the power and phase of alpha band oscillations affect not only working memory but even the conscious experience of stimuli.

S04 001: Decreased Beta Power As A Predictor Of Memory Encoding

Simon Hanslmayr, University of Birmingham, UK

In the past decades, research on brain oscillations and memory formation has strongly focused on the question of how synchronization, especially in the theta and gamma range, gives rise to the formation of memories. The role of power decreases, presumably reflecting local desynchronization, however has been mostly neglected although they are one of the most prominent features in EEG/MEG recordings during memory formation. Therefore, very little is known about the functional role of these power decreases for memory processing and how they mechanistically relate to the formation of memories. In this talk, recent studies from our lab will be presented where we investigated this issue and show that power decreases in the beta range are crucially important for memory formation. Specifically, results will be presented showing that beta power decreases occur in regions highly relevant for memory encoding such as the left inferior frontal cortex and are correlated with energy consumption therein. Moreover, memory formation is selectively impaired of these brain regions are artificially synchronized via repetitive transcranial magnetic stimulation in the beta frequency range. These results support a recently proposed model which assumes that power decreases reflect local desynchronization of neural assemblies and thereby enhance the information coding capacity of the memory system.

Biography

Since his PhD, which he received in 2005 from the University of Salzburg, Simon Hanslmayr's research is primarily concerned with the question of how brain oscillations mediate complex cognitive functions such as attention and episodic memory.

He has published 48 peer-reviewed papers in this area, some of which appeared in prestigious Journals such as Current Biology and The Journal of Neuroscience. Since 2010 Simon Hanslmayr is an independent PI of his own research group, funded by a prestigious Emmy-Noether Award from the German Research Council, and currently holds a Senior Lecturer position at the University of Birmingham.

S04 002: Pre-Stimulus Oscillations Determine Conscious Access In The Attentional Blink Task

Denes Szucs, University of Cambridge, UK

We used the attentional blink paradigm in combination with event-related brain potentials to examine whether the ongoing state of the brain before a stimulus can determine both conscious access and the post-stimulus neural events associated with consciousness. In a first study participants discriminated two target letters from digit distractors whilst their brain activity was being recorded. T2-detected trials were predicated by a fronto-central positive going deflection that started more than 200msec before the stream began. Accurate T2 detection was also accompanied by enhanced post-stimulus neural activity, as reflected by a larger P3b component. Prestimulus and post-stimulus markers of T2-detection were highly correlated with one another. We conclude that conscious experiences are shaped by potentially random fluctuations in neural activity. In a follow-up study we hypothesized that entraining ongoing oscillations with sensorial stimulation could influence temporal attention to assume an optimal processing state. In the pre-RSVP period, a rhythmic stream of auditory stimuli was employed to entrain temporal attention at the same frequency of the upcoming RSVP, whereas an arrhythmic stream was used as a control condition. T2 accuracy was improved following rhythmic entrainment. Enhanced perception was associated with increases in the posterior T2-evoked N2. Moreover, a frontal-right positivity and long-lasting oscillatory variations in the beta band were found to be crucial for the attentional system to exploit rhythmicity in the environment. Overall, the results suggest that endogenous fluctuations in the brain – before relevant stimuli appear – may be shaped by sensorial events in order to generate optimal cognitive performance.

Biography

Denes Szucs is senior lecturer at the Department of Psychology, University of Cambridge; Deputy Director of the Center for Neuroscience in Education and Official Fellow of Darwin College, Cambridge. Denes connects his basic research interests of neural oscillations in adults with the study of cognitive and emotional development of children. He has funded research programmes on EEG oscillations in the attentional blink; on developmental dyscalculia, working memory development and mathematics anxiety. Denes has been awarded a prestigious James McDonnell Foundation Investigator Award in 2013.

S04 003: Oscillatory Brain States and Variability in Visual Short-Term Memory

Nicholas Myers, University of Oxford, UK

Our capacity to remember and manipulate objects in visual short-term memory (VSTM) is severely limited. Moreover, current theoretical models predict that the precision of a memory representation can change substantially from trial to trial. We argue that fluctuations in neural excitability during stimulus encoding may contribute to this variability. Specifically, we hypothesized that the spontaneous state of slow oscillations (in the alpha band, 8-14 Hz), as an indicator of the state of cortical excitability, should correlate with trial-by-trial fluctuations in visual short-term memory. In EEG recorded from human observers during a visual short-term memory task, we found that the pre-stimulus desynchronization of alpha oscillations predicted the accuracy of memory recall. A model-based analysis indicated that this effect arises from a modulation in the fidelity of memorized items, but not the likelihood of remembering them, lending support to recent computational models of VSTM. We speculated that the pre-stimulus state of the visual system may modulate a cascade of state-dependent processes in the evoked signal, ultimately affecting behaviour. This proposal was borne out in a correlation of the visual evoked response with prestimulus alpha power and memory performance. Finally, the phase of posterior alpha oscillations preceding the memory item also predicted memory accuracy. Our results indicate that spontaneous changes in cortical excitability can have profound consequences for visual memory.

Biography

Nick is a PhD student at the University of Oxford, working with Anna Nobre and Mark Stokes at the Oxford Centre for Human Brain Activity. Nick studies the control of visual working memory, and how brain oscillations may act to organize such control. He uses modelling, EEG, MEG, and fMRI to look at these questions. He is also interested in how neural synchronization and working memory change during normal ageing and in Alzheimer's disease.

S04 004: Alpha And Beta Entrainment Affects Simple And Complex Perception

Simon Hanslamyr, University of Birmingham, UK

Recent literature has been replete with reports of the involvement of brain oscillations in many higher-order human information processing functions, including perception, attention, and visual short-term memory (VSTM).

Since many such reports have focussed on demonstrating the mechanisms by which such oscillations work, e.g., phase resetting, frequency cross-coupling, there remains an important need to show how such mechanisms actually affect daily human behaviour. The present talk will focus on two such affects in the domains perception and attention. With regard to the latter, we use the attentional blink (AB) paradigm to show that this ubiquitous phenomenon occurs only in a relatively narrow oscillatory frequency range, alpha and beta. With regard to the former, we show that rapid serial visual presentation (RSVP) in the alpha range affects even single-target perception. These findings are consistent with the theoretical view that brain oscillations in the 8-20 Hz frequency range index the state of communication between the thalamus and cortex; a vital channel for perception in the human brain.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S05: Neural Indices Of Primitive Intelligence: From The Midbrain To Cortex

Co-Chair: Emeritus Professor Pat Michie, University of Newcastle, Australia
Co-Chair & Speaker: Manuel S. Malmierca, University of Salamanca, Spain
Sabine Grimm, University of Leipzig, Germany
Lauren Harms, University of Newcastle, Australia
Risto Näätänen, University of Arhus, Denmark

Overview

The ability of the auditory system to detect change in background sounds even in the absence of active attention is remarkable. Recent research indicates that this extraordinary sensitivity relies on a capacity to model regularities in background sounds, and that these perceptual achievements are based on properties that are encoded at the earliest stages of the auditory pathway. The term 'primitive intelligence' has been used to capture the ability of the auditory system to not only model simple and complex acoustic regularities but also to predict future events and detect violations of these predictions. In human electrophysiology, 'primitive intelligence' was first identified via the mismatch negativity or MMN — an event-related potential (ERP) evoked by the occurrence of a deviant sound. In this symposium, the four speakers will demonstrate 1) that embryonic aspects of the principles underpinning this remarkable capacity of the auditory system are evident already at the midbrain in both rodents (Malmierca) and humans (Grimm) and 2) that higher order aspects reflecting detection of events deviating from modelled regularities are only evident at a cortical level in both rodents (Harms) and humans (Näätänen). The latter properties also provide tools for investigating clinical conditions, such as schizophrenia.

S05 001: Stimulus-Specific Adaptation In The Subcortical Auditory Brain

Manuel S. Malmierca, University of Salamanca, Spain

Stimulus-specific adaptation (SSA) is the reduction in the responses to a common sound relative to the same sound when rare. It has been described in auditory cortex (AC; Ulanovsky et al., 2003) and in the auditory midbrain and thalamus (inferior colliculus (IC) and medial geniculate body (MGB). I will present our recent findings on recordings from single neurons in the IC and MGB of rats to an oddball paradigm. Our data indicates: 1) Most neurons in the non-lemnical divisions of the IC and MGB show strong SSA (Malmierca et al. 2009, Antunes et al., 2010); 2) the magnitude of adaptation in many IC neurons increases proportionally with frequency contrast and low probability of occurrence for deviant tones (Ayala et el., 2012). 3) SSA varies within the neuronal receptive field (Duque et al., 2012). 4) GABAergic (Pérez-González et al., 2012) and/or glycinergic inhibition plays a role in shaping SSA in the IC. 5) AC modulates the responses of neurons in a gain control manner but SSA in the MGB is not inherited from AC (Antunes et al., 2011) and 6) Acetylcholine modulates SSA. Our results suggest that SSA can be generated in a bottom-up manner throughout the auditory pathway and are congruent with the notion that subcortical SSA can contribute upstream to the generation of MMN. Funding: Supported by the Spanish MINECO (BFU2009-07286) and (EUI2009-04083) in the frame of the ERA-NET NEURON to M.S.M. D.D. held a fellowship from the Spanish MEC (BES-2010-035649).

Biography

Professor Manuel Malmierca, MD completed his doctoral training in Neuroanatomy at the University of Oslo. After postdoctoral training in Neurophysiology at the University of Newcastle-upon-Tyne, and a senior Research Fellowship at the University of Salamanca, he established and now directs the Auditory Neurophysiology Laboratory at the Institute of Neuroscience at the University of Salamanca and chairs the Neuroscience PhD program. He is an editor and a member of the editorial boards of journals such as Hearing Research, JARO and PLOS One. His primary research interest is in determining which subdivisions and relay stations of the auditory brain exhibit stimulus specific adaptation.

S05 002: Early Occurrence Of Auditory Change Detection In The Human Brain

Sabine Grimm, University of Leipzig, Germany

The ability to detect novel information quickly, such as rare or non-regular auditory events, reflects a basic organizational principle of the auditory system. In humans, change detection based on acoustic regularity modeling has been linked to an EEG-derived brain response, MMN. MMN has its main generators in auditory cortex and peaks at 100-200 ms from change onset. Yet, recent single- and multi-unit recordings in animals have shown much earlier (20-50 ms) novelty-related responses at multiple levels of the auditory pathway (A1, medial geniculate body, inferior colliculus). Multiple findings obtained in our laboratory using EEG and/or MEG to measure the Frequency Following Response (FFR), Middle Latency Response (MLR), and MMN will be presented which suggest that human auditory regularity encoding and novelty detection occurs at multiple latencies and stages along the auditory pathway. Violations of simple regularities can be already detected at the level of the brainstem or generators of the MLR, probably reflecting activity in the vicinity of primary auditory cortex.

Violations of more complex regularities do not elicit differential activation before the MMN time range, reflecting the differential activation of later stages. In congruence with animal findings, results support the view that novelty detection occurs at multiple stages of the auditory system, from lower levels of the auditory pathway in the brainstem to higher-order cortical areas. Funding: Supported by Consolider-Ingenio 2010 (CDS2007-00012), National Program for Fundamental Research (PSI2012-37174), ERANET NEURON project PANS (EUI2009-04086), Bial Foundation 12/30 (Portugal), Catalan Government (SGR2009-11), and ICREA Academia Distinguished Professorship awarded to Carles Escera.

Biography

Dr Sabine Grimm recently took up the position of Assistant Professor at the Institute of Psychology, University of Leipzig where she also completed her doctoral training in 2006. Subsequent to the award of her PhD, she held a prestigious Postdoctoral Fellowship at the University of Barcelona in the Cognitive Neuroscience Group under the guidance of Professor Carles Escera. She has published numerous papers and reviews on early deviance detection in the auditory system.

S05 003: Mismatch Responses To Frequency Deviants In The Surface EEG Of Awake, Freely Moving Rats: A Platform For Examining Pharmacological And Developmental Animal Models Of Schizophrenia

Lauren Harms, University of Newcastle, Australia

There is still controversy about whether mismatch responses to oddball sounds extracted from surface EEG recordings in the rat meet the criteria for deviance detection. Here I will describe a series of recent experiments that attempt to resolve this controversy. The impetus for this research is the fact that reduction in MMN amplitude is one of the most robust neurobiological observations in patients with schizophrenia. Therefore, we aimed to develop a rat model to facilitate investigations of the underlying neurobiology and pharmacology of MMN and obtain insights into the cause(s) of reduced MMN in patients.

The methodology that we adopted includes control conditions that control for differences in adaptation, probability and stimulus attributes but also prevent the modeling of regularity in sound sequences. Using these controls, we find evidence of deviance effects in both early (20 - 50 ms) and late (>60 ms) components of the rat ERPs to high frequency sounds but not low frequency sounds (see also Nakamura et. al, 2011). Together with previously published data, these data demonstrate that robust mismatch responses can be observed in the awake rat, enabling future investigations of the major neurotransmitter and cellular mechanisms underlying deviance-detection in rats and of MMN in an animal model of an environmental risk factor for schizophrenia. Funding: Supported by NHMRC project grant APP1026070, Near Miss Grant from University of Newcastle, CAPEX grant from Faculty of Science & IT, University of Newcastle; Grant-in-Aid from Schizophrenia Research Institute.

Biography

Dr Lauren Harms was awarded her PhD in the field of Neuroscience from Queensland Brain Institute, The University of Queensland in 2012. Throughout her PhD and in her current role as a Postdoctoral Research Fellow at the University of Newcastle, her research has focused on developmental animal models of schizophrenia and how these can be used to model specific cognitive and electrophysiological features of schizophrenia.

S05 004: Primitive Intelligence Of The Human Brain As Indexed By The Mismatch Negativity (MMN)

Risto Näätänen, University of Arhus, Denmark

A large number of recent studies show that in audition, surprisingly complex cognitive processes occur automatically and mainly in the sensory-specific cortical areas. These processes include, among other things, stimulus anticipation and extrapolation, as well as sequential stimulus-rule, stimulus pattern, and pitch-interval extraction. Moreover, these complex automatic perceptual-cognitive processes, first found in waking adults performing a primary task in vision, occur similarly even in sleeping newborns, anesthesized rats, and deeply sedated healthy adult humans, suggesting that they form the common perceptual-cognitive core of cognitive processes in general, shared by different species, ontological stages, and states of consciousness. Consequently, these studies also suggest that MMN could be used in the objective assessment of cognitive abilities in healthy human subjects and in different clinical populations by recording it in paradigms targeting such complex sensory-cognitive processes. This might complement the objective assessment of cognitive abilities already demonstrated by some previous studies recording MMN to simple auditory changes.

Biography

Professor Risto Naatanen received his training in cognitive electrophysiology in the laboratories of Prof. D. B. Lindsley at UCLA, Los Angeles, CA. in 1965-6. He defended his Doctoral Thesis work on brain mechanisms of selective attention in the University of Helsinki in 1967 and served as Professor of General Psychology in the same university in 1975-83 when he was appointed as Academy Professor of The Academy of Finland for 1983-2007. Currently, he is Professor of Cognitive Neuroscience in the University of Tartu, Estonia and Visiting Professor at the Centre of Functionally Integrative Neurosciences (CFIN) in the University of Århus, Denmark.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S06: Cross-Modal Integration And Plasticity Of Sensory Systems In The Normal And Peripherally Deprived Brain

Chair & Speaker: Franco Lepore, University of Montréal, Canada
Krish Sathian, Emory University, USA
Stephen G. Lomber, University of Western Ontario, Canada
Amir Amedi, Hebrew University Jerusalem

Overview

The brain is well wired at birth in order to treat the unisensory and multisensory information to which it is exposed. However, it undergoes substantial transformations to adapt to its specific environment and capabilities. In the first presentation we show, using functional Magnetic Resonance Imaging (fMRI), how haptic stimuli recruit in a functionally specific manner brain structures related to visual objects and spatially related imagery. In the second, we compare deaf and hearing cats on a battery of visual cognitive tasks and show not only normal performance but, even more importantly, cross-modal compensation and superior performance for discriminating visually complex images of conspecific and human faces. The third presentation illustrates how super-performance for discriminating haptic and auditory stimuli in blind humans can be attributed to the recruitment of visually related areas as well as how auditory cortex is activated by visual stimuli, including faces in the deaf. The fourth presentation examines both how the blind treat sound and touch and how the technological development of Sensory Substitution Devices (SSD) using sound and touch can allow the rehabilitation of these sensory deprived individuals so that they can be more independent and 'see' in a manner similar to bats and dolphins.

S06 001: Cross-Modal Compensation And Plasticity In The Blind And Deaf : These Two Modalities Do Not Always Show Similar Outcomes

Franco Lepore, University of Montréal, Canada

It has been shown by various researchers that the early loss of a sensory system due to peripheral damage leads to the cross-modal takeover of the brain structures of the deprived system. In agreement with these findings, we showed that in blind individuals, the visual cortex is recruited by auditory and haptic stimuli and a proprioceptically defined angle discrimination. In the deaf, the auditory cortex is similarly colonized by visual inputs. We moreover show that the recruitment is carried out in a functionally specific manner : in the blind, the dorsal 'where' areas are recruited by localization tasks (identifying the position of a sound) and the ventral 'what' areas by identifying its pitch or vocal content. Similarly, in the deaf, discriminating randomnly moving dots recruits dorsal areas whereas identifying the shape created by similar but coherent stimuli recruits ventral areas. Using a prosthesis for substituting vision by audition (PSVA) and Transcranial Magnetic Stimulation (TMS), we confirmed these function related activations. We also show, using anatomical MRI and DTI, that structural modifications of various areas and axonal pathways permit us to explain these functional findings. At the behavioural level, we showed that blind subjects are better at auditory discrimination of simple or complex sounds as well as tactile and proproceptically definded objects. We could, however, not confirm this supra-performance in the deaf for discriminating faces and in fact the visual take-over of auditory areas interferes with language discrimination when complex visual stimuli are simultaneously presented.

Biography

Dr. Franco Lepore is professor and Chair of the CERNEC as well as the holder of a Canada Research Chair in Cognitive Neurosciences. He has worked on the theme of cross-modal plasticity of sensory systems in both blind and deaf individuals using imaging approaches (EEG, MEG, PET, MRI/fMRI) and the study of cognitve functions in humans, as well as rehabilitation using an auditory SSD in the blind and cochlear implants in the deaf, and single-cell recording in animals. He is funded by numerous agencies, including the Canadian Institutes of Health Research for the research to be presented

S06 002: Surface Vs Structural Properties Of Multisensory Object Representations

Krish Sathian, Emory University, USA

Visual imagery can be divided into object and spatial subtypes. Object imagery involves pictorial images that integrate surface properties, such as color and texture, with structural information about shape. In contrast, spatial imagery involves more schematic images, and tends to ignore surface properties while focusing on structural information and spatial transformations. We propose that haptic activation of the visually shape-selective lateral occipital complex (LOC) reflects a model of multisensory object representation in which the role of visual imagery is modulated by object familiarity. Functional magnetic resonance imaging (fMRI) studies from our laboratory support this model: visual object imagery shared similar patterns of effective connectivity with haptic perception of familiar (fHS) but not unfamiliar (uHS) shapes, whereas visual spatial imagery showed the opposite pattern, sharing effective connectivity patterns with uHS but not fHS. Individuals vary in their preference for visual object or spatial imagery. We showed that these imagery preferences also exist in haptically-derived representations, and that imagery preferences are stable across the visual and haptic modalities.

Ongoing studies in our laboratory suggest that auditory imagery can also be divided into two subtypes: "surface" imagers incorporated loudness patterns into their representation of melodies (equivalent to visuo-haptic object imagery) whereas "structural" imagers focused on the melodies at the expense of loudness patterns (equivalent to visuo-haptic spatial imagery). Thus, individual propensities for surface vs. structural representations characterize multiple sensory modalities, and are important considerations for sensory substitution approaches to individuals with sensory deprivation in one or other modality.

Biography

Dr. Krish Sathian is Professor of Neurology, Rehabilitation Medicine & Psychology at Emory University and Director of the VA Center of Excellence in Visual and Neurocognitive Rehabilitation, Atlanta, GA. He obtained his medical degree at Vellore, India, and a PhD in neuroscience from the University of Melbourne, Australia. His research in multisensory perception and neurorehabilitation is funded by the NIH, NSF and VA. A recipient of the Grafton Elliot-Smith award of the Australian Neuroscience Society, he serves as President of the American Society of Neurorehabilitation and is on the Editorial Boards of the Journal of Neuroscience and PLoS ONE.

S06 003: Enhanced Visual Cognition In The Congenitally Deaf

Stephen G. Lomber, University of Western Ontario, Canada

When the brain is deprived of input from one sensory modality, it often compensates with supernormal performance in one or more of the intact sensory systems. In the absence of acoustic input, it has been proposed that "deaf" auditory cortex may be recruited to perform visual cognitive functions. To test this hypothesis we examined the visual capabilities of adult congenitally deaf cats and adult hearing cats on a battery of visual cognitive tasks to define which visual abilities are involved in cross-modal compensation. The animals were tested on their abilities to both learn and recall pattern and object discriminations consisting of simple patterns (geometric black shapes), simple objects (geometric black objects), natural scenes (2-dimensional pictures), and faces (both human and conspecific). Both the deaf and hearing cats learned to discriminate the simple patterns, simple objects, and natural scenes at similar rates. However, the deaf cats were significantly faster at learning (fewer trials and errors to criterion) both the human and conspecific faces compared to the hearing cats. Abilities to recall any of the visual discriminations were no different between the hearing and deaf cats. These results demonstrate that deaf subjects possess enhanced visual cognitive abilities compared to hearing subjects. The next step in these experiments will be to examine the contributions of "deaf" auditory cortex to these enhanced visual cognitive functions.

Biography

Dr. Stephen G. Lomber is a Professor of Physiology and Psychology at the University of Western Ontario, where he is also an investigator in the Brain and Mind Institute and National Centre for Audiology. Dr. Lomber examines cortical plasticity utilizing animal models of human hearing, deafness, and the restoration of hearing with cochlear implants. Dr. Lomber has received numerous research and teaching awards, including the 2012 Dean's Award for Research Achievement from the Schulich School of Medicine and Dentistry. He has authored over 90 original research publications and two books – Reprogramming the Cerebral Cortex and Virtual Lesions.

S06 004: "Seeing" And Reading With The Ears: From Basic Research To Visual Rehabilitation

Amir Amedi, Hebrew University Jerusalem

My research focuses on blindness, which constitutes a unique model for answering fundamental questions in neuroscience. The work ranges from basic science, querying brain plasticity and sensory integration, to technological developments, allowing the blind to be more independent and even "see" using sounds and touch similar to bats and dolphins (a.k.a. Sensory Substitution Devices, SSDs), and back to applying these devices in research. The central hypothesis is that visual areas can process sound and touch to a similar extent as they process vision, but only when subjects learn to fully extract the relevant information encoded by these alternative senses. With proper training, many visual areas or networks can change the type of sensory input it uses to retrieve behaviorally (task)-relevant information within a matter of weeks. We also show that visual-like selectivity can develop without any visual experience. This may also have implications for clinical rehabilitation. To achieve this, we are currently developing several SSDs which encode the most crucial aspects of vision along with targeted, structured training protocols both in virtual environments and in real life scenarios.

For the results of such training and summary of the concept see: http://www.youtube.com/watch?v=jVBp2nDmg7E. Finally, SSDs can also be used in conjunction with invasive approaches for visual rehabilitation: the SSDs are used in training the brain to "see" prior to surgery, and in providing explanatory and augmentry signals (e.g. adding color, depth and, increased resolution).

Biography

Dr Amir Amedi is an internationally acclaimed brain scientist working towards enabling the blind to see through technologies he and his team develop to help the world's 45 million blind either using novel training approaches after bionic eyes implants or using non-invasive approaches. He is an Associate Professor at the Department of Medical Neurobiology at the Hebrew University's Faculty of Medicine and the new ELSC Brain Center. An alumnus of the University, he received his Ph.D. at the Interdisciplinary Center for Neural Computation and recently spent two years as an Instructor of Neurology at the Harvard School of Medicine

PANEL DISCUSSION OVERVIEW
AND SPEAKER BIOGRAPHIES

D01: Translational Cognitive Neuroscience: Understanding Attention And Multitasking On The Roadway

Chair & Speaker: **David Strayer**, University of Utah, USA
Paul Atchley, University of Kansas, USA
Jason McCarley, Flinders University, Australia

Overview

Driver distraction caused by multitasking is a significant source of injuries and fatalities on the roadway. This panel will discuss what basic cognitive and neuroscience research in the laboratory, driving simulator, and instrumented vehicle can tell us about the mechanisms underlying multitasking behavior. Our approach will sample from a wide variety of methods and techniques including sophisticated behavioral analysis using driving simulation and instrumented vehicles, measures of eye movement behavior, spectral EEG and ERP measures, as well as fMRI, and DTI from individuals with extraordinary multitasking ability. We will examine the factors that lead a person to multitask in the first place (and why they keep doing it) despite that fact that they readily acknowledge that it is dangerous (at least for others). We will also examine how multitasking impairs the sampling of information from the driving environment, suppressing visual scanning, impairing awareness of safety-critical objects in the drivers field of view, degrading the anticipation of potential hazards, and worsening situation awareness of the driving environment. We consider driving to be a complex skill that is supported by a hierarchical network of control that is differentially affected by different multitasking activities. Finally, we show individual differences in the efficiency of a frontal-mediated attentional network that supports multitasking in this real-world context.

D01 001

David Strayer, University of Utah, USA

Biography

Dr Strayer is a professor in the Department of Psychology at the University of Utah. He received his Ph.D. from the University of Illinois @ Urbana-Champaign in 1989. Dr. Strayer's research examines attention and multitasking using a variety of cognitive and neuroscience methods to examine this real-world behavior.

D01 002

Paul Atchley, University of Kansas, USA

Biography

Dr Atchley is a professor in the Department of Psychology at the University of Kansas. He received his Ph.D. from the UC-Riverside in 1996 and is an expert on driver distraction and factors that govern how and why drivers choose to multitask in the automobile.

D01 003

Jason McCarley, Flinders University, Australia

Biography

Dr McCarley is an associate professor in the Department of Psychology at Flinders University. He received his Ph.D. from the University of Louisville in 1997 and has used a variety of methods to study applied and basic aspects of perception, attention, and cognition.

ORAL PRESENTATION
ABSTRACTS

OP1: Methods Development

Carlo Miniussi, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy
Peter Bell, Brain and Mind Research Institute, Australia
Chun-Yu Tse, The Chinese University of Hong Kong, Hong Kong
Michael Wagner, Compumedics, Germany

OP1 001: The Contribution of TMS-EEG Coregistration in the Exploration of the Human Connectome

Carlo Miniussi, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy

Recent developments in neuroscience have emphasised the importance of integrated distributed networks of brain areas for successful cognitive functioning. Neuroimaging studies adopting analyses from the graph field of mathematics have shown that the brain architecture has a modular organisation in which segregated networks supporting specialised processing are linked through a few long-range connections, ensuring processing integration. Although such architecture is structurally stable, it appears to be flexible in its functioning, enabling long-range connections to regulate the information flow and facilitate communication among the relevant modules, depending on the contingent cognitive demands. Importantly, much of the current understanding of the brain architecture relays on measures of structural connectivity, reflecting anatomical connections, and of functional connectivity, reflecting the temporal correlations between cortical activity (Friston et al., 1993). These measures cannot fully explain the causal dynamics of connectivity and their relationship with cognition. Here we aim to highlight an emerging distinctive approach based on the direct activation of an area by transcranial magnetic stimulation (TMS) and the simultaneous evaluation of the distribution of this activity in cortical networks by electrophysiological recordings (EEG). By presenting TMS-EEG studies on network dynamics at rest and during cognition, and comparing them with fMRI-based functional connectomics, we will show how TMS-EEG data support the general principles of brain architecture inferred from graph theory and provide further insights into the properties of the functional connectome. Moreover, we will highlight the types of data that can be obtained through TMS-EEG, such as the timing of signal propagation, the excitatory/inhibitory nature of connections and, most importantly, causality of cortical interactions.

OP1 002: Exploring The Topology Of Network Convergence: Integration And Segregation In The Human Connectome

Peter Bell, Brain and Mind Research Institute, Australia

Introduction The human brain is organized into a scale-free neuronal architecture, consisting of specialized networks that dynamically communicate to create the vast array of human behavior. Although communication between large-scale neuronal networks is a fundamental organizational property of the brain, exactly how information is integrated across these networks has proven difficult to define. Here, we provide a novel, data-driven method for systematically exploring the topology of network integration within the human connectome.

Methods 3T resting state BOLD data was collected from 42 healthy adults. ICA was used to extract 9 networks that represented those most commonly assessed in the literature. To assess the topology of network convergence, we summed together binarized masks of each of the nine network components to create a map in which the intensity at each voxel reflects the extent to which the voxel is 'shared' across multiple network components. Further, we explored the extent of network cross-talk between each network component, providing novel graphical and statistical measures that represent estimates of the relative degree of segregation and integration within each individual neuronal network. Results Our data provide new insights into the functional organization of the human brain. We show that individual large-scale neuronal networks are markedly heterogeneous in their propensity to integrate information, shedding new light into the functions of human brain networks. Moreover, we demonstrate the existence of a central 'integrative core', that is well-positioned to support the convergence and integration of distributed global neural signals. Conclusions Our results provide new insights into how information is processed, transferred and distributed throughout the large-scale networks of the brain, helping to define the pathways of information flow within the human brain.

ORAL PRESENTATION
ABSTRACTS

OP1: Methods Development cont'd

OP1 003: Tracking Brain Plasticity in Cochlear Implant Patients Using the Event-Related Optical Signal (EROS)

Chun-Yu Tse, The Chinese University of Hong Kong, Hong Kong

Cochlear implants assist people with profound hearing loss to interact with the environment and to reestablish verbal communication, by replacing the function of damaged cochlear hair cells with direct stimulation of the auditory nerve. This process provides a unique opportunity for studying plasticity in the adult human brain. Changes in the fronto-temporal network involved in auditory sensory discrimination were tracked from before to after implantation (i.e., before the implant, at 2-weeks post-implant, and at 6-months post-implant) in six cochlear implant patients using the Event-Related Optical Signal (EROS). EROS measures changes in the way brain tissue scatters near-infrared light that are associated with neuronal activity. EROS has high resolution in both the temporal and spatial dimensions, as it can measure the time course of neuronal activity in localized brain regions. All participants suffered from post-lingual hearing loss in the high frequency range, but had some residual hearing in the low frequency range. Each imaging session included three types of stimulus blocks: high and low frequency auditory discrimination, and visual discrimination (control) blocks. Auditory blocks consisted of 100-ms (80%) and 50-ms (20%) tones while visual blocks consisted of vertical (80%) or horizontal (20%) black-and-white bars. Participants had to classify the stimuli according to the length of the tones or the orientation of the bars by button press. After implantation, larger improvements in accuracy were observed for the high-frequency than for the low-frequency blocks. This corresponded to an increase in activity in the high-frequency blocks at a latency of 100-200 ms after tone presentation, which was observed in temporal cortex in most participants and in frontal cortex in some participants. This is the first study demonstrating the feasibility of using EROS for monitoring brain reorganization associated with recovery of hearing ability after cochlear implant.

OP1 004: Analysis Of EEG/MEG Map Topographies And Source Distributions On The Epoch Level Using Non-Parametric Randomization Tests

Michael Wagner, Compumedics, Germany

In Event-Related Potential (ERP) and Event-Related Field (ERF) experiments, stimuli are presented repeatedly, and the subject's brain response is recorded using EEG or MEG, respectively. After artifact removal, epoching, and averaging, though, it is no longer possible to establish whether and for which latencies the averaged waveforms are significantly different between stimulus types, nor whether the epochs per stimulus type are consistent enough to warrant averaging them in the first place. A statistical analysis across epochs can provide exactly this information. Traditional statistical measures in channel space such as the t-test make disputable assumptions regarding repeatability and independence. Therefore, non-parametric methods have recently attracted attention for the analysis of ERPs and ERFs. In this contribution, a framework is proposed that allows the application of non-parametric methods such as Topographic Analysis of Variance (TANOVA) and Statistical non-Parametric Mapping of Current Density Reconstructions (CDR SnPM) not only to individual averages in the context of a group study but to the individual epochs themselves, even for single-subject data. Unlike described in previous publications, the statistical analysis is conducted sample-by-sample as opposed to using a maximum statistic over all samples. The then necessary multiple comparison correction is based on the spectral properties of the data. For CDR SnPM, in addition to a test for significant differences between conditions, a within-condition consistency test is used to justify testing for differences on a sample-by-sample basis. A visual Continuous Performance Task (CPT) EEG experiment eliciting Mismatch Negativity (MMN) is used to demonstrate the methods. Latencies and brain locations where the brain response differs significantly between stimulus types are consistent with what is known about the MMN.

POSTER SESSION 1

TOPICS IN THIS POSTER SESSION ARE:

TOPIC	CODE
Attention	MAT
Cognition and Executive Processes	MCE
Language	MLA
Memory and Learning	MML
Motor Behaviour	MMO
Sensation & Perception	MPE

Attention

MAT001: Electrophysiological Assessment of Attention Bias in Good vs. Poor Sleepers
Presented by: Ruth Ann Atchley, University of Kansas, USA
Authors: Ruth Ann Atchley, Natalie Stroupe

MAT002: Neural Responses To Heartbeats Dissociate The Self As The Subject And The Self As The Object During Spontaneous Thoughts
Presented by: Mariana Babo-Rebelo, Laboratoire de Neurosciences Cognitives / Ecole Normale Supérieure, France
Authors: Mariana Babo-Rebelo, Craig Richter, Catherine Tallon-Baudry

MAT003: Left-Handers Are Resistant To Drowsiness Induced Spatial Attention Bias
Presented by: Corinne Bareham, MRC Cognition and Brain Sciences Unit, UK
Authors: Corinne Bareham, Tristan Bekinschtein, Sophie Scott, Tom Manly

MAT004: Characterizing The Topology Of Attentional And Sensory Network Communication
Presented by: Peter Bell, Sydney University, Australia
Authors: Peter Bell, James Shine

MAT005: Role Of Modality-Specific Pre-Stimulus Oscillations In A Spatialized Temporal Order Judgment task. A Challenge To The "Gating-Through-Inhibition" Framework?
Presented by: Lars T Boenke, Leibniz Institute for Neurobiology, Germany
Authors: Lars T Boenke, Abdelhafid Zeghbib, David Alais, Frank Ohl

MAT006: Emotional Burden Effects on Attention and Executive Function in Family Caregivers of Alzheimer Patients
Presented by: Elke Bromberg, Pontifical Catholic University of Rio Grande do Sul, Brazil
Authors: Elke Bromberg, Mácio Corrêa, Kelem Vedovelli, Bruno Giacobbo, Carlos Souza, Daiane Lima, Leticia Beras, Irani Argimon

MAT007: Adult Developmental Trajectories Of Pseudoneglect In The Tactile, Visual And Auditory Modalities
Presented by: Joanna Brooks, Australian National University, Australia
Authors: Joanna Brooks, Stephen Darling, Catia Malvaso, Sergio Della Sala

MAT008: Object Exposure Is Not Critical For Object-Based Attention
Presented by: Cameron T Ellis, University of Auckland, New Zealand
Authors: Cameron T Ellis, Paul M Corballis, Anthony J Lambert

MAT009: Face-Sex Categorisation is Better Above-Fixation Than Below: Evidence From The Reach-to-Touch Paradigm
Presented by: Matthew Finkbeiner, Macquarie University, Australia
Authors: Matthew Finkbeiner, Genevieve Quek

MAT010: Neural Correlates Of Endogenous And Exogenous Attention In Touch: Evidence For Independent And Interdependent Mechanisms
Presented by: Bettina Forster, City University London, UK
Authors: Bettina Forster, Alexander Jones

MAT011: Exploring The Mechanisms That Support Attentional Bias Modification
Presented by: Gina Grimshaw, Victoria University of Wellington, New Zealand
Authors: Gina Grimshaw, Lisa Hunkin

MAT012: Electrophysiological Indices of Competition for Neural Resources in a Dual Working-Memory and Selective-Attention Task
Presented by: Dion Henare, University of Auckland, New Zealand
Authors: Dion Henare, Paul Corballis

MAT014: Effects Of Emotional States On Eye Movements During Visual Search
Presented by: Zhenlan Jin, University of Electronic Science and Technology of China, China
Authors: Zhenlan Jin, Ling Li

MAT015: Transcranial Direct Current Stimulation of the Right Inferior Parietal Cortex Modulates the Frequency of Task-Unrelated Thoughts
Presented by: Shogo Kajimura, Kyoto University, Japan
Authors: Shogo Kajimura, Yoshihiro Kadono, Michio Nomura

MAT016: Spatial Attention Influences Plasticity Induction in the Motor Cortex
Presented by: Marc Kamke, Queensland Brain Institute, The University of Queensland, Australia
Authors: Marc Kamke, Alexander Ryan, Martin Sale, Megan Campbell, Stephan Riek, Timothy Carroll, Jason Mattingley

POSTER SESSION 1

Attention cont'd

MAT017: The Neural Mechanisms For Working Memory Based Biased Attention To Food

Presented by: Sanjay Kumar, Oxford Brookes University, UK

Authors: Sanjay Kumar, Suzanne Higgs, Femke Rutters, Glyn Humphreys

MAT018: Efficacy of Attentional Modulation of Visual Activity in Visual Short-Term Memory

Presented by: Bo-Cheng Kuo, National Taiwan University, Taiwan

Author: Bo-Cheng Kuo

MAT019: Role of the Dorsal Visual Stream in Shifting Attention in Response to Peripheral Visual Information.

Presented by: Tony Lambert, University of Auckland, New Zealand

Authors: Tony Lambert, Adrienne Wootton, Nathan Ryckman, Jaimie Wilkie

MAT020: Mapping Development Of The MMN and P3a Potentials During Adolescence: A Longitudinal Investigation Of Healthy Individuals And Individuals At-Risk For Psychosis

Presented by: Kristin Laurens, University of New South Wales, Australia

Authors: Kristin Laurens, Jennifer Murphy, Hannah Dickson, Ruth Roberts

MAT021: Children's Performance on the Sustained Attention to Response Task: A Cross-Sectional Analysis of Age-Related Changes.

Presented by: Frances Lewis, University of Melbourne, Australia

Authors: Frances Lewis, Robert Reeve, Katherine A Johnson

MAT022: The Effect of Unconscious Emotional Faces on Spatial Attention: an ERP Study

Presented by: Ling Li, School of Life Science and Technology, University of Electronic Science and Technology of China, China

Authors: Ling Li, Xianxian Kong, Zhenlan Jin

MAT023: Speed-Accuracy Trade-Off Influences The Effect Of Attentional EEG Alpha Modulation

Presented by: Katharina Limbach, University of Auckland, New Zealand

Authors: Katharina Limbach, Paul M Corballis

MAT024: Listening Costs Associated With Shifts In Auditory Spatial Attention

Presented by: Gaven Lin, The University of Sydney, Australia

Authors: Gaven Lin, Simon Carlile

MAT025: Visuo-Spatial Attention Influences The Rate Of Evidence Accumulation During Perceptual Decision making

Presented by: Gerard Loughnane, Neural Engineering Trinity College Dublin, Ireland

Authors: Gerard Loughnane, Daniel Newman, Mark Bellgrove, Edmund Lalor, Simon Kelly, Redmond O'Connell

MAT026: Reduced Age-related Gray Matter Atrophy in Long-term Meditators within the Medial Occipital Lobe

Presented by: Eileen Luders, UCLA, USA

Authors: Eileen Luders, Florian Kurth

Cognition and Executive Processes

MCE001: Stroke patients with aphasia show impeded motor recovery: A story of mirror neurons in BA44.

Presented by: Deanna Anderlini, The University of Queensland, Australia

Authors: Deanna Anderlini, Guy Wallis, Timothy Carroll

MCE002: Metabolic Aberrations In Fronto-Parietal Brain Regions In Recently Detoxified Alcohol Dependent Individuals: Contribution To Impaired Abstract Reasoning Abilities

Presented by: Deepika Bagga, INMAS, India

Authors: Deepika Bagga, Namita Singh, Subash Khushu, Prabhjot Kaur, Mohan Garg, Debajyoti Bhattacharya

MCE003: Game-Based Training of Mental Flexibility: ERPs Suggest a Forward Shift of Control During Task Switching

Presented by: Guido Band, Leiden Institute for Brain and Cognition, Netherlands

Authors: Guido Band, Kerwin Olfers

MCE004: White Matter Matters For Grey(Ing) Areas: A Functional And Structural View Of Task Switching Dynamics In Middle-To-Old Age

Presented by: Pauline Baniqued, University of Illinois at Urbana-Champaign, USA

Authors: Pauline Baniqued, Kathy Low, Mark Fletcher, Nils Schneider-Garces, Chin Hong Tan, Benjamin Zimmerman, Gabriele Gratton, Monica Fabiani

MCE005: Who Jumps To Conclusions? A Comprehensive Assessment Of Probabilistic Reasoning In Psychosis Following Traumatic Brain Injury (PFTBI).

Presented by: Rachel Batty, Swinburne University of Technology, Australia

Authors: Rachel Batty, Andrew Francis, Neil Thomas, Malcolm Hopwood, Jennie Ponsford, Susan Rossell

MCE006: Executive Dysfunction In Psychosis Following Traumatic Brain Injury (PFTBI)

Presented by: Rachel Batty, Swinburne University of Technology, Australia

Authors: Rachel Batty, Andrew Francis, Neil Thomas, Malcolm Hopwood, Jennie Ponsford, Susan Rossell

MCE007: The Link Between Numerical Exposure at Home and Children's Exact Numerical Skills

Presented by: Carlo Semenza, University of Padova, Italy

Authors: Silvia Benavides-Varela, Brian Butterworth, Francesca Burgio, Giorgio Arcara, Daniela Lucangeli, Carlo Semenza

MCE008: Belief Updating Is Indexed By Single-Trial P3 Amplitude: A Neurocognitive Modelling Approach To EEG

Presented by: Daniel Bennett, University of Melbourne, Australia

Authors: Daniel Bennett, Stefan Bode, Carsten Murawski

MCE009: Induced Gamma-Band Activity Signals Awareness Of Change In A Bistable Percept During Wakefulness But Changes Dynamics With Sleep Onset

Presented by: Andrés Canales-Johnson, University of Cambridge, UK

Authors: Andrés Canales-Johnson, Daniela Cabezas, Carolina Silva, Francisco Olivares, Roberto García, Álvaro Rivera-Rei, Valdas Noreika, David Huepe, Robert Carlyon, Tristan Bekinschtein

MCE010: State-Dependent High Frequency Power Changes In Human Neonatal EEG

Presented by: Maya Cano, University of California, USA

Authors: Maya Cano, Rachel Kuperman, Kristopher Anderson, Robert Knight

MCE011: Fast Dynamics Of Domain-General Vs. Specific Neural Mechanisms Of Task Switching: Interactions Between The Frontoparietal And Spatial Orienting Networks

Presented by: Marcelina Chamielec, University of Balearic Islands, Spain

Authors: Marcelina Chamielec, Álvaro Darriba, Javier Villacampa, Rosa Martorell, Alejandro Gálvez, Francisco Barceló

POSTER SESSION 1

MCE012: Inhibitory Control Over Rewarding Stimuli In Opiate Dependent Participants

Presented by: Kathleen Charles-Walsh, University of Melbourne, Australia

Authors: Kathleen Charles-Walsh, Daniel J. Upton, Robert Hester

MCE013: Integrity Of The Grey/White Matter Border Is Associated With Cognitive Performance In Ageing: The PATH Through Life Project.

Presented by: Nicolas Cherbuin, Australian National University, Australia

Authors: Nicolas Cherbuin, Marnie Shaw, David H. Salat, Perminder S. Sachdev, Kaarin J. Anstey

MCE014: The Significance of Different Non-symbolic and Symbolic Magnitude Comparison Judgment Profiles in Children

Presented by: Cindy Chew, University of Melbourne, Australia

Authors: Cindy Chew, Robert Reeve

MCE016: Dissociable Visual Perception And Executive Functioning Processes In Typically Developing Adults With Varying Degrees Of Autistic-Like Characteristics.

Presented by: Philippe Chouinard, La Trobe University, Australia

Authors: Philippe Chouinard, Karisa Parkington, Becky Clements, Oriane Landry

MCE017: Hemispheric Specialization for Processing Arithmetic in Adults

Presented by: Veronica Connaughton, The University of Western Australia, Australia

Authors: Veronica Connaughton, Vicole Bothma, Azhani Amiruddin, Karen Cluniess-Ross, Noel French, Allison Fox

MCE018: Dissociable Frontoparietal Oscillatory Networks For Proactive and Reactive Control Characterised Using Complex Network Analyses

Presented by: Patrick Cooper, University of Newcastle, Australia

Authors: Patrick Cooper, Aaron Wong, Renate Thienel, Patricia Michie, Frini Karayanidis

MCE019: Myelin Paucity Of The Superior Cerebellar Peduncle In Individuals With Friedreich Ataxia: An MRI Magnetization Transfer Imaging study

Presented by: Louise Corben, Murdoch Childrens Research Institute, Australia

Authors: Louise Corben, Saman Kashuk, Hamed Akhlaghi, Sharna Jamadar, Martin Delatycki, Joanne Fielding, Beth Johnson, Nellie Georgiou-Karistianis, Gary Egan

MCE020: Cognition Early After Stroke Correlates Better With Regional Brain Volume Than White Matter Hyperintensity Volume

Presented by: Toby Cumming, Florey Institute of Neuroscience and Mental Health, Australia

Authors: Toby Cumming, Qi Li, Emilio Werden, Audrey Raffelt, Renee Lichter, Heath Pardoe, Amy Brodtmann

MCE021: Do Nicotine Dependent Subjects Show Differences In Response To Risk?

Presented by: Louise Curley, The University of Auckland, New Zealand

Authors: Louise Curley, Rob R Kydd, Ian J Kirk, Bruce R Russell, Robert Hester

MCE022: Fast Neural Dynamics Of A "Multiple Demand" Frontoparietal Network For Cognitive Control

Presented by: Francisco Barceló, University of the Balearic Islands, Spain

Authors: Francisco Barceló, Javier Villacampa, Rosa Martorell, Marcelina Chamielec, Alejandro Gálvez, Álvaro Darriba

MCE023: Brain Correlates of Creative Musical Activity

Presented by: Liudmila Dikaya, Southern Federal University, Russia

Authors: Liudmila Dikaya, Pavel Ermakov, Igor Dikiy

MCE024: Brain Cortical Patterns of Lying Responses Realization

Presented by: Igor Dikiy, Southern Federal University, Russia

Authors: Igor Dikiy, Pavel Ermakov, Liudmila Dikaya

MCE025: Brain Mechanisms Associated With Single And Dual-Tasks During Locomotion

Presented by: Shelley Duncan, Victoria University, Australia

Authors: Shelley Duncan, Derek Panchuk, Remco Polman

MCE027: Endogenous vs. Exogenous Action Inhibition: A TMS-EEG Study

Presented by: Stefania Ficarella, University of Trento, Italy

Authors: Stefania Ficarella, Lorella Battelli

MCE028: Effects of Pharmacological Blockade and Genotype of Serotonin Transporters on Response Inhibition and Post Error Slowing

Presented by: Adrian Fischer, Otto von Guericke University Magdeburg, Germany

Authors: Adrian Fischer, Christian Kubisch, Martin Reuter, Markus Ullsperger

MCE029: Neural Responses to Musical Consonance and Dissonance in the Human Superior Temporal Gyrus

Presented by: Francine Foo, University of California, Berkeley, USA

Authors: Francine Foo, David King-Stephens, Peter Weber, Kenneth Laxer, Josef Parvizi, Robert Knight

MCE030: Patterns Of Response Times For Enumeration, Number Comparison, Addition And Subtraction Are Different For Symbolic And Non-Symbolic Stimuli

Presented by: Jason Forte, University of Melbourne, Australia

Authors: Jason Forte, Robert Reeve

MCE031: Common And Distinct Electromagnetic Correlates Of Mental Travel In Time And Space

Presented by: Baptiste Gauthier, CEA/ Neurospin Center, France

Authors: Baptiste Gauthier, Karin Pestke, Virginie van Wassenhove

MCE032: Sleepy? Doing It Worst Without Noticing: Decrease In Performance But Not Confidence In Decision-Making While Falling Asleep

Presented by: Stanimira Georgieva, MRC Cognition and Brain Sciences Unit, UK

Authors: Stanimira Georgieva, Tristan Bekinschtein

MCE033: Working Memory Deficits In Individuals With Friedreich Ataxia: The IMAGE-FRDA Study

Presented by: Nellie Georgiou-Karistianis, Monash University, Australia

Authors: Nellie Georgiou-Karistianis, Monique Stagnitti, Gary Egan, Elsdon Storey, Martin Delatycki, Louise Corben

MCE034: An Aware Error Is A Salient Event: The Anterior Insula Assigns Salience To Aware Errors Through Interoceptive Mechanisms

Presented by: Elke Godefroid, Ghent University, Belgium

Authors: Elke Godefroid, Gilles Pourtois, Jan Wiersema

MCE036: Functional Brain Correlates Of Psychiatric Function In Huntington's Disease: The Image-HD Study

Presented by: Shannon Driscoll, Monash University, Australia

Authors: Shannon Driscoll, Govinda Poudel, Julie Stout, Juan Dominguez, Andrew Churchyard, Phyllis Chua, Gary Egan

POSTER SESSION 1

Language

MLA001: Tracking The Emergence Of Meaning In The Brain During Natural Story Comprehension
Presented by: Phillip M. Alday, University of Marburg, Germany
Authors: Phillip M. Alday, Jona Sassenhagen, Ina Bornkessel-Schlesewsky

MLA002: An Event-Related Potential Study Of Sentence Processing In Parkinson's Disease
Presented by: Anthony Angwin, The University of Queensland, Australia
Authors: Anthony Angwin, Nadeeka Dissanayaka, Katie McMahon, Peter Silburn, David Copland,

MLA003: Lexical Representation For Oral Reading And Writing/Spelling: Evidence From Aphasia
Presented by: Venugopal Balasubram, Seton Hall University, USA
Authors: Venugopal Balasubram, Maha Aldera, Maureen Costello

MLA004: The neurobiology of language: in defense of a nonhuman primate model
Presented by: Ina Bornkessel-Schlesewsky, University of South Australia, Australia
Authors: Ina Bornkessel-Schlesewsky, Matthias Schlesewsky, Steven Small, Josef Rauschecker

MLA005: An MEG Study Of Semantic Competition In Picture Naming
Presented by: Jon Brock, Macquarie University, Australia
Authors: Jon Brock, Erin Martin, Paul Sowman

MLA006: Practice Makes Perfect: Training The Interpretation Of Emotional Ambiguity
Presented by: Jessica Clifton, Victoria University of Wellington, New Zealand
Authors: Jessica Clifton, Gina M. Grimshaw

MLA007: The Impact of Phonological Similarity between First and Second Language on Lexical Access during Overt Speech Production: An ERP Study
Presented by: Manfred F. Gugler, Max Planck Institute for Human Cognitive and Brain Sciences, Germany
Authors: Manfred F. Gugler, Jana Aurig, Hellmuth Obrig, Sonja Rossi

MLA008: Evidence for Predictive Coding in Human Auditory Cortex
Presented by: Christopher Holdgraf, Uuniversity of California, Berkeley, USA
Authors: Christopher Holdgraf, Wendy de Heer, Jochem Rieger, Brian Pasley, Robert Knight, Frederic Theunissen

MLA009: Perinatal Testosterone Exposure and Cerebral Lateralisation in Adult Males: Evidence for the Callosal Hypothesis
Presented by: Lauren Hollier, The University of Western Australia, Australia
Authors: Lauren Hollier, Murray Maybery, Jeffrey Keelan, Martha Hickey, Andrew Whitehouse

MLA010: fMRI Reveals Atypical Processing Of Letters And Speech Sounds In Beginning Readers At Family Risk For Dyslexia
Presented by: Katarzyna Jednoróg, Nencki Institute of Experimental Biology, Poland
Authors: Katarzyna Jednoróg, Anna Banaszkiewicz, Katarzyna Chyl, Agnieszka Dębska, Magdalena Łuniewska, Agata Żelechowska, Marek Wypych, Artur Marchewka

MLA011: Measurement Of Auditory Brain Function In Cochlear Implant Recipients Using MEG
Presented by: Blake Johnson, Macquarie University, Australia
Authors: Blake Johnson, David Meng, Stephen Crain

MLA012: Structural Connectivity Of Left Cortical Speech Regions Defined By Direct Cortical Stimulation During Awake Language Mapping
Presented by: Christian Kell, Goethe University, Germany
Authors: Christian Kell, Pavel Hok, Silke Fuhrmann, Ines Kropff, Marie-Therese Forster, Christian Senft, Volker Seifert

MLA013: Language Lateralisation And Cognitive Performance During Infancy
Presented by: Mark Kohler, University of South Australia, Australia
Authors: Mark Kohler, Jessica Hofmann, Atlanta Flitton, Rachael Spooner, Nicholas Badcock, Owen Churches, Hannah Keage

MLA014: A MEG Study of Auditory Verbal Hallucinations And Inhibition In Patients With Schizophrenia.
Presented by: Sarah Lancaster, Swinburne University of Technology, Australia
Authors: Sarah Lancaster, Susan Rossell, Matthew Hughes, William Woods

MLA015: Intonation Processing Deficits Among Mandarin Chinese Speakers With Congenital Amusia: An ERP Study
Presented by: Xuejing Lu, Macquarie University, Australia
Authors: Xuejing Lu, Daxing Wu, Fang Liu, William Forde Thompson

MLA016: R34D1NG W0RD5 W1TH NUMB3R5: Electrophysiological Evidence for Semantic Activation
Presented by: Nicole Martin, Oregon State University, USA
Authors: Nicole Martin, Mei-Ching Lien, Philip Allen

MLA017: Transcranial Direct Current Stimulation in Mild Cognitive Impairment: Behavioral Effects and Neural Mechanisms
Presented by: Marcus Meinzer, The University of Queensland, Australia
Authors: Marcus Meinzer, Robert Lindenberg, Mai Thy Phan, Lena Ulm, Carina Volk, Agnes Flöel

MLA018: Subcortical Links In Bilingual Language Representation
Presented by: Amanda Miller Amberber, University of New South Wales, Australia
Authors: Amanda Miller Amberber, Lyndsey Nickels, Max Coltheart, Stephen Crain

Memory & Learning

MML002: Neurophysiological Markers Of Perceptual Learning In Awake And Sleeping Humans
Presented by: Thomas Andrillon, Ecole Normale Superieure, France
Authors: Thomas Andrillon, Daniel Pressnitzer, Trevor Agus, Damien Léger, Sid Kouider

MML003: The Neuroanatomical Layout Of V1 And Its Links To Individual Visual Imagery Strength And Precision
Presented by: Johanna Bergmann, University of New South Wales, Australia
Authors: Johanna Bergmann, Erhan Genç, Axel Kohler, Wolf Singer, Joel Pearson

MML004: Aging and Episodic Memory: The Role Of Attention In Hemispheric Asymmetry Reduction
Presented by: Badiâa Bouazzaoui, Francois Rabelais University, France
Authors: Badiâa Bouazzaoui, Gaën Plancher, Michel Isingrini, Lucie Angel, Laurence Taconnat, Sandrine Vanneste, Séverine Fay

POSTER SESSION 1

MML007: L-Dopa Improves Learning And Maintenance Of New Nouns In Healthy Adults

Presented by: David Copland, The University of Queensland, Australia

Authors: David Copland, Alana Campbell, Alicia Rawlings, Katie McMahon, Peter Silburn, Pradeep Nathan

MML008: The Role Of Stimulus Train Length In Mismatch Negativity (MMN) Abnormalities In Schizophrenia: A Comparison of the 'Roving' and 'Oddball' MMN Paradigms

Presented by: Rodney Croft, University of Wollongong, Australia

Authors: Sumie Leung, Lisa-marie Greenwood, Patricia Michie, Rodney Croft

MML009: Sleep Restores The Potential To Undergo Learning Induced Increases Of Corticomotor Excitability: New Evidence In Line With The Synaptic Downscaling Hypothesis

Presented by: Toon de Beukelaar, Catholic University of Leuven, Belgium

Authors: Toon de Beukelaar, Jago Van Soom, Nicole Wenderoth

MML010: ERP Evidence For Lifespan Differences In Feedback-Induced Learning: How The Processing Of Positive And Negative Feedback Changes From Childhood To Old Age

Presented by: Nicola Ferdinand, Saarland University, Germany

Authors: Nicola Ferdinand, Jutta Kray

MML012: Event-Related-Potentials Reveal An Age-Related Decline In Inhibition During A Working Memory Task

Presented by: Helen Gaeta, AUT University, New Zealand

Authors: Helen Gaeta, David Friedman

MML013: Acute Glycine Administration Increases Mismatch Negativity In Chronic Schizophrenia

Presented by: Lisa-marie Greenwood, University of Wollongong, Australia

Authors: Lisa-marie Greenwood, Sumie Leung, Patricia Michie, Amity Green, Pradeep Nathan, Paul Fitzgerald, Patrick Johnston, Nadia Solowij, Jayashri Kulkarni, Rodney Croft

MML015: Eye Fixation Patterns Support Improved Guidance As The Source Of Reduced Search Times In Contextual Cueing

Presented by: Anthony Harris, Queensland Brain Institute, The University of Queensland, Australia

Authors: Anthony Harris, Roger Remington

MML016: The Impact Of Sleep On Three-Ball Cascade Juggling

Presented by: Kerstin Hoedlmoser, University of Salzburg, Austria

Authors: Kerstin Hoedlmoser, Kathrin Bothe, Sabrina Tibi, Manuel Schabus

MML017: Multimodal Brain Imaging of Motor Sequence Learning

Presented by: YunYing Huang, The University of Oxford, UK

Authors: YunYing Huang, Chun-Yu Tse, Trevor Penney

MML022: Evidence For A Working Memory Construct Evolution Rather Than a "paradigm shift": A New Meta-Analysis Of Normative Functional Neuroimaging Studies of n-back Tasks

Presented by: Peter Goodin, Swinburne University of Technology, Australia

Authors: Gemma Lamp, Peter Goodin, Robin Laycock, Sheila Crewther

MML023: Inhibition Of Semantic Association: Evidence From Item Method Directed Forgetting

Presented by: Huang-Mou Lee, Chang Jung Christian University, Taiwan

Author: Huang-Mou Lee

MML025: What Makes A Picture Memorable For A Long Time – An fMRI Study Using Nencki Affective Picture System

Presented by: Artur Marchewka, Nencki Institute of Experimental Biology, Poland

Authors: Artur Marchewka, Marek Wypych, Abnoos Moslehi, Marcin Sińczuk, Katarzyna Jednoróg

MML026: Investigating the Electrophysiological Correlates of Rewards and Contingency in a Two-Alternative-Choice Procedure

Presented by: Stuart McGill, University of Auckland, New Zealand

Authors: Stuart McGill, Douglas Elliffe, Paul Corballis

MML027: Effects of Exercise Program Requiring Attention, Memory and Imitation on Cognitive Function in Elderly Persons

Presented by: Ryosuke Shigematsu, Mie University, Japan

Authors: Ryosuke Shigematsu, Tomohiro Okura, Masaki Nakagaichi, Yoshio Nakata

Motor Behaviour

MMO001: A TMS Investigation Of Dorsal And Ventral Premotor Regions In Arbitrary And Direct Motor Preparation

Presented by: Joshua Balsters, ETH Zurich, Switzerland

Authors: Joshua Balsters, Kathy Ruddy, Richard Carson, Nicole Wenderoth

MMO002: Decoding Attentional Shifts From Motor Preparatory Brain Activity

Presented by: Jeffery Bednark, The University of Queensland, Australia

Authors: Jeffery Bednark, Michelle Steffens, Ross Cunnington

MMO003: Does The Nervous System Search For A Less Painful Movement Strategy During Acute Elbow Pain?

Presented by: Michael Bergin, The University of Queensland, Australia

Authors: Michael Bergin, Kylie Tucker, Bill Vicenzino, Paul Hodges

MMO004: The Role Of Music Training In The Development Of Emergent And Event Timing Mechanisms

Presented by: Thenille Braun Janzen, Macquarie University, Australia

Authors: Thenille Braun Janzen, William Thompson, Ronald Ranvaud

MMO005: Inter-Limb Generalization Of Visuomotor Adaptation Is More Automatic When The Perturbation Is Aligned In Extrinsic And Joint-Based Coordinates

Presented by: Timothy Carroll, The University of Queensland, Australia

Authors: Timothy Carroll, Eugene Poh, Tania Duarte Ferreira, Aymar de Rugy

MMO006: Cellular Neuropathology Associated With Cognitive And Behavioural Dysfunction In A Mouse Model of Williams-Beuren Syndrome

Presented by: Cecilia Chin Roei Chang, University of New South Wales, Australia

Authors: Cecilia Chin Roei Chang, Cesar Canales, John Power, Anthony Hannan, Edna Hardeman, Stephen Palmer

MMO007: Movement-Related Neuromagnetic Fields In Preschool Age Children

Presented by: Douglas Cheyne, Hospital for Sick Children, Canada

Authors: Douglas Cheyne, Cecilia Jobst, Graciela Tesan, Stephen Crain, Blake Johnson

POSTER SESSION 1

Motor Behaviour cont'd

MMO008: The Direction Of Force Twitches Evoked By TMS In A Passive Limb Shift According To The Direction Of Impending Contralateral Muscle Activation

Presented by: Lilian Chye, The University of Queensland, Australia

Authors: Lilian Chye, Stephan Riek, Aymar de Rugy, Tim Carroll

MMO009: Do Action Goals Change Distractor Interference? Evidence For Top-Down Modulation Of Visual Attention In Action Space During Action Execution

Presented by: Hayley Colman, The University of Queensland, Australia

Authors: Hayley Colman, Roger Remington, Ada Kritikos

MMO010: Effect of Anodal tDCS on Cortical Activation During Response Preparation And Activation

Presented by: Alexander Conley, University of Newcastle, Australia

Authors: Alexander Conley, Jodie Marquez, Aaron Wong, Patrick Cooper, Mark Parsons, Frini Karayanidis

MMO012: Similarity of Finger And Hand Intermittent Corrective Movements

Presented by: Jason Friedman, Tel Aviv University, Israel

Authors: Jason Friedman, Lior Noy

MMO013: Using a Virtual Reality Paradigm to Explore known Triggers of Freezing of Gait in Parkinson's Disease.

Presented by: Moran Gilat, Brain and Mind Research Institute, University of Sydney, Australia

Authors: Moran Gilat, Mac Shine, Courtney Walton, Julie Hall, Sharon Naismith, Simon Lewis

MMO014: Interaction of Concurrent Motor Plans And Perceived Actions On Neural Oscillations

Presented by: Veronika Halász, Queensland Brain Institute, The University of Queensland, Australia

Authors: Veronika Halász, William Woods, Ross Cunnington

MMO015: Does Dancing Improve Fall Risk Due To Its Demands On Cognitive Effort?

Presented by: Dennis Hamacher, Otto von Guericke University Magdeburg, Germany

Authors: Dennis Hamacher, Daniel Hamacher, Kathrin Rehfeld, Anita Hökelmann, Lutz Schega

MMO016: Novel Adaptations In Motor Cortical Maps In Persistent Elbow Pain

Presented by: Paul Hodges, The University of Queensland, Australia

Authors: Paul Hodges, Siobhan Schabrun, Lucy Chipchase, Bill Vicenzino, Emma Jones

MMO017: Transcranial Direct Current Stimulation with an M1 / Orbitofrontal Montage shows No Effect on Simple Visual Motor Reaction Time

Presented by: Jared Horvath, University of Melbourne, Australia

Authors: Jared Horvath, Olivia Carter, Jason Forte

Sensation & Perception

MPE001: Effects Of Categorical Speech Perception During Active Discrimination Of Stop-Consonants And Vowels Within The Left Superior Temporal Cortex

Presented by: Christian Altmann, Kyoto University, Japan

Authors: Christian Altmann, Maiko Uesaki, Kentaro Ono, Masao Matsuhashi, Tatsuya Mima, Hidenao Fukuyama

MPE002: Tolerance For Local And Global Differences In The Integration Of Shape Information

Presented by: David Badcock, The University of Western Australia, Australia

Authors: David Badcock, James Dickinson, Jason Bell, Serena Cribb

MPE003: The Impact of Prior Expectations on Subliminal Priming

Presented by: Leonardo Barbosa, ENS LSCP, France

Authors: Leonardo Barbosa, Sid Kouider

MPE004: Imaginary Companions In Childhood: A Marker For Adulthood Schizotypal Traits?

Presented by: Emma Barkus, University of Wollongong, Australia

Author: Emma Barkus

MPE005: Functional Imaging of Cognitive Processes Underlying the Perception of Contemporary Visual Art

Presented by: Marion Behrens, Frankfurt University Hospital, Germany

Authors: Marion Behrens, Pascal Nicklas, Christian Kell

MPE006: Autistic Children Show More Efficient Parvocellular Visual Processing

Presented by: Alyse Brown, Latrobe University, Australia

Authors: Alyse Brown, David Crewther

MPE008: Effects of Motion Imagery and Motion Perception on Subsequent Conscious Perception

Presented by: Shuai Chang, University of New South Wales, Australia

Authors: Shuai Chang, Joel Pearson

MPE009: Subjective Stimulus Duration Depends on Visual Field Location

Presented by: Xiaoqin Cheng, National University of Singapore, SIngapore

Authors: Xiaoqin Cheng, Katrin Kliegl, Anke Huckauf, Trevor Penney

MPE010: A Study On Visual And Semantic fMRI-Adaptation Using A Normal Range Analogue Of Autism

Presented by: Philippe Chouinard, La Trobe University, Australia

Authors: Philippe Chouinard, Oriane Landry, Melvyn Goodale

MPE011: Hemispheric Differences In Auditory Temporal Integration As Indexed By The T-Complex Of The Auditory Event-Related Potential

Presented by: Karen Clunies-Ross, The University of Western Australia, Australia

Authors: Karen Clunies-Ross, Allison Fox, An Nguyen, Christopher Brydges, Veronica Connaughton

MPE012: To Mu is to Move, to Tau is to Understand: a Possible Functional Role for Lower Alpha Oscillations in Human Speech Perception.

Presented by: Bernadine Cocks, University of South Australia, Australia

Authors: Bernadine Cocks, Graham Jamieson, Ian Evans

MPE013: Dynamic Systems In Human Face Recognition: A Novel Face Processing Model

Presented by: William Comfort, Federal University of ABC, Brazil

Authors: William Comfort, Yossi Zana

POSTER SESSION 1

MPE014: Atypical Brainstem Responses To Repeated Amplitude?Modulated Sounds In Children Diagnosed With Autism Spectrum Disorders

Presented by: Miriam Cornella, University of Barcelona, Spain

Authors: Miriam Cornella, Sumie Leung, Amaia Hervàs, Jordi Costa-Faidella, Isabel Rueda, Sabine Grimm, Carles Escera

MPE016: Attention to Global and Local Features of Letter Stimuli Modulates Early Visual Processing

Presented by: Scott Coussens, University of South Australia, Australia

Authors: Scott Coussens, Owen Churches, Mark Kohler, Hannah Keage

MPE017: Relative Timing Of Initial Striate And Extrastriate Visual Cortical Activations Using Human Magnetic Evoked Fields

Presented by: David Crewther, Swinburne University of Technology, Australia

Authors: David Crewther, Alyse Brown, Laila Hugrass

MPE018: Persistent Order-Driven Biases In Auditory Relevance-Filtering Processes – A Mismatch Negativity (MMN) study

Presented by: Karlye Damaso, University of Newcastle, Australia

Authors: Karlye Damaso, Daniel Mullens, Lisa Whitson, Alexander Provost, Andrew Heathcote, Istvan Winkler, Juanita Todd

MPE019: Are Multisensory Inputs Integrated Automatically In BodyRrepresentation?: The Effect of Perceptual Lad on Visuo-Proprioceptive Itegration

Presented by: Harriet Dempsey-Jones, The University of Queensland, Australia

Authors: Harriet Dempsey-Jones, Ada Kritikos

MPE020: The Influence of Pre-Specified Targets on Categorisation Tasks

Presented by: Natalie Doring, Southern Cross University, Australia

Authors: Natalie Doring, Anna Brooks, Rick Van Der Zwan

MPE021: Goal-Directed Pointing Enhances Target Identification In Object Substitution Masking

Presented by: Eve Dupierrix, Queensland Brain Institute, The University of Queensland, Australia

Authors: Eve Dupierrix, Jason. B Mattingley

MPE022: How a Model of Object Recognition Learns to Become a Model of Face Recognition

Presented by: Guy Wallis, The University of Queensland, Australia

Author: Guy Wallis