BACN

British Association for Cognitive Neuroscience

24th & 25th May 2022
Edgbaston Park Hotel, University of Birmingham

Overview

Tuesday 24th May

8.30am	9.20am	*Registration and Welcome*
9.20am	11.00am	*Symposium 1: Social and cognitive development across the lifespan*
11.00am	11.30am	*Break*
11.30am	12.15pm	*Individual presentations 1 (3 speakers)*
12.15pm	12.45pm	*Datablitz presentations 1 (10 speakers)*
12.45pm	2.30pm	*Lunch & poster session 1*
2.30pm	3.30pm	*Individual presentations 2 (4 speakers)*
3.30pm	4.00pm	*Break*
4.00pm	4.45pm	*2021 early-career prize: Matthew Apps*
4.45pm	5.30pm	*2021 mid-career prize: Sarah Garfinkel*

Wednesday 25th May

8.30am	9.00am	*Registration*
9.00am	10.40am	*Symposium 2: The role of theta oscillations as a binding mechanism in cognitive processes*
10.40am	11.15am	*Break*
11.15am	12.00pm	*Individual presentations 3 (3 speakers)*
12.00am	12.30am	*Datablitz presentations 2 (10 speakers)*
12.30pm	2.00pm	*Lunch & poster session 2*
2.00pm	3.40pm	*Symposium 3: What do human hippocampal neurons code?*
3.40pm	4.15pm	*Break*
4.15pm	5.00pm	*2022 mid-career prize: Beth Jefferies*

Details of venue (map, travel, parking) can be found here:
https://www.edgbastonparkhotel.com/location/

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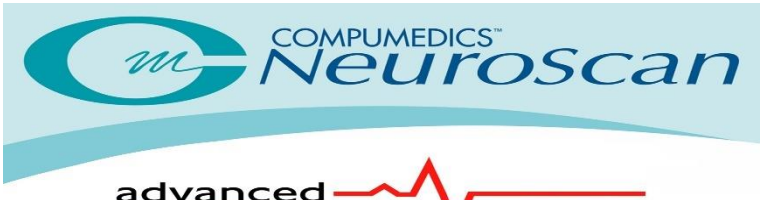

Program

Tuesday 24th May

9.20-11am: *Symposium 1*: *Social and cognitive development across the lifespan*

Tobias Hauser (UCL)
Using smartphones to study decision making across the lifespan

Jennifer Keating (Cardiff University)
Exploring the EEG mu rhythm during observation and execution of fine and gross motor skills in typically developing children

Heather Ferguson (University of Kent)
A longitudinal study of visual perspective-taking across *the lifespan*

Jo Cutler (University of Birmingham; Chair)
Psychological and computational mechanisms of prosocial behaviour across the adult lifespan

The neural systems underlying decision making and social cognition show drastic changes from childhood to older adulthood. Understanding age-related changes in our choices and social interactions is therefore vital for healthy development and ageing. This symposium brings together researchers using longitudinal approaches, novel methods, and global samples to show how social and cognitive abilities develop across the lifespan. To capture the intricate developmental trajectories in decision making requires large, representative samples of all ages. Dr Hauser will present data from multiple tasks, collected with smartphone-based crowdsourcing from thousands of participants, showing non-linear development. Throughout our lives, another vital aspect of cognitive development is understanding and interacting with others. Dr Keating will discuss EEG recordings in healthy children (8-12 years old) while executing fine and gross motor skills and observing others perform those actions. In addition to observing others, we must also take their perspective. Professor Ferguson will highlight longitudinal associations between visual perspective-taking abilities and executive functions from adolescence to older adulthood (10-88 years old). Finally, choosing whether to help others combines decision-making and socio-cognitive processes. Dr Cutler will discuss the computational mechanisms underlying these behaviours and examine how social preferences differ across the adult lifespan and around the world.

11.30am-12.15pm: *Individual presentations 1*

Petar Raykov (1), Konstantinos Bromis (1), Leah Wickens (1), Warrick Roseboom (1), Chris Bird (1)
(1) School of Psychology, University of Sussex

The Neural Representation of Events Is Dominated by Elements that Are Most Reliably Present

An episodic memory is specific to an event that occurred at a particular time and place. However, the elements that comprise the event ,the location, the people present, their actions and goals might be shared with numerous other similar events. Does the brain preferentially represent certain elements of a remembered event? If so, which elements dominate its neural representation: those that are shared across similar events, or the novel elements that define a specific event? We addressed these questions by using a novel experimental paradigm combined with fMRI. Multiple events were created involving conversations between two individuals, using the format of a television chat show. Chat show hosts occurred repeatedly across multiple events, whereas the guests were unique to only one event. Before learning the conversations, participants were scanned while viewing images or names of the (famous) individuals to-be-used in the study, in order to obtain person-specific activity patterns. After learning all the conversations over a week, participants were scanned for a second time while they recalled each event multiple times. We found that during recall, person-specific activity patterns within the posterior midline (PM)

network were reinstated for the hosts of the shows but not the guests, and that reinstatement of the hosts was significantly stronger than reinstatement of the guests. These findings demonstrate that it is the more generic, familiar and predictable elements of an event that dominate its neural representation compared to the more idiosyncratic, event-defining, elements.

Lucy Hiscox (1), Kirsty Donald (2), Nynke Groenewald (2), Nastassja Koen (2) Katherine L Narr (2), Annerine Roos (3), Marina Lawrence (2), Nadia Hoffman (2), Catherine Wedderburn (2), Whitney Barnett (2), Dan Stein (3), Heather J Zar (4), Graeme Fairchild (1) and Sarah Halligan (1,2)
(1) Department of Psychology, University of Bath, Bath, United Kingdom; (2) Department of Psychiatry and Mental Health, University of Cape Town, Cape Town, South Africa; (3) MRC Unit on Anxiety & Stress Disorders, Stellenbosch University, Cape Town, South Africa; (4) Division of Developmental Pediatrics, Department of Pediatrics and Child Health, Red Cross War Memorial Children,Äôs Hospital and University of Cape Town, Cape Town, South Africa.

Effects of exposure to intimate partner violence during pregnancy on neonatal brain structure: Evidence from the Drakenstein Child Health Study, South Africa

Introduction: Maternal stress in pregnancy increases the risk of adverse outcomes in children, but little is known about its impact on brain morphology in newborns. In low-and-middle income (LMIC) countries, one major source of maternal stress is exposure to intimate partner violence (IPV). Here, we examined the association between maternal IPV during pregnancy, neonatal brain volumes, and white matter microstructure in an LMIC sample. Methods: IPV was assessed during pregnancy in 143 mothers (63 IPV-exposed; 80 controls). Neonates (72 male, 71 female; mean age 3-weeks) underwent structural magnetic resonance and diffusion tensor imaging (DTI). Multivariable linear regression models assessed the impact of IPV on neonatal brain outcomes while adjusting for potential confounds including maternal depression, substance use, previous exposure to IPV, infant eTIV, and birthweight. Results: Significant interactions between IPV and neonatal sex were observed, with smaller amygdala volumes found in girls compared to boys, and with larger caudate volumes in IPV-exposed boys relative to unexposed boys. In a subsample with DTI data available (n=70), IPV was associated with higher diffusivity in limbic tracts and the corpus callosum, with further tentative evidence of sex-specific alterations. Conclusion: Antenatal IPV exposure predicted volumetric and microstructural changes to neural structures involved in emotion regulation and executive functioning, that differed by sex. This study provides further insight into how chronic stress during pregnancy translates into children'ss outcomes and reemphasizes the need for prevention of violence towards women.

Alicia J Rybicki (1), Bianca A Schuster (1), Sophie Sowden (1), Jennifer L Cook (1)
(1) School of Psychology, University of Birmingham, Birmingham B15 2TT

Dopaminergic modulation of learning from social and individual information

Some theories of human cultural evolution posit that humans have social-specific learning mechanisms, adaptive specialisations for group living. However, the existence of specialised neurochemical pathways for learning from social and individual experience is debated (1), with mixed evidence: some studies find dissociable neural correlates for social/individual learning whereas others find the same brain areas and dopamine-mediated computations for both (2). Here we demonstrate that, like individual learning, social learning is modulated by the dopamine D2 receptor antagonist haloperidol when social information is the primary learning source, but not when it comprises a secondary, additional element. On two separate days participants (n = 43) ingested 2.5mg haloperidol, a dopamine D2 receptor antagonist, or placebo, and completed a probabilistic learning task which required primary learning, from own experience, and secondary learning from an additional source. For one group the primary source was social, and secondary was individual; for the other group this was reversed. A mixed-effects model with fixed factors drug, learning source (social, individual), volatility (volatile, stable) and group (social-primary, social-secondary), and random intercepts for subject, was employed to test our hypothesis that haloperidol would affect primary learning irrespective of its social/non-social nature. Haloperidol affected primary learning irrespective of social/individual nature, with no effect on learning from the secondary source. Thus, we illustrate that neurochemical mechanisms underpinning learning can be dissociated along a primary-secondary but not a social-individual axis. Results support an expanding field showing that, rather than being specialised for particular inputs,

neurochemical pathways in the human brain can process both social and non-social cues and arbitrate between the two depending upon which cue is primarily relevant for the task at hand.

12.15-12.45pm: Datablitz presentations 1

Daniel Bush (1,2), Laura Convertino (1,2), Fanfan Zheng (3), Rick A Adams (4), Neil Burgess (1,2,5)
(1) UCL Institute of Cognitive Neuroscience, London, UK (2)UCL Institute of Neurology, London, UK (3)Peking Union Medical College, Chinese Academy of Medical Sciences, Beijing, China (4)UCL Department of Computer Science, London, UK (5)Wellcome Centre for Human Neuroimaging, London, UK

Hexadirectional Modulation of Theta Power during Movement is Impaired in Schizophrenia

Anna Guttesen (1), M. Gareth Gaskell (1) and Scott A. Cairney (1)
(1) Department of Psychology, University of York

The sleeping brain's response to verbal and non-verbal memory cues

L. Sebastian Contreras-Huerta (1)(2)(3), Michel-Pierre Coll (4), Geoffrey Bird (1), Molly J. Crockett (5) and Matthew A.J. Apps (1)(2)(3)(6)
(1) Department of Experimental Psychology, University of Oxford, Oxford, UK; (2) Wellcome Centre for Integrative Neuroimaging, University of Oxford, Oxford, UK; (3) Centre for Human Brain Health and Institute for Mental Health, School of Psychology, University of Birmingham, Birmingham, UK; (4) School of Psychology, Laval University, Quebec City, QC, Canada; (5) Department of Psychology, Yale University, New Haven, USA; (6) Institute for Mental Health, School of Psychology, University of Birmingham, Birmingham, UK

Neural representations of vicarious rewards are linked to interoception and prosocial behaviour

Courtney Mansfield (1), Tim C Kietzmann (2), Jasper J. F. van den Bosch (3), Ian Charest (3,4), Marieke Mur (5) & Nikolaus Kriegeskorte (6) & Fraser W Smith (1)
(1) Department of Psychology, University of East Anglia, Norwich, United Kingdom; (2) Donders Institute for Brain, Cognition and Behaviour, Radboud University, Nijmegen, Netherlands; (3) School of Psychology, University of Birmingham, United Kingdom; (4) Departement de Psychologie, University of Montreal, Montreal, Canada;
(5) Department of Psychology, Western University, London, Canada; (6) Zuckerman Mind Brain Behavior Institute, Columbia University, New York, USA

Neural representation of occluded objects in visual cortex

Syanah Wynn (1,2) and Erika Nyhus (1)
(1) Department of Psychology and Program in Neuroscience, Bowdoin College, (2) School of Psychology, University of Birmingham

Frontoparietal network involvement in episodic memory: a tACS-EEG study

Xiaochen Zheng (1), Roshan Cools (1, 2) and Mona Garvert (3)
(1) Radboud University, Donders Center for Cognitive Neuroimaging, Nijmegen, the Netherlands (2) Radboud University Medical Center, Department of Psychiatry, Nijmegen, the Netherlands (3) Max-Planck-Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Parallel cognitive maps for statistical and semantic relationships in the hippocampal formation

Vinura Munasinghe (1), David Acunzo (1). Damiano Grignolio (1) and Clayton Hickey (1)
University of Birmingham (all)

Electrophysiological indices of selective attention predict the quality of object representation in the human brain

Marcus O. Harrington (1), Michael C. Anderson (2), and Scott A. Cairney (1)
(1) Department of Psychology, University of York; (2) MRC Cognition and Brain Sciences Unit, University of Cambridge

Neural mechanisms of memory suppression are impaired by sleep deprivation

Kai S. Thomas (1), Catherine R. G. Jones (1), Marc O. Williams (1), Ross E. Vanderwert (1, 2)
(1) School of Psychology, Cardiff University, Cardiff, UK; (2) Cardiff University Brain Research Imaging Centre (CUBRIC), School of Psychology, Cardiff University, Cardiff, UK

Associations between disordered eating, obsessive-compulsive behaviours, and neural indicators of response inhibition during preadolescence

Christina N Kampoureli (1,2), Chris Racey (3), Raul Ungureanu (1), Jamie Ward (3), **Charlotte L Rae** (3)
(1) Sussex Neuroscience 4-year PhD program, University of Sussex, UK; (2) Department of Neuroscience, Brighton & Sussex Medical School, UK; (3) School of Psychology, University of Sussex, UK

Neural markers of occupational wellbeing in the UK Biobank: how do hours worked affect task fMRI?

2.30-3.30pm: ***Individual presentations 2***

Alessandro Bongioanni (1), Nima Khalighinejad (1), Davide Folloni (2), Lennart Verhagen (3), JѴ©rѴ¥me Sallet (1), Miriam Klein-Flugge (1), Matthew Rushworth (1)
(1) Dept. of Experimental Psychology, University of Oxford; (2) Icahn School of Medicine at Mount Sinai; (3) Donders Institute, Radboud University.

Neural circuits for novel choices and for choice speed and accuracy changes in macaques

While most experiments aim at isolating simple cognitive processes to study their neural bases, naturalistic behaviour is often complex and multidimensional. I will present two studies uncovering not previously characterised neural circuits for sophisticated forms of decision-making in macaques. Firstly, I will describe a specialised medial frontal circuit for novel choice in macaques. Traditionally, monkeys receive extensive training before neural data can be acquired, while a hallmark of human cognition is the ability to act in novel situations. With fMRI we show how this medial frontal circuit enables efficient novel choices by combining on-the-fly the value of multiple attributes of each available novel item. This integration process elicits a hexagonal symmetry pattern in the BOLD response, typical of a grid-like representation of the space of all available options (1). The causal role played by this circuit is then proven by transcranial ultrasound stimulation (TUS)(2), which impairs optimal choice based on attribute integration and forces the subjects to default to a simpler heuristic strategy. Secondly, I will present unpublished data on the neural mechanisms driving behaviour shifts in an evidence accumulation task requiring to trade speed for accuracy. While perceptual decision-making has been thoroughly studied, both cognitively and neurally (3), the reasons and mechanisms by which speed and accuracy are adjusted are less known. We describe two orthogonal dimensions of behavioural variability (traditional speed-accuracy trade-off and efficiency) and combining fMRI and TUS we uncover independent neural circuits concerned respectively with changes in strategy and fluctuations in the engagement level. The first seats in frontopolar cortex, an area unique to primates, crucial in managing competing goals (4); the second is associated with a subcortical network including habenula, an area crucial for adaptive behaviour across motivational state changes (5).

Benjamin J. Griffiths (1), Tino Zaehle (2), Stefan Repplinger (2, 3), Friedhelm C. Schmitt (2), JvºrgenVoges (4), Simon Hanslmayr (5), Tobias Staudigl (1)
(1)Department of Psychology, Ludwig-Maximilians-UniversitV§t MvºnchenMunich, Germany.(2)Department of Neurology, Otto-von Guericke-University, Magdeburg, Germany. (3)ESF International Graduate School on Analysis, Imaging and Modelling of Neuronal and Inflammatory Processes, Otto-von-Guericke University, Magdeburg, Germany.(4)Department of Stereotactic Neurosurgery, Otto-von-Guericke University, Magdeburg, Germany.(5)Centre for Cognitive Neuroimaging, Institute for Neuroscience and Psychology, University of Glasgow, UK.

Rhythmic interactions between the mediodorsal thalamus and prefrontal cortex precede human visual perception

The thalamus is much more than a simple sensory relay. High-order thalamic nuclei, such as the mediodorsal thalamus, exert a profound influence over animal cognition. However, given the difficulty of directly recording from the thalamus in humans, next-to-nothing is known about thalamic and thalamocortical contributions to human cognition. To address this, we analysed simultaneously-recorded thalamic iEEG and whole-head MEG in six patients (plus MEG recordings from twelve healthy controls) as they completed a visual detection task. We observed that both the phase of ongoing mediodorsal thalamic and prefrontal alpha activity was predictive of perceptual performance. Critically however, mediodorsal thalamic activity mediated prefrontal contributions to perceptual performance. These results suggest that it is thalamocortical interactions, rather than cortical activity alone, that is predictive of upcoming perceptual performance and, more generally, highlights the importance of accounting for the thalamus when theorising about cortical contributions to human cognition.

Giulia Orioli (1), Irene Parisi (2), Jos L. van Velzen (2) and Andrew J. Bremner (1)
(1) School of Psychology, University of Birmingham (2) Department of Psychology, Goldsmiths, University of London

Visual-tactile expectations and peripersonal space representations in infancy

The influence of visual motion on the processing of bodily events offers a marker for tracing the development of human infants' perception of themselves in relation to their peripersonal space. The aim of the present research was to investigate how infants begin to link visual information about the space surrounding them with tactile information perceived on their bodies, in order to support the construction of a situated representation of their body in the surrounding environment. We presented 4- (n = 20) and 8-month-old (n = 20) infants with videos of an unattended visual object moving towards or away from their body, followed by a vibrotactile stimulus on their hands. We recorded the infants' spontaneous brain activity and analysed their responses to the tactile stimuli. We found that the 4-month-olds,Äô somatosensory evoked potentials (SEPs) were enhanced in response to tactile stimuli preceded by approaching visual motion, demonstrating the early ontogeny of the cortical multisensory foundations of peripersonal space representation. Within the 8-month-olds,Äô sample, instead, SEPs were increasingly enhanced by (unexpected) tactile stimuli following receding visual motion as age in days increased. These results show, for the first time, that human infants process somatosensory information differently depending on temporally and spatially distant visual information preceding it. Altogether, these findings provide important clues to the ontogeny of human self-awareness in the first year of life, and suggest important postnatal developments in infants' expectations about interactions between the body and the external world, in particular within peripersonal space.

Marco Wittman
Department of Experimental Psychology, UCL

Interlinked estimates of self and other in medial prefrontal cortex

Humans have to track the success of their actions for survival. However, in a social world, we not only have to monitor our own performance, but also the performance of other people. This raises the question how the neural circuits that allow us to have insights in the success of our own actions are interlinked our ability to learn about other people. Here we show using functional magnetic resonance imaging, that dorsomedial prefrontal area 9, an area typically involved in mentalizing, tracks the performance of other people. In addition, it encodes information

about the relationship between oneself and others (cooperation or competition), and also one's own performance success. Importantly, the presence of self-related signals in area 9 was crucial for how area 9 monitored other's performance. Knowledge about one's own performance spread to how well participants judged others. This resulted in estimating other people as more similar to oneself in cooperative relationships: if oneself performed well, people tended to overestimate the performance of the partner and if oneself performed poorly, people tended to underestimate the performance of the partner. However, inversely, in competitive social context, the competitor's performance was underestimated if oneself performed well, and overestimated if oneself performed poorly. In a second study we show that transcranial magnetic stimulation to area 9 enhances this bias, causing judgements of other's performance to me even more merged with knowledge about one's own. These findings highlight a key role for area 9 in monitoring other's performance and suggest it operates in an implicit self-centred frame of reference.

4-4.45pm: *2021 early-career prize winner talk*

Matthew Apps (University of Birmingham)

Can I be bothered? Neural and computational mechanisms underlying the dynamics of effort processing

From a workout at the gym to helping a colleague with their work, everyday we make decisions about whether we are willing to exert effort to obtain some sort of benefit. Increases in how effortful actions and cognitive processes are perceived to be has been linked to clinically severe impairments to motivation, such as apathy and fatigue, across many neurological and psychiatric conditions. However, the vast majority of neuroscience research has focused on understanding the benefits for acting, the rewards, and not on the effort required. As a result, the computational and neural mechanisms underlying how effort is processed are poorly understood. How do we compute how effortful we perceive a task to be? How does this feed into our motivation and decisions of whether to act? How are such computations implemented in the brain? and how do they change in different environments? I will present a series of studies examining these questions using novel behavioural tasks, computational modelling, fMRI, pharmacological manipulations, and testing in a range of different populations. These studies highlight how the brain represents the costs of exerting effort, and the dynamic processes underlying how our sensitivity to effort changes as a function of our goals, traits, and socio-cognitive processes. This work provides new computational frameworks for understanding and examining impaired motivation across psychiatric and neurological conditions, as well as why all of us, sometimes, can't be bothered.

4.45-5.30pm: 2021 mid-career prize winner talk

Sarah Garfinkel (UCL)

Clinical neuroscience and the heart-brain axis

Cognitive and emotional processes are shaped by the dynamic integration of brain and body. A major channel of interoceptive information comes from the heart, where phasic signals are conveyed to the brain to indicate how fast and strong the heart is beating. This talk will discuss how interoceptive processes operate across conscious and unconscious levels to influence emotion and memory. The interoceptive channel is disrupted in distinct ways in individuals with autism and anxiety. Selective interoceptive disturbance is related to symptomatology including dissociation and the transdiagnostic expression of anxiety. Interoceptive training can reduce anxiety, with enhanced interoceptive precision associated with greater insula connectivity following targeted interoceptive feedback. The discrete cardiac effects on emotion and cognition have broad relevance to clinical neuroscience, with implications for peripheral treatment targets and behavioural interventions.

Wednesday 25th May

9-10.40am: ***Symposium 2: The role of theta oscillations as a binding mechanism in cognitive processes***

Anna-Katharina Bauer (University of Oxford)
Rhythmic modulation of auditory-visual perception through cross-modal entrainment

Martin I. Antov (University of Osnabrück; Chair)
Effects of phase-synchronized stimulus presentation in a human fear-conditioning task

Moritz Köster (Freie Universität Berlin)
The theta rhythm in early human brain development

Danying Wang (University of Glasgow; Chair)
Externally induced cross-regional theta synchronisation modulates human episodic memory: empirical and computational evidence

Emmanuel Biau (University of Liverpool)
The role of theta synchrony in the formation of new audio-visual speech memories

Binding attributes of stimuli from different sensory channels into coherent representations aids perception, learning, memory, and decision-making. This symposium focuses on neural oscillations in the theta band (3 – 8 Hz) that synchronise the activity of distributed brain regions, providing a possible mechanism for multisensory integration. Anna-Katharina Bauer will demonstrate that the rhythmic modulation of auditory-visual perception is subject to cross-modal entrainment: the synchronisation of neural oscillations across sensory cortices. Martin I. Antov will show that theta synchronisation of visual and auditory input causally modulates the association of aversive and neutral stimuli in fear conditioning. Moritz Köster will report data from infants, children, and adults suggesting that theta oscillations have a critical role in human cognitive development, integrating novel information into increasingly sophisticated semantic knowledge structures. Danying Wang will present empirical data and computational modelling on the role of theta-phase synchronisation in multisensory episodic memory formation. Emmanuel Biau extends the findings to real-world speech, by investigating whether phase alignment between visible lip movements and audible speech increases theta synchronisation between auditory and visual brain regions and improves speech memory formation. Together, we aim to highlight how theta oscillations aid information processing on multiple processing levels and across different cognitive systems.

11.15am-12pm: ***Individual presentations 3***

Hyojin Park (1), Joachim Gross (2)
(1) Centre for Human Brain Health (CHBH), School of Psychology, University of Birmingham, Birmingham, United Kingdom; (2) Institute for Biomagnetism and Biosignalanalysis, University of Muenster, Muenster, Germany

Spatio-Temporal Neural Map of Representation of Topic Keywords during Natural Auditory Speech Perception

Neural representation of lexico-semantics in natural speech has been revealed in recent years. However, to date, how the brain makes sense of the higher-level semantic gist (topic keywords) of a coherent natural speech remains mysterious. Here we show spatio-temporal neural representation of topic keywords of a naturalistic speech in a multi-speaker environment (1) and its attentional modulation using a generative probabilistic topic modelling, Latent Dirichlet Allocation (LDA) (2) in Natural Language Processing (NLP) on speech materials to which participants listened while their brain activities were recorded by Magnetoencephalography (MEG). We report neural representation for salient semantic gist of attended speech in the left inferior frontal and temporal areas. Moreover, we show that subjects with a stronger sensitivity to attended speech than to unattended speech in

midcingulate cortex performs better at speech comprehension. This study demonstrates that high-order semantic system can be mapped above word level and provides evidence for the neural mechanism underlying processing salient semantic gist of multiple speeches with different sensitivity and spatial patterns.

Aleksandra K. Eberhard-Moscicka (1, 2), Magdalena Chechlacz (3, 4), Branislav Savic (2), Tobias Nef (5), Ren M. Mouri (1, 2, 5) and **Dario Cazzoli** (5, 6, 7)
(1) Perception and Eye Movement Laboratory, Departments of Neurology and BioMedical Research, Inselspital, Bern University Hospital and University of Bern, Switzerland; (2) Department of Neurology, Inselspital, Bern University Hospital and University of Bern, Switzerland; (3) Centre for Human Brain Health, University of Birmingham; (4) School of Psychology, University of Birmingham; (5) Gerontechnology and Rehabilitation Group, ARTORG Center for Biomedical Engineering Research, University of Bern, Switzerland; (6) Neurocenter, Lucerne Cantonal Hospital, Switzerland; (7) Department of Psychology, University of Bern, Switzerland.

Better to focus or to spread? Signal propagation, white matter properties, and their relationship to cognitive performance in the aging human brain

Even in healthy aging, advancing age is often associated with a decline in cognitive performance. We combined simultaneous transcranial magnetic stimulation (TMS) and high-density electroencephalography (hd-EEG), as well as diffusion magnetic resonance imaging (dMRI), in order to study effective and structural connectivity and their relationship to cognitive performance in the healthy aging brain. Twenty elderly and 20 younger healthy participants performed a selective attention task, during which TMS was applied over the frontal eye field (FEF), a node of the fronto-parietal attention network. Signal transmission was assessed by means of TMS-hd-EEG, and white matter microstructure was also examined using dMRI. Preliminary analyses of the TMS-hd-EEG data considering the global-mean field power (GMFP; reflecting the general response of the brain to TMS perturbation) highlighted two patterns: 1. elderly individuals exhibited higher GMFP values than younger ones, irrespective of performance, consistent with the idea that prefrontal areas are hyperexcitable in older age; 2. better performers exhibited higher GMFP values than worse performers, irrespective of age, consistent with the idea that the FEF was more active in better performers. Concerning dMRI findings, tract-based spatial statistics on fractional anisotropy (FA) data revealed that, after controlling for age, performance differences were associated with variability within the superior longitudinal fasciculus, part of the fronto-parietal attentional network. When comparing better with worse performers, irrespective of age, better performance was associated with higher FA within the frontal corpus callosum and inferior fronto-occipital fasciculus, two pathways functionally linked to attention capacity. These preliminary results evidence specific patterns of functional/effective and structural connectivity that are neural candidates of individual differences in cognitive performance in the healthy aging brain.

Ioannis Delis(1), Robin AA Ince(2), Paul Sajda(3) and Qi Wang(3)
(1)School of Biomedical Sciences, University of Leeds, Leeds, LS2 9JT, UK (2) School of Psychology and Neuroscience, University of Glasgow, G12 8QQ, UK (3) Department of Biomedical Engineering, Columbia University, New York, NY, 8 10027, USA

Neural encoding of active multi-sensing enhances perceptual decision-making via a synergistic cross-modal interaction

Most perceptual decisions rely on the active acquisition of evidence from the environment involving stimulation from multiple senses. However, our understanding of the neural mechanisms underlying this process is limited. Crucially, it remains elusive how the different sensory representations interact in the formation of perceptual decisions. To answer these questions, we employed an active sensing paradigm coupled with neuroimaging, multivariate analysis and computational modelling to probe how the human brain processes multisensory information to make perceptual judgments. Participants of both sexes actively sensed to discriminate two texture stimuli using visual (V) or haptic (H) information or the two sensory cues together (VH). Crucially, information acquisition was under the participants' control, who could choose where to sample information from and for how long on each trial. To understand the neural underpinnings of this process, we first characterized where and when active sensory experience (movement patterns) is encoded in human brain activity (electroencephalography - EEG) in the three sensory conditions. Then, to offer a neurocomputational account of active multisensory decision

formation, we used these neural representations of active sensing to inform a drift diffusion model of decision-making behavior. This revealed a multisensory enhancement of the neural representation of active sensing which led to faster and more accurate multisensory decisions. We then dissected the interactions between the V, H and VH representations using a novel information-theoretic methodology. Ultimately, we identified a synergistic neural interaction between the two unisensory (V, H) representations over contralateral somatosensory and motor locations that predicted multisensory (VH) decision-making performance.

12.00-12.30pm: Datablitz presentations 2

Thomas Pfeffer (1,2), **Christian Keitel** (3,4), Daniel S. Kluger (5,6), Anne Keitel (7), Alena Russmann (2), Gregor Thut (4), Tobias H. Donner (2), Joachim Gross (4,5,6)
(1) Universitat Pompeu Fabra, Center for Brain and Cognition, Computational Neuroscience Group, Barcelona, Spain, (2) University Medical Center Hamburg-Eppendorf, Department of Neurophysiology and Pathophysiology, Martinistr. 52, 20246 Hamburg, Germany, (3) University of Stirling, Psychology, FK9 4LA Stirling, UK, (4) Centre for Cognitive Neuroimaging, Institute of Neuroscience and Psychology, University of Glasgow, 62 Hillhead Street, G12 8QB Glasgow, UK, (5) Institute for Biomagnetism and Biosignal Analysis, University of Munster, Malmedyweg 15, 48149 Muenster, Germany, (6) Otto Creutzfeldt Center for Cognitive and Behavioral Neuroscience, University of Munster, Fliednerstrasse 21, 48149 Muenster, Germany, (7) University of Dundee, Psychology, DD1 4HN Dundee, UK

Coupling of pupil- and neuronal population dynamics reveals diverse influences of arousal on cortical processing

Rhys Yewbrey (1), Myrto Mantziara (1), Katja Kornysheva (1,2)
(1) Bangor Imaging Unit, Bangor University, Wales (2) Centre For Human Brain Health, University of Birmingham, England

Cortical integration of order and timing occurs during sequence execution, but not planning

Lydia J. Hickman (1), Dagmar S. Fraser (1), Jennifer L. Cook (1)
(1) School of Psychology, University of Birmingham, UK

The selective role of dopamine in movement vigour and not adaptation of movement speed to curvature

Yueyang Zhang (1), Rafael Lemarchand(1), Aliff Asyraff(1) & Paul Hoffman(1)
(1)School of Philosophy, Psychology & Language Sciences, University of Edinburgh, UK

Representation of motion concepts in occipitotemporal cortex: fMRI activation, decoding and connectivity analyses

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The association between resting-state functional connectivity and adolescent alcohol use varies given ADHD risk status

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Peer presence elicits task-independent changes within and beyond the mentalizing network across children and adults

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Entraining corticocortical plasticity changes oscillatory activity in action control and inhibition

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Strategic control over incentive salience in naturalistic human vision

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Temporal course of object-based attentional strengthening in the control of working memory

Mairi Houlgreave (1,2), Eneko Urunuela (3), Cesar Caballero-Gaudes (3), Penny Gowland (2), Katherine Dyke (1) , Rosa Sanchez Panchuelo (2), Valarie Brandt (4), Georgina Jackson (5), Richard Bowtell (2), Imaan Mohammed (1), Matthew Brookes (2) and Stephen Jackson (1,5)
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Detecting the functional anatomy of the urge-to-blink

2-3.40pm: Symposium 3: What do human hippocampal neurons code?

Rodrigo Quian Quiroga (University of Leicester)
Concept neurons as the building blocks of declarative memory

Doris Dijksterhuis (Netherlands Institute for Neuroscience)
Cells in the human medial temporal lobe are reactivated by pronouns that refer to concepts to which they are tuned

Matthew Self (Netherlands Institute for Neuroscience)
Human hippocampal neurons track moments in a sequence of events

Luca D. Kolibius (University of Birmingham)
Hippocampal neurons code individual episodic memories in humans

Robert M. Mok (University of Cambridge)
How the hippocampus encodes concept and spatial representations: a multi-level account from behaviour to neurons

The hippocampus is a brain structure that allows for the flexible association of concepts. This flexibility makes the hippocampus important for many tasks, such as episodic memory, learning, time perception, and language processing. Despite this variety of tasks, we do not know what hippocampal neurons code. Recent intracranial recordings from patients with epilepsy have led to the identification of three different sub-classes of hippocampal

neurons. (A) Concept cells fire in response to specific invariant features independent of the context. Visual presentation, as well as a written descriptor, can induce their activity. One prevailing idea is that the simultaneous activity of multiple concept cells can code for the diverse elements that make up an episodic memory. (B) Time cells represent temporal information and provide a scaffolding that helps us remember events in the correct order. (C) Episode Specific Neurons are hippocampal cells that bind all features of an experience into a discrete episodic memory. Unlike concept cells, they represent a conjunctive code that represents an entire experience. During the symposium, the speakers will present the latest research concerning these hippocampal neurons. Interestingly, a computational model suggests that the same general coding algorithm underlies the emergence of these heterogeneous neural sub-types.

4.15-5.00pm: 2022 mid-career prize winner talk

Beth Jefferies (University of York)

The neural basis of flexible semantic cognition

Semantic cognition brings meaning to our world – it allows us to make sense of what we see and hear, and to produce adaptive thoughts and behaviour. Since we have a wealth of information about any given concept, our store of knowledge is not sufficient for successful semantic cognition; we also need mechanisms that can steer the information that we retrieve so it suits the context or our current goals. This talk traces the neural networks that underpin this flexibility in semantic cognition. It draws on evidence from multiple methods (neuropsychology, neuroimaging, neural stimulation) to show that two interacting heteromodal networks underpin different aspects of flexibility. Regions including anterior temporal cortex and left angular gyrus respond more strongly when semantic retrieval follows highly-related concepts or multiple convergent cues; the multivariate responses in these regions correspond to context-dependent aspects of meaning. A second network centred on left inferior frontal gyrus and left posterior middle temporal gyrus is associated with controlled semantic retrieval, responding more strongly when weak associations are required or there is more competition between concepts. This semantic control network is linked to creativity and also captures context-dependent aspects of meaning; however, this network specifically shows more similar multivariate responses across trials when association strength is weak, reflecting a common controlled retrieval state when more unusual associations are the focus. Evidence from neuropsychology, fMRI and TMS suggests that this semantic control network is distinct from multiple-demand cortex which supports executive control across domains, although challenging semantic tasks recruit both networks. The semantic control network is juxtaposed between regions of default mode network that might be sufficient for the retrieval of strong semantic relationships and multiple-demand regions in the left hemisphere, suggesting that the large-scale organisation of flexible semantic cognition can be understood in terms of cortical gradients that capture systematic functional transitions that are repeated in temporal, parietal and frontal cortex.

Posters
Tuesday 24th May

1. Ahmad Alghamdi (University of Birmingham) *The impact of rehabilitation on action selection and execution in a reward-based reaching task in chronic stroke patients*

2. Alexander MacLellan (University of Bath) *Investigating the attentional and emotional regulation mechanisms of action for brief digital cognitive trainings in individuals 'at risk' of anxiety and depression*

3. Alexandra Radosi (Research Centre for Natural Sciences, Budapest) *Neural reward response and adolescent psychopathology: Testing associations and mediated moderation with affectivity and psychopathology*

4. Luca Kolibius (University of Glasgow) *Hippocampal neurons code individual memory episodes in humans*

5. Mathilde Bauer (University of Sussex) *Profiling Misophonia in Adults: From Heightened Sensory Sensitivity to Intolerance of Sounds*

6. Dwaynica Greaves (UCL) *Exploring theatre neuroscience: using wearable fNIRS to measure the sense of self and interpersonal coordination in professional actors*

7. Scott Cairney (University of York) *Neural Mechanisms of Learning are Critically Dependent on Sleep*

8. Damiano Grignolio (University of Birmingham) *Disentangling the roles of reward and object-status in visual attention*

9. Astrid Emilie Lund (King's College London) *How should we measure metacognitive judgements of episodic memory during ageing?*

10. Ceci Qing Cai (UCL) *You make me laugh! Friends, strangers and neurodiversity*

11. Chatrin Suksasilp (UCL) *Interoceptive training improves heartbeat detection accuracy and reduces anxiety*

12. Jessica Daly (University of Sussex) *Effects of APOE e4 on successful retrieval of object location and precision in mid-life*

13. Alex Leff (UCL) *Gotcha! an app-based therapy for proper name anomia in people with Alzheimer's disease: behavioural effects and MEG correlates*

14. Sam Berens (University of Sussex) *Hippocampal and medial prefrontal cortices encode structural task representations despite poor generalisation performance*

15. Abdul Shugaba (Lancaster University) *Cognitive demands associated with performing Robot Assisted Laparoscopic surgery compared to standard Laparoscopic surgery*

16. Ann-Kathrin Johnen (UEA) *Modulation of electrophysiological subsequent memory effects at frontal electrodes by repetition*

17. Matteo Martini (University of East London) *Beyond measurement: an exploration of the possible utilization of NIRS as cognitive enhancer*

18. Haya Akkad (UCL) *Theta-gamma activity during word retrieval in the spoken language network*

19. Helena Gellersen (University of Cambridge) *Medial temporal lobe structure, mnemonic and perceptual discrimination in older adults at risk for mild cognitive impairment*

20. Jennifer Ashton (University of York) *Holistic reinstatement of episodic memory following a period of forgetting and consolidation*

21. Joshua Bolam (University of Leeds) *Neurocomputational mechanisms underlying cross-modal associations and their influence on perceptual decisions*

22. Kira Noad (University of York) *A natural viewing approach to understanding how familiar faces are represented in the human brain*

23. Levan Bokeria (University of Cambridge) *Local vs global effects of schemas on facilitation of learning*

24. Lisa Henderson (University of York) *Do naps benefit novel word learning? Developmental differences and white matter correlates*

25. Lucy Jackson (Cardiff University) *Theta EEG-neurofeedback does not enhance episodic memory performance: Preliminary findings*

26. Lucy Palmer (Birkbeck University) *Inhibitory control and the neural correlates of science and maths counterintuitive reasoning in children*

27. Nick Davis (Manchester Met University) *Adding TMS data to coordinate-based meta-analysis of neuroimaging*

28. Pranay S. Yadav (University of Cambridge) *Effective connectivity of the ventral occipito-temporal cortex during face perception & recognition*

29. Rachel Green (Aston University) *Comparing Visual Perspective Taking and True Belief Reasoning*

30. Roni Tibon (University of Cambridge) *The neural shift of sleep quality and cognitive ageing: A resting-state MEG study of transient neural dynamics*

31. Ruolan Zhang (King's College London) *The interaction between emotional content and contextual details in episodic memory*

32. Sophie Alderman (University of Bath) *Fastball; A novel functional biomarker of cognition in Mild Cognitive Impairment*

33. Tom Lockhart (University of Portsmouth) *Insights from an ecologically valid approach to goal conflict and anxiety biomarker research*

34. Wayne Anderson (Middlesex University) *The phase of oscillatory cortical activity affects tactile spatial attention – a tACS study*

35. Alexander Jones (Middlesex University) *Temporal and spatial expectancy improve recognition memory*

36. Andreea Zaman (King's College London*) Autonoetic Consciousness: a novel method of capturing the subjective experience of memory recall and future thinking*

37. Cliona Kelly (Aston University) *Investigating joint attention with a virtual human: A Neuro-VR study*

38. Wei Wu (University of Edinburgh) *An investigation into semantic cognition in the ageing brain*

39. Oscar Ferrante (University of Birmingham) *FLUX: A pipeline for MEG analysis*

40. Rebecca Denniss (University of Sheffield) *Cognitive Improvements following TBI: Vitamins, Minerals and Omega-3, an Exploratory Study*

41. Giorgia Ricchetti (University of Granada) *Sequence knowledge in ADL - the case of tea-making: an fMRI study*

42. Tae Twomey (UCL) *Role of the contralateral inferior frontal cortices in speech following aphasic stroke*

43. Ioannis Delis (University of Leeds) *Prior probability affects the drift rate, not the starting point, of evidence accumulation in perceptual decision making*

44. Daniel Campbell-Meiklejohn (University of Sussex) *Serotonin and Interoception: A Single SSRI Dose Alters Neural Processing while Attending to Internal Body Sensations*

45. Hamid Karimi-Rouzbahani (University of Cambridge) *Maximum object category information and behavioural prediction in multiscale EEG patterns*

46. Jennifer Cook (University of Birmingham*) Dopaminergic modulation of* emotion *perception from dynamic cues*

47. Daniel Bush (UCL) *Hexadirectional Modulation of Theta Power during Movement is Impaired in Schizophrenia*

48. Anna Guttesen (University of York) *The sleeping brain's response to verbal and non-verbal memory cues*

49. L. Sebastian Contreras-Huerta (University of Oxford) *Neural representations of vicarious rewards are linked to interoception and prosocial behaviour*

50. Courtney Mansfield (UEA) *Neural representation of occluded objects in visual cortex*

51. Syanah Wynn (Bowdoin College) *Frontoparietal network involvement in episodic memory: a tACS-EEG study*

52. Xiaochen Zheng (Radboud University) *Parallel cognitive maps for statistical and semantic relationships in the hippocampal formation*

53. Vinura Munasinghe (University of Birmingham) *Electrophysiological indices of selective attention predict the quality of object representation in the human brain*

54. Marcus O. Harrington (University of York) *Neural mechanisms of memory suppression are impaired by sleep deprivation*

55. Kai S. Thomas (Cardiff University) *Associations between disordered eating, obsessive-compulsive behaviours, and neural indicators of response inhibition during preadolescence*

56. Charlotte L Rae (University of Sussex) *Neural markers of occupational wellbeing in the UK Biobank: how do hours worked affect task fMRI?*

57. Georgia Roughton (University of Birmingham) *Constructing Lineups for Distinctive Suspects*

Wednesday 25th May

1. Oscar Ferrante (University of Birmingham) Statistical Learning of Distractor Suppression is Expressed as Altered Neural Excitability in Early Visual Cortex

2. Benjamin J. Griffiths (LMU Munich) Electrophysiological representations of veridical head direction in humans

3. Alkistis Saramandi (UCL) *Interoception Belief Updating in Women with Anorexia Nervosa*

4. Ana Pesquita (University of Birmingham) *Solving the two-body problem: A new task to investigate the oscillatory brain mechanisms underpinning social interaction perception*

5. Andrea Greve (University of Cambridge) *The Influence of Expectancy and Prediction Error on Episodic Memory in Normal Aging*

6. Bethany E. Richards (University of Birmingham) *Breaking the social gestalt: The perception of 'facing bodies' under selective and integrative attention*

7. Bethany Jones (University of Surrey) *Open-ended vs. closed executive function tests, and the role of mentalizing difficulties in autism*

8. Chloe Brunskill (University of Kent) *Counterfactual imagination as a source of memory distortion: cognitive and brain mechanisms*

9. David Acunzo (University of Birmingham) *Temporal integration and segregation of visual information are associated with different speeds of neural oscillations: evidence from sEEG*

10. Dominika Varga (University of Sussex) *Memory errors for lifelike events reflect expectations about typical event structure*

11. Hongfang Wang (Aston University*) Investigating two spatial navigation strategies using EEG in a fully immersive virtual reality environment*

12. Emily Madden (University of York) *Understanding the role of theta in episodic memory formation and consolidation*

13. Emma Sullivan (University of York) *Using Virtual Reality to Understand the Anxiogenic Impact of Sleep Deprivation*

14. Felix Carter (University of Birmingham) *The relationship of individual differences in bilingual experience and cognitive control*

15. Fiona Lancelotte (UEA) *Dissociable subcomponents of the DMN are associated with episodic details and subjective vividness in autobiographical recall*

16. Flavia De Luca (University of Sussex) *Neural representation of people's goals in event perception*

17. Samantha Gregory (University of Salford) *Investigating the influence of retro-cuing with uninformative dynamic social and non-social VR stimuli on Alpha and theta neural oscillations*

18. Alexis Deighton MacIntyre (UCL) *Listeners are Sensitive to the Speech Breathing Time Series: Evidence from a Gap Detection Task*

19. Katarzyna Dudzikowska (University of Birmingham) *A transdiagnostic, computational psychiatry approach to fatigue*

20. Ruihan Wu (UCL) *In-group favouritism in smile discrimination in autism*

21. Viviana Greco (Cardiff University) *Sleep Counteracts Functional Fixedness and Enhances Insight Problems Solving*
22. Alice Bush (UEA) *Examining the underpinnings of rich and vivid re-experiencing of events*

23. Oscar Bowen-Hill (University of Sussex) *Developing Connectomic Biomarkers for Synaesthesia*

24. Daniel Rogers (University of York) *The role of shape and texture in the recognition of familiar faces*

25. Eleanor Hassan (University of Exeter) *A novel method to induce mental fatigue*

26. Greta Melega (UEA) *Switching Between Retrieval Modes Influences Autobiographical Memory Recall*

27. Lucie Reed (Cardiff University) *Mental time travel in positive, negative, and disorganised schizotypy*

28. Paula Wicher (UCL) *Choice but not facial mimicry induces liking: an online study of art preferences*

29. Sankalp Garud (University of Oxford) *Neural mechanisms of social decision making in environments with differing rates of social reward*

30. Aysegul Ozkan (Cardiff University) *Influence of Multiple Sources on Preference-Based Decisions*

31. Olga Leticevscaia (University of Reading) *Investigation of the causal role of the PFC on working memory protection from visual distractors using continuous measure of object memory recall*

32. Alexis An Yee Low (UCL) *Self-Esteem depends on beliefs about the rate of change of social approval*

33. Camilla Neergaard Clark (St George's University of London) *Self-awareness, cognitive control and interoception: towards an understanding of emotional dysregulation after traumatic brain injury*

34.

35. Ulrike Senftleben (Aston University) *A Neuro-VR approach to investigating driving performance at intersections in older adults*

36. Benedict Greenwood (UCL) *Do ADHD traits modulate the effects of emotional information on executive functioning?*

37. Ishita Chowdhury (UCL) *Can you detect lies? Deception Detection Abilities in Autistic and Neurotypical Adults, and its Impact on Victimization*

38. Hannah Savage (University of Melbourne) *Neural mediators of subjective and autonomic responding during threat learning and regulation*

39. Stephanie Rossit (UEA) *Decoding structural and functional manipulation knowledge of tools from viewing and pantomiming*

40. Lynne Barker (Sheffield Hallam University) *Parkinson's Disease and the microbiome: Is it a bug's life?*

41. Christian Keitel (University of Sterling) *Coupling of pupil- and neuronal population dynamics reveals diverse influences of arousal on cortical processing*

42. Rhys Yewbrey (Bangor University) *Cortical integration of order and timing occurs during sequence execution, but not planning*

43. Lydia J. Hickman (University of Birmingham) *The selective role of dopamine in movement vigour and not adaptation of movement speed to curvature*

44. Yueyang Zhang (University of Edinburgh) *Representation of motion concepts in occipitotemporal cortex: fMRI activation, decoding and connectivity analyses*

45. Kristof Agrez (Research Centre for Natural Sciences, Budapest) *The association between resting-state functional connectivity and adolescent alcohol use varies given ADHD risk status*

46. Leslie Tricochi (University of Lyon) *Peer presence elicits task-independent changes within and beyond the mentalizing network across children and adults*

47. Alejandra Sel (University of Oxford) *Entraining corticocortical plasticity changes oscillatory activity in action control and inhibition*

48. Clayton Hickey (University of Birmingham) *Strategic control over incentive salience in naturalistic human vision*

49. Dongwei Li (Beijing Normal University) *Temporal course of object-based attentional strengthening in the control of working memory*

50. Mairi Houlgreave (University of Nottingham) *Detecting the functional anatomy of the urge-to-blink*

51. Renzo Lanfranco (Karolinska Institute) *Minimal required exposures reveal the primacy of awareness in human face perception*

52. Yali Pan (University of Birmingham) *Saccades are locked to the phase of alpha activity during natural reading*

53. Daria Jensen (University of Oxford) *Association between longitudinal dietary and metabolic health with hippocampus connectivity and volume in older age*

54. Francesca Branzi (University of Liverpool) *Revealing task-specific and domain-general neural networks that track coherence and integrate contextual information: evidence from semantic and non-semantic tasks in different perceptual modalities*