KEYNOTE ABSTRACTS

KEY006: Temporal Decoding Of Brain Signals: A Window Into Conscious And Non-Conscious Operations

Keynote Speaker: **Professor Stanislas Dehaene**, Collège de France, Paris, France

Overview

Parsing a cognitive task into a sequence of operations is a central problem in cognitive neuroscience. A major advance is now possible thanks to the application of pattern classifiers to time-resolved recordings of brain activity (electro-encephalography [EEG], magneto-encephalography [MEG], or intracranial recordings). By probing when a specific mental content becomes decodable in brain activity, we can characterize the time course of cognitive codes. Most importantly, how the trained classifiers generalize across time, and from one experimental condition to another, sheds light on the temporal organization of information-processing stages.

I will illustrate these ideas using several MEG+EEG experiments in which temporal decoding is used to track the fate of conscious and unconscious stimuli in the brain. With Moti Salti, using masking, we present a brief pulse of sensory evidence about a bar presented at a peripheral spatial location. Blindsight is extensive, as subjects behave way above chance in localizing the unseen target. The representation of the invisible percept can be tracked through a series of stages, but the same percept, when visible, leads to an additional series of activations which involve amplified activity in parietal and prefrontal cortices. In a second experiment, Lucie Charles and I investigate, more specifically, how self-monitoring processes of error detection are modulated by perceptual awareness of a masked target digit. Although subjects perform above chance in both number comparison and metacognitive confidence judgments, the error-related negativity (ERN) is present only on conscious trials, and multivariate decoding reveals the presence of intention and error codes unique to conscious trials. On this basis, we propose the existence of two distinct brain mechanisms for metacognitive judgments: a conscious all-or-none process of single-trial evaluation, indexed by the ERN, and a non-conscious statistical assessment of confidence.

KEY007: Schizophrenia As A Cognitive Disorder: Insights From Cognitive Neuroscience

Keynote Speaker: **Emeritus Professor Pat Michie**, University of Newcastle, Australia

Overview

Despite diagnostic emphasis on positive and negative symptoms, cognitive deficits and decline in functioning are core to schizophrenia. I will focus on an ERP measure of deviance detection in audition, mismatch negativity (MMN), in combination with other neuroimaging methodologies, pharmacological studies and animal models, to demonstrate what insights have been revealed about schizophrenia. Following our initial reports that MMN amplitude to simple duration deviants is reduced in schizophrenia, many research groups subsequently documented that reduced MMN is substantial in schizophrenia, and arguably one of the most robust neurobiological findings in the literature. In addition, while data on the relationship of MMN to cognitive deficits is still scant, there is strong evidence that MMN is related to general, social and occupational functioning, a relationship that our research suggests is mediated by grey matter loss in anterior regions. One reason why MMN has attracted so much attention is evidence of its dependence on the glutamate NMDAR system, providing a link to PCP-models of schizophrenia: NMDAR antagonists such as PCP not only induce psychotic and cognitive changes in healthy people that parallel schizophrenia symptoms, they also reduce MMN in humans and animals. Other evidence from our group (not universally replicated) that reduced MMN precedes the onset of the illness, is present in those identified as at risk of developing psychosis and in first degree relatives of patients, indicate that MMN meets criteria for an endophenotype for schizophrenia and is therefore a good candidate marker in animal models of the disorder. Our most recent research utilising two animal models, maternal immune activation, a risk factor for schizophrenia, and NMDAR antagonist challenge, demonstrates that MMN is affected in both models, although not quite in the manner expected. The MMN story has therefore recently become somewhat more complicated - but nonetheless informative.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S13: Segregation And Integration Of Cortical Laminar Information Streams And Their Role In Attention

Markus Barth, The University of Queensland, Australia
Saskia Haegens, Columbia University, USA
Co-Chair & Speaker: **René Scheeringa**, Donders Institute for Brain, Cognition and Behaviour, Netherlands
Co-Chair & Speaker: **Andre M. Bastos**, Ernst Strüngmann Institute (ESI) for Neuroscience, Germany

Overview

One of the most fascinating anatomical properties of the cortex, established since the time of Ramon y Cajal, is its laminar structure. This prominent anatomical feature suggests distinct functional roles for the different laminae in cognitive processes such as attention. The precise computational function of these cortical layers, however, is a largely open question. Recent theories of cortical function, such as predictive coding, posit that there is a functional segregation of dynamics and computations which occur in the superficial and deep cortical layers. These models predict a strong functional segregation in the connectivity, dynamics, and physiological properties of cells situated in distinct cortical laminae. In this symposium we will present the latest developments on laminar resolution fMRI in humans (Markus Barth) and recent work on animal (Saskia Haegens) and human physiology (René Scheeringa). This work supports the notion of functional segregation between superficial and deep layers. These results constrain and inform computational models of how canonical microcircuits interact, and the characteristic frequencies which support neuronal communication (André Bastos). Together, these studies shed new light on the function of laminar cortical circuits, and how they may support complex and dynamic cognitive functions.

S13 001: The Possibility To Image Functional Changes In Cortical Laminae Using fMRI

Markus Barth, The University of Queensland, Australia

Recent developments in high field MRI and receiver coil technology have opened up the possibility of laminar fMRI in humans which holds great promise to detect activation at the level of functionally relevant cortical substructures. It could offer greater insight into human brain function by elucidating both the interaction between brain regions on the basis of laminar activation patterns associated with input and output, and in the interactions between laminae in a specific region. Experimental results and physiological models show that it is possible to investigate laminar profiles and laminar activation using a very high isotropic spatial resolution at high field strength.

Biography

As the Facility Fellow at the Centre for Advanced Imaging, the University of Queensland, Associate Professor Markus Barth leads the 7 Tesla research program. Having obtained his PhD in Technical Physics from the Technical University of Vienna, and having worked in the field of MRI at the Medical University of Vienna (Austria) and the Donders Institute for Brain Cognition and Behaviour (Radboud University, Nijmegen, The Netherlands) for the last 15 years, A/Prof. Barth has become an expert in advanced MR imaging methods. His main contributions have been made in the field of (cognitive) neuroscience and functional MRI, as well as clinical applications at high and ultra high field. Recent groundbreaking achievements include the development of accurate detection of layer specific functional activation in the human brain and ultra-fast MRI.

S13 002: Structure/Function/Model Analyses Of The Neocortical Laminar Activity Profile In Awake-Behaving Primates

Saskia Haegens, Columbia University, USA

We study laminar profiles of physiological activity in the neocortex of awake primates using linear array multielectrodes that sample the cortical laminar expanse at 100-200 micron spatial intervals. This method allows simultaneous recordings of field potentials (FPs) along with concomitant neuronal spiking activity across cortical layers. FPs arise from the first-order synaptic response, transmembrane current flow, which occurs whether or not there is sufficient spatiotemporal summation to cause neurons to fire. Indexing this subthreshold activity is essential to the understanding of ensemble excitability fluctuations and related cortical oscillatory dynamics. To precisely localize and currents related to the excitatory and inhibitory processes generating FPs, one-dimensional current source density (CSD) analysis is applied to the FP profile. Assisted by modeling/computational analyses, and anatomical reconstruction of input/output circuitry, this delineates the timing and laminar sequence of feedforward (bottom-up) and feedback (top-down) influences that impinge on the ongoing dynamic activity of local neuronal ensembles. Positioning multiple multielectrodes in interconnected structures allows examination of laminar patterns of interactions; this capacity is augmented by selective microstimulation. Microcannulae incorporated into the multielectrodes allow precise delivery of neurotransmitter agonists/antagonists and of anatomical tract tracing compounds. This talk will address: 1) the neural generators of key EEG components particularly alpha, delta and gamma, 2) the demonstrable physiological correlates of activating anatomical feedforward and feedback pathways, and 3) the underappreciated impact of non-specific, so-called matrix thalamic inputs on neuronal synchrony and on processing of driving inputs from the periphery.

Biography

Saskia Haegens did her PhD research in Ole Jensen's lab at the Donders Institute in Nijmegen, where she studied the functional role of oscillations in the somatosensory system, using both MEG and intracranial methods. Part of this research was done in collaboration with Ranulfo Romo in Mexico City. A main focus of her research is the role of the alpha rhythm in selective attention. Currently she works as a postdoctoral researcher with Charles Schroeder at Columbia University in New York, where she further explores the neurophysiological mechanisms of attention, now on the level of cortical layers using laminar recordings.

S13: Segregation And Integration Of Cortical Laminar Information Streams And Their Role In Attention cont'd

S13 003: The Relation Between Oscillatory EEG Activity And The Laminar Specific BOLD Signal

René Scheeringa, Donders Institute for Brain, Cognition and Behaviour, Netherlands

Recent developments in high-resolution fMRI have made it possible to measure BOLD signals with laminar resolution in humans. The relevance of this technique for neuroscience would be enhanced if the relationship between laminar BOLD signals and electrophysiology could be elucidated. Laminar electrophysiological recordings in animals have indicated that in the early visual cortex gamma band oscillatory activity is predominantly measured in superficial layers, while alpha and beta band activity show a strong presence in deeper layers.

In a previous experiment we demonstrated in a visual attention task that alpha/beta band power decreases and gamma band increases measured with simultaneously recorded EEG independently contribute to the BOLD response in early visual cortex. In the work we present here we show data from a very similar visual attention experiment in which we simultaneously measure EEG and laminar specific BOLD signals. We investigate whether power changes in the different EEG frequency bands show different correlation profiles over the cortical layers with the BOLD signal. In line with laminar electrophysiological recordings in animals, the results suggest the gamma band oscillations tend to show the most consistent relation with superficial layers, while for the alpha band a preference for specified layers is less apparent. With this experiment we take a first step towards establishing a neurophysiological basis for the application of laminar fMRI in human cognitive and systems neuroscience.

Biography

René Scheeringa obtained his masters' degree in experimental psychology at the University of Groningen in 2004. He obtained his PhD in 2011 from the Radboud University Nijmegen where he worked at the Donders Institute. Here he studied the relation between oscillatory EEG activity and the human BOLD signal by using simultaneously recorded EEG & fMRI. He worked as a post-doc at Neurospin, Gif-sur-Yvette, France to study how alpha-phase affects the stimulus evoked BOLD response. Currently he is back at the Donders Institute to study sensory processing using a combination of techniques, including simultaneously recorded EEG and high-resolution laminar-resolved fMRI.

S13 004: Visual Areas Exert Bottom-Up And Top-Down Influences Through Distinct Frequency Channels

Andre M. Bastos, Ernst Strüngmann Institute (ESI) for Neuroscience, Germany

Visual cortical areas are thought to form a hierarchy and to subserve cognitive functions by interacting in both bottom-up and top-down directions. However, the neurophysiological mechanisms through which top-down and bottom-up influences are exerted remain largely elusive. To address this, we recorded local field potentials from eight visual areas of two monkeys and quantified inter-areal directed influences between these areas. Using Granger causality analysis, we found that bottom-up influences are carried by theta-band (~4 Hz) and gamma-band (~60-80 Hz) synchronization and top-down influences by beta-band (~14-18 Hz) synchronization. These results motivated a dynamic causal model which was equipped with superficial and deep pyramidal cell populations – the cell populations giving rise to bottom-up and top-down connections, respectively. The model enabled us to reconstruct the transfer functions of specific subpopulations within cortical sources, and correctly discriminated top-down from bottom-up connections. Furthermore, an examination of the transfer functions associated with superficial and deep pyramidal cells confirmed that bottom-up connections employed gamma frequencies, while top-down connections were mediated by alpha/beta frequencies. This work demonstrates that in the visual cortex, functional and anatomical inter-areal asymmetries are highly correlated – this in turn made it possible to build a visual cortical hierarchy from the functional asymmetries alone. The possibility to infer hierarchical relationships through functional data alone may make it possible to derive a cortical hierarchy in the human brain. Furthermore, it will enable us to test whether concepts like hierarchy, counter-streams, and segregation of processing are general motifs that apply to all cortical systems.

Biography

Andre Moraes Bastos recently completed his PhD at the University of California, Davis. His PhD work took him on a tour of multiple scientific institutes, leading to a collaboration between himself and researchers at UC Davis, the Donders Institute for Cognitive Neuroimaging in Nijmegen, the Netherlands, the Wellcome Trust Centre for Neuroimaging in London, and the Ernst Strüngmann Institute (ESI) for Neuroscience in Cooperation with Max Planck Society in Frankfurt, Germany. His primary research interest is to understand how top-down and bottom-up counter-streams are signaled and integrated to enable dynamic cognitive behaviors.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S14: Consciousness, Integrated Information And The Free Energy Principle

Chair & Speaker: Jakob Hohwy, Monash University, Australia
Guilio Tononi, University of Wisconsin, USA
Anil Seth, University of Sussex, UK
Naotsugu Tsuchiya, Monash University, Australia

Overview

One approach to the science of consciousness is to develop a theory designed to explain core features of conscious experience, and look for neuroscientific evidence in favour of this theory. One of the most promising and prominent theories of consciousness in this vein is integrated information theory. Another approach to the science of consciousness is to take an overall theory of brain function and explore its potential to explain core features of conscious experience. One of the most promising and prominent theories of overall brain function centers on the Bayesian brain or free energy principle. This interdisciplinary symposium asks whether these two approaches can and should be combined. This question is important because a confirmatory answer would anchor information integration in overall brain function, and would throw light on the relation between free energy and the mind. The focus will be on the following questions: (1) Is it possible to interpret aspects of integrated information in terms of the free energy principle? (2) Is it possible to interpret aspects of the free energy principle as explanations of conscious experience? (3) Is there a meaningful overlap between the answers to questions (1) and (2)?

S14 001: Can The Free Energy Principle Be Used To Generate A Theory Of Consciousness

Jakob Hohwy, Monash University, Australia

This talk presents the free energy principle (FEP) and develops aspects of it that can be used to address core aspects of conscious experience. In particular, the talk focuses on how the inferential and hierarchical aspects of FEP may pertain to perceptual binding, how the agency-related notion of active inference central to FEP can explain unity of consciousness, and how the notion of precision optimization in FEP can speak to the relation between consciousness and attention. On this background, I then set out how FEP in various ways share aspects with the information integration theory but also how FEP presents a theoretical and explanatory advance over the integration information theory (IIT) of consciousness.

Biography

Jakob Hohwy is associate professor in philosophy at Monash University. He has set up the Philosophy & Cognition lab in the philosophy department at Monash and conducts interdisciplinary research in philosophy, psychology, and neuroscience. He is on a research fellowship from the Australian Research Council, focusing on contemporary theories about brain function according to which the brain fundamentally is a sophisticated hypothesis tester. His book on the topic, The Predictive Mind, is due out with Oxford University Press in November 2013.

S14 002: Integrated Information Theory and the Sources of Meaning

Guilio Tononi, University of Wisconsin, USA

Integrated information theory (IIT) is an attempt to mathematically characterize consciousness both in quantity and in quality. IIT starts from the fundamental phenomenological properties of consciousness (axioms), and asks which conditions must be satisfied by physical mechanisms, such as neurons and their connections, to account for those properties (postulates).

IIT offers a way to analyze systems of mechanisms to determine if they are properly structured to give rise to consciousness, how much of it, and of which kind. The fundamental postulates of IIT, such as integration and differentiation, can provide a parsimonious explanation for many neuroanatomical, neurophysiological, and neuropsychological findings. IIT also leads to experimental predictions, for instance that the loss and recovery of consciousness should be associated with the breakdown and recovery of information integration. Furthermore, IIT claims that meaning is synonymous with consciousness, is always internal, and only relates indirectly to the external environment. Finally, according to IIT, the relationship of inner phenomenology to the outside world is not one of processing the information contained in an input, or of optimally predicting inputs by explaining away error. Instead, it is one of "matching" internal with external relations, where external stimuli act as mere triggers that select particular internal states and the associated integrated conceptual structures that constitute experience.

Biography

Guilio Tononi is a neuroscientist and psychiatrist who holds the David P. White Chair in Sleep Medicine, as well as a Distinguished Chair in Consciousness Science, at the University of Wisconsin. Tononi is a leader in the field of consciousness studies, and has co-authored a book on the subject with Gerald Edelman. He developed the Integrated Information Theory (IIT) of consciousness. The theory is being tested with neuroimaging, TMS, and computer models.

S14 003: Integrated Information And Free Energy – Peas In A Pod?

Anil Seth, University of Sussex, UK

This talk will summarize key aspects of the free energy principle (FEP) and integrated information theory (IIT) relevant to conscious experience and its neural underpinnings. This will highlight the common theme of "reduction of uncertainty" as a potentially unifying process. New experimental results will be outlined which speak to both approaches and their integration, in which (i) expectations are manipulated to determine the extent to which predictions or prediction errors influence in access to consciousness in psychophysical paradigms and (ii) approximations to integrated information are applied to data from different conscious states.

The talk will finish with a constructive critique of both the IIT and the FEP, highlighting shortcomings as well as identifying promising pathways for their future development in cognitive neuroscience and consciousness science.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S14: Consciousness, Integrated Information And The Free Energy Principle cont'd

Biography

Anil Seth is Professor of Cognitive and Computational Neuroscience at the University of Sussex, and Founding Co-Director of the Sackler Centre for Consciousness Science. Research in his group integrates consciousness science with computational and cognitive neuroscience, with a particular emphasis on the role of predictions on perception and on empirical approaches to measuring integrated information. He is Editor-in-Chief of Frontiers in Consciousness Research and was overall conference chair for the 16th Meeting of the Association for the Scientific Study of Consciousness (Brighton, 2012).

S14 004: Integrated Information And Free Energy – Obstacles To Their Combination.

Naotsugu Tsuchiya, Monash University, Australia

I will point out several difficulties in expecting a fruitful marriage of the two prominent theories. First, while the free energy principle may be able to explain how brains work, it seems to explain equally well both conscious and non-conscious processes in the brain. The integrated information theory, on the other hand, is directly developed to address this issue. Second, while the amount of integrated information is, on average, expected to increase as organisms evolve and adapt to the environment, this tie is rather loose. In fact, recent computer simulation studies imply that evolution can result in emergence of organisms whose conscious experience would be rather limited, if any (like insects on the current earth). The adaptability to the environment as well as the course of evolution may be better explained in the free energy principle. At the end of the talk, I will consider one potential venue for a successful marriage. The free energy principle may be able to explain why and how the brain adapts to the environment and may explain the way neurons are connected in adulthood, separately for each different sensory system (e.g., vision vs. audition). Then, in the future, integrated information might possibly be able to explain why different senses are experienced in their particular ways, based on these differential connection patterns across different modalities.

Biography

Naotsugu Tsuchiya is Associate Professor in the School of Psychology and Psychiatry, Monash University. His group, housed at Monash Biomedical Imaging, focuses on questions in the science of consciousness, specifically concerning the relation between consciousness and attention, the nature of visual conscious experience, and applications of integrated information theory. He discovered the widely studied phenomenon of continuous flash suppression, and holds an ARC Future Fellowship.

S15: Task Set Representation And Updating: Aging, Training And Reward Motivation

Frini Karayanidis, University of Newcastle, Australia
Chair & Speaker: Jutta Kray, Saarland University, Germany
Hannah Schmitt, Saarland University, Germany
Jo Etzel, Washington University, USA

Overview

Cognitive decline is generally accepted as a normal part of aging. Despite extensive research, the underlying mechanisms have yet to be determined. Yet this is an essential step in designing effective intervention programs to reduce the incidence or slow the progress of age-related cognitive decline. This symposium examines key mechanisms involved in cognitive performance changes in normal aging. Axel Mecklinger shows that poor recollection is central to age-related decline in associative memory and presents ERP evidence for recruitment of compensatory perceptual processes in poor performers. Shulan Hsieh shows that the age-related decline in interference control can be mitigated by recruitment of compensatory processes under high task load. Mick Rugg presents evidence that age-related decline in episodic memory performance is predicted the efficacy with which information is initially encoded. Finally, Richard Ridderinkhof discusses recent research showing that older adults rely more heavily on S-R habit learning at the expense of flexible, goal-directed action.

S15 001: Progression Of Age-Related Decline In Task-Switching Performance And White Matter Microstructural Integrity: A Longitudinal Study

Frini Karayanidis, University of Newcastle, Australia

In cross-sectional studies, old adults show both less efficient performance on task-switching paradigms and reduced microstructural organisation of white matter pathways, as compared to younger adults. In the present study, we examine whether the rate of decline in task-switching performance over a 24-month interval is associated with rate of reduction in white matter microstructural organisation. Cognitively intact older adults (53-82 years) completed a comprehensive neuropsychological assessment, as well as a cued-trials task-switching paradigm with event-related potentials recorded to examine both preparatory (cue-target interval 1000ms) and target-driven control processes. MRI scanning included T1 structural, T2 weighted FLAIR and diffusion-weighted imaging sequences. Microstructural white matter changes were calculated using DTI analyses. Testing was repeated at 24-months with identical parameters. We show changes in both task-switching performance and measures of whole brain white matter microstructural integrity as well as grey matter volume over time. Decline in task-switching performance, especially under conditions that encourage preparation and have low interference, was associated with greater white matter microstructure decline. We examine whether the relationship between performance and white matter microstructural integrity decline is specific to frontoparietal and fronto-basal ganglia pathways associated with cognitive control.

Biography

Frini Karayanidis is an Associate Professor in Psychology at the University of Newcastle. She completed her PhD at University of New South Wales and undertook post-doctoral fellowships at Macquarie University and University of Montreal. Her research program has contributed to the establishment of electrophysiological signatures of proactive and reactive cognitive control processes in the task switching paradigm. She currently heads the Age-ility project which focuses on how variability in cognitive control contributes to the development and maintenance of adaptive behaviours throughout the lifespan.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S15 002: Is The Transfer Of Task-Switching Training In Older Adults Dependent On The Type Of Training? The Impact Of Working Memory And Inhibitions Demands

Jutta Kray, Saarland University, Germany

Recent aging studies on training in cognitive control found that older adults benefitted more from training in task switching than younger ones, that is, they showed larger transfer to untrained but similar switching tasks (Karbach & Kray, 2009). However, in this study participants practiced task switching (a) with bivalent stimuli, requiring the inhibition of irrelevant task attributes, and (b) without task cues, helping them keeping track of the task sequence. The aim of the present study is to specify the training conditions under which transfer occurs. To this end we created conditions in which working-memory and inhibition demands were reduced. Performance improvements were compared between four training groups that differed in practicing task switching with univalent or bivalent stimuli (variation of inhibition control) and with and without task cues (variation of memory demands) and an active control group (practicing single tasks) in a pretest-training-posttest design. Results indicated that all training groups showed improvements in task switching with increasing practice, independently of age and training condition. We also found larger improvements in task switching to a new untrained task in older than in younger adults. Interestingly, for younger adults improvements were independent of the training condition, while for older adults improvements were larger for conditions with bivalent stimuli, requiring inhibition of irrelevant task attributes in the context of switching. Hence, it seems that memory and switching demands alone are not critical components for the occurrence of transfer in the elderly. We will also report findings on far transfer and maintenance effects.

Biography

Jutta Kray is currently a Full Professor for Developmental Psychology at Saarland University in Saarbrücken. She received her PhD from Free University Berlin in 1998 and then worked as a Research Scientist and later as Associate Professor at the Department of Psychology at Saarland University in Saarbrücken. In 2000 she received the Margret-and-Paul Baltes Prize for outstanding dissertations in Developmental Psychology. Her research interests are the Cognitive Development Across the Lifespan, Behavioral and Neuronal Changes in Cognitive Control, and Cognitive Interventions.

S15 003: How Effective Are Monetary Incentives For Context Updating In Younger And Older Adults?

Hannah Schmitt, Saarland University, Germany

The goals of our studies were to examine age differences in separate components of context processing by means of an ERP approach and to investigate whether context processing can be promoted by motivational cues in younger and older adults. A modified AX Continuous-Performance-Task was conducted, suitable for determining neuronal correlates of context processing in Study 1, and including monetary incentive cues in Study 2. In this task, context updating on context-dependent trials was mandatory to correctly respond on a subsequent probe, while correct responses to probes on context-independent trials were independent of the context. Results of our studies indicated age differences in context updating at the behavioral level, that is, higher error rates and longer latencies on context-dependent than -independent trials in older than in younger adults. At the neuronal level, we found a larger P3b on context-dependent than –independent trials in younger adults, whereas older adults continuously updated context information, reflected in comparable P3b amplitudes on both trial types. Age-related differences in P3b amplitude and topography persisted, even if performance matched younger and older adults were compared, suggesting differences in context updating to be fundamental to cognitive aging. We also found age differences in the incentive manipulation: While younger adults showed faster responding after motivational cues, older adults showed longer latencies. Moreover, only younger adults showed a reduced P3b and a larger Contingent-Negative-Variation (CNV) after loss cues on context-dependent trials, indicating a compensational adaption of context processing during task preparation that was not applied by the elderly.

Biography

Hannah Schmitt graduated in Psychology from Saarland University in 2011. After her research stay at the University of Hull, Great Britain in 2011, she started her PhD within the "International Research Training Group" at Saarland University. Her research focus is on age-related differences in electro-physiological correlates of cognitive control and on motivational and emotional influences on cognitive control. She is also interested in cultural differences in approach and avoidance motivation.

S15 004: Reward motivation enhances coding of task-set information in frontoparietal cortex

Jo Etzel, Washington University, USA

A major function assumed to be mediated by the frontoparietal cognitive control network is the representation of task sets (or goals). The neural coding of task set information has typically been investigated by studies employing multi-tasking or task-switching paradigms. Prior studies have demonstrated that reward motivation may enhance task-switching performance, but the neural mechanisms of this effect are still unclear. Here we utilize multivariate pattern analysis (MVPA) methods in conjunction with fMRI to examine whether reward motivation modulates how task-sets are coded. Twenty participants took part in a two-session fMRI cued-task switching experiment, with the first session performed under baseline (no-reward) conditions, while in the second high-reward motivation trials (monetary bonuses for fast/accurate performance) were randomly intermixed with no-reward trials. Whole-brain searchlight analysis performed on the first session identified voxel clusters that reliably classified the to-be-performed task from cue-related activation. A cross-session validation analysis confirmed a set of regions within prefrontal and parietal components of the brain cognitive control networks that showed highly robust classification performance. A comparison of classifier performance on high-reward vs. no-reward trials revealed significantly more accurate task classification under high-reward conditions. Further, the enhanced behavioral performance under these conditions was found to be statistically mediated by the improvement in task-classification. Together, the results suggest that reward motivation might enhance task-switching performance by enabling more robust encoding and representation of task-set information within frontoparietal cortex. More broadly, they highlight the utility of reward motivation manipulations for understanding the nature of task representation in the human brain.

Biography

Jo Etzel completed a PhD in Bioinformatics and Computational Biology at Iowa State University (USA) with Julie Dickerson and Ralph Adolphs, then a postdoc under Christian Keysers at the Social Brain Lab, University Medical Center Groningen (The Netherlands). Since 2010 Jo has worked as a Research Analyst in the Psychology Department at Washington University in St. Louis (USA), primarily with the groups of Todd Braver, Jeff Zacks, and Deanna Barch. My research interests are focused on methodology, particularly multivariate analyses of fMRI data, but also nonparametric statistics and psychophysiological measures. Jo blogs about fMRI analysis at mvpa.blogspot.com.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S16: Brain Processes Associated With Cognitive Control

Diane M. Beck, University of Illinois at Urbana-Champaign, USA
Paul M. Corballis, University of Auckland, NZ
Chair & Speaker: **Gabriele Gratton**, University of Illinois at Urbana-Champaign, USA
Pauline Baniqued, University of Illinois at Urbana-Champaign, USA

Overview

This symposium will overview research on brain processes associated with cognitive control. The four talks will review different paradigms and methodologies related to cognitive control, and in particular the interactions between top-down control (supported in part by the dorsal attention network, DAN, and the cingulo-opercular network, CON) and the feed-forward analysis of incoming information. Dr. Diane Beck (University of Illinois) will consider how top-down and bottom up processes interact in forming our percepts, using fMRI, optical imaging, EEG, and trans-cranial magnetic stimulation. Dr. Paul Corballis (University of Auckland) will concentrate on on-line re-direction of attention studies using ERPs. Drs. Gabriele Gratton and Monica Fabiani (University of Illinois) will examine preparatory mechanisms controlling the input of information, making us of optical imaging and ERPS. Finally, Dr. William Gehring (University of Michigan) will discuss error processing during development of young children (relationship to executive function and motivation) and in pediatric anxiety disorders and autism, using ERPs and genetic data.

S16 001: The Role of Feedback in Visual Processing

Diane M. Beck, University of Illinois at Urbana-Champaign, USA

We use two masking paradigms that are thought to depend on feedback: metacontrast masking and object substitution masking (OSM). Both are examples of masking in which a mask reduces the visibility of an earlier target. Metacontrast masking occurs even when the target and mask are the only stimuli present, whereas OSM requires the presence of multiple potential targets. This difference suggests that the feedback mechanisms necessary to detect a target in OSM may overlap with those involved in attentional selection, whereas metacontrast masking is less dependent on attention. In line with this idea, we show that priming for a masked stimulus, which is thought to depend on attention, is obtained only during metacontrast masking and not during OSM or during metacontrast with multiple potential targets. These data support the idea that OSM interferes with attention-related feedback mechanisms, whereas metacontrast is less dependent on these particular feedback mechanisms. In a second experiment, we ask whether transcranial magnetic stimulation (TMS) can interfere with feedback and thus stimulus visibility. TMS over occipital lobe elicits phosphenes and shows a similar suppression of visibility as metacontrast masking. TMS over parietal cortex, however, shows no such reduction in visibility despite the fact that it produces similar phosphene experiences and has been shown to evoke activity in ventral visual areas. Together these data suggest that although parietal feedback and attention may impact visual awareness, they are not the only factors at play.

Biography

Diane Beck is an Associate Professor in the Department of Psychology and Neuroscience Program, and a full-time faculty member at the Beckman Institute for Advanced Science and Technology at the University of Illinois, Urbana-Champaign. Her main area of interest is visual cognition, attention and perception and she is particularly interested in the interactions between visual cortex and frontoparietal mechanisms. She and her laboratory use a variety of approaches and methods, including functional magnetic resonance imaging behavioral methods, eye-movement recordings, optical imaging and transcranial magnetic stimulation. Dr. Beck received her Ph.D. in Psychology from the University of California, Berkeley.

S16 002: Lateralisation of the Event-Related Brain Potential Reveals Neural Correlates of Attention, Distractor Suppression, and Visual Short-Term Memory

Paul M. Corballis, University of Auckland, NZ

Successful interaction with the visual environment requires the abilities to select relevant information in a rapid and flexible manner, to ignore or suppress stimuli that are irrelevant or distracting, and to retain relevant information over time in order to make appropriate responses. For the past several years my laboratory and collaborators have been investigating the mechanisms of visual information processing using a modified visual-search paradigm called "localised attentional interference" (LAI). By combining LAI and related paradigms with event-related brain potentials (ERPs) we have been able to isolate neural correlates of a variety of attentional processes, including the spatial biasing of attention, the discrimination of task-relevant targets, suppression of distractors, and the representation of visual information in short-term memory. Much of this program of research has focused on a series of lateralised ERP components – including the late directing-attention positivity (LDAP), N2pc, Ptc, contralateral delay activity (CDA) and sustained posterior contralateral negativity (SPCN) – as correlates of attentional selection, distractor suppression, and working-memory representation. Here, I will review the major findings from this research program, with particular focus on the interactions between top-down and bottom-up mechanisms in the representation and processing of visual information.

Biography

Paul Corballis is a native of Auckland, New Zealand, and attended the University of Auckland before moving to New York to undertake doctoral studies at Columbia University. He spent six years at the Center for Cognitive Neuroscience at Dartmouth College before taking a faculty position in the School of Psychology at the Georgia Institute of Technology in Atlanta. After 10 years in Georgia he returned to Auckland in 2011. He holds the rank of associate professor in the School of Psychology and is a principal investigator in the Auckland University Centre for Brain Research.

S16 003: Investigating Brain Networks In Task Preparation

Gabriele Gratton, University of Illinois at Urbana-Champaign, USA

Humans are extremely flexible in interpreting and responding to external events. This adaptation process can be investigated by using cues that inform the subject about which component of a complex upcoming stimulus they have to respond to. Electrophysiological and neuroimaging data show that this adaptive process involves activities which develop over time after the presentation of the cue. In my talk I will present data obtained with event-related brain potentials (ERPs) and the event-related optical signal (EROS) that provide a spatial-temporal description of these adaptive processes. The data come from a series of studies in which stimulus and response dimensions that have to be attended to are varied. They indicate that a particular brain network, the dorsal attention all network, DAN, is involved in all these conditions, starting at a latency of approximately 250-300 ms with activation in the left MFG, which then spread to regions around the intraparietal sulcus (IPS) at a latency of 400-500 ms. These same regions are involved in controlling posterior alpha rhythm, which is presumable involved in gating visual information input.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

Task-specific areas are also activated at longer latencies. Analyses of lagged cross-correlation between areas reveal that these activations are functionally linked. The activation pattern is conserved in older adults although it is influenced by changes in structural connectivity. The EROS data provide a strong link between the neuroimaging and ERP data. The data indicate that DAN plays a central role in controlling the allocation of attention in a variety of tasks and conditions.

Biography

Gabriele Gratton, M.D. (1980,Universita' di Roma La Sapienza), Ph.D. (Psychology, 1991, University of Illinois at Urbana-Champaign). Professor of Psychology, Neuroscience, and Bioengineering, University of Illinois at Urbana-Champaign). Selected Honors and Awards: President-Elect (2008-2009); President (2009-2010) and Past-President (2010-2011) of the Society for Psychophysiological Research (SPR); Fellow of the Association for Psychological Science (APS); Foundations of Augmented Cognition Award (DARPA, 2005), Provost Outstanding Junior Faculty Research Award (University of Missouri, 2000), Distinguished Scientific Award for Early Career Contribution to Psychophysiology (SPR, 1997).

S16 004: A Functional and Structural Network View of Task-Switching Dynamics in Ageing

Pauline Baniqued, University of Illinois at Urbana-Champaign, USA

Control demanding situations such as switching between tasks or strategies rely on communication among regions of the frontoparietal network, areas which undergo significant age-related decline. We integrate data from brain anatomy, event-related potentials (ERPs), and event-related optical signals (EROS) to better characterize the preparatory dynamics of attentional control. We analyze interactions between frontoparietal control regions and task-specific regions using lagged cross-correlations that not only show synchronous activity between brain regions, but importantly, how these functional interactions evolve over time. We find that connectivity between frontal control and sensorimotor regions is critical to controlling attention; results show distinct frontal-dependent networks based on task demands, with activity in frontal cortex predicting downregulation in task-irrelevant sensorimotor areas, followed by upregulation in task-relevant regions. New findings in older adults underscore the synergistic effect of white matter structure and functional network interactions: the degree to which older participants overcame the cost of switching and activated task-relevant processes was predicted by corpus callosum volume, the main connection between the frontal cortices. Our results suggest that structural disconnection and thus weaker interactive control dynamics lead to sub-optimal preparation strategies, but also that interventions that target the health of frontoparietal regions such as the corpus callosum may attenuate age-related cognitive decline.

Biography

Pauline Baniqued received her M.A. in Psychology (Cognitive Neuroscience) from the University of Illinois at Urbana-Champaign in 2012, and her B.A. in Cognitive Science from the University of Pennsylvania in 2008. She is currently a Ph.D. candidate at the University of Illinois at Urbana-Champaign. Her research interests are in understanding the neurocognitive mechanisms of executive control, and how these control processes change with age, training and intervention. She uses converging methods of structural and functional magnetic resonance imaging (MRI), event-related brain potentials (ERPs), and optical imaging (EROS) to study the dynamics of these processes.

S17: Sensorimotor Foundations Of Understanding And Interacting With Others

Paola Sessa, University of Padova, Italy
Pascal Molenberghs, The University of Queensland, Australia
Chair & Speaker: Emily Cross, Bangor University, UK
Ross Cunnington, The University of Queensland, Australia

Overview

As humans, we have a remarkable ability to make sense of other people's behaviour by observing their actions. A rich literature within cognitive and social neurosciences provides evidence for a so-called mirror system, comprising brain regions that respond similarly when performing or observing actions. It has been argued that the mirror system critically supports our ability to interact with others in a social world. This symposium presents the state of the art of sensorimotor foundations of social perception from neuroscientific perspectives, with a focus on basic mechanisms that link action perception (Molenberghs), and how social information modulates this link (Cross, Cunnington & Sessa). Sessa presents EEG work on how empathy for pain encompasses dissociable sensorimotor/affective and mentalizing components and on how these empathic components exhibit both contextual and interindividual variance. Molenberghs discusses metaanalytical work calling into question the involvement of a putative mirror system region, BA44, in action execution and perception tasks. Cross shows how information concerning whether an observed agent is animate impacts perception and interaction with that agent, and finally Cunnington explores how an observer's race or group membership influences how they perceive another agent's pain.

S17 001: Dissociable routes to empathy for pain and variance in empathic processes

Paola Sessa, University of Padova, Italy

Empathy is a basilar form of communication between individuals, acting as a powerful social binding agent. This capacity is deep-rooted in the human brain allowing an individual to rapidly share both affective and sensorimotor facets of other people's internal states (experience sharing) and to explicitly consider/understand their states (mentalizing). Although extant evidence strongly suggests that these empathic components are anatomically dissociable, it is still unclear whether they are also functionally and temporally dissociable and selectively sensitive to certain social cues. In a set of EEG experiments we examined these issues in the context of empathy for others' pain. In the first study both sensorimotor and contextual cues of others' pain were orthogonally manipulated. Results showed that experience sharing and mentalizing are two functionally and temporally dissociable mechanisms. Building on this evidence, in separate experiments we explored how other's race and perceived trustworthiness modulate these empathic components. Results further supported a functional, neural, and temporal distinction between two sequential processing stages underlying empathy, namely, a race-biased stage of experience sharing followed by a race-unbiased stage of cognitive evaluation of pain (mentalizing); on the other hand, perceived trustworthiness shaped both empathic components, such that individuals looking trustworthy induced in the observers magnified neural empathic responses at both processing stages.

S17: Sensorimotor Foundations Of Understanding And Interacting With Others cont'd

Biography

Paola Sessa obtained her PhD in 2005 at the University of Padova and much of her initial research was on basic attentional and visual working memory processes. Since 2008, she is a lecturer at the University of Padova. She co-directs the Electroencephalography Laboratory and is a member of the Cognitive Neuroscience Center (CNC) of the same University. Her research mostly focuses on using EEG/ERP to study how social cues conveyed by human faces, such as emotional expressions, group membership and perceived trustworthiness shape both low-level processes (resolution of faces' representations in visual working memory) and empathy towards others' emotional states.

S17 002: Is The Human Mirror System Located Within Broca's Area? A Selective Meta-Analysis Of fMRI Studies Of Action Observation And Execution

Pascal Molenberghs, The University of Queensland, Australia

Mirror neurons are active when an animal executes an action or observes a similar action. Mirror neurons were first found in macaques, in area F5 and later in area PF. It is now widely believed that mirror neurons also exist within the human homologues of these areas, namely Broca's area (Brodmann areas 44 and 45) and the rostral part of the inferior parietal lobule, respectively. The suggested occurrence of mirror neurons in Broca's area is central to the hypothesis that the mirror system might have played a key role in the evolution of language in humans. Here I sought to determine, based on published fMRI studies of the human mirror system, whether Broca's area is reliably activated during action observation and execution. I employed activation likelihood estimation (ALE) on data from all published fMRI studies that included both an action observation condition and an action execution condition. Within frontal cortex, areas showing mirror-like activation were located within the ventral and dorsal premotor region rather than Broca's area. I also found that within parietal cortex, regions showing mirror activity extended beyond the rostral inferior parietal lobule into the superior parietal lobule. To the extent that existing fMRI investigations of action observation and execution reflect activity in mirror neurons, these findings call into question the notion that Broca's area is a key node within the human mirroring network. The findings also have important implications for the manner in which regions of interest are chosen in human imaging studies of mirror activity.

Biography

Pascal Molenberghs obtained his PhD in 2009 from the University of Leuven where he investigated attentional processes in healthy volunteers and stroke patients using fMRI and lesion mapping. After his PhD he moved to the University of Queensland as a Postdoctoral researcher, studying the links between action perception and execution using fMRI and meta-analyses. Since 2011, he is a Research Fellow in the School of Psychology and his research focus at the moment is on action perception, spatial neglect and social cognition. He uses fMRI, activation likelihood estimation (ALE) meta-analyses and neuropsychological testing in stroke patients to investigate these topics.

S17 003: The Impact Of Social Information On How We Perceive And Interact With Other Agents

Emily Cross, Bangor University, UK

Humans automatically imitate other people's actions during social interactions, building rapport and social closeness in the process. While the behavioural consequences and neural correlates of imitation have been studied extensively, little is known about the neural mechanisms that control imitative tendencies. For example, the degree to which an agent is perceived as human-like influences automatic imitation, but it is not known how animacy perception influences brain circuits that control imitation. In the current fMRI study, we examined how perception and belief of animacy influence the control of automatic imitation. Using an imitation-inhibition paradigm, which involves suppressing the tendency to imitate an observed action, we manipulated both bottom-up (visual input) and top-down (belief) cues to animacy. Results show divergent patterns of behavioural and neural responses. Behavioural analyses show that automatic imitation is equivalent when one or both cues to animacy are present, but reduces when both are absent. By contrast, right temporoparietal junction (rTPJ) showed sensitivity to the presence of both animacy cues. We demonstrate that rTPJ is biologically tuned to control imitative tendencies when the observed agent both looks like and is believed to be human. This suggest that rTPJ may be involved in a specialised capacity to control automatic imitation of human agents, rather than a universal process of conflict management, which would be more consistent with generalist theories of imitative control. Evidence for specialised neural circuitry that "controls" imitation offers new insight into developmental disorders that involve atypical processing of social information, such as autism spectrum disorders.

Biography

Emily Cross is a senior lecturer and co-director of the Social Brain in Action Laboratory, based jointly in Wales and the Netherlands. Since completing her PhD in 2008 at Dartmouth College, her primary research questions address how experience shapes perception and the neural foundations of action expertise. To investigate these questions, and she uses neuroimaging, neurostimulation and behavioural training approaches, often with complex action paradigms involving dance, gymnastics or contortion. Her work is currently funded by the Dutch Science Foundation, the Economic and Social Research Council, the Ministry of Defense, and the European Commission.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S17 004: Racial Bias In Neural Empathy To Observed Pain

Ross Cunnington, The University of Queensland, Australia

Brain regions representing the first-hand experience of pain also respond to seeing another person in pain. Previous studies have shown that race modulates this empathic response in the brain, such that activation is much greater when we observe pain in people of our own race than people of a different race. Across several studies, we have examined whether this racial bias in neural empathy is fixed or whether it can be changed through experience with other races or by other learnt group associations. We have used fMRI to examine neural empathic responses in Chinese students living in Australia and in Australian Caucasian students when observing painful versus non-painful touch to either Chinese or Caucasian actors. We have also used a minimal group paradigm, randomly allocating participants to one of two mixed-race teams, to examine whether meaningless group association can influence racial biases in neural empathy to pain. Overall, we consistently find activation the anterior cingulate and anterior insula cortex when observing painful versus non-painful touch that is significantly greater when observing pain in same-race than other-race actors. Crucially, however, this racial bias in neural empathy is strongly correlated with the level of daily contact participants report with the other race, with greater empathic responses in the anterior cingulate in those participants who report more daily contact with people of the other race. We therefore suggest that the racial bias in neural empathy to observed pain of others is malleable and is reduced by contact with other races.

Biography

Ross Cunnington is a Principal Research Fellow at the Queensland Brain Institute and Director of the UQ Centre for Perception and Cognitive Neuroscience, University of Queensland, Brisbane. His research focuses on understanding the neural processes crucial for planning and representing actions prior to initiation, and for perceiving and understanding the actions of others, using brain imaging methods of fMRI, EEG, and MEG. He has published over 80 journal articles and regularly presents keynote lectures and public talks on the readiness for action and free-will, the human mirror system, and empathy.

S18: Mechanisms Of Cognitive Decline In Normal Aging

Axel Mecklinger, Saarland University, Germany
Chair & Speaker: Shulan Hsieh, National Cheng Kung University, Taiwan
Michael D. Rugg, University of Texas at Dallas, USA
K. Richard Ridderinkhof, University of Amsterdam, Netherlands

Overview

Cognitive decline is generally accepted as a normal part of aging. Despite extensive research, the underlying mechanisms have yet to be determined. Yet this is an essential step in designing effective intervention programs to reduce the incidence or slow the progress of age-related cognitive decline. This symposium examines key mechanisms involved in cognitive performance changes in normal aging. Axel Mecklinger shows that poor recollection is central to age-related decline in associative memory and presents ERP evidence for recruitment of compensatory perceptual processes in poor performers. Shulan Hsieh shows that the age-related decline in interference control can be mitigated by recruitment of compensatory processes under high task load. Michael Rugg presents evidence that age-related decline in episodic memory performance is largely a consequence of the efficacy with which information is initially encoded. Finally, Richard Ridderinkhof discusses recent research showing that older adults rely more heavily on S-R habit learning at the expense of flexible, goal-directed action.

S18 001: Differential Effects Of Aging On Recollection And Familiarity: An ERP Study

Axel Mecklinger, Saarland University, Germany

It has been argued that poor recollection is a key aspect of the associative memory deficit in old adults whereas preserved familiarity can still support memory for individual items. In the present event-related potential (ERP) study, we explored the effects of aging on recollection and familiarity in a recognition memory task with speeded and non-speeded response requirements. We assumed that a speeded response condition should reduce the availability of recollection so that memory performance should be less affected by aging in this condition as compared to the non-speeded condition. Consistent with this prediction memory performance was better for young than for older adults in the non-speeded condition whereas memory in the speeded version was relatively unaffected by aging. In showing an attenuated ERP correlate of recollection in older adults in the non-speeded condition and highly similar ERP measures of familiarity across age groups and response conditions, the ERP data confirm and extend the behavioral findings. Furthermore and consistent with the view that older adults rely more on literal perceptual information when giving recognition judgments there was a sustained bilateral negativity at posterior recording sites in the older adults' ERPs in the speeded response condition. This negativity was larger for low than high performing participants in line with the possibility that it reflects processes engaged to compensate for declined memory performance in old age.

S18: Mechanisms Of Cognitive Decline In Normal Aging cont'd

Biography

Axel Mecklinger is currently a Full Professor for Neuropsychology at Saarland University in Saarbrücken and Speaker of the International Research Training Group "Adaptive minds". Prior to this he worked as a Senior Research Scientist at the Max-Planck-Institute for Human Cognitive and Brain Sciences in Leipzig. In 1999 he received the Distinguished Scientific Award for Early Career Contributions to Psychophysiology from the Society for Psychophysiological Research. His research interests are the Cognitive Neuroscience of Learning, Memory and Cognitive Control.

S18 002: The Boundary Condition For Compensatory Responses By The Elderly In A Flanker-Task Paradigm

Shulan Hsieh, National Cheng Kung University, Taiwan

The goals of this study were to determine whether there is an age-related flanker effect, whether elderly adults produce compensatory responses to overcome their deficiencies, and the extent to which any compensatory responses vary depending on the degree of task demands. To achieve these goals, we manipulated three different degrees of task demands in cognitive control in a flanker-task paradigm. Throughout the three experiments, we observed an increased flanker effect on behavioral measures exhibited by elderly adults compared with young adults, but only when task demand was low. Conversely, when task demand was increased, then there was no longer an increased flanker effect for elderly adults, but instead several compensatory responses could be evident on some event-related potential components. The current results thus suggest that elderly adults could be as capable as young adults in inhibiting flanker influence by means of compensatory responses, but when task demand was high.

Biography

Prof. Hsieh is affiliated as a distinguished professor with National Cheng Kung University in Tainan, Taiwan. Prof. Hsieh has been doing research to understand the relationship between brain and behavior, in particular about the brain substrates of the higher cognitive control functions (e.g., task switching, multi-tasking behavior, error-monitoring, and inhibition) by means of the electrophysiological approach. In more recent years, Prof. Hsieh has also devoted to researching emotion, cognitive aging, and developing some intervention programs to prevent cognitive aging.

S18 003: The Effects Of Age On Episodic Memory - What Stays Up And What Goes Down?

Michael D. Rugg, University of Texas at Dallas, USA

As a group, healthy people in their 60s and 70s are outperformed by people in their 20s on tests that depend on episodic memory. In this presentation, the results of ERP and fMRI studies, including a study employing a large sample of people in middle age, will be described. Together, the studies permit evaluation of the association between memory performance and neural correlates of episodic encoding, retrieval, and the monitoring and evaluation of retrieved information. Variance in memory performance at all ages is independently predicted by variance in the neural activity associated with each of these mnemonic operations. Age-related decline in performance is predicted mainly by differences in the efficacy with which information is initially encoded into memory.

Biography

Dr Rugg is a leading expert in cognitive neuroscience and human. His current work is aimed at understanding how age-related changes in the brain's structure and function affect cognitive abilities, both in healthy people and those with age-related diseases such as Alzheimer's. Dr. Rugg is a fellow of the American Association for the Advancement of Science and the Association for Psychological Science. He was awarded the Henri Hecaen Award for contributions to neuropsychology in 1989 and was elected a Fellow of the Royal Society of Edinburgh—one of the world's oldest scientific societies—in 1996. He is currently editor-in-chief of the international journal Neuropsychologia. He received his bachelor's and doctoral degrees in psychology from the University of Leicester in the United Kingdom and went on to professorships at the University of St. Andrews in Scotland and University College London. He joined the University of California, Irvine in 2003, where he served as the director of the Center for Neurobiology and Learning and Memory. In 2011, he joined UT Dallas as the Distinguished Chair in Behavioral and Brain Sciences and co-director of the Center for Vital Longevity.

S18 004: Effects of Age on the Balance Between Habitual and Goal-Directed Action

K. Richard Ridderinkhof, University of Amsterdam, Netherlands

Instrumental learning is supported by dissociable goal-directed and habitual systems. Although the balance between these systems has not been investigated in healthy aging, previous research suggests that aging affects controlled, effortful, conscious processing, while there is less evidence for impaired skill learning based on stimulus-response (S-R) mappings. In order to investigate directly the effect of healthy aging on the dual-system balance, we compared performance of young and older adults on an instrumental learning task in which devaluation of action outcomes affects goal-directed but not habitual action. Older adults display over-reliance on S-R habit learning at the expense of flexible, goal-directed action. These findings are novel but consistent with previous research and will be discussed in relation to changes in frontostriatal circuitry, and in relation to other recent findings from our lab on aging and association learning.

Biography

Richard Ridderinkhof is a Full Professor in Neurocognitive Development and Aging at this University of Amsterdam. He heads Amsterdam Center for the study of Adaptive Control in brain and behavior (Acacia), which focuses on the development of adaptive control processes. He has published over 150 papers in high impact peer-reviewed journals, with his 2004 Science publication receiving over 1300 citations.

ORAL PRESENTATION
ABSTRACTS

OP3: Language

Daniela Sammler, Max Planck Institute for Human Cognitive and Brain Sciences, Germany
Fahimeh Darki, Karolinska Institute, Sweden
Ghislaine Dehaene-Lambertz, INSERM U992, France
Julie Tremblay, Ste-Justine Hospital Research Center, Canada

OP3 001: Ventral and Dorsal Pathways for Prosodic Intentions

Daniela Sammler, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Prosody – on top of its linguistic and emotional roles – serves an interpersonal function in speech: to convey the speaker's communicative intentions. Research on the neural bases of prosodic intentions requires a fusion of the fields of neurolinguistics and social neurosciences. The present data outline (i) a right-hemispheric dual-stream account of prosodic comprehension, in analogy to prevailing dual-stream models of language comprehension in the left hemisphere;; and (ii) motor simulation in the dorsal stream as a conceptual interface between prosodic comprehension and the decoding of the speaker's stimulus-linked intentions. In two separate functional/diffusion magnetic resonance imaging (MRI) and transcranial magnetic stimulation (TMS) experiments, participants categorized the prosodic intention ("naming" vs "asking";; experimental task) or the word-initial consonant (/bear/ or /pear/;; control task) of single word utterances that varied along a pitch contour (falling to rising) or phoneme continuum (/b/ to /p/). The prosody task (vs control) activated (i) right posterior and anterior superior temporal sulcus (p/aSTS) connected via the middle longitudinal fasciculus (ventral pathway), and (ii) right pSTS and laryngeal premotor cortex (PMC) connected via the arcuate fasciculus (dorsal pathway). (iii) Functional relevance of the dorsal pathway was demonstrated by reduced performance in the prosody (but not control) task after TMS-induced inhibition of right PMC. These data draw a dual-stream picture of prosodic comprehension built on complementary mechanisms: A ventral WHAT pathway to map vocal pitch patterns to meaning by evaluating auditory features, and a dorsal HOW pathway to recognize a speaker's vocal action by covertly mapping the perceived pitch contour to laryngeal gestures. Following motor simulation accounts of social cognition, this latter mechanism may ground the understanding of the speaker's (low-level) intention conveyed by speech prosody.

OP3 002: DCDC2 Polymorphism Is Associated With Cortical Thickness In Left Supramarginal And Angular Gyri

Fahimeh Darki, Karolinska Institute, Sweden

Background Three genes, DYX1C1, DCDC2 and KIAA0319 have been repeatedly associated with dyslexia, neuronal migration and cilia function. Three polymorphisms within these genes, rs3743204 (DYX1C1), rs793842 (DCDC2) and rs6935076 (KIAA0319) have also been linked to normal variability of left temporo-parietal white matter volume connecting the middle temporal cortex to the angular and supramarginal gyri. Here, we assessed whether these polymorphisms are also related to the variability of cortical thickness in the parietal and temporal associated regions during childhood development. Methods Brain measures and behavioral scores were assessed using a longitudinal dataset of 76 randomly selected children and young adults (aged between 6 to 25 years) who were scanned up to 3 times, each 2 years apart. Cortical regions of interest were defined based on the fiber tracking of white matter regions previously associated with the three polymorphisms. Homologous regions in the right hemisphere were also included. Results Analyses confirmed the association of all polymorphisms to white matter volume connecting the inferior parietal and middle temporal lobes. Out of the 3 SNPs, rs793842 in DCDC2 was also significantly associated with cortical thickness of the left angular ($p = 0.008$) and supramarginal gyri ($p = 2.68\times10\text{-}4$). The cortex was significantly thicker for T-allele carriers, who also had lower white matter volume. Rs793842 was the only polymorphism that showed significant association with reading comprehension scores ($p = 0.014$), with lower reading scores identified amongst T-allele carriers. Conclusion These results show how normal variability in reading comprehension is related to genes, white matter volume and cortical thickness in the inferior parietal lobe. Possibly, the variability of gray and white matter structures could both be related to the role of DCDC2 in cilia function and neuronal migration.

ORAL PRESENTATION
ABSTRACTS

OP3: Language cont'd

OP3 003: Electrophysiological Evidence Of Statistical Learning In Preverbal Infants

Ghislaine Dehaene-Lambertz, INSERM U992, France

Statistical learning is a powerful implicit learning mechanism that infants can use to perform complex computations of co- occurrences among adjacent or more distant elements. We investigated infants' ability to extract the underlying structure of a continuous speech stream using electroencephalography. We also explored the interplay between experience and maturation, comparing 8-months-old full-term with preterm infants matched by maturational age or duration of exposure to speech. First, during a training session, infants were exposed to a 2 minutes synthesized speech stream comprising nine AxC words (3 families with 3 words), randomly presented separated by a subliminal 25ms pause. Then, during the subsequent test session, infants were presented with either "rule-words", which did not appear during training, but followed the AxC training rule, or "part-words" (xCA), that appeared in the stream, but violated the rule. Using a frequency tagging approach to analyze the training, we found a significant phase-locking at the syllables frequency but also at the word frequencies relative to surrogate data. It suggests that infants were indeed segmenting the stream in words. Rule learning was confirmed by the significantly different responses to rule- words and part-words during the test at 400-700ms and 1200-1600 ms post word-onset. These results observed in each of the 3 groups suggest that as soon as 6 months of maturational age and/or 8 months of exposure to speech, infants can compute long distance dependencies in speech and generalize them to new tokens.

OP3 004: Functional Near Infrared Spectroscopy (fNIRS) To Investigate Language Patterns Development Over Ages

Julie Tremblay, Ste-Justine Hospital Research Center, Canada

Neuroimaging techniques such as fMRI have been the object of many studies aiming to localise language areas and find a replacement for the amobarbital procedure. Although good results have been obtained in adults, fMRI is not always conclusive in children, mainly because fMRI scanner is a stressful environment for young children and it is difficult to verify if they perform the task correctly. Functional near infrared spectroscopy (fNIRS) seems to be a good alternative to investigate language, especially in paediatric populations. We recorded fNIRS data during a verbal fluency task performed aloud by 41 individuals. Participants were divided in 4 groups: 1 – younger children (3-6 years (n=10)), 2- older children (7-10 years (n=10)), adolescents (11-16 years (n=12)) and adults (18 years + (n=9)). A method to detect and correct abrupt variations due to movement artefact developed by our group has been applied on individual data. Then, modified Beer Lambert Law was applied to estimate variations in HbO2 and HbR concentrations. For all groups an increase in HbO2 concentration was seen during the language task in Broca's area along with a weaker activation in the homologous area. The effect of age on hemodynamic response was further assessed using a mixed design ANOVA with Hemisphere as a within-subject factor and age groups as the between- subject factor. Results revealed a significant main effects for factors Group ($F(3, 37) = 5.42$, $p < 0.05$) indicating an increase of amplitude with age and a main effect for hemisphere ($F(1, 37) = 35.63$, $p < 0.001$) indicating a higher HbO2 concentration in the left hemisphere than in the right hemisphere in all groups. fNIRS is a good technique to investigate language dominance in participants from as young as 3 years old. Finally, our results suggest that our movement artefact rejection and correction tool increases significantly the NIRS data quality especially in young participants.

OP4: Sensation & Perception

Auréliane Pajani, Laboratory of Cognitive Sciences and Psycholinguists, France
Simon van Gaal, University of Amsterdam, Netherlands
Thomas Carlson, Macquarie University, Australia
Oliver Baumann, The University of Queensland, Australia

OP4 001: Hallucinated And Correctly Detected Stimuli Evoke Similar Activity Patterns In Early Visual Cortex

Auréliane Pajani, Laboratory of Cognitive Sciences and Psycholinguists, France

When you are trying to detect a faint stimulus in noisy background, you can correctly detect it when it is there ('Hit') and correctly report its absence when it is not there ('Correct Rejection', CR), but you can sometimes miss the stimulus when it is there ('Miss'), and sometimes report seeing it even though it is not there ('False Alarms', FAs). Previous research has shown that during a challenging contrast-detection task, Hits and FAs elicited greater activity in early visual cortex than Misses and CRs (Ress & Heeger, Nature Neuroscience, 2003). This suggests that the activity in early sensory cortices correlates more strongly with subjects' percepts than with the physically presented stimulus. However, it is unclear whether this activity is stimulus-specific, or if it reflects a non-specific arousal response. Here, we investigated the representational content of neural activity in visual cortex during FAs in a challenging detection task, using functional magnetic resonance imaging (fMRI). Subjects had to detect a low- contrast gabor at detection threshold, embedded in Gaussian white noise. Crucially, the experiment was organised in blocks: when present, gabors always had the same orientation within one block (either 45° or 135°), which is the orientation that we assume subjects see when incorrectly reporting a gabor. Our results show that FAs are associated with a feature-specific pattern of activity in early visual cortex similar to that observed during Hits, which is not observed during CRs. Hallucinated stimuli are hence represented in early visual cortices through activity patterns that resemble those evoked by actual stimuli. This supports the view that false alarms arise at the perceptual level, as a result of erroneous sensory inference driven by predictions.

OP4 002: Qualitatively Different Neural Mechanisms For Conscious And Subliminal Multiple Word Integration

Simon van Gaal, University of Amsterdam, Netherlands

Although great progress has been made in characterizing the flow of information triggered by a single unconscious visual stimulus, whether and how multiple sources of unconscious information can be integrated is strongly debated. Influential models suggest that consciousness is required for multiple-step rule-based algorithms, for example in doing mental arithmetic or performing grammatical language operations. Here we tested this hypothesis and explored whether language circuits can process simple grammatical constructions unconsciously, and integrate the meaning of several unseen words. Using behavioral priming and electroencephalography (EEG), we studied a specific rule-based linguistic operation traditionally thought to require conscious cognitive control: the negation of valence.

ORAL PRESENTATION
ABSTRACTS

Two subliminal/visible words were successively (Exp. 1) or simultaneously presented (Exp. 2), a modifier ("not"/"very") and an adjective (e.g., "good"/"bad"), followed by a visible target noun (e.g., "peace"/"murder") that required a response. The combination of these three words could either be contextually consistent (e.g., "very bad - murder") or inconsistent (e.g., "not bad - murder"). EEG recordings revealed that grammatical negations could unfold partly unconsciously, as reflected in similar occipito-parietal N400 effects for conscious and unconscious three-word sequences forming inconsistent combinations. However, only conscious word sequences elicited P600 effects, later in time. Overall, these results suggest that multiple unconscious words can be rapidly integrated and that an unconscious negation can automatically "flip the sign" of an unconscious adjective. However, they also highlight that consciousness modulates the grammatical integration of multiple words. We speculate that the time-consuming re-analysis of the preceding word sequence, which relies on active working memory mechanisms and is reflected in the P600, might require conscious awareness.

OP4 003: The Emerging Perceptual Representation Of Faces Decoded From Human Neuromagnetic Recordings

Thomas Carlson, Macquarie University, Australia

As highly social creatures, face perception is essential to daily human life. From the moment we turn our gaze to an individual, our brain begins to form a perceptual representation of the individual's face to promote recognition and ultimately guide our social interactions. In the present study we used a generative model of face perception, human behaviour, and a magnetoencephalography (MEG) decoding approach to study when and how the brain constructs a perceptual representation of a face. We first generated 18 individual face exemplars using a generative model of face perception that encodes faces using a range of metric features, e.g. eye width. In a behavioural experiment, we then measured the human capacity to discriminate faces for all possible pairwise comparisons between face exemplars. The behavioural data was then used to estimate a perceptual geometry of the face stimuli, which is described quantitatively in a dissimilarity matrix (DSM). Next, in a MEG experiment, we used a sliding window decoding approach to measure the neural discriminability between the face stimuli as a function of time (100Hz temporal resolution). The decoding analysis produced a set of time varying DSMs, which describe the brain's emerging representational geometry of the stimuli. To determine when the brain forms a perceptual representation of a face, we compared the perceptual geometry (from behaviour) to the time varying representational geometry of the stimuli in the brain.

Our analysis found a significant correspondence between perception and the brain's representation 80ms after stimulus onset that peaked at 100ms. Our results show that the brain rapidly constructs a perceptual representation of a face;; and the extremely short latency further suggests this representation is constructed using feed forward mechanisms. This early (fast) representation might underlie our capacity to rapidly recognize individuals and their emotional state, and to guide social interactions.

OP4 004: Effects Of Attention And Perceptual Uncertainty On Cerebellar Activity During Visual Motion Perception

Oliver Baumann, The University of Queensland, Australia

Recent research suggests that the cerebellum plays an important role in the processing of visual motion, but the nature of its contribution is unknown. Some studies point to a role in discriminating motion signals under conditions of high perceptual uncertainty. Others suggest that it might facilitate motion perception by aiding attentive tracking of visual objects. We aimed to determine the degree to which cerebellar activity during visual motion perception can be explained by a role in aiding attentive tracking of visual motion, in contrast to a role in facilitating visual motion discrimination under levels of high perceptual uncertainty. Using functional magnetic resonance imaging, we monitored neural activity in the cerebellum while 18 participants engaged in a task, which required them to identify and covertly monitor a directional visual motion signal in noise. The stimuli were random-dot arrays containing a central stationary fixation spot whose colour alternated periodically. While holding the visual displays constant, we manipulated attention by having participants attend covertly to the dot motion or the coloured spot at fixation. Perceptual uncertainty was manipulated by varying the percentage of coherently moving dots contained within the random-dot arrays. Image processing and statistical analyses were performed using SPM8, at a significance-threshold of p=0.05 (FWE-corrected). We found that attention to motion under high perceptual uncertainty was associated with activity in two left hemispheric cerebellar clusters. The first was located at the border between lobules VI and crus I. The second cluster was located at the border between lobules crus II and VIIB. Our results support the notion that the cerebellum facilitates the detection and discrimination of moving objects under conditions of high perceptual uncertainty, but are inconsistent with the idea that the cerebellum is crucial for sustained attentive tracking of salient motion stimuli.

POSTER SESSION 3

TOPICS IN THIS POSTER SESSION ARE:

TOPIC	CODE
Cognition and Executive Processes	WCE
Emotion and Social Processes	WES
Memory and Learning	WML
Methods Development	WME
Motor Behaviour	WMO
Sensation & Perception	WPE

Cognition & Executive Processes

WCE001: Cross-Sectional Variation in Cognitive Skills Achievement: A Gender Gap Analysis

Presented by: Afiza Akashah John, University of Malaya, Malaysia

Authors: Afiza Akashah John, Siti Nurani Mohamed Nor

WCE002: Individual Differences In Salience And Executive-Control Networks

Presented by: Jaime Rennie, University of Newcastle, Australia

Authors: Jaime Rennie, Patrick Cooper, Renate Thienel, Frini Karayanidis

WCE003: Double Dissociation In The Roles Of The Left And Right Prefrontal Cortices In Anticipatory Regulation Of Action

Presented by: Stephanie Ries, University of California, Berkeley, USA

Authors: Stephanie Ries, Ian Greenhouse, Nina F. Dronkers, Kathleen Y. Haaland, Robert T. Knight

WCE004: The Effects Of Early Onset Type 1 Diabetes On The Young Adult Brain: A Voxel-Based Morphometry Study

Presented by: Gareth Roberts, Murdoch University, Australia

Authors: Gareth Roberts, Mike Anderson, Timothy Jones, Elizabeth Davis, Trang Ly

WCE005: Music Training, Executive Functions and the P3a Response: Training-Related Changes in Performance and Neural Correlates

Presented by: Katri Saarikivi, University of Helsinki, Finland

Authors: Katri Saarikivi, Vesa Putkinen, Mari Tervaniemi, Minna Huotilainen

WCE007: Mismatch Negativity in Autism Spectrum Disorder

Presented by: Ulrich Schall, University of Newcastle, Australia

Authors: Ulrich Schall, Benjamin Weismueller, Renate Thienel, Anne-Marie Youlden, Ross Fulham

WCE008: Early Post-Stroke Measures Of Slowed Frontal Lobe Activity Can Help Predict Cognitive Outcomes

Presented by: Emma Schleiger, The University of Queensland, Australia

Authors: Emma Schleiger, Nabeel Sheikh, Tennille Rowland, Andrew Wong, Stephen Read, Simon Finnigan

WCE009: A Man vs Machine Shootout Duel: Do We Have Control Over Our Intention-Predictive Brain Signals? In A Real-Time Duelling Game Subjects Try To Execute Self-Initiated Movements Before Being Predicted And Interrupted By An EEG-Based Brain-Computer Interface

Presented by: Matthias Schultze-Kraft, Berlin Institute of Technology, Germany

Authors: Matthias Schultze-Kraft, Daniel Birman, Marco Rusconi, Sven Daehne, Benjamin Blankertz, John-Dylan Haynes

WCE011: Changes Of Single Word-Induced Cerebral Oxy-Hb Using Japanese And English Shiritori In Schizophrenia: Comparison With Healthy Subjects

Presented by: Yoshihisa Shoji, Kurume University, School of Medicine, Japan

Authors: Yoshihisa Shoji, Kiichiro Morita, Ryo Fujiki, Youhei Ishii, Mamoru Satou, Yuusuke Katou, keiichiro Mori, Naohisa Uchimura

WCE012: Single Word-Related Changes In Cerebral Oxy-Hb During Discrimination Task In Schizophrenic Patients: Comparison With Healthy Subjects

Presented by: Mamoru Satou, Kurume University, School of Medicine, Japan

Authors: Mamoru Satou, Kiichiro Morita, Yoshihisa Shoji, Ryo Fujiki, Yuusuke Katou, Hiroyuki Yamashita, Keiichiro Mori, Youhei Ishii, Naohisa Uchimura

WCE013: Anticipatory Processes In Brain State Switching – Implicating Default Mode And Salience Networks

Presented by: Justina Sidlauskaite, Ghent University, Belgium

Authors: Justina Sidlauskaite, Jan R. Wiersema, Herbert Roeyers, Ruth M. Krebs, Eliana Vassena, Wim Fias, Marcel Brass, Eric Achten, Edmund Sonuga-Barke, Edmund Sonuga-Barke

WCE014: Reactive Inhibitory Control Is Reduced In Older Adults: A Behavioural And Electroencephalographic Study

Presented by: Paul Sowman, Macquarie University, Australia

Author: Paul Sowman

WCE015: Manipulating Item Proportion And Deception Reveals Crucial Dissociation Between Behavioral, Autonomic And Neural Indices Of Concealed Information

Presented by: Kristina Suchotzki, Ghent University, Belgium

Authors: Kristina Suchotzki, Bruno Verschuere, Judith Peth, Geert Crombez, Matthias Gamer

POSTER SESSION 3

WCE016: The Value Of Steady State Models Of Cognition-Emotion
Presented by: Kelly Trezise, University of Melbourne, Australia
Authors: Kelly Trezise, Robert Reeve

WCE017: Brain DC Potential Changes Associated with Meditation Techniques of Concentration and Mindfulness
Presented by: Michael Trimmel, Medical University of Vienna, Austria
Authors: Michael Trimmel, Christina Pieringer, Karin Trimmel

WCE018: Hypoactive Error-Related Activity Associated With Failure To Learn From Errors In Substance Dependent Individuals
Presented by: Daniel Upton, University of Melbourne, Australia
Authors: Daniel Upton, David O'Connor, Kathleen Charles-Walsh, Sarah Rossiter, Jennifer Moore, Robert Hester

WCE019: Noradrenaline And Dopamine Neurons Integrate Reward Value And Effort Cost: A Direct Electrophysiological Comparison In Behaving Monkeys
Presented by: Chiara Varazzani, ICM - Brain & Spine Institute, France
Authors: Chiara Varazzani, Aurore San-Galli, Sebatien Bouret

WCE020: Differential Activation Patterns During Visual And Spatial Working Memory In Children With ADHD, Dysthymic Disorder And Typically Developing Children
Presented by: Veronika Vilgis, University of Melbourne, Murdoch Childrens Research Institute. Australia
Authors: Veronika Vilgis, Alasdair Vance, Timothy Silk

WCE021: Investigating The Role Of The Internal Features Of The Face In Competition For Representation By Modulation Of The Face-Sensitive N170
Presented by: Sreekari Vogeti, University of Auckland, New Zealand
Authors: Sreekari Vogeti, Paul Corballis

WCE023: Oscillatory Mechanisms Related To (Pre-)Reflective Decision-Making
Presented by: Martijn E Wokke, University of Amsterdam, Netherlands
Authors: Martijn E Wokke, K. Richard Ridderinkhof

WCE024: Variability In Inter-Trial Coherence Predicts Variability In Cognitive Control Efficiency
Presented by: Aaron S.W. Wong, The University of Newcastle, Australia
Authors: Aaron S.W. Wong, Patrick S. Cooper, Renate Thienel, Patricia T. Michie, Frini Karayanidis

WCE025: How Domain General Is Information Coding In The Brain? A Meta-Analysis Of 93 Multi-Voxel Pattern Analysis Studies
Presented by: Alexandra Woolgar, Macquarie University, Australia
Authors: Alexandra Woolgar, Jade Jackson, John Duncan

WCE026: MicroRNA-200 Family Promotes Neurite Outgrowth by Suppression of PTEN Expression in PC12 Cells and SCG Neurons
Presented by: Wu Qi, Biomedical Research Institute, Shenzhen-PKU-HKUST Medical Center, China
Authors: Qi Wu, Jun Wan

WCE028: Construal Level and Perceived Distance – A Psychophysical Test of Construal Level Theory
Presented by: Mark Yates, University of Melbourne, Australia
Authors: Mark Yates, James Scully

WCE029: IL23/IL17-Mediated Inflammation Induced by A? Accelerates Alzheimer's Disease Development
Presented by: Xiaoyang Ye, Biomedical Research Institute, Shenzhen-PKU-HKUST Medical Center, China
Authors: Xiaoyang Ye, Jun Wan

WCE032: ERPs in Young and Older Adults in the Equiprobable Auditory Go/NoGo Task
Presented by: Robert Barry, University of Wollongong, Australia
Authors: Robert Barry, Frances De Blasio, Adele Cave

WCE033: Moral Judgment About Socio-Scientific Issues
Presented by: Wen Hua Chang, National Taiwan Normal University, Taiwan
Authors: Wen Hua Chang, Miao Hsuan Yen, Sufen Chen, Chia Wen Tsai

WCE034: The Internet Addiction Level on Resting-state Brain Connectivity
Presented by: Shulan Hsieh, National Cheng Kung University, Taiwan
Authors: Jen-Tang Chang, Der-Yow Chen, Shulan Hsieh

WCE035: Total And Relative Prestimulus EEG Band Power Contributions To The ERP And Behavioural Outcomes In An Equiprobable Auditory Go/NoGo Task
Presented by: Frances M. De Blasio, University of Wollongong, Australia
Authors: Frances M. De Blasio, Robert J. Barry

WCE036: The Neural Timecourse Of Metacognition. Investigating The Subjective Experience Of Response Conflict
Presented by: Kobe Desender, Free University Brussels, Belgium
Authors: Kobe Desender, Filip Van Opstal, Gethin Hughes, Eva Van den Bussche

WCE037: Functional Organization of Brain Cortex at Stages of Professional Creative Problem Solving in Highly-Creative Individuals
Presented by: Liudmila Dikaya, Southern Federal University, Russia
Author: Liudmila Dikaya

WCE038: The Distribution of Event-Related Potentials Components in Participants With Different Modes of Thinking during False Responses
Presented by: Igor Dikiy, Southern Federal University, Russia
Author: Igor Dikiy

WCE039: Examining The Effect Of Oral Contraceptive Use On Verbal Learning And Memory, Verbal Fluency And Mental Rotation
Presented by: Andrea Gogos, University of Melbourne, Australia
Authors: Andrea Gogos, Loic Tse, Amy Scarlett, Jane Ackerl, Tracey Woodhead, Linda Byrne

WCE040: Under the Influence: Alcohol Impairs Inhibition of Negative Distractors, But Only In Men
Presented by: Laura Kranz, Victoria University of Wellington, New Zealand
Authors: Laura Kranz, Lauren Bell, David Carmel, Matt Crawford, Natalija Andrejic, Gina Grimshaw

POSTER SESSION 3

Cognition & Executive Processes cont'd

WCE041: Neural Correlates of Creativity in Schizotypy: An fMRI Study

Presented by: Haeme Park, University of Auckland, New Zealand

Authors: Haeme Park, Reece Roberts, Ian Kirk, Karen Waldie

WCE042: Maturation of Neural Oscillations in the Anterior Cingulate Cortex During Response Conflict: An EEG Study using Measure Projection Analysis

Presented by: Gareth Roberts, Murdoch University, Australia

Authors: Gareth Roberts, Chris Brydges, Corinne Reid, Mike Anderson

WCE043: Prefrontal Contributions To Initiation, Suppression And Strategy: A Neuropsychological Study Of Focal Frontal Patients

Presented by: Gail Robinson, The University of Queensland, Australia

Authors: Gail Robinson, David Walker, Lisa Cipolotti, Vivien Biggs, Marco Bozzali, Tim Shallice

Emotion & Social Processes

WES001: Is the Devil (or Angel) Located in Frontal Cortical Areas?

Presented by: Martial Mermillod, Grenoble-Alpes University, France

Authors: Martial Mermillod, Brice Beffara, Amélie Bret, Johan Lepage, Tiffany Morisseau, Nicolas Vermeulen

WES002: Moving Beyond Valence And Arousal: Emotional Processing Of Human Injury, Snake And Gun Images Is Indexed By N2 Activity

Presented by: Rosemaree Miller, University of Newcastle, Australia

Authors: Rosemaree Miller, Frances Martin

WES004: Complex Hyper-Brain Networks Emerge During Kissing

Presented by: Viktor Müller, Max Planck Institute for Human Development, Germany

Authors: Viktor Müller, Ulman Lindenberger

WES006: Reactance to Deterrence: How Discouragement Impels Success

Presented by: Charlotte Prevost, University of Geneva, Switzerland

Authors: Charlotte Prevost, Hakwan Lau, Dean Mobbs

WES007: Older Adults Suppress Emotion as Effectively as Young Adults But Only the Young Incur Memory Costs

Presented by: Peter G Rendell, Australian Catholic University, Australia

Authors: Peter G Rendell, David Pedder, Gill Terrett, Julie Henry, Phoebe Bailey, Ted Ruffman

WES008: Brain Responses To Disgusting And Fearful Pictures With And Without High Spatial Frequencies

Presented by: Elisabeth Ruiz-Padial, University of Jaén, Spain

Authors: Elisabeth Ruiz-Padial, M. Teresa Mendoza, Francisco Esteves, Jose Luis Mata-Martin

WES009: Does Deception Always Require Cognitive Control?

Presented by: Justyna Sarzynska, University of Social Sciences and Humanities, Poland

Authors: Justyna Sarzynska, Marcel Falkiewicz, Edward Necka

WES010: An Improved Human Anxiety-Specific Biomarker: Personality, Pharmacology, Frequency Band, and Source Characterisation.

Presented by: Shabah Shadli, University of Otago, New Zealand

Authors: Shabah Shadli, Paul Glue, Ian Kirk, Neil McNaughton

WES011: A Prospective Study Of Stress Sensitivity: Emotion Regulation As A Moderator Of The Stress-Depression Relationship

Presented by: Michael Tooley, Victoria University of Wellington, New Zealand

Authors: Michael Tooley, Paul Jose, Gina Grimshaw

WES013: Multimodal Emotion Integration In Bipolar Disorder: An Investigation Of Involuntary Cross-Modal Influences Between Facial And Prosodic Channels

Presented by: Tamsyn Van Rheenen, Swinburne University of Technology, Australia

Authors: Tamsyn Van Rheenen, Susan Rossell

WES015: Losing The Feel For Social Judgements: Age-Related Physiological Changes When Evaluating The Approachability Of Emotional Faces

Presented by: Megan Willis, Australian Catholic University, Australia

Authors: Megan Willis, Christina Netscher, Gill Terrett, Peter Rendell

WES016: EEG Functional Connectivity Is Associated With The Valence Of Experienced Affective States

Presented by: Miroslaw Wyczesany, Jagiellonian Universiy, Poland

Authors: Miroslaw Wyczesany, Magdalena A. Ferdek

WES017: Age-Differences In Brain Correlates Of Attentional Control Of Emotional Items During Working Memory Encoding

Presented by: Maryam Ziaei, The University of Queensland, Australia

Authors: Maryam Ziaei, Nathalie Peira, Jonas Persson

WES018: Changes In miRNA Expression Profile Between Stress-Vulnerable And Stress-Resilient Rats In Chronic Mild Stress (CMS) – An Animal Model Of Depression

Presented by: Dariusz Zurawek, Institute of Pharmacology, Polish Academy of Sciences, Poland

Authors: Dariusz Zurawek, Agata Faron-Gorecka, Maciej Kusmider, Magdalena Kolasa, Paulina Pabian, Joanna Solich, Kinga Szafran, Piotr Gruca, Mariusz Papp, Marta Dziedzicka-Wasylewska

WES019: fMRI Activation and Graph Theoretical Analysis of Unfamiliar Versus Self-Selected Music Towards Developing An Optimal Paradigm for Music Therapy

Presented by: Christof Karmonik, Houston Methodist Research Institute, USA

Authors: Christof Karmonik, Anthony Brandt, Jeff Anderson, Steve Fung, Forrest Brooks, Todd Frazier

WES022: Implicit Measurement of Environmental Concern: The Potential of Startle Eyeblink Modulation

Presented by: Royce Willis, Southern Cross University, Australia

Authors: Royce Willis, Stephen Provost

POSTER SESSION 3

Methods Development

WME003: Restoring Latency-Variable ERP Components from Single Trials: A New Approach to ERP Analysis with Residue Iteration Decomposition (RIDE)?

Presented by: Guang Ouyang, Hong Kong Baptist University, Hong Kong

Authors: Guang Ouyang, Werner Sommer, Changsong Zhou

WME004: Correcting Sample Size Bias in d' and A'

Presented by: Bradley Patten, University of Auckland, New Zealand

Authors: Bradley Patten, Jeff Hamm

WME005: Machine Learning Techniques Show Sensory and Association Network Alterations in Severe Epilepsy

Presented by: Mangor Pedersen, University of Melbourne, Australia

Authors: Mangor Pedersen, Evan K. Curwood, John S. Archer, David F. Abbott, Graeme D. Jackson

WME006: Towards a Methodology for Neuronal Mental Workload Registration during Execution of Cognitive Tasks

Presented by: Thea Radüntz, Federal Institute for Occupational Safety and Health, Germany

Author: Thea Radüntz

WME009: Magnetic Resonance Spectroscopy and Cognitive Function: The Role of Plasma B vitamin Status

Presented by: Tamara Simpson, Swinburne University of Technology, Australia

Authors: Tamara Simpson, Chao Suo, Helen Macpherson, Andrew Pipingas, Con Stough

WME011: A Free And Open Source BCI System In Python

Presented by: Bastian Venthur, Berlin Institute of Technology, Germany

Authors: Bastian Venthur, Benjamin Blankertz

WME012: 2nd Level Modelling In fMRI Analysis With A Clinically Depressed Sample - Comparisons Between Classical And Bayesian Methods

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

Authors: Peter Goodin, Joseph Ciorciari, Susan Rossell, Matt Hughes, Richard Nibbs

WME013: Clinical Applicability Of The Prosocial Effects Of Oxytocin And Inter-/Intrapersonal Models Of Social Dysfunction: A Methodological Review

Presented by: Yasuko Kitano, The University of Tokyo, Japan

Author: Yasuko Kitano

Memory & Learning

WML001: Connectivity Across Recognition Memory Circuits Is Reduced In Carriers Of The BDNF Val66Met Single Nucleotide Polymorphism

Presented by: Nicole Mckay, University of Auckland, New Zealand

Authors: Nicole Mckay, Ian Kirk

WML002: Long-Lasting Effects Of Social Defeat On Spatial Learning And Hystone Acetylation In The Hippocampus

Presented by: Jose Miñarro, University of Valencia, Spain

Authors: Jose Miñarro, Sandra Montagud-Romero, M. Carmen Blanco-Gandia, Asunción Aguilar, Maria Pascual, Consuelo Guerri, Marta Rodríguez-Arias

WML003: Effects of DHEA Administration On Learning Memory, PKC Activity, Membrane Fluidity And CREB levels in iron-Induced Epileptic Model

Presented by: Monika Mishra, Jawaharlal Nehru University, India

Authors: Monika Mishra, Deepak Sharma

WML005: Does Naturally Occurring High Salience For Speech Sounds Impact The Primacy Bias Observed In Mismatch Negativity (MMN)?

Presented by: Daniel Mullens, University of Newcastle, Australia

Authors: Daniel Mullens, Alex Provost, István Winkler, Juanita Todd

WML006: Decoupling of Haptic Components Suggests that Somatosensory Percepts are Differentially Processed in Working Memory

Presented by: Michael Notaras, University of Melbourne, Australia

Authors: Michael Notaras, George Van Doorn, Mark Symmons

WML007: Chronic Activation of the Glucocorticoid Receptor Alters Memory Function of Val66Met Polymorphism Knock-in hBDNF Mice

Presented by: Michael Notaras, University of Melbourne, Australia

Authors: Michael Notaras, Rachel Hill, Joseph Gogos, Maarten van den Buuse

WML008: Passively Improving Face Processing with LTP-like Visual Stimulation

Presented by: Felipe Pegado, University of Leuven , Belgium

Authors: Felipe Pegado, Bart Boets, Hans OpDeBeeck

WML009: A, B, C As Linear As 1, 2, 3: Numerical And Non-Numerical Representation In Adults

Presented by: Christine Podwysocki, University of Melbourne, Australia

Authors: Christine Podwysocki, Jacob Paul, Jason Forte

WML010: Frontal-Parietal Alpha Networks Reflect A Compensatory Mechanism To Overcome The Associative Deficit In Mild Cognitive Impairment

Presented by: Laura Prieto, University Pablo de Olavide, Spain

Authors: Laura Prieto, José Luis Cantero Lorente, Mercedes Atienza Ruiz

WML012: Effects Of Gestational Administration Of Vitamine E On Learning And Memory In APPswe/PS1dE9 Transgenic Mice

Presented by: Marta Rodriguez-Arias, University of Valencia, Spain

Authors: Marta Rodriguez-Arias, M Carmen Blanco-Gandia, Ana Lloret, Esther Giraldo, Jose Viña, Jose Miñarro

POSTER SESSION 3

Memory & Learning cont'd

WML013: The Relationship Between Dorsolateral Prefrontal Cortical Inhibition And Working Memory Performance: A Combined TMS-EEG study.
Presented by: Nigel Rogasch, Monash University, Australia
Authors: Nigel Rogasch, Zafiris Daskalakis, Paul Fitzgerald

WML014: Age Related Changes of MEG Alpha and Gamma-Band Activity Reflect the Late Maturation of Distractor-Inhibition during Working Memory Maintenance
Presented by: Frédéric Roux, Basque Center for Cognition, Brain & Language (BCBL), Spain
Authors: Frédéric Roux, Harald Mohr, Michael Wibral, Wolf Singer, Peter Uhlhaas

WML015: Stimulus Uncertainty Enhances Motor Cortical Plasticity Induced With A Paired Associative Stimulation Paradigm
Presented by: Martin Sale, The University of Queensland, Australia
Authors: Martin Sale, Abbey Nydam, Marc Kamke, Jason Mattingley

WML016: Sleep and Social Memory Consolidation
Presented by: Amanda Santamaria, University of South Australia, Australia
Authors: Amanda Santamaria, Owen Churches, Alex Chatburn, Hannah Keage, Mark Kohler

WML017: Sleep-Dependent Memory Consolidation And Neurofeedback In Insomnia – A Long-Term Study
Presented by: Manuel Schabus, University of Salzburg, Austria
Authors: Manuel Schabus, Hermann Griessenberger, Dominik Heib, Daniel Koerner, Kerstin Hoedlmoser

WML019: Temporal Pattern Similarity In Human MEG And Intracranial EEG Reveals The Reinstatement Of Episodic Memory Trajectories
Presented by: Tobias Staudigl, University of Konstanz, Germany
Authors: Tobias Staudigl, Christian Vollmar, Soheyl Noachtar, Simon Hanslmayr

WML020: Visual Mismatch Response Dynamics Predict Social Cognitive Performance in Healthy Adults: An ERP study
Presented by: Gabor Stefanics, University Zurich & ETH Zurich, Switzerland
Authors: Gabor Stefanics, Justin Chumbley, Jakob Heinzle, Klaas Enno Stephan

WML023: The Impact of Movement Fluency, Complexity and Diverted Attention on Working Memory Processes
Presented by: Richard Tindle, Southern Cross University, Australia
Authors: Richard Tindle, Mitchell Longstaff

WML024: The Effects of Drug Induced Changes in Dopamine and Galantamine Levels on Attentional Selection and Working Memory Storage in Young and Elderly. A Pharmacological fMRI Study.
Presented by: Anne Vellage, DZNE Magdeburg, Germany
Authors: Anne Vellage, Andreas Becke, Hendrik Strumpf, Max Hopf, Ariel Schönfeld, Notger Müller

WML026: Gone For 60 Seconds: Reactivation Length Determines Motor Memory Degradation During Reconsolidation
Presented by: Nicole Wenderoth, ETH Zürich, Switzerland
Authors: Nicole Wenderoth, Toon T De Beukelaar, Daniel G Woolley

WML027: Frequency-Tagging In Memory – Context Or Reactivation?
Presented by: Maria Wimber, University of Birmingham, UK
Authors: Maria Wimber, Simon Hanslmayr, Rik Henson, Michael Anderson

WML028: Assessing The Role Of The Motor Cortex In Visuomotor Memory
Presented by: Hesam Alavi, The University of Queensland, Australia
Authors: Hesam Alavi, Stephan Riek, Welber Marinovic, Tim Carroll

WML029: Associative Memory And Sleep: A Systematic Review And Meta-Analysis Of Behavioural Evidence And Underlying EEG Mechanisms.
Presented by: Alex Chatburn, University of South Australia, Australia
Authors: Alex Chatburn, Kurt Lushington, Mark Kohler

WML030: Neuroprotective Effect Of Ginseng Against Alteration Of Calcium Binding Proteins Immunoreactivity In The Mice Hippocampus After Chronic Radiofrequency Exposure.
Presented by: Dhiraj Maskey, Nepalese Army Institute of Health Sciences, Nepal
Authors: Dhiraj Maskey, Myeung Ju Kim, Hyung Gun Kim

WML031: The Investigation of Social Anxiety Disorder, Depressive Symptoms and Self-Esteem, and its Effects on Autobiographical Memory Retrieval.
Presented by: Felicia Neo, Swinburne University of Technology, Australia
Authors: Felicia Neo, Joseph Ciorciari, Glen Bates

WML032: Behavioural Correlates of Periconceptional Ethanol Exposure in Aged Offspring
Presented by: Diana Zanfirache, The University of Queensland, Australia
Authors: Diana Zanfirache, Karen Moritz, Carlie Cullen

Motor Behaviour

WMO001: Constraints Upon Learning Novel Muscle Activation Patterns after Virtual Tendon Transfer
Presented by: Hossein Jahanabadi, The University of Queensland. Australia
Authors: Hossein Jahanabadi, Timothy Carroll, Andrew Cresswell, Aymar de Rugy

WMO002: On The Relationship Between LFP Oscillations And Spiking Activity In Monkey Motor Cortex
Presented by: Bjørg Kilavik, CNRS - Aix Marseille University, France
Authors: Bjørg Elisabeth Kilavik, Thomas Brochier, Sonja Grün, Alexa Riehle

WMO003: The Role Of The Cerebellum In Challenging Postural Control Conditions
Presented by: Inge Leunissen, KU Leuven, Belgium
Authors: Inge Leunissen, David Drijkoningen, Wouter Hoogkamer, Karen Caeyenberghs, Stephan Swinnen

WMO004: The Sense of Agency during Verbal Action
Presented by: Hannah Limerick, University of Bristol, UK
Authors: Hannah Limerick, David Coyle, James Moore

POSTER SESSION 3

WMO005: The Involuntary Initiation Of Timing Actions By Loud Sounds Depends On Attention To Sensory Modalities

Presented by: Welber Marinovic, The University of Queensland, Australia

Authors: Welber Marinovic, Fiona Cheung, James Tresilian, Stephan Riek

WMO009: Autism And The Sensorimotor Effects Of The Rubber-Hand Illusion

Presented by: Colin Palmer, Monash University, Australia

Authors: Colin Palmer, Bryan Paton, Melissa Kirkovski, Peter Enticott, Jakob Hohwy

WMO010: The Effect Of Acute Sports Concussion on Corticomotor Excitability in Australian Football Players.

Presented by: Alan Pearce, Deakin University, Australia

Authors: Alan Pearce, Mark Rogers, Daniel Corp, Brendan Major, Kate Hoy

WMO011: Using Transcranial Magnetic Stimulation as a valid tool to evaluate sports concussion. A systematic review with preliminary results.

Presented by: Brendan Major, Deakin University, Australia

Authors: Brendan Major, Mark Rogers, Alan Pearce

WMO012: Visuomotor Adaptation Generalizes Partially According To An Eye-Centred Coordinate Frame

Presented by: Eugene Poh, The University of Queensland

Authors: Eugene Poh, Guy Wallis, Stephan Riek, Aymar de Rugy, Timothy Carroll

WMO013: The Effects Of Six-Month Exercise Programs On Structural Changes In Gray And White Matter Volume And Balance Abilities In Senior Citizens: The Case For Dance Training

Presented by: Kathrin Rehfeld, Otto-von-Guericke University Magdeburg, Germany

Authors: Kathrin Rehfeld, Anita Hoekelmann, Angie Lueders, Joern Kaufmann, Notger G. Mueller

WMO014: Spatial Attention To Key Body Sites Is Sufficient For Goal-Irrelevant Motor Priming In Reach-To-Grasp Action When Eye Movement Is Constrained

Presented by: Samuel Sparks, The University of Queensland, Australia

Authors: Samuel Sparks, Maxwell Lyons, Ada Kritikos

WMO015: Experimental Pain Differentially Affects Cortical Involvement In Force And Position Control Tasks

Presented by: Kylie Tucker, The University of Queensland, Australia

Authors: Kylie Tucker, Peter Poortvliet, Dion Scott, Paul Sowman, Simon Finnigan, Paul Hodges

WMO017: Short-Term Musical Training Modulates Functional Connectivity Of The Sensorimotor System: An EEG coherence study

Presented by: Carolyn Wu, The University of Auckland,New Zealand

Authors: Carolyn Wu, Jeff Hamm, Vanessa Lim, Ian Kirk

Sensation & Perception

WPE001: Intracerebral Electrical Stimulation Of An Occipital Face-Selective Area Impairs Individual Face Discrimination

Presented by: Bruno Rossion, University of Louvain, Belgium

Authors: Bruno Rossion, Jacques Jonas, Julien Krieg, Laurent Koessler, Sophie Colnat-Coulbois, Jean-Pierre Vignal, Hélène Brissart, Corentin Jacques, Louis Maillard

WPE002: Rapid Definition Of Objective Electrophysiological Face-Selective Responses By Means Of Fast Periodic Visual Stimulation

Presented by: Bruno Rossion, University of Louvain, Belgium

Authors: Bruno Rossion, Katrien Torfs, Talia Retter, Joan Liu-Shuang

WPE003: Bottom-Up Predictive Processing Of Melodic Stimuli

Presented by: Narayan Sankaran, The University of Sydney, Australia

Authors: Narayan Sankaran, Francesca Meliton, Simon Carlile

WPE004: Information Content Of Electrophysiological Responses Elicited By Omissions Of Self-Initiated Sounds

Presented by: Iria SanMiguel, Leipzig University, Germany

Authors: Iria SanMiguel, Erich Schröger

WPE005: Does Timing Regularity Facilitate Sound Frequency Tracking At The Brainstem Level?

Presented by: Lenka Selinger, University of Barcelona, Spain

Authors: Lenka Selinger, Katarzyna Zarnowiec, Carles Escera

WPE006: Abnormal Patterns Of Attentional Network Communication Underlie Visual Hallucinations In Parkinson's Disease

Presented by: James Shine, The University of Sydney, Australia

Authors: James Shine, Claire O'Callaghan, Alana Muller, Glenda Halliday, Simon Lewis

WPE007: Binocular Rivalry Dynamics And Mixed Percept In Schizophrenia

Presented by: Jody Stanley, University of Melbourne, Australia

Authors: Jody Stanley, Sohee Park, Randolph Blake, Olivia Carter

WPE008: Broad Tuning Of Motion Streak Aftereffect Reveals Reciprocal Gain Interactions Between Orientation And Motion Neurons

Presented by: Matthew Tang, The University of Western Australia, Australia

Authors: Matthew Tang, J. Edwin Dickinson, Troy Visser, David Badcock

WPE009: Do Cross-Modal Phase Differences between Acoustic and Vibrotactile AM Stimuli Influence Audio-Tactile Integration? A Psychophysical and EEG Investigation

Presented by: Justin Timora, University of Newcastle, Australia

Authors: Justin Timora, Timothy Budd

WPE010: How Veridical Is Feedback Of Visual Object Information To Foveal Retinotopic Cortex?

Presented by: Kimberly Weldon, Macquarie University, Australia

Authors: Kimberly Weldon, Alexandra Woolgar, Anina Rich, Mark Williams

WPE011: Medial Temporal Lobe Roles in Human Path Integration

Presented by: Naohide Yamamoto, Cleveland State University, USA

Authors: Naohide Yamamoto, John Philbeck, Adam Woods, Daniel Gajewski, Joeanna Arthur, Samuel Potolicchio, Lucien Levy, Anthony Caputy

WPE012: A Model-Based Comparison Of Three Theories Of Audiovisual Temporal Recalibration

Presented by: Kielan Yarrow, City University London, UK

Authors: Kielan Yarrow, Shora Minaei

POSTER SESSION 3

Sensation & Perception cont'd

WPE013: Auditory Discrimination In Children With Autism Using The Magnetic Acoustic Change Complex (mACC)

Presented by: Shu Hui Yau, Centre for Cognition and its Disorders, Macquarie University, Australia

Authors: Shu Hui Yau, Genevieve McArthur, Jon Brock

WPE015: Viewing Hands And Specifically One's Own Hand Improves Movement Synchrony Perception

Presented by: Regine Zopf, Macquarie University, Australia

Authors: Regine Zopf, Jason Friedman, Mark Williams

WPE016: Do You See What I See? Personality And Perceptual Suppression

Presented by: Anna Antinori, University of Melbourne, Australia

Authors: Anna Antinori, Olivia Carter, Luke Smillie

WPE017: Oscillatory Activity In The Auditory Cortex Determines Auditory Temporal Resolution

Presented by: Alina Baltus, Carl von Ossietzky University of Oldenburg, Germany

Authors: Alina Baltus, Christoph S Herrmann

WPE018: Neural Processing Of Face Repetitions In Pre-Schoolers And Adults: An MEG Study

Presented by: Wei He, Macquarie University, Australia

Authors: Wei He, Jon Brock, Blake Johnson

WPE019: The benefit of two? : An Investigation Of Concurrent Segregation In Autistic Spectrum Disorder Using The Dichotic Pitch Paradigm

Presented by: Veema Lodhia, University of Auckland, New Zealand

Authors: Veema Lodhia, Blake Johnson, Jon Brock, Jeffrey Hamm, Michael Hautus

WPE020: Hierarchical Predictive Coding In Frontotemporal Networks With Pacemaker Expectancies: Evidence From Dynamic Causal Modelling Of Magnetoencephalography (MEG)

Presented by: Holly Phillips, University of Cambridge, UK

Authors: Holly Phillips, Alejandro Blenkmann, Laura Hughes, Tristan Bekinschtein, James Rowe

WPE021: Adults Can Be Trained to Acquire Synesthetic Experiences

Presented by: Anil Seth, University of Sussex, UK

Authors: Anil Seth, Daniel Bor, Nicholas Rothen, Stephanie Clayton, David Schwartzman

WPE022: Red, Green, Blue Equals 1, 2, 3: Investigating The Bidirectionality Of Digit-Colour Synaesthesia

Presented by: Lina Teichmann, Macquarie University, Australia

Authors: Lina Teichmann, Mark Nieuwenstein, Anina Rich