International Conference on Cognitive Neuroscience

Abstracts Book

Diego Pinal, Olivia Morgan Lapenta, Natividade Couto Pereira,
Adriana Sampaio (organising committee)

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International Conference on Cognitive Neuroscience

Abstracts Book

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The **International Conference on Cognitive Neuroscience** (**ICON**) has been fostering scientific collaboration since its inception in 1980, becoming a cornerstone event in the field. **ICON 2025 in Porto, Portugal**, continues the tradition of excellence in scientific inquiry and interdisciplinary dialogue.

From exploring neuroimaging to delving into neurostimulation techniques and cognitive testing, ICON explores the intricate relationship between the human brain, mind, and behaviour across various topics. The conference features an extensive scientific program, including keynote lectures, symposia, and poster sessions, inviting researchers from diverse backgrounds to exchange their latest findings and methodologies, thus advancing our understanding of the neural basis of human cognition.

Welcome to Porto! During ICON 2025, immerse yourself in the excitement of scientific discovery, embrace the warmth of Portuguese hospitality, and marvel at the beauty of this coastal city. Get ready to be inspired, engaged, and fully immersed in the forefront of cognitive neuroscience research as ICON 2025 promises an intellectually stimulating experience.

ICON 2025 Organising Committee

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THE COMPUTING BRAIN: Explaining cognition through a realistic whole-brain anatomically constrained reservoir model

The perhaps most important unsolved problem in neuroscience is how the brain survives in a complex world by performing a rich repertoire of computation on a minimal energy budget. The brain is much better at adapting to the multiplicity of stimuli and outcomes than current generations of computers, artificial neural deep learning and reservoir model architectures. Yet, at first glance the brain appears to use a fixed anatomical architecture to perform the necessary huge variety of computations. But evolution's boldest trick is that in fact the brain's effective connectivity is constantly being updated through neuromodulation to allow the rich repertoire of computation. Inspired by this, we created a whole-brain model using empirical neurotransmitter maps modulating the underlying local regional dynamics. This NEMO (neurotransmission modulated) whole-brain model is able to flexibly compute the full task repertoire and associated functional connectivity of the neuroimaging data from 971 healthy participants. For each individual we defined a measure of 'brain computability' as the fitting of the NEMO whole-brain model to all tasks performed by the individual. Importantly, brain computability correlates with both behavioural performance on individual tasks and with a general behavioural measure of intelligence. Overall, our proposed unifying NEMO framework offers a natural way to sculpt different brain dynamics in a fixed brain architecture to compute the rich repertoire of tasks required for surviving and thriving.

Uta Noppeney
Donders Institute for Brain, Cognition and Behaviour, Radboud University

See what you hear: Making sense of the senses

Adaptive behavior in a complex, dynamic, and multisensory world raises some of the most fundamental questions for neural processing, notably perceptual inference, decision making, learning, binding, attention and probabilistic computations. In this talk, I will present our recent behavioral, computational and neural research that investigates how the brain tackles these challenges. First, I will focus on how the brain solves the causal inference or binding problem, deciding whether signals come from common causes and should hence be integrated or else be processed independently. Combining psychophysics, Bayesian modelling and neuroimaging (fMRI, EEG) we show that the brain arbitrates between sensory integration and segregation consistent with the principles of Bayesian Causal Inference by dynamically encoding multiple perceptual estimates across the cortical hierarchy. Next, I will explore how prior expectations and attentional mechanisms can modulate sensory integration. Finally, I will show how causal inference influences how the bran dynamically adapts to changes in the external environment and its the sensorium.

Giacomo Rizzolatti
Department of Medicine and Surgery, Neuroscience Unity, University of Parma

The mirror mechanism, empathy and motor rehabilitation

Mirror mechanism is a basic neural mechanism that transforms sensory representations of others' actions into motor or viscero-motor representations of the same actions in the brain of the observer. In the first part of my talk I will describe the functions of the mirror mechanism of the parieto-fontal network of monkeys and humans. I will show that this mechanism enables one to understand others in an immediate,

phenomenological way, without recourse to cognitive inferential processing. In the second part of my talk I will discuss the role of the mirror mechanism in understanding vitality forms and basic emotions. The data on emotions will lead me to the last part of my talk where I will present stereo-EEG data on action, emotion recognition and empathy. I will conclude discussing the clinical application of the mirror mechanism (action observation therapy, AOT).

Marta Garrido

Melbourne School of Psychological Sciences; Faculty of Medicine, Dentistry, and Health Sciences, University of Melbourne

The insight of blindsight

Much of what we know about brain circuitry for human vision comes from neuroimaging studies and investigations on people with brain damage. A remarkable example are the studies in blindsight patients, who despite being blind after injury to their primary visual cortex (V1), display remarkable visual abilities. Indeed, blindsight patients can navigate through obstacles, detect motion, and correctly identify emotion in unseen faces. A possible explanation for this apparent paradox is that visual information is conveyed from subcortical structures to other cortical regions, bypassing V1. In this talk, I will present converging evidence from a diverse range of neuroimaging techniques and large data sets, which show this is the case for behavioural salient stimuli charged with motion and emotion information. I propose that the brain circuitry underpinning such residual vision, albeit without awareness, relies on brain shortcuts. These shortcuts may be a means for expediency of information processing and a useful alternative for the preservation and rehabilitation of critical visual functions after brain insult.

Todd Braver

Department of Psychological and Brain Sciences, Stuckenberg Chair of Human Values & Moral Development, Washing ton University

Neural mechanisms of cognitive control

Research in my lab investigates the neural mechanisms that give rise to successful cognitive control: the ability to regulate thoughts and actions in an intelligent, goal-directed manner. We have argued that such mechanisms, which involve a network of brain regions centered on the lateral prefrontal cortex, can operate in either a proactive (i.e., anticipatory / sustained) or reactive (i.e., transient and stimulus-triggered) mode. This framework thus emphasizes the importance of examining temporal dynamics in the neural mechanisms of cognitive control. I'll discuss recent work examining this framework, including findings that have come out of our larger-scale Dual Mechanisms of Cognitive Control project, as well as our newest efforts to implement a precision neuroscience approach to identify reliable proactive and reactive control signatures within single individuals.

Symposium Abstracts

Symposium abstract [SY04]
Session: Sensory Systems & Perception I
Date: 16 September 2025 (9h00)
Symposium Title: ***The Body Whispering to the Ear: How Self and Others' Bodily Signals Affect Auditory and Speech Processing***
Symposium organiser(s): Simone Gastaldon
Department of Developmental Psychology and Socialisation (DPSS) & Padova Neuroscience Center (PNC), University of Padua, Padua, Italy

Talk 1 – ***Gesture-speech integration in neurotypical and non-neurotypical development***
Presenter: Matteo Maran
Donders Centre for Cognition, Radboud University, Nijmegen, The Netherlands
Co-Authors: Kim Jonkman[1], Robert Jertberg[1], Lotus Verbiest[1], Erik van der Burg[1], Sander Begeer[1], Hans Rutger Bosker[2]

[1] Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

[2] Donders Centre for Cognition, Radboud University, Nijmegen, The Netherlands

Talk 2 – ***The brain tracks mouth movements to predict speech, even when the mouth is not visible***
Presenter: Giorgio Piazza
Department of Developmental Psychology and Socialisation (DPSS), University of Padua, Padua, Italy
Co-Authors: Francesco Vespignani[1,2], Simone Gastaldon[1,2], Martin M. Winchester[3,4], Francesca Peressotti[1,2]

[1] Department of Developmental Psychology and Socialisation (DPSS), University of Padua, Padua, Italy

[2] Padova Neuroscience Center (PNC), University of Padua, Padua, Italy

[3] School of Computer Science and Statistics, Trinity College Dublin, Dublin, Ireland

[4] ADAPTCentre, Trinity College Institute of Neuroscience, Dublin, Ireland

Talk 3 – ***The harder the speech, the more engaging the mouth, even for infants!***
Presenter: Irene Arrieta-Sagredo
Université Paris Cité, Paris, France
Co-Authors: Zuriñe Martinez[1], Xabier Altuna[1], Manuel Carreiras[2,3], Marina Kalashnikova[2,3]

[1] Hospital de Donostia-San Sebastián, Donostia-San Sebastián, Spain

[2] BCBL – Basque Center on Cognition, Brain and Language, Donostia-San Sebastián, Spain

[3] Ikerbasque – Basque Foundation for Science, Bilbao, Spain

Talk 4 – ***Bodily signals facilitate auditory regularity processing in human wakefulness and sleep***
Presenter: Andria Pelentritou
Department of Clinical Neuroscience (DNC), Lausanne University Hospital (CHUV) & University of Lausanne (UNIL), Lausanne, Switzerland
Co-Authors: Jacinthe Cataldi[1], Christian Pfeiffer[2], Sophie Schwartz[3,4], Marzia De Lucia[1,5]

[1] Department of Clinical Neuroscience (DNC), Lausanne University Hospital (CHUV) & University of Lausanne (UNIL), Lausanne, Switzerland

[2] Federal Institute of Technology Zurich (ETHZ), Zurich, Switzerland

[3] Department of Neuroscience, University of Geneva, Geneva, Switzerland

[4] Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland

[5] Center for Biomedical Imaging (CIBM), Lausanne, Switzerland

Talk 5 – *B-Waves: an open-access body-brain dataset to investigate perception and action*

Presenter: Antonio Criscuolo

Department of Neuropsychology and Psychopharmacology, Maastricht University, Maastricht, The Netherlands

Co-Authors: Michael Schwartze[1], Sonja A. Kotz[1,2]

[1] Department of Neuropsychology and Psychopharmacology, Maastricht University, Maastricht, The Netherlands

[2] Department of Neuropsychology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Abstract

Effective and situated auditory and speech processing is shaped by a range of factors; these may include signals from both others' bodies and one's own. In this symposium, we will discuss if and how the body influences auditory and speech processing, with an emphasis on the role of both external and internal cues. Visual cues from an interlocutor, such as facial expressions, lip movements, and hand gestures, provide essential paralinguistic and temporal information, enhancing speech comprehension. For instance, beat gestures can guide attention to syllables, affecting word stress perception in both neurotypical participants and individuals with autism (Maran), while lip movements improve speech prediction in audiovisual comprehension (Piazza). These visual mouth cues become even more critical as listening difficulty increases, particularly for toddlers and children, whether they have normal hearing or rely on cochlear implants (Arrieta-Sagredo). Interestingly, internal bodily signals such as cardiac and respiratory rhythms seem to influence basic auditory processing. For example, heartbeats synchronize with auditory inputs, enhancing neural responses to sound omissions during both wakefulness and sleep (Pelentritou). To further characterize the body-brain interaction in auditory perception and the potential consequences on higher-level speech processing, advancements in wearable sensors enabling the simultaneous recording of multimodal neural and bodily signals offer a promising avenue (Criscuolo). Featuring a panel of early career researchers, the symposium aims at exploring the different ways in which the body "whispers" to the ear, potentially modulating auditory and speech processing. By integrating perspectives from both external and internal bodily signals, the discussion seeks to inspire fresh insights with potential far-reaching implications for research across diverse areas of cognitive neuroscience. **Gesture-speech integration in neurotypical and non-neurotypical development** (Maran) – In face-to-face communication,

visual cues aid speech comprehension. Beat gestures (simple hand flicks) influence speech perception by emphasizing syllable stress in minimal pairs (e.g., "CONtent" vs. "conTENT"). While early studies suggested disrupted audiovisual integration in autistic individuals, recent research shows similar integration abilities. This large-scale online study tested whether beat gestures bias speech perception in autistic individuals using prosodically ambiguous minimal pairs. Preliminary results suggest that beat gestures influence perception similarly in both neurotypical and autistic participants. These findings align with recent research challenging the idea of altered integration of auditory and gestural-visual signals in autism. **The brain tracks mouth movements to predict speech, even when the mouth is not visible** (Piazza) – Humans excel in face-to-face interactions by using linguistic and extralinguistic cues to predict upcoming speech. We explored the role of mouth cues in prediction during naturalistic speech comprehension. Italian speakers (N = 25) watched videos (~44 minutes) of a narrator with the mouth either visible or covered while EEG was recorded. Temporal Response Function analysis linked stimulus features to neural responses, focusing on mouth movements, visemic surprisal (visual phoneme unpredictability), and semantic surprisal. Results showed that the brain encodes mouth movements even when it is covered, with enhanced tracking when visible. Mouth visibility also improved lexical predictions, underscoring the importance of mouth signals integration in predictive speech comprehension. **The harder the speech, the more engaging the mouth, even for infants!** (Arrieta-Sagredo) – Language acquisition often occurs in audio-visual, face-to-face interactions in less-thanideal environments, yet acquisition research mainly focuses on auditory-only, clear speech. This talk examines how infants and children use audio-visual speech when intelligibility is compromised by acoustic degradation or sensory limitations like hearing loss. Data from 60 typically hearing infants and children (8 months to 12 years) and 12 children with hearing loss (before and after cochlear implants) were analyzed. Eye-tracking revealed that as speech intelligibility decreased, typically hearing children shifted focus from the eyes to the mouth. Children with hearing loss showed a similar trend post-implant, though not statistically significant. The results highlight the role of early audio-visual speech exposure and of mouth signals in attention patterns during speech listening in adverse conditions. **Bodily signals facilitate auditory regularity processing in human wakefulness and sleep** (Pelentritou) – The human brain continuously monitors external and internal signals to detect changes or threats. This work examined how internal bodily signals influence auditory processing in wakefulness and sleep. In two closed-loop auditory experiments, EEG and ECG data were collected from healthy volunteers. Sounds were synchronized with heartbeats and compared to non-regular conditions. In Experiment 1 (N = 26), unexpected sound omissions triggered neural surprise responses during wakefulness and stage N2 of sleep, and a heartbeat deceleration in wake and sleep. Experiment 2 (N = 30) showed that N2 and N3 sleep slow oscillations aligned with cardiac-synchronized sounds. A new study explores if this extends to respiratory-synchronized auditory sequences. These results suggest an integration of bodily and auditory signals across vigilance states. **B-Waves: an open-access body-brain dataset to investigate perception and action** (Criscuolo) – Rhythm permeates our lives: from walking and cycling to listening to

speech and music. Syllable and walking rates, cardiac, and respiratory signals enrich our sensory landscape with gradients of temporal regularities. Here we propose the B-Waves dataset, which employs smart sensing technologies (mobile EEG, breathing belts, smart glasses) to record physiological, ocular, motion, and speech data. By exploring oscillatory dynamics in bodily (cardiac, respiratory, pupil) and brain signals, we can characterize individual body-brain bidirectional interactions to better understand if and how they influence auditory processing and rhythmic behaviors. This multimodal approach aims to highlight the importance of internal body signals in sensing and acting in the environment.

Symposium abstract [SY07]
Session: Language & Music I
Date: Thursday 18 September 2025 (09:00)
Symposium Title: ***Challenges and Opportunities for Studying Neural Processing of Real-Life Speech***
Symposium organiser(s): Elana Zion Golumbic
Bar Ilan University, Israel

Talk 1 – ***Exploring the Impact of Operating Room Acoustics on Surgical Performance: Insights from Mobile EEG***
Presenter: Martin Bleichner
Carl von Ossietzky Universität Oldenburg, Germany
Co-Authors: Marc Rosenkranz
Carl von Ossietzky Universität Oldenburg, Germany

Talk 2 – ***Hierarchical dynamic coding coordinates sound-to-meaning transformation during continuous speech processing***
Presenter: Laura Gwilliams
Stanford University, USA.

Talk 3 – ***EEG responses to natural speech: from hearing to understanding to being deeply engaged in a conversation***
Presenter: Tom Francart KU Leuven, Belgium.
Co-Authors: Bernd Accou[1], Lotte Lambrechts[1], Jonas Vanthornhout[1]

[1] KU Leuven, Belgium

Talk 4 – ***Walking, Talking, and Listening: Neural and Behavioral Insights into Real-World Communication and Movement***
Presenter: Martin Orf[1,2]
Co-Authors: Jonas Obleser[1,2]

[1] Department of Psychology, University of Lübeck, Lübeck 23562, Germany

[2] Center of Brain, Behavior and Metabolism (CBBM), University of Lübeck, Lübeck 23562, Germany

Talk 5 – *"This class is boring": Students' neural processing of speech during real-life classroom learning*

Presenter: Elana Zion Golumbic
Bar Ilan University, Israel
Co-Authors: Ofek Ben-Abu
Bar Ilan University, Israel

Abstract

Spoken language, the natural mode of communication for hearing individuals, is central to human cognition and social interactions. Understanding how the brain encodes and processes natural speech can offer critical insights into the process of extracting meaning from sound and the nature of semantic and contextual processes. However, the dynamic and complex nature of natural speech has often been a barrier to conducting rigorous neuroscientific research, which typically prefers using carefully designed stimuli and tasks that are highly controlled for addressing specific research questions, but fail to capture the richness of real-life spoken language. In this symposium, we will present novel approaches for studying how the brain processes natural speech in real-life scenarios, such as casual conversations, classroom learning or amidst the ambient sounds of a café. Specifically, we demonstrate how advanced linear modeling of magneto- and electroencephalographic data (M/EEG), recorded while individuals listen to natural speech, can be leveraged to offer insights into higher-order aspects of speech processing, such as: hierarchical processing of language, syntactic and semantic representations, individual differences in hearing and attention capabilities, as well as aspects of interpersonal communication. M/EEG data will be presented from a variety of sources, ranging from traditional laboratory experiments, through clinical settings to real-life situations, such as classrooms. However, all speakers share a common scientific goal - to better understand how the brain encodes, processes, understands and responds to the type of speech that it encounters in everyday situations. The symposium will include the following 5 talks: **Talk 1** - ***Exploring the Impact of Operating Room Acoustics on Surgical Performance: Insights from Mobile EEG*** Dr. Martin Bleichner will present findings from mobile EEG research collected during simulated laparoscopic surgeries designed to closely replicate real-world operating room conditions. The study investigates how the complex acoustic environment influences surgical performance, focusing on the neural processing of irrelevant speech during tasks requiring different levels of attention. Combining EEG, performance metrics, and subjective reports, the results offer insights into how auditory distractions interact with cognitive demand. This work demonstrates the potential of mobile EEG in work related contexts and addresses the challenges of balancing ecological validity with experimental rigor. **Talk 2** - ***Hierarchical dynamic coding coordinates sound-to-meaning transformation during continuous speech processing*** Dr. Laura Gwilliams will present findings from her MEG and intracranial EEG research, where participants listen to audiobooks while answering simple comprehension questions. The audiobooks were annotated for a comprehensive suite of language features, which span from sound to meaning. Using

time-resolved decoding methods, Dr Gwilliams finds that each feature of the hierarchy traverses a dynamic neural code, and the speed of feature processing is commensurate with the feature's position in the hierarchy. These findings lead her to propose the Hierarchical Dynamic Coding theory - a new dynamic model for how continuous natural language is cortically encoded in neural activity. **Talk 3 - *EEG responses to natural speech: from hearing to understanding to being deeply engaged in a conversation***. Dr. Tom Francart will present a series of studies that investigate the neural processing of natural speech, all the way from hearing sound, processing of acoustics, phonetics, and semantics, up to being fully engaged with the content. The interplay of understanding, attention, effort and engagement will be discussed. A number of practical clinical applications will be demonstrated. **Talk 4** - ***Walking, Talking, and Listening: Neural and Behavioral Insights into Real-World Communication and Movement*** Dr. Martin Orf and Dr. Jonas Obleser will present a set of recent studies that aim at understanding speech comprehension and auditory tracking of speech ("neural tracking") in normal-hearing ageing adults as well as those with hearing impairment. While acoustic scenes with multiple sound sources are challenging enough, interesting new problems arise when we measure neural tracking "in the wild", e.g. as two interlocutors take a walk, and as the acoustics of the scenery change. We present a combination of gait data, acoustic analysis of spontaneously produced speech, and simultaneously recorded and modelled EEG data of ageing adults. Together, these findings emphasize the value of combining neural, behavioral, and motor measures to advance hearing technologies and improve our understanding of communication in complex, real-world scenarios. **Talk 5** - ***"This class is boring": Students' neural processing of speech during real-life classroom learning*** Dr. Elana Zion Golumbic will share data from a real-world study, conducted as part of a unique research-practice partnership with a local high-school, where EEG is recorded from students during a frontal lesson (about the brain), within their organic classroom. Behavioral and neural data are analyzed in order to characterize fluctuations in students' engagement with the lecture over time and to quantify the effects of background noises and irrelevant speech on neural speech tracking and learning outcomes. This unique dataset demonstrates both the feasibility and the scientific potential of using mobile EEG for furthering our understanding of speech processing in dynamic, multi-sensory and cognitively demanding real-life situations.

Symposium abstract [SY08]
Session: Attention I
Date: Friday, 19 September 2025 (09:00)
Symposium Title: ***How much do (micro) eye movements mediate well-known links between EEG-alpha oscillations and cognition?***
Symposium organiser(s): Tzvetan Popov[1] & Freek van Ede[2]

[1] University of Zurich, Switzerland.

[2] Vrije Universiteit Amsterdam, The Netherlands.

Talk 1 – ***Linking spatial modulations in microsaccades and EEG activity during top-down shifts of covert and internal attention***
Presenter: Freek van Ede
Vrije Universiteit Amsterdam, The Netherlands.

Talk 2 – ***The role of microsaccades in attention-related alpha-modulations: Towards disentangling distinct attentional mechanisms concealed in the canonical alpha band***
Presenter: Gabriela Cruz
University of Glasgow, Scotland.

Talk 3 – ***Saccades are locked to the phase of alpha oscillations during natural reading***
Presenter: Yali Pan
University of Birmingham, United Kingdom.

Talk 4 – ***Alpha oscillations mediated oculomotor action as the control of perception and the formation of episodes***
Presenter: Tzvetan Popov
University of Zurich, Switzerland.

Abstract
Symposium at large A century ago, Hans Berger discovered the brain's dominant rhythm: 8-12 Hz alpha oscillations. To this day, alpha activity remains among the most studied brain rhythm in cognitive neuroscience, with established links to attention, reading, working memory and long-term memory. Recently, studies have started to uncover a close connection between alpha activity and eye-movements, including microscopic eye-movements known as microsaccades. These eye movements are also known to be modulated by aforementioned cognitive processes. This raises an urgent and timely question: to what extent is the reported link between alpha activity and cognition mediated by eye movements? Alternatively, how much room is left for a direct link between alpha activity and cognition, unmediated by co-occurring gaze modulations? This symposium will bring together four speakers who have begun tackling these questions, taking on distinct perspectives. The aim is to establish the current state of knowledge and identify critical open questions that remain to be addressed. ***Linking spatial modulations in microsaccades and EEG activity during top-down shifts of covert and internal attention*** (F. van Ede) True fixation is an illusion. Even under attempted fixation – a methodological cornerstone in cognitive neuroscience – humans continue to make small eye movements known as microsaccades. Because microsaccades are modulated by key cognitive operations, this poses the question to what extend microsaccade biases may 'explain' neural modulations observed during cognitive tasks. I will address this for the lateralisation of alpha activity (as well as the N2pc) observed during top-down shifts of covert and internal attention. I start by showing why we should be worried, as even spontaneously microsaccades transiently lateralise EEG-alpha activity. I next delineate the relation between spatial modulations in microsaccades and EEG activity during top-down shifts of covert and internal attention. I will show how spatial modulations

in microsaccades and neural activity are correlated (the "bad" news), but also how microsaccades are not a pre-requisite for neural modulations by attention to occur (the "good" news). I end by discussing a recent study that helps explain this intricate relationship. ***The role of microsaccades in attention-related alpha-modulations: Towards disentangling distinct attentional mechanisms concealed in the canonical alpha band*** (G. Gruz) Endogenous attention dynamically modulates sensory processing and is often indexed by changes in alpha-band (8-14 Hz) oscillatory activity. While classical models associate lateralized alpha-amplitude modulations with attentional engagement and disengagement, recent findings suggest these effects arise from distinct functional alpha-sources. (1) I will explore the relationship between microsaccades, frequently overlooked in EEG/MEG studies, and alpha sub-band oscillatory activity during spatial attention tasks. I will present evidence for dissociable high- and low-frequency alpha-band changes, linked to distinct occipital and parietal sources, which correspond to different patterns of microsaccadic directional activity and likely reflect distinct attentional mechanisms. (2) I will highlight the importance of incorporating concurrent eye-tracking, designing robust control paradigms, and leveraging both sensor-level and source-modeling approaches in combined EEG/MEG setups to better understand alpha rhythms' roles in attention and perception. (3) Finally, I will address the limitations of studying attention using prolonged fixation and covert shifts in artificial laboratory conditions, and propose future directions for investigating alpha oscillations in more naturalistic spatial attention scenarios, bridging controlled experimental findings with everyday attention processes. ***Saccades are locked to the phase of alpha oscillations during natural reading*** (Y. Pan) During natural reading, we make 3 to 5 saccades per second to direct the text of interest to the fovea (the region of the highest visual acuity). For efficient processing, the text sampled by these saccades must arrive in the visual cortex at the optimal phase. However, the neuronal mechanisms underlying the precise coordination between the oculomotor and visual systems remain poorly understood. Could brain oscillations play a role in this process? To investigate this, we simultaneously recorded MEG and eye-tracking data as participants silently read sentences. Each sentence contained a target word with either high or low lexical frequency. Our findings revealed that saccade onsets were phase-locked to alpha oscillations (8-13 Hz), particularly before saccades towards low-frequency words. Source modeling localized these alpha oscillations to the right visuomotor cortex (Brodmann Area 7). These results suggest that alpha oscillations play a critical role in timing the coordination between the oculomotor and visual systems during natural reading, with this coordination becoming more pronounced when pre-processing demanding words. ***Alpha oscillations mediated oculomotor action as the control of perception and the formation of episodes*** (T. Popov) Contemporary cognitive neuroscience depends on the validity of the premise that, under well-controlled experimental conditions, the alpha oscillations vary with task-specific cognitive demands and reflect the neural support of the cognitive operation performed. A complementary view is discussed, exploring the hypothesis of rhythm-mediated action control. This hypothesis is based on the premise that the rhythm evolved to control the movement of the brain's sensors and to register the consequences of this movement. This control of perception is a species-independent

necessity and a key survival requirement for all organisms equipped with and relying on the ability to explore the environment. Initially evolved to support physical movement, rhythm-mediated action is also utilized during higher-order cognition. Consequently, the alpha oscillations appear correlated with the cognitive task at hand, while in fact, they evolved primarily to support the control of perception. Considering the primacy of action a novel perspective is offered: how and why alpha oscillations enable collective behavior across various organizational scales, ranging from neural circuits controlling eye movements to animal societies controlling the movement direction of the swarm.

Symposium abstract [SY09]
Session: Executive Functions & Decision Making II
Date: September 2025 (13h45)
Title: ***Brain Beats – How Slow and Fast Oscillations Orchestrate Cognitive Functions***
Symposium organiser(s): Yannik Hilla
University of Zurich (UZH), Switzerland; University of the Bundeswehr Munich (Unibw), Germany; Ludwig-Maximilians-Universität München (LMU), Germany

Talk 1 - ***Cognitive Coordination as Key for Social Cognition in Individuals with Low and High Autistic Personality Trait***
Presenter: Elisabeth V. C. Friedrich
University of Sustainability Vienna – Charlotte Fresenius Privatuniversität, Austria; University of Zurich (UZH), Switzerland; Ludwig-Maximilians-Universität München (LMU), Germany Co-Authors: Yannik Hilla[1,3,4], Larissa Behnke[1,2], Paul Sauseng[1,2]

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4 Ludwig-Maximilians-Universität München (LMU), Germany

Talk 2 – ***Directionality of Traveling Waves During Selective Working Memory***
Presenter: Yifan Zeng
University of Zurich (UZH), Switzerland; Neuroscience Center Zurich (ZNZ), University of Zurich and ETH Zurich, Switzerland
Co-Authors: Paul Sauseng[1,2], Andrea Alamia[3]

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Talk 3 – *One Moment in Time: Spatio-Temporal Signatures of Neural Oscillations in Dynamic Cognition*

Presenter: Charline Peylo
University of Zurich (UZH), Switzerland; Ludwig-Maximilians-Universität München (LMU), Germany
Co-Authors: Larissa Behnke[1,3], Carola Romberg-Taylor[2], Paul Sauseng[1,3]

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Talk 4 – *Inter-Individual Differences in Slow Oscillatory Activity as Neural Substrates of Differential Attention Control Between Video Game Players and Control Individuals*

Presenter: Yannik Hilla
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Talk 5 – *Investigating the Role of the Primary Motor Cortex as the Neurophysiological Driver of Memory Guided Action Planning*

Presenter: Larissa Behnke
University of Zurich (UZH), Switzerland; Neuroscience Center Zurich (ZNZ), University of Zurich and ETH Zurich, Switzerland
Co-authors: Lucien Koch1, Paul Sauseng[1,2]

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Abstract

Similar to instruments of an orchestra contributing to a symphony, neural activity enables cognitive functions, which in turn, allow for information processing. Furthermore, as instruments are being played in a systematic order and a coordinated rhythm to elicit enjoyable music, neural activity emerges from specific brain areas according to a precise temporal schedule to produce goal-driven and complex behaviors. In the electroencephalogram, this is illustrated by oscillatory activity related to specific sites and time-locked to an event. This constitutes a neural network accounting for cognitive information processing. In this regard, slow oscillatory signatures likely represent pace makers of time windows either fostering or inhibiting information processing. In line with this, Elisabeth Friedrich will present their electroencephalography (EEG) data supporting the hypothesis according to which a fronto-parietal theta-gamma phase-amplitude coupling mechanism poses a unifying working memory processing mechanism. For this, they recorded the electrical brain activity of individuals with different levels of autistic-traits while performing a working memory task requiring them to memorize and manipulate verbal, visual,

and social information in low and high memory load conditions. They found that the individuals' performance depended on how well posterior gamma activity temporally aligned with frontal theta activity as individuals with high autistic traits showed an impairment of this mechanism coinciding with worse performance compared to individuals with low autistic traits. Moreover, by inhibiting the dorsomedial prefrontal cortex (i.e., a hub for cognitive coordination) with transcranial magnetic stimulation (TMS), they could also confirm that this coupling mechanism was crucial for effective communication between distant brain areas to control cognitive functions and might even explain cognitive and social deficits (as observed in individuals with high autistic traits). But sometimes instrumentalists get carried away in the course of their performance and lose pace requiring the conductor to get them back on track. Regarding brain activity, alpha waves, that is brain oscillatory activity around 10 Hz, serves a similar purpose as alpha activity modulation has been observed to coincide with a decreased likelihood of information processing. Therefore, alpha activity has been discussed as a neural substrate of inhibition. In contrast, Yifan Zeng will present research results in favor of alpha waves illustrating a gating mechanism. In detail, they investigated the directionality of alpha wave propagation during a working memory task and found it to be closely tied to attentional control over working memory content. Forward (posterior-to-anterior) waves were modulated by the presence of distractors, indicating enhanced bottom-up gating processes. Conversely, backward (anterior-to-posterior) waves were inversely modulated by the number of targets, suggesting top-down gain control over downstream visual regions. Getting back to our orchestra metaphor, this implies that alpha activity constitutes a conductor being able to both speed up and slow down instrumentalists. Of course, this requires the conductor to act dynamically and to allocate their attention flexibly in time and space. Charline Peylo will provide evidence in favor of alpha oscillatory activity exhibiting exactly such characteristics. She will present results of an EEG study that probed the dynamics of attention and corresponding neural signatures using a novel dynamic target detection paradigm that allowed for flexible attention allocation with minimal interference from stimulus-evoked activity (i.e., counting the occurrences of a remembered orientation within the cued hemifield of a continuous bilateral stimulus rotation). She observed performance-related alpha power reductions and slow negative potentials around task-relevant locations and time points (i.e., orientation onset within the attended hemifield), suggesting that humans can naturally and dynamically focus their attention in space and time and that such spatio-temporal attention shifts can be reflected by dynamic alpha power modulations and slow negative potentials. This is very challenging and a conductor requires a lot of practice and experience to master this. But what kind of experience may be suitable for training the brain to coordinate information? Yannik Hilla will address this question by presenting the outcome of a research project aiming to investigate if and how alpha waves differ between video game players and control individuals. For this, they recorded the individuals' electrical brain activity using EEG while performing a visual short-term memory task whereby shape targets had to be memorized in different difficulty conditions. Performance differences were then used to operationalize cognitive functions according to the theory of visual attention framework. Video

game players and control individuals differed in their relations between cognitive functions and alpha activity. This indicates that habitual video game playing may alter cognitive processing via alpha activity. All this points towards the musicians relying on the conductor to be able to guide them. One could also say: the conductor illustrates the brain and the musicians the body of the orchestra. But how dependent are both parties on each other really? Larissa Behnke will provide insights into how future behavior as a function of action planning relates to upper alpha/beta activity (12-17Hz). For this, they investigated how 13 Hz TMS applied over the primary motor cortex impacts memory guided action planning, aiming to prove the missing causal link between upper alpha/beta activity and prospective action planning. They could not show the link between working memory processing and motor planning/execution with upper alpha/beta activity mediating this relationship. This implies that the brain can compensate for disturbance even in complex cases such as memory guided action planning. Regarding our orchestra metaphor, one could conclude that the musicians can still play the symphony even if the conductor is temporarily unavailable. In sum, our symposium will outline how rhythmical brain activity of a fronto-parietal brain network accounts for information processing by enabling and coordinating cognitive functions across different workload conditions.

Symposium abstract [SY10]
Session: Sensory Systems & Perception II
Date: September 2025 (13h45)
Title: ***Investigating Cortical Temporal Predictions via Peripheral Measurements in Healthy and Clinical Populations***
Symposium organiser(s): Alessandro Tavano[1] & Marzia De Lucia[2]

1 Goethe University Frankfurt, Germany

2 Lausanne University Hospital, Switzerland

Talk 1 – ***The influence of cardiorespiratory rhythm on associative learning***
Presenter: Miriam Nokia
University of Jyväskylä, Finland

Talk 2 – ***Interactions between cortical and respiratory oscillations***
Presenter: Alessandro Tavano
Goethe University Frankfurt, Germany

Talk 3 – ***Cardiac responses to auditory regularities in the absence of consciousness***
Presenter: Marzia De Lucia
Lausanne University Hospital, Switzerland

Talk 4 – ***Assessing temporal predictions through eye movements***
Presenter: Shlomit Yuval-Greenberg
Tel Aviv University, Israel

Talk 5 – ***A Peripheral View of the Predictive Brain: Linking Ocular Dynamics to the Neural Signatures of Natural Language Comprehension***
Presenter: Quirin Gehmacher
University College London, England, UK

Talk 6 – ***Pitch predictability of music affects rhythm processing***
Presenter: Anne Keitel
University of Dundee, Scotland

Abstract
Peripheral measures (e.g., skin conductance, heart-rate variability, respiratory rate) are often informative about a participant's cognitive state. This can be either because cortical circuits top-down modulate peripheral responses, or because peripheral nervous system circuits independently modulate central processes. Our symposium focuses on a fundamental component of cognitive and behavioral states, that is the computation of temporal expectancies, and attempts to compose a theoretical feedforward-feedback loop between central and peripheral modulations of temporal expectations. The focus of Miriam Nokia's talk "The influence of cardiorespiratory rhythm on associative learning" sets the scene on how the phase of cardiorespiratory rhythm affects brain responses to and learning about external stimuli. In particular, eyeblink conditioning - a form of hippocampus dependent associative motor learning - is enhanced in individuals who receive the conditioned stimulus consistently at diastole during expiration, compared to those who are trained at systole during inspiration. This effect is observed in both young adults and elderly adults, suggesting that fast fluctuations in physiological state can be used to optimize learning. Next, Alessandro Tavano's talk "Interactions between cortical and respiratory oscillations" will focus specifically on respiratory rhythms and how they reliably encode cortically computed statistical information. By progressively varying auditory stimulus statistics, he determines an individual lag in information transfer and information disruption between central and peripheral nervous system circuits (feedforward), as well as how long information can be stored in each system. Marzia De Lucia will pick up the clinical tab with her talk "Cardiac responses to auditory regularities in the absence of consciousness", focussed on the preservation of interoceptive processing in relation to external sensory processing when any form of perception can be excluded. She investigated the integration of cardiac and auditory inputs in the deep unconscious state of coma and in a cohort of healthy participants using ECG and EEG, using auditory sequences in synchrony or out of synchrony with the ongoing heartbeat and randomly interrupted by sound omissions. She found that unexpected sound omissions elicited cardiac deceleration only in sequences synchronized with the ongoing heartbeat, for both healthy awake individuals and comatose patients, consistent with top down readjustment of cardiac rhythmic states to optimize temporal expectancies, across conscious and unconscious states. From the heart we move to the eyes in Shlomit Yuval Greenberg's talk "Assessing temporal predictions through eye movements". A major challenge of the perceptual system is to accurately extract signals from their noisy environment, but behavioral response

measurements provide mostly retrospective rather than real-time estimates. Hence, Shlomit will present an approach for estimating temporal prediction using saccadic eye movements. Saccades are a highly promising tool for assessing temporal prediction and expectation, not only because they occur continuously and without explicit instructions, but also because they can be monitored prior to target onset. In a series of studies, she demonstrated that eye movements are inhibited prior to the onset of predictable visual, auditory, or tactile targets, suggesting that oculomotor inhibition reflects supramodal temporal expectations. Her findings suggest that this effect is based on trial-by-trial expectation rather than a global arousal state or an effect of duration estimation. Quirin Gehmacher's talk: "A Peripheral View of the Predictive Brain: Linking Ocular Dynamics to the Neural Signatures of Natural Language Comprehension", investigates how eye movements, and in particular dynamic changes in pupil size, align with low-level speech and high-level language properties. These include the acoustic envelope and semantics predictions. Thus, it provides another component of an integrated loop between the central and peripheral nervous systems. Simultaneous MEG and eye-tracking recordings demonstrated that temporal patterns in eye features reliably aligned with neural responses during both predictable and random auditory conditions, as well as omitted tones, directly connecting these findings with those of Marzia De Lucia, and thus providing another component of the integrated loop between central peripheral nervous systems. The oculomotor system is however part of the motor system, and Anne Keitel's talk "Pitch predictability of music affects rhythm processing" explicitly bridges central cognition and peripheral actions by testing whether cortical tracking (acoustic envelope and pitch surprisal) of tonal and atonal music measured using EEG is modulated by pitch predictability. Behaviourally, she measured participants' ability to finger-tap to the beat of tonal and atonal sequences and found that while finger tapping performance was better in the tonal condition, cortical envelope tracking was stronger while listening to atonal music. For the cortical tracking of pitch surprisal, she shows that listeners' expectations match those computed by the IDyOM model, with higher surprisal for atonal than tonal music, thereby highlighting different sources of top-down modulation on central and peripheral musical rhythm processing. In conclusion, the symposium highlights the multifaceted interactions between central and peripheral systems in modulating temporal expectations and cognitive states. From the influence of cardiorespiratory rhythms on learning to the role of cortical-respiratory dynamics, interoceptive cardiac responses, oculomotor and tapping behavior, these findings collectively advance our understanding of the bidirectional feedback-feedforward loops between the brain and the body. By integrating evidence from diverse domains and methodologies, the talks provide a cohesive framework that bridges physiological rhythms, sensory processing, and motor dynamics, with far reaching implications for both basic neuroscience and clinical research.

Symposium abstract [SY11]
Session: Consciousness & Cognition I
Date: Wednesday, 17 September 2025 (13h45)
Symposium Title: ***Towards Robust and Reliable Cognitive Neuroscience: Meta-Scientific Perspectives***
Symposium organiser(s): Laura-Isabelle Klatt[1] & Christian Keitel[2]

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[2] Psychology, University of Dundee, Scotland

Talk 1 – ***Reassessing the Alpha Phase: An #EEGManyLabs Investigation into Visual Perception***
Presenter: Manuela Ruzzoli[1,2]

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Talk 2 – ***#EEGManyPipelines: A many-analyst project on the variability of EEG analysis approaches***

Presenter: Elena Cesnaite
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Talk 3 – ***From Raw to Refined: How Data Transformations Shape Effect Sizes and Reliability***

Presenter: Alina Koppold[1,2]

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Talk 4 – *Effect sizes in oscillatory cognitive neuroscience – a SCONe project*

Presenter: Laura-Isabelle Klatt
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Talk 5 – *Time-on-task explains variability in oscillatory brain-behaviour relationships*

Presenter: Martina Kopčanová
Psychology, University of Dundee, Scotland.
Co-Authors: Raquel London[1], Chris Benwell[2], Christian Keitel[2]
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Abstract

That Cognitive Neuroscience, like many related fields, suffers from a serious replication crisis is old news. The problem arises – in part – from underpowered studies, lack of replication, as well as the flexibility and high number of analytical choices in analyses of neuroimaging data. In recent years, cognitive neuroscientists have increasingly recognized the need to improve robustness and replicability in the field and to synthesize and integrate data across studies and laboratories. This symposium highlights current meta-scientific efforts to address these challenges. The first talk, Reassessing the Alpha Phase: An #EEGManyLabs Investigation into Visual Perception, showcases a multi-lab initiative (#EEGManyLabs), aimed at reconciling inconsistent findings regarding pre-stimulus alpha fluctuations and visual perception. Specifically, the overall goal is to assess the influence of high and low excitability states in the alpha band (8-13 Hz) for visual awareness, gathering data from nine independent labs. We will present the most recent results from the project, and discuss insight into the #EEGManyLabs collaboration. The second talk, #EEGManyPipelines: A many-analyst project on the variability of EEG analysis approaches, highlights the #EEGManyPipelines project, a many-analyst endeavor that aims to investigate the robustness of EEG findings across different analytical approaches. With this goal, a single EEG dataset and a set of hypotheses were sent to expert teams. In total, 168 teams completed the task, analyzed the data, and returned their results. The collected data include preprocessed EEG data, processing scripts, an analysis questionnaire, and outcomes of hypothesis testing. Here, new results, linking the size of a p-value and the size of an ERP difference wave to different analysis pipeline choices, will be presented. In the third talk, From Raw to Refined: How Data Transformations Shape Effect Sizes and Reliability, the German Interest Group for Open and Reproducible Science (IGOR) presents a comprehensive review of data transformation procedures for psychophysiological measures and their impact on effect sizes and reliability. Using the field of human fear conditioning as a case example, the project reviews

the literature on transformation heterogeneity and reporting standards for multiple outcome measures (e.g., skin conductance, heart rate, electromyography) and assesses the impact of different transformation procedures using empirical and simulated datasets. Preliminary results emphasize the need for standardized reporting practices and reveal the complexity of transformation choices across measures. Specific transformations enhance reliability and effect sizes by reducing systematic error variance, highlighting the importance of methodological choices. Fourth, the talk Effect sizes in oscillatory cognitive neuroscience – a SCONe project presents work from the Scottish-EU Critical Oscillations Network (SCONe) which underscores the importance of estimating and reporting effect sizes in our field. The traditional focus on statistical significance, and increasingly complex analysis techniques pose a challenge to the accurate and transparent quantification and reporting of how strongly cognitive factors affect brain activity. In a large-scale feasibility project, the authors aim to provide a comprehensive meta-analytic assessment of the landscape of effect sizes for the established case of lateralized alpha power associated with (cued) shifts of spatial attention. The included studies cover a wide range of experimental paradigms (e.g., posner cueing task vs. retro-cue paradigm), types of attentional shifts (e.g., anticipatory vs. retro-active), as well as sensory modalities. Ultimately, this work offers a template to advance future investigations into related effects and links between brain activity and cognition. In a final contribution, entitled Time-on-task explains variability in oscillatory brain-behaviour relationships, new findings will highlight the need to control for time-on-task effects as a critical but often overlooked source of variability. While fluctuations in rhythmic brain activity have been shown to co-occur with variations in task performance, part of these fluctuations has been attributed to long-term (>1hr) monotonous trends in the power and frequency of alpha oscillations (8 - 13 Hz). In a recent example, controlling for time-on-task effectively removed the relationship between alpha activity and reaction times. These findings highlight the need to make explicit and potentially challenge basic assumptions when investigating brain-behaviour relationships. Together, these projects demonstrate crucial steps to resolve systemic issues in cognitive neuroscience and provide guidance on how to enhance robustness and replicability in the field.

Symposium abstract [SY13]
Session: Language & Music II
Date: 18 September 2025 (13h45)
Symposium Title: ***Shared and Distinct Auditory Competencies in Language and Music Processing across the Lifespan***
Symposium organiser(s): Anne Kösem[1] & Barbara Tillman[2]

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[2] Laboratory for Research on Learning and Development, LEAD-CNRS UMR5022, Université de Bourgogne, Dijon, France

Talk 1 – ***Development of neural synchronization to auditory rhythm: the impact of tempo***

Presenter: Sahar Moghimi
Multimodal Analysis of Brain Function Research Group (GRAMFC), Université de Picardie, France, Lyon
Co-Authors: Fabrice Wallois[1], Mohammadreza Edalati[1], Bahar Saadatmehr[1], Arthur Foulon[1], Guy Kongolo[1], Ghida Ghostine[1], Christelle Chazal[1], Barbara Tillmann[2], Laurel Trainor[3]

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Talk 2 – ***Exposure to musical rhythms influence the regularity of produced speech in children with and without developmental language disorder***

Presenter: Julie Camici
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Talk 3 – ***Short-term memory for music and speech: typical and atypical development***

Presenter: Anne Caclin
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Talk 4 – ***The role of temporal predictions in language and non-verbal auditory processing***

Presenter: Anne Kösem
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Talk 5 – *Predicting "what" and "when" in music and speech: Effects of musical training and domain*

Presenter: Anna Fiveash[1,2]

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Talk 6 – *The influence of auditory rhythm-based stimulation on speech production: Insights from Parkinson's disease and neurocognitive mechanisms*

Presenter: Anahita Basirat

University of Lille, CNRS, SCALab UMR 9193, France

Co-Authors: Jules Fumel[1], Paolo Mairano[2], David Devos[3], Caroline Moreau[3]

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Abstract

The symposium will cover auditory processing of content and timing throughout the lifespan. We will examine similarities and differences in auditory cognition related to speech and music processing, as well as their interrelationship. Specifically, we will examine how musical abilities may influence speech cognition and how non-verbal auditory skills are linked to language deficits. This analysis will encompass the entire lifespan, beginning with auditory development from the prenatal stage to late adulthood. We will address both typical and atypical patterns of language and music development, along with considerations of disorders in both children (DLD) and the elderly (Parkinson's disease). The first three talks will focus on the co-development of language and music auditory skills in infancy and childhood. The last three talks will present recent data on the interaction between verbal and non-verbal auditory skills in adulthood, and their link with musical expertise, language deficits, and pathology. Sahar Moghimi will present data on the early emergence of auditory rhythm perception, beginning in the third trimester of gestation. She will report several electroencephalography studies where neural activity was recorded in premature babies, neonates, and adults while they listened to various rhythms. The findings demonstrate that the encoding of auditory rhythms develops progressively during the third trimester of gestation, and that the neural synchronization to auditory rhythms occurs across multiple frequencies and varies systematically with tempo and development. Results show that rhythm experience begins in fetal life, shaping neural capacities essential for language, music, communication, and motor skills. She will discuss

how neurodevelopment might influence the underlying neural dynamics, leading to the developmental trajectory of rhythm processing in both music and language. Julie Camici will discuss the impact of auditory rhythm exposure on speech rhythm production. Speech rhythm is a feature relevant to fluency and speech comprehension. Exposure to musical rhythms has been shown to influence the production of subsequently presented speech, but the influence of rhythmic priming on speech prosody has not been studied yet. French children with and without Developmental Language Disorder (DLD) were asked to repeat sentences after the presentation of regular and irregular musical primes. Results show that (1) DLD children produced slower and more variable speech compared to matched control children, and (2) the temporal regularity of musical primes influenced speech regularity, with more regular speech after regular priming compared to irregular primes. A correlation between rhythmic priming effects and reading skills is observed, with more pronounced priming effects in infants with lower verbal abilities. Anne Caclin will present her work on the development of short-term and working memory processes in auditory cognition. She will present typical and atypical (congenital amusia, dyslexia) neurodevelopmental studies that test whether a unitary system subserves short-term memory for all types of sounds, or whether separate systems exist for musical and verbal information. Results show that auditory short-term memory processes undergo significant maturation both in childhood (around 7-years-old) and adolescence, with a tight link between musical short-term memory and speech-in-noise perception abilities. The results also argue in favor of partly separate systems that subtend short-term memory for music and speech, and that atypical development can result in selective impairments of musical or verbal short-term memory, with also cases of deficits in both domains. Anne Kösem will examine the influence of temporal prediction mechanisms on auditory perception. In behavioral and EEG experiments, adult participants were asked to distinguish between standard and deviant sounds within sound sequences of varying levels of temporal variability. The findings revealed that temporal context impacts perception, with more predictable sequences leading to enhanced performance in auditory discrimination and faster response times. However, adults with dyslexia experienced diminished benefits from temporal regularity compared to those without dyslexia. The results indicate that (1) predictive timing mechanisms may manifest in auditory stimuli with temporal fluctuations as in speech, and (2) that dyslexia is linked to deficits in temporal prediction mechanisms, which may be one of the root causes of challenges in understanding prosody and phonological processing associated with reading deficits in dyslexia. Anna Fiveash will discuss the relationship between “what” and “when” predictions in auditory processing, and whether they differ depending on stimulus domain (i.e., music, speech). To investigate these questions, content and timing predictability were comparably manipulated within melodies and sentences to investigate effects on completion judgements and timing judgements. Musicians and non-musicians were recruited to investigate music training effects across domains. Differences were found depending on domain and musical training, as well as the task. Results suggest that content and timing predictions affect music and speech differently, perhaps depending on the relative importance of these cues for each domain. Further, musical training may

enhance predictive capacities in both music and speech. Findings have implications for understanding different types of prediction, and how these are influenced by expertise. Anahita Basirat will discuss her work on auditory rhythm-based interventions that aim at enhancing communication in various disorders affecting speech and language, with a focus on speech production in individuals with Parkinson's disease. A growing body of evidence suggests that exposure to rhythmic auditory patterns may modulate speech and language processing. This presentation will focus on production, with a particular emphasis on prosody. An EEG study with typical individuals investigated the potential mechanisms that are thought to be involved in the impact of rhythm on language processing, such as neural entrainment and sensorimotor capacities. The results will be discussed in relation to the perception-production link and how auditory rhythm exposure as well as rhythmic skills of participants influence speech production and the limits regarding the cross-domain transfer.

Symposium abstract [SY15]
Session: Executive Functions I
Date: Wednesday, 17 September 2025 (09:00)
Symposium Title: ***From Adaptive to Maladaptive: Rethinking the Malleability of Pavlovian Bias in Decision-Making***
Symposium organiser(s): Yulong Huang[1] & Luigi Degni[2]

[1] Department of Experimental Psychology, Ghent University, Belgium.

[2] Department of Psychology, University of Bologna, Italy.

Talk 1 – ***Adaptive Function of Pavlovian-to-Instrumental Transfer***
Presenter: Emilio Cartoni
Institute of Cognitive Sciences and Technologies, Consiglio Nazionale delle Ricerche, Italy.
Co-Authors: Andrea Mattera, Gianluca Baldassarre
Institute of Cognitive Sciences and Technologies, Consiglio Nazionale delle Ricerche, Italy

Talk 2 – ***The Motor Way of Pavlovian Bias: Neural and Attention Mechanisms***
Presenter: Yulong Huang
Department of Experimental Psychology, Ghent University, Belgium.
Co-Authors: Lara Bardi
Department of Experimental Psychology, Ghent University, Belgium.

Talk 3 – ***Action Framing Influences Pavlovian Bias in the Orthogonalized Go/No-go Task***
Presenter: Zhang Chen
Department of Experimental Psychology, Ghent University, Belgium.

Co-Authors: Senne Braem
Department of Experimental Psychology, Ghent University, Belgium

Talk 4 – ***Maladaptive Pavlovian Bias over Decision-making and Its Neural Mechanisms***
Presenter: Luigi Degni
Department of Psychology, University of Bologna, Italy.
Co-Authors: Claudio Danti, Giuseppe di Pellegrino
Department of Psychology, University of Bologna, Italy

Talk 5 – ***The Cost of Pavlovian Bias: Maladaptive Decision-making in Human Sign-trackers and Goal-trackers***
Presenter: Sara Garofalo
Department of Psychology, University of Bologna, Italy.
Co-Authors: Lorenzo Mattioni, Giuseppe di Pellegrino
Department of Psychology, University of Bologna, Italy

Abstract
In everyday life, decision-making and actions are often shaped by environmental cues predicting outcomes, a phenomenon known as Pavlovian bias. This reflects how reward- or punishment-associated cues influence behavior, even when irrelevant to the task. While often adaptive—facilitating efficient actions in predictable environments—Pavlovian biases can become maladaptive, such as addiction, eating disorders, or impulsivity when misaligned with instrumental goals. Understanding this dual nature of Pavlovian bias—how it functions adaptively and how it devolves into maladaptive pattern—is vital for advancing research and interventions for related psychopathologies. This symposium brings together leading experts and emerging researchers to explore the malleability of Pavlovian biases across ecological, computational, neural, and behavioral domains, through five interconnected talks. 1) **Emilio Cartoni** presents a theoretical framework that examines the evolutionary and computational underpinnings of Pavlovian-to-Instrumental Transfer, a key task for studying Pavlovian bias. 2) **Yulong Huang** examines the neural foundations of Pavlovian bias, highlighting the motor system's role in integrating cues and preparing actions. 3) **Zhang Chen** challenges the often-theorized rigidity of Pavlovian bias, demonstrating instead how action framing influences these biases in a go/no-go task. 4) **Luigi Degni** investigates neural dynamics of cognitive control failures and how these biases lead to suboptimal behaviors. 5) **Sara Garofalo** contrasts individual differences in susceptibility, comparing sign-trackers and goal-trackers to reveal how learning styles drive maladaptive behaviors. Together, these talks transition from theoretical foundations to novel insights into the dual nature of Pavlovian bias and how it shapes human behavior. **Individual Talks**. **1)** ***Adaptive Function of Pavlovian-to-Instrumental Transfer.*** Pavlovian-to-Instrumental Transfer (PIT) reveal how Pavlovian cues bias instrumental behavior, often contributing to maladaptive behaviors. While the impact is well-established, its underlying function remains unclear. Is it an accident of brain evolution or is there an adaptive function of PIT in ecological settings? This talk will

explore the adaptive significance of PIT through computational models, showing how specific and general PIT effects reflect rational computations that identify context and optimize behavior. Framing PIT within an evolutionary context provides insights into its role in guiding adaptive decision-making. Furthermore, understanding the computations behind PIT paves the way to uncover how its beneficial function may devolve into maladaptive patterns. **2)** ***The Motor Way of Pavlovian Bias: Neural and Attention Mechanisms***. What are the neural foundations of environmental influence on decision-making? Cue-triggered behavior arises from learned reward prediction or sensory representations of rewarding outcomes and actions? Focusing on the motor system's role in Pavlovian bias, this talk argues that sensory cues actively shape motor activity, driving action preparation and execution. Using a modified PIT task with fMRI and pupillometry, findings reveal sensory-motor pathways actively drive decision-making, challenging the view of motor systems as merely downstream of cognitive processes. Results highlight the importance of sensory-motor mechanisms in action valuation and Pavlovian bias. **3)** ***Action Framing Influences Pavlovian Bias in the Orthogonalized Go/No-go Task.*** Reward-predictive cues often activate action, while punishment-predictive cues lead to inhibition. These Pavlovian biases, evident in the orthogonalized go/no-go task, can conflict with instrumental learning. For instance, people more easily learn go responses to win rewards than to avoid punishments, and no-go responses to avoid punishments than to win rewards. These biases are often seen as hardwired reflexes linking reward to action invigoration and punishment to inhibition. This talk challenges the rigidity of Pavlovian bias, demonstrating its malleability through action framing. In our experiments, when go was framed as collecting a mushroom and no-go as not collecting, a Pavlovian bias emerged. Framing go as throwing it away and no-go as keeping eliminated the bias. Pavlovian bias is thus flexible and shaped by how actions are framed. **4)** ***Maladaptive Pavlovian Bias over Decision-making and Its Neural Mechanisms.*** Humans optimize decision-making to maximize rewards. Reward-predictive cues can adaptively bias decisions, however, there are circumstances in which Pavlovian learning conflicts with instrumental goals. This talk hypothesizes that Pavlovian bias can lead to suboptimal choices. In a PIT paradigm, participants first learned an optimal strategy of choosing a rich option (70% rewarded) over a poor option (30% rewarded) to maximize rewards. Reward-predictive cues were then introduced, altering decision-making strategies. Findings show that maladaptive Pavlovian bias exists, reflecting cognitive control failures over motivational processes, as indicated by theta oscillations in electroencephalography, and can be modulated. **5)** ***The Cost of Pavlovian Bias: Maladaptive Decision-making in Human Sign-trackers and Goal-trackers.*** Individuals vary in their responses to reward-predictive cues. Two profiles are identified in Pavlovian learning: sign-trackers who focus on the conditioned cue, and goal-trackers, who prioritize the reward location. Though the cue predicts rewards for both, sign-trackers assign it higher incentive value. This talk will examine whether sign-trackers, compared to goal-trackers, exhibit greater maladaptive Pavlovian bias. Results show sign-trackers are susceptible, even when this favors suboptimal choices, while goal-trackers maintain optimal decision-making. Computational modeling suggests this bias stems from slower cue values updating than overvaluation. These findings highlight how Pavlovian bias

drives maladaptive behavior in sign-trackers, shedding light on vulnerabilities to disorders like addiction. **Diversity and Integration**. This symposium features a diverse group of junior and senior researchers across institutions (2 females, 3 males), integrating varied methodologies to rethinking Pavlovian biases in decision-making. The session will include: 5-minute introduction by co-organizers; Five 20-minute talks with Q&A; and 15-minute roundtable discussion led by Sara Garofalo.

Symposium abstract [SY16]
Session: Memory I
Date: 16 September 2025 (9h00)
Symposium Title: ***The Electrophysiology Of Human Event Memory***
Symposium organiser(s): Marta Silva[1] & Benjamin J. Griffiths[2]

[1] Columbia University, USA

[2] University of Nottingham, UK

Talk 1 – ***Eye movements and neural oscillations jointly support episodic memory formation***
Presenter: Xiongbo Wu
Ludwig Maximilian University of Munich, Germany
Co-Authors: Staudigl, T.[1]

[1] Ludwig Maximilian University of Munich, Germany

Talk 2 – ***The strength of theta power predicts the retention of event memories***
Presenter: Marta Silva
Columbia University, Department of Biomedical Engineering, USA Ludwig-Maximilians-Universität München, Munich, Germany
Co-Authors: Wu, X.[2], Sabio, M.[3], Conde-Blanco, E.[4], Roldan, P.[4], Carreño, M.[4], Axmacher, N.[5], Fuentemilla, L.[3,6], Baldassano, C.[7], Jacobs, J.[1]

[1] Columbia University, Department of Biomedical Engineering, USA

[2] Ludwig-Maximilians-Universität München, Munich, Germany

[3] Department of Cognition, Development and Education Psychology, University of Barcelona, Spain

[4] Servicio de Neurologia, Unidad de Epilepsia, Hospital Clinic – IDIBAPS, Barcelona, Spain

[5] Ruhr-Universität Bochum (Institute of Cognitive Neuroscience, Faculty of Psychology), Ruhr, Germany

[6] Bellvitge Institute for Biomedical Research, Hospitalet de Llobregat, Spain

[7] Columbia University, Department of Psychology, USA

Talk 3 – ***Spatial tuning via phase-locking in MTL neurons***
Presenter: Luca D. Kolibius
Columbia University, Department of Biomedical Engineering, USA
Co-Authors: Hermiller, M. S.[2], Holman, C. M.[1], Khazali, M.[3], Brandt, A.[3], Kahana, M.[4], Jacobs, J.[1]

[1] Columbia University, Department of Biomedical Engineering, USA
[2] Florida State University, Department of Psychology, USA
[3] Albert-Ludwigs-Universität Freiburg, Epilepsy Center, University Medical Center, Germany
[4] University of Pennsylvania, Department of Psychology, USA

Talk 4 – *Hippocampal ripples initiate cortical dimensionality expansion for memory retrieval*

Presenter: Casper Kerren
Max Planck Institute for Human Cognitive and Brain Sciences, Germany
Co-Authors: Michelmann, S.[2], Doeller, C. F.[1,3]
[1] Max Planck Institute for Human Cognitive and Brain Sciences, Germany
[2] Department of Psychology, New York University, New York City, USA
[3] Kavli Institute for Systems Neuroscience, Centre for Neural Computation, Egil and Pauline Braathen and Fred Kavli Centre for Cortical Microcircuits, Jebsen Centre for Alzheimer's Disease, NTNU Norwegian University of Science and Technology, Trondheim, Norway

Talk 5 – *Investigating the long-term effects of targeted TMR during sleep using M/EEG*

Presenter: Anna Guttesen University of Oxford, UK
Co-Authors: Van Es, M. W. J.[1], Schruers, K. B.[1], Weichert, I.[1], Nordenström, L. N.[1], Puicar, O. M.[1], Woolrich, M. W.[1], Fleming, M. K.[1]
[1] University of Oxford, UK

Talk 6 – *Gamma oscillations causally contribute to event memory reactivation*

Presenter: Benjamin J. Griffiths
University of Nottingham, UK
Co-Authors: Weinert, D.[2], Duecker, K.[3], Quinn, A.[4], Staudigl, T.[2], Jensen, O.[5]
[2] Ludwig-Maximilians-Universität München, Germany
[3] Brown University, USA
[4] University of Birmingham, UK
[5] University of Oxford, UK

Abstract

Event memory is a complex cognitive phenomenon that emerges through the interaction of numerous electrophysiological processes. This symposium will explore how our brains use electrophysiological dynamics to convert an ongoing event into a storable memory trace, and later recall it in vivid detail. Our symposium begins by exploring how these memories are formed. Xiongbo Wu will discuss how eye movements and alpha/beta oscillations interact to jointly impact episodic memory formation. Marta Silva will talk about how modulations in hippocampal theta power predict which events are later remembered. Luca Kolibius will discuss how weaker-tuned neurons contribute to spatial memory coding. We then turn our attention to memory recall. Casper Kerren will present how hippocampal ripples translate simple memory codes into complex reimaginings of an event. Anna Guttensen will discuss

how targeted memory reactivation (TMR) alters memory traces and the electrophysiological dynamics required to recall them. Finally, Benjamin Griffiths will discuss the causal role that gamma oscillations play in event memory reactivation. Together, these talks elucidate the complex electrophysiological dynamics that underpin human event memory, from its genesis to its vivid reactivation, and highlight new trends, methods, and interventions that can propel the field forward. **Xiongbo Wu: Eye movements and neural oscillations jointly support episodic memory formation** Episodic memory formation is linked to a reduction in low-frequency alpha/beta activity (~10–20 Hz) and an increase in eye movements. As eye movements are closely linked to the modulation of low-frequency neural oscillations, we hypothesize that these two predictors interact during episodic memory formation. Combining EEG and eye-tracking, we show that actively restricting eye movements produces a less pronounced reduction in alpha/beta power. Critically, increased eye movements and decreased alpha/beta activity jointly predict memory performance across varying levels of viewing restriction. This suggests a causal role of eye movements in driving alpha/beta-related memory effects and emphasizes the need to understand how viewing behavior influences the neural activity that drives memory formation. **Marta Silva: The strength of theta power predicts the retention of event memories** Ongoing experience is transformed into discrete event memories through event segmentation, in which temporally extended information is bound together into a coherent event representation. However, the neural mechanisms underlying this process remain unknown. Hippocampal theta power has been shown to reliably increase for successful memory encoding of discrete stimuli. Using iEEG, we investigate how hippocampal theta modulations at event boundaries of a 45min film impact long-term memory for an event. We find that hippocampal theta power is modulated at event boundaries and that its strength predicts which events will be later remembered. These results bring novel insights into the mechanisms that convert continuous experience into discrete long-term memories. **Luca D. Kolibius: Spatial tuning via phase-locking in MTL neurons** Hippocampal spatial coding emphasizes place cells with elevated firing rates in specific place fields. We explored the contribution of weaker-tuned neurons to spatial coding, focusing on spiking phases relative to theta oscillations. Analyzing neural activity in a virtual arena, we found that non-place neurons showed consistent theta phase-locking for particular spatial bins. This suggests spatial information is encoded in spike timing, independent of rate modulation. Phase-locked spiking emerges as a distributed coding mechanism, complementing rate-based coding and broadening our understanding of hippocampal function in spatial navigation and memory. **Casper Kerren: Hippocampal ripples initiate cortical dimensionality expansion for memory retrieval** During learning, sensory inputs are transformed into low-dimensional representations that are stored in the hippocampus. Recall transforms these simple hippocampal representations into a high-dimensional cortical pattern of the original experience. We propose that hippocampal ripples initiate this process. Analyzing iEEG data during memory retrieval, we found that the dimensionality of cortical representations significantly increases following hippocampal ripple events. This effect predicted successful neural reinstatement and explicit recall and correlated with faster reaction times. Moreover, expansion enabled representations to

become separated in cortical state space. These findings elucidate how hippocampal ripples alter the geometry of memory representations during successful retrieval. **Anna Guttesen: Investigating the long-term effects of targeted TMR during sleep using M/EEG** Sleep is thought to support the reactivation and reorganization of newly formed memories so they become long-lasting. Empirical evidence of long-lasting benefits, however, is lacking. Here, we investigate how TMR benefits associative memory over the course of weeks, hypothesizing that one night of TMR will provide benefits for cued vs not-cued memories and that this benefit will increase at delays of 1 and 3 weeks. Using MEG, we expect that neocortical representational areas will increase their functional interaction with semantic association areas for remote recall (1 day and 1 week post-encoding), reflecting the reorganization of reactivated memories. We also expect that increases in EEG-measured sleep signatures following TMR will predict the extent of behavioral/neural changes. **Benjamin J. Griffiths: Gamma oscillations causally contribute to event memory reactivation** While gamma oscillations are intimately linked to event recall, their causal role remains elusive. The critical challenge lies in disentangling oscillatory and aperiodic responses to rhythmic stimulation, which we address using a novel approach: subharmonic stimulation. We demonstrate that (1) gamma-band stimulation enhances associative memory recall relative to control conditions; (2) gamma-band stimulation increases both gamma oscillations and aperiodic high-frequency activity (as measured by MEG); and (3) gamma oscillations (but not aperiodic activity) mediates the link between stimulation and memory recall. These findings establish a causal role for gamma oscillations in event recall and highlight the potential for gamma-band sensory stimulation to augment memory.

Symposium abstract [SY17]
Session: Memory II
Date: 16 September 2025 (13h45)
Symposium Title: ***Sudden Learning Across Systems***
Symposium organiser(s): Johannah Voeller[1,2] & Carlos González-García[1,2]

[1] Mind, Brain and Behavior Research Center (CIMCYC), University of Granada, Spain

[2] Department of Experimental Psychology, University of Granada, Spain

Talk 1 – ***Insight-like strategy switches in humans and machines***
Presenter: Anika T. Löwe
University of Freiburg, Germany
Co-Authors: Léo Touzo[1], Paul S. Muhle-Karbe[2,3], Andrew M. Saxe[4,5,6], Christopher Summerfield[7] & Nicolas W. Schuck[8,9,10]

[1] Laboratoire de Physique de l'Ecole Normale Supérieure, CNRS, ENS, Université PSL, Sorbonne Université, Université Paris Cité, Paris, France

[2] Department of Experimental Psychology, University of Oxford, Oxford, United Kingdom
[3] School of Psychology, University of Birmingham, Birmingham, United Kingdom, Centre for Human Brain Health, University of Birmingham, Birmingham, United Kingdom
[4] Gatsby Computational Neuroscience Unit, University College London, London, United Kingdom
[5] Sainsbury Wellcome Centre, University College London, London, United Kingdom
[6] CIFAR Azrieli Global Scholar, CIFAR, Toronto, Canada
[7] Department of Experimental Psychology, University of Oxford, Oxford, United Kingdom
[8] Max Planck Research Group NeuroCode, Max Planck Institute for Human Development, Berlin, Germany
[9] Max Planck UCL Centre for Computational Psychiatry and Ageing Research, Berlin, Germany
[10] Institute of Psychology, Universität Hamburg, Hamburg, Germany

Talk 2 – ***Determinants of sudden visual ambiguity resolution***

Presenter: Juan Linde-Domingo
Mind, Brain and Behavior Research Center (CIMCYC), University of Granada, Spain; Department of Experimental Psychology, University of Granada, Spain
Co-Authors: Javier Ortiz-Tudela[1,2], Johannah Voeller[1,2], Martin N. Hebart[3,4,5] & Carlos González-García[1,2]

[1] Mind, Brain and Behavior Research Center, University of Granada, Granada, Spain
[2] Department of Experimental Psychology, University of Granada, Granada, Spain
[3] Department of Medicine, Justus Liebig University Giessen, Giessen, Germany
[4] Vision and Computational Cognition Group, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany
[5] Center for Mind, Brain, and Behavior, Universities of Marburg, Giessen, and Darmstadt, Marburg, Germany

Talk 3 – ***From sensory inputs to abstract concepts: Parallels in one-shot learning between brains and machines***

Presenter: Pablo Marcos-Manchón
Department of Cognition, Development and Educational Psychology, University of Barcelona, Spain; Institute of Neurosciences, University of Barcelona, Spain
Co-Authors: Lluís Fuentemilla[1,2]

1 Department of Cognition, Development and Educational Psychology, University of Barcelona, Spain
2 Institute of Neurosciences, University of Barcelona, Spain

Talk 4 – ***The role of surprise and schema in episodic memory encoding***

Presenter: Andrea Greve
Medical Research Council Cognition and Brain Sciences Unit, University of Cambridge, Cambridge, UK
Co-Authors: Kshipra Gurunandan[1] & Richard N Henson[1]

[1] Medical Research Council Cognition and Brain Sciences Unit, University of Cambridge, Cambridge, UK

Talk 5 – ***Perceptual insight as a prediction error readout and its role in memory***

Presenter: Johannah Voeller
Mind, Brain and Behavior Research Center (CIMCYC), University of Granada, Spain; Department of Experimental Psychology, University of Granada, Spain
Co-Authors: Carlos González-García[1,2*] & Juan Linde-Domingo[1,2*] (*equal contribution)

1 Mind, Brain and Behavior Research Center (CIMCYC), University of Granada, Spain

2 Department of Experimental Psychology, University of Granada, Spain

Abstract

Sudden learning refers to a fast mechanism that allows humans (and other systems) to rapidly acquire new knowledge from a single experience, reflected in a sudden and drastic improvement in task performance. Despite its significance for learning in situations where evidence is scarce or ambiguous, the 'how' (cognitive operations) and 'what' (content) of sudden learning remain poorly understood. To shed light on these two aspects, this symposium will compare and contrast different forms of sudden learning in both human and artificial agents. In humans, rapid learning is often marked by a moment of insight – a sudden switch from incomprehension to comprehension which feels discontinuous from the ongoing stream of thoughts. Surprisingly, however, even simple neural networks, using nothing more than a gradual learning rule and a constant learning rate, can mimic these insight-like shifts in task performance. To better understand the how of sudden learning, we will explore how neural networks accumulate "silent knowledge" and examine their architecture to shed light on the mechanisms behind human insight learning, revealing a fascinating connection between the two. Next, we turn to the question of what information exactly we acquire during sudden learning. Using one-shot perceptual learning as an example, where participants must disambiguate unclear visual stimuli (such as Mooney images), we will analyze the relative contributions of low-level visual features (e.g., lines and borders) versus higher-level information (e.g., semantic information) in resolving unclear sensory input. A new approach introduces two innovative metrics that precisely track the resolution of perceptual ambiguity, going beyond subjective recognition. Another compelling aspect of sudden learning is its memorability, with the newly acquired knowledge being vividly remembered even months later. To understand this phenomenon, this talk will explore the importance of the successful and rapid integration of new knowledge into existing schemas. By leveraging neural networks, we will demonstrate how aligning low- and high-level representations between networks and the human visual system reveals the role of abstract, high-level knowledge in facilitating this rapid integration. Then, we will examine sudden learning through a Bayesian lens, framing it as a consequence of strong and precise prediction errors that arise from a dynamic interplay between the accuracy and precision of both the predictions and sensory input. We will explore how such prediction errors during encoding shape which and how information from an episode is remembered. Finally, we will explain how understanding insight as a sudden resolution of ambiguity, i.e. a sudden prediction error minimization, helps to

understand the memorability of these insight events, showing that the subjective feeling of insight tracks with the size of the prediction errors which in turn boost learning on different levels. With this talk we aim to bridge the gap between the fields of memory and perception using the concept of the "engram" to promote a representational perspective on sudden learning.

Symposium abstract [SY18]
Session: Sensory Systems & Perception III
Date: Wednesday, 17 September 2025 (16:30)
Symposium Title: ***Internal states and neural fluctuations***
Symposium organiser(s): David Pascucci[1,2] & Maëlan Q. Menétrey[1,2]

[1] Department of Radiology, Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland.

[2] The Sense Innovation and Research Center, Lausanne, Switzerland.

Talk 2 – ***Critical synchronization dynamics and cognition***
Presenter: Satu Palva[1,2]

[1] Neuroscience Center, Helsinki Institute of Life Science, University of Helsinki, Finland.

[2] School of Neuroscience and Psychology, University of Glasgow, UK.

Co-Authors: Matias Palva[1,2,3], Ehtasam Javed[1], Felix Siebenhühner[1],Marco Fusca[2]

[1] Neuroscience Center, Helsinki Institute of Life Science, University of Helsinki, Finland.

[2] School of Neuroscience and Psychology, University of Glasgow, UK.

[3] Aalto University, Finland.

Talk 3 – ***Alpha oscillations index transient dynamics and stable traits of visual processing***
Presenter: Maëlan Q. Menétrey[1,2]

[1] Department of Radiology, Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland.

[2] The Sense Innovation and Research Center, Lausanne, Switzerland.

Co-Authors: David Pascucci[1,2]

[1] Department of Radiology, Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland.

[2] The Sense Innovation and Research Center, Lausanne, Switzerland.

Talk 4 – ***External and internal modes of perception***
Presenter: Veith Weilnhammer[1]

[1] Helen Wills Neuroscience Institute, University of California, Berkeley, CA, USA.

Co-Authors: David Whitney[1,2,3], Philipp Sterzer[4]

[1] Helen Wills Neuroscience Institute, University of California, Berkeley, CA, USA.

[2] Department of Psychology University of California, Berkeley, CA, USA.

[3] Vision Science Group, University of California, Berkeley, CA, USA.

[4] Department of Psychiatry (UPK), University of Basel, Basel 4001, Switzerland.

Talk 5 – ***Perceptual state fluctuations and sequential biases in medical image judgments***

Presenter: David Whitney[1,2,3]

[1] Helen Wills Neuroscience Institute, University of California, Berkeley, CA, USA.

[2] Department of Psychology University of California, Berkeley, CA, USA.

[3] Vision Science Group, University of California, Berkeley, CA, USA.

Co-Authors: Veith Weilnhammer[1], Zhihang Ren[2,3]

[1] Helen Wills Neuroscience Institute, University of California, Berkeley, CA, USA.

[2] Department of Psychology University of California, Berkeley, CA, USA.

[3] Vision Science Group, University of California, Berkeley, CA, USA.

Abstract

Neural activity exhibits dynamic transitions across multiple time scales, even at rest, reflecting intrinsic fluctuations in neural states. These fluctuations also manifest in human performance, shaping moment-to-moment perception, attention, and memory. However, the link between neural fluctuations and behavioral variability during active tasks remains poorly understood. This symposium unites experts in neuroimaging, psychophysics, and clinical research to discuss how neural fluctuations influence functional states and behavior. The main topics range from the organizing principles of rhythmicity and critical brain states to the specific roles of alpha oscillations, perceptual modes, and state-dependent biases in decision-making. By integrating findings across these domains, the symposium aims to uncover key mechanisms underlying variability in brain function and dysfunction, advancing our understanding of what makes each brain unique. **Talk 2 – Critical synchronization dynamics and cognition, Satu Palva:**

Network oscillations are fundamental for healthy cognition but show remarkable inter- and intra-individual variability in functional coupling patterns, influencing behavior and performance variability even in healthy subjects. Moreover, hyper- or dysconnectivity is often linked to brain disorders. However, the mechanisms regulating oscillatory levels across individuals, brain areas, and frequencies are not well understood. I will discuss how this variability could be explained in the framework of extended critical regime – the Griffith Phase. It posits that brains operate at the extended critical regime between disordered (subcritical) and ordered (supercritical) phases. We have shown that variability in oscillation-based functional connectivity aligns with the Griffiths Phase framework (Fusca et al., 2023 Nat. Com). I will discuss these results and how the framework can be used to explain via this link the variability in cognitive performance and emergence of brain disorder symptoms (Javed et al., 2025 J. Neurosci). **Talk 3 – Alpha oscillations index transient dynamics and stable traits of visual processing, Maëlan Q. Menétrey:** Alpha rhythms (8–13 Hz) are generally thought to modulate perception of brief and isolated stimuli. However, most research overlooks the dynamic nature of perception, often emerging from the

integration of information across space and time. In this talk, I will evaluate the role of alpha rhythms using tasks that involve the long-lasting integration of visual features. First, I will demonstrate that modulations in alpha frequency, following spontaneous bursts of alpha activity, can affect the sensory representation of visual features over several hundred milliseconds. Second, I will focus on dynamic neural states defined by the interplay between multiple alpha parameters and their role in shaping perceptual decision making at multiple time scales. These findings provide new insights into the functional role of alpha rhythms, through both transient dynamics and stable individual traits, and emphasize their influence on sensory processing over longer timescales than previously recognized. **Talk 4 – External and internal modes of perception, Veith Weilnhammer:** Recent evidence shows that perception alternates between an external mode, prioritizing new stimuli, and an internal mode, shaped by prior knowledge. These modes align with the explore-exploit trade-off, balancing between acquiring new information or relying on existing knowledge. Imbalances between these two modes may lead to profound distortions of conscious experience. I will present evidence showing that schizophrenia patients and healthy observers under the N-Methyl-D-aspartate receptor antagonist ketamine spend more time in the external mode. These findings suggest the explore-exploit trade-off is key to adaptive perception, with shifts in its balance potentially driving pathological states of awareness. **Talk 5 – Perceptual state fluctuations and sequential biases in medical image judgments, David Whitney:** Perceptual decisions on medical images have critical consequences for millions. However, clinicians' decisions often involve sequential judgments of several image batches, such as during dermatology screenings. In non-clinical settings, sequential judgments are influenced by perceptual states that occasionally favor an internally driven mode, biased by prior experiences—serial dependence. It remains unclear whether perceptual states affect medical image judgments in expert clinicians. Here, we investigated whether clinicians and untrained observers experience perceptual state fluctuations during sequential medical image judgments. We show these states are present, mirroring patterns seen in other visual tasks. These findings highlight the need to address perceptual state fluctuations and biases in medical image evaluation, with implications for diagnostics, training, and decision support systems.

Symposium abstract [SY20]
Session: Memory III
Date: 16 September 2025 (16h30)
Symposium Title: ***Translational Contributions to Updating the Role of Sleep in Memory Consolidation***
Symposium organiser(s): Judith Nicolas
Centre de Recherche en Neurosciences de Lyon, France

Talk 1 – ***A role for the midline thalamic nuclei in sleep-dependent memory consolidation in mice***

Presenter: Aurélie Brécier
Centre de Recherche en Neurosciences de Lyon, France

Talk 2 – *Neurophysiological signature of memory reactivations during sleep*
Presenter: Judith Nicolas
Centre de Recherche en Neurosciences de Lyon, France

Talk 3 – *Cross-Species Insights into Neural Coding Efficiency in Sleep-Dependent Memory Systems*
Presenter: Michael Hahn
Hertie-Institute for Clinical Brain Research, University Medical Center Tübingen, Germany

Talk 4 – *Brain state-dependent memory consolidation – a special role of sleep?*
Presenter: Svenja Brodt
Max Planck Institute for Biological Cybernetics, Tübingen, Germany

Abstract
Memories are essential for shaping identity and developing knowledge and skills. After acquisition, they are consolidated into stable representations via offline reactivations, where neuronal firing patterns are replayed. These reactivations, occurring notably in the hippocampus, are supported by offline periods. Non-rapid eye movement (NREM) sleep provides an optimal window for consolidation, with slow oscillations, spindles, and ripples mediating hippocampo-cortical dialogue. However, reactivations also occur outside the hippocampus and during wakefulness, challenging sleep-specific frameworks. This symposium presents empirical findings to refine theoretical models and clarify the role of sleep in memory consolidation. **Audrey Hay: A role for the midline thalamic nuclei in sleep-dependent memory consolidation in mice** Coordinated oscillations is a feature of sleep which serves several purposes such as promoting memory consolidation through local and global synchronisation of neuronal activity. These oscillations are the thalamocortical slow waves and spindles as well as the hippocampal ripples. Correlative studies have highlighted the increased power of slow waves and spindles in specific cortical areas after learning, and an increase of sleep oscillation coordination across areas involved in the task. Moreover, locally promoting or impairing sleep oscillations coordination can promote or alter memory consolidation, respectively. However, how the oscillations are physiologically coordinated is still a matter of debate. Here, we suggest that the midline thalamic nuclei (MTN) might play a role in this coordination. We show that MTN neurons fire in burst at the beginning and end of the active phase of the slow wave. Moreover, their optogenetic stimulation promotes global Down states (inactive phase of the slow wave), while their silencing reduces the precision of Down states coordination. Last, using closed loop stimulation after detecting a ripple, we show that the optogenetic stimulation of MTN can promote memory consolidation of hippocampus dependent memory. Thus, MTN could play a critical role as sleep

oscillation coordinator which is important for memory consolidation. **Judith Nicolas: Neurophysiological signature of memory reactivations during sleep** After initial acquisition, motor memories are consolidated into stable representations through offline reactivation, where neuronal firing patterns from encoding are replayed. These reactivations, supported by hippocampal ripple events, occur spontaneously during offline intervals. NREM sleep provides an optimal window for these reactivations, enhancing consolidation processes. Target Memory Reactivation (TMR) uses sensory cues associated with learned material during encoding, replaying them during sleep to boost memory consolidation. Despite its promise, gaps remain in understanding how reactivations support consolidation, with causal links between TMR-induced reactivations and motor memory consolidation still lacking. This talk will present ongoing research using the rodent model to manipulate TMR-induced reactivations with optogenetics, either promoting or silencing hippocampal ripples during sleep. Spontaneous and TMR-induced reactivations will be identified from LFP data using supervised machine learning. The relationships between behavioral performance and reactivation occurrence under different the experimental conditions will explore the qualitative and quantitative causal relationships between reactivations and memory consolidation. **Michael Hahn: Cross-Species Insights into Neural Coding Efficiency in Sleep-Dependent Memory Systems** Sleep facilitates memory consolidation and restores cognitive resources in humans and rodents. However, the mechanisms underlying how sleep supports information processing remain largely unknown. Synaptic scaling models suggest that learning during wakefulness accumulates neural information, which is then consolidated and downregulated during sleep. Yet, there's a lack of in-vivo data elucidating how sleep normalizes information processing capacities in humans and rodents. From an information-theoretical perspective, the consolidation process during sleep should reduce neural pattern variability. In a cross-species study, we observed a tradeoff in neural population coding efficiency during sleep, with the neocortex demonstrating greater efficiency compared to the archicortex, humans outperforming rodents, and wakefulness being more efficient than sleep. Notably, NREM sleep specifically reduces coding efficiency in the neocortex, potentially reflecting neural pattern replay. In contrast, the hippocampus maintains a consistent yet more redundant population code across sleep stages. These findings underscore the neocortex's role in long-term memory storage. Additionally, task engagement enhances coding efficiency, while induced unconsciousness disrupts the population code. In sum, neural pattern variability is important for cognitive engagement and memory formation, with repetitive patterns likely aiding the consolidation process. **Svenja Brodt: Brain state-dependent memory consolidation – a special role of sleep?** Sleep benefits memory performance by fostering systems consolidation, a process that embeds memories into neocortical networks and renders them independent of the hippocampus. Recent evidence shows that memory rehearsal during wakefulness likewise initiates systems consolidation and rapidly engenders neocortical engrams. This talk will highlight our ongoing research on characterizing similarities and differences of sleep-dependent and rehearsal-induced reactivation for memory consolidation in humans. Using a combination of behavior, functional and diffusion-weighted MRI, I will present short- and long-term consequences of solitary

state-dependent consolidation in wakefulness or sleep. Finally, I will show how sleep affects memories that already have undergone rapid systems consolidation during wakefulness. Based on these findings, I will discuss how memory reactivation during wakefulness and sleep might serve complementary functions. This symposium brings together cutting-edge research to refine our understanding of memory consolidation and the specific role of sleep. By integrating insights from rodent and human studies, it addresses how neural oscillations, memory reactivations, and coding efficiency contribute to memory. This symposium underscores the contributions of early-career scientists driving innovative approaches in neuroscience.

Symposium abstract [SY21]
Session: Sensory Systems & Perception IV
Date: 19 September 2025 (9h00)
Symposium Title: ***State Dependencies of Brain-body Interactions in Health and Disease***
Symposium organiser(s): Daniel Kluger[1] & Tahnée Engelen[2]

[1] University of Münster

[2] University of Jyväskylä

Talk 1 – ***Flexibility of brain-body interactions in states of affect and self-relevance***
Presenter: Tahnée Engelen
University of Jyväskylä

Talk 2 – ***Towards embodied precision neuroscience***
Presenter: Daniel Kluger
University of Münster

Talk 3 – ***Respiratory Modulation of Sleep Oscillations and Memory Consolidation***
Presenter: Thomas Schreiner
LMU Munich

Talk 4 – ***Stomach-Brain Coupling Indexes a Multidimensional Signature of Transdiagnostic Mental Health***
Presenter: Leah Banellis
Aarhus University

Talk 5 – ***Is there a link between constipation, cognition and gut-brain coupling?***
Presenter: Anke Karabanov
University of Copenhagen

Abstract

State dependencies of brain-body interactions in health and disease Human systems neuroscience is undergoing a paradigm shift in which a growing emphasis is put on understanding brain activity as not just isolated neural events, but as recurring, multivariate states extending across the brain. Simultaneously, an ever-increasing body of empirical work continues to illuminate profound modulatory effects of peripheral bodily signals on action, perception, and cognition in health and disease: Rhythmic peripheral processes like respiratory, cardiac, and gastric signals constantly send information up to the brain where it is sensed and processed. This central monitoring or interoception mostly takes place unconsciously, but also occasionally gives rise to interoceptive conscious percepts in humans. Consequently, interoceptive processing is critically dependent on changes of both neural and bodily states: Rather than conceptualizing brain-body coupling as a static entity, it is likely state-dependent, where different states can relate to a broad spectrum of brain and bodily changes in both health and disease. For example, monitoring of visceral inputs has been suggested as a marker for conscious states and has long been thought to play a significant role in changes in affect, both in adaptive and maladaptive ranges. Diseased states of either brain or body likewise contribute to alterations in brain-body coupling. For example, aberrant respiratory patterns as well as increased gastric-brain coupling appear to be linked to a wide array of psychopathological symptoms. Borrowing from concepts of low-dimensional representations, one recent formulation has attempted to unify these dynamics in a single dynamical system of brain-body states. In this symposium, a diverse international panel of mostly earlycareer experts will highlight latest developments and present challenges in understanding state dependencies within the realm of brain-body interactions. Tahnée Engelen (University of Jyväskylä, Finland) is an expert in interoception and studies how the coupling between the brain and different visceral organs underlie subjective experiences. In her talk titled 'Flexibility of brain-body interactions in states of affect and self-relevance', she will provide a comprehensive overview of multimodal brain-body coupling across bodily systems and the extent to which this coupling is dependent on different states of the healthy brain. The concept of brain-body states and their practical implementation will be presented by Daniel Kluger (University of Münster, Germany) in his talk titled 'Towards embodied precision neuroscience'. Daniel's work is focussed on (dys-)functional brain-body interactions across multiple organ systems, which he will illustrate in the context of human perception and cognition.Commencing a series of presentations on central state changes which modulate brain-body interactions, Thomas Schreiner (LMU Munich, Germany) will propose a physiological framework in which respiration may serve as a pacemaker for brain-wide communication and memory consolidation during sleep. In his talk titled 'Respiratory Modulation of Sleep Oscillations and Memory Consolidation', he will examine the relevance of respiration in coordinating sleep-related oscillations and the memory function of sleep. The role of brain-body coupling in mental and physical health will be discussed in the remaining two talks of the symposium: First, Leah Banellis (Aarhus University, Denmark) will introduce the physiology and analysis of stomach-brain coupling. Leah is an expert in brain-body interactions across numerous organ modalities, with a focus on their role in mental health and states of consciousness. Her presentation titled

'Stomach-Brain Coupling Indexes a Multidimensional Signature of Transdiagnostic Mental Health' focuses on the psychopathological individual differences associated with stomach-brain coupling. Finally, Anke Karabanov (University of Copenhagen, Denmark) will show how stomach-brain coupling can be used as a marker of brain-gut communication in interventional studies. In her talk "Is there a link between constipation, cognition and gut-brain coupling?", Anke will explore the effect of gut motility and nutrition on gut-brain interactions. Anke's work focuses on the influence of lifestyle factors such as nutrition and exercise on brain health and brain plasticity.

Symposium abstract [SY22]
Session: Memory V
Date: 19 September 2025 (9h00)
Symposium Title: ***Rhythmic Sensory Stimulation As A Non-invasive Read-out And Write-in Tool For Cognitive Neuroscience***
Symposium organiser(s): Laura Hainke[1] & Eleonora Marcantoni[2]

[1] TUM School of Medicine and Health, Technical University of Munich, Germany

[2] School of Psychology and Neuroscience, University of Glasgow

Talk 1 – ***Multi-sensory entrainment of visual-somatosensory alpha coherence and its effect on visual-tactile integration***
Presenter: Charline Peylo
Department of Psychology, University of Zurich, Switzerland
Co-Authors: Zimmermann, N.D.1, D'Addio, P.[1]

[1] Department of Psychology, University of Zurich, Switzerland

Talk 2 – ***Enhancing memory in humans via MEG-closed-loop Rhythmic Sensory Stimulation (RSS) tuned to the frequency of hippocampal theta oscillations***
Presenter: Eleonora Marcantoni
School of Psychology and Neuroscience, University of Glasgow, UK
Co-Authors: Wang, D.[2], Ince, R.[1], Bush, D.[2], Parkkonen, L.[3], Palva, S.[4], Hanslmayr, S.[1]

[1] Centre for Neurotechnology, School of Psychology and Neuroscience, University of Glasgow, Glasgow (UK)

[2] Department of Neuroscience, Physiology and Pharmacology, University College London, London (UK)

[3] Department of Neuroscience and Biomedical Engineering, Aalto University, Espoo (Finland)

[4] Neuroscience Center, HiLIFE, University of Helsinki, Helsinki (Finland)

Talk 3 – ***Decoding Real-World Visual Scenes with LCD Flicker Glasses***

Presenter: James Dowsett
Department of Psychology, University of Stirling, UK
Co-Authors: Muñoz, I. M.[1], Taylor, P.[2]

[1] Institute for Cognitive Systems, Technical University Munich, Munich, Germany

[2] Department of Experimental Psychology, LMU Munich, Munich, Germany

Talk 4 – *Using sensory stimulation to control sleep rhythms*

Presenter: Dr. Marcel S. Kehl
Department of Experimental Psychology, University of Oxford, UK
Co-Authors: Staresina, B. P.[1], Schruers, K. B.[1]

[1] Department of Experimental Psychology, University of Oxford, UK

Talk 5 – *Modulating gamma oscillations across sleep stages through visual flicker in health and disease*

Presenter: Laura Hainke
TUM School of Medicine and Health, Technical University of Munich, Germany
Co-Authors: Dowsett, J.[1], Spitschan M.[2,3,4], Vogelmann, U.[2,7], Priller, J.[2,5,6,7]

[1] Division of Psychology, University of Stirling, Stirling, UK

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[3] Translational Sensory & Circadian Neuroscience, Max Planck Institute for Biological Cybernetics, Tübingen, Germany

[4] TUM Institute of Advanced Study (TUM-IAS), Technical University of Munich, Garching, Germany

[5] Neuropsychiatry, Charité – Universitätsmedizin Berlin and DZNE, Berlin, Germany

[6] Centre for Clinical Brain Sciences, University of Edinburgh and UK DRI, Edinburgh, UK

[7] German Center for Mental Health (DZPG), Munich, Germany

Talk 6 – *Harnessing our Senses: Sensory stimulation to regulate immune function and mitigate pathology*

Presenter: Annabelle Singer
Coulter Department of Biomedical Engineering, Georgia Tech & Emory University, USA
Co-Authors: Prichard, A.[1], Garza, K. M.[1,2], Blanpain, L. T.[1,2,3], Willie, J. T.[4], Wood, L. B.[1,5,6]

[1] Wallace H. Coulter Department of Biomedical Engineering, Georgia Institute of Technology & Emory University, Atlanta, GA, USA

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[5] Parker H. Petit Institute for Bioengineering and Bioscience, Georgia Institute of Technology, Atlanta, GA 30332

[6] George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA 30332

Abstract

Chaired by Simon Hanslmayr, School of Psychology and Neuroscience, University of Glasgow

Rhythmic Sensory Stimulation (RSS) is a useful method to externally manipulate neuronal oscillations. One posited mechanism underlying its effects is entrainment, where endogenous brain rhythms synchronize to periodic sensory stimuli, such as fluttering sounds or visual flicker. This symposium will highlight RSS as a versatile tool for advancing our understanding of neuronal oscillations and exploring novel applications in cognitive neuroscience, covering a broad spectrum from basic science to clinical interventions. Our discussions will emphasize RSS's adaptability across various domains, including sensory modalities (visual, auditory, and tactile), dimensionalities (uni- or multimodal), experimental settings (stationary or mobile), frequency ranges (e.g., theta, alpha, gamma), recording techniques (EEG or MEG), and paradigms (open- or closed-loop). The symposium will be opened with a talk on multi-sensory entrainment as a tool to study multi-modal integration and the role of alpha coherence therein. Using a newly developed visual-tactile integration task that combines 10 Hz visual flicker and 10 Hz vibrotactile stimulation to manipulate the presence (rhythmic vs. arhythmic) and phase lag (in-phase vs. antiphase) of visual-somatosensory alpha coherence in the EEG, this talk will shed new light on the causal relevance, possible phase dependency and potential mechanisms underlying the role of alpha coherence for multi-modal integration. The second speaker will present a closed-loop MEG paradigm to estimate individuals' hippocampal theta frequencies online, and thus dynamically adjust the audiovisual stimulation frequency during an associative memory task. This pipeline addresses the inter- and intra-individual variability in neuronal oscillations and was validated prior to data collection to ensure that individual hippocampal frequencies can indeed be estimated using MEG. The ensuing talk will revolve around the successful decoding of real-world visual scenes from subjects' Steady-State Visually Evoked Potentials (SSVEPs) generated with LCD flicker glasses, emphasizing how SSVEPs differ markedly across scenes and participants while remaining consistent within individuals across sessions. Evidence will be presented for reliable decoding even with data from a single electrode or a trial duration below one second. The results also reveal the particularly rich visual information contained in lower gamma band oscillations. Moving to the domain of sleep, the fourth presenter will show how slow waves and spindles can be induced via auditory and visual stimuli, respectively. This introduces a novel approach to modulate the interplay between key sleep oscillations, whose dynamic coupling is posited to support memory consolidation. Strengthening memory formation was also the aim of another study using a closed-loop portable EEG device to modulate ongoing sleep spindles through auditory clicks. Next, evidence for gamma-band neuronal oscillations modulated by 40 Hz visual flicker in different sleep stages will be shared. These oscillations are posited to play a role in cognitive processes, including memory, and seem to be disrupted in schizophrenia. The feasibility and implications of 40 Hz visual stimulation during sleep in both healthy subjects and patients will be discussed. The symposium will be concluded with a clinical perspective on 40 Hz audiovisual stimulation, which was found to mobilize the immune system and reduce pathogenic proteins in mouse models of Alzheimer's disease. Results unveiled an immune sign-

aling cascade by which gamma neural activity recruits neuroimmune function, with varied stimulation frequencies affecting the immune system differently. In humans, not only was neuroimmune signaling altered by gamma sensory stimulation, but it also reduced subclinical epileptiform activity. Most importantly, we look forward to an engaging discussion with the audience on how these diverse advances facilitated by RSS can help us better understand the functions of neuronal oscillations, and how this knowledge should be translated into outputs valuable for researchers and patients alike. In sum - safe, non-invasive, and accessible, RSS is a highly relevant tool to capture and manipulate oscillatory neuronal activity. We anticipate that RSS will continue to drive progress in basic neuroscience research, neurotechnology applications for healthy individuals, and clinical interventions in the years to come.

Symposium abstract [SY23]
Session: Executive Functions & Decision Making III
Date: 18 September 2025 (13h45)
Symposium Title: ***Decision Signal(s) In The Electroencephalogram***
Symposium organiser(s): Leendert van Maanen[1] & Jelmer P. Borst[2]

[1] Utrecht University, Netherlands

[2] University of Groningen, Netherlands

Talk 1 – ***Neural signatures of decision formation in the human EEG***
Presenter: Redmond O'Connell
Trinity College Dublin, Ireland
Co-Authors: Kelly, S. P.[1]

[1] School of Electrical and Electronic Engineering, University College Dublin

Talk 2 – ***Disentangling EEG sources of multiple latent computational decision-processes***
Presenter: Tarryn Balsdon
LSP, DEC, ENS-PSL University, & CNRS, France
Co-Authors: Philiastides, M. G.[1]

[1] School of Psychology and Neuroscience, University of Glasgow, UK

Talk 3 – ***Decision-making components and times in the EEG***
Presenter: Gabriel Weindel
Utrecht University, Netherlands

Talk 4 – ***Using neurocognitive modeling to test theories of event-related potentials during decision-making***
Presenter: Michael Nunez
University of Amsterdam, Netherlands

Talk 5 – ***Is CPP an ERP marker of evidence accumulation in complex perceptual decision-making?***

Presenter: Hu Chuan-Peng
Nanjing Normal University, China
Co-Authors: Liu, Y.[1], Yan, C.[1]

[1] School of Psychology, Nanjing Normal University

Abstract

Decision making research has benefited from a fruitful two-way transfer between neurophysiological analyses and computational models of behaviour. These models have guided the search for neural correlates of decision formation and, in turn, neural data have increasingly been used to inform the construction and constraint of the models. In EEG for example, sequential sampling models were instrumental in the identification of signals that resemble an actual evidence accumulation signal in the brain. Nevertheless, the effort to integrate neural data with behavioural models is fraught with challenges. Establishing the extent to which a given measurement corresponds to particular model parameters and predictions is not straightforward as any linking function can be obscured by issues such as poor measurement, model validity, or inaccuracies in the mathematical representation of this link.

In this symposium we will explore a range of new approaches to resolving these challenges when examining relationships between computational models and EEG signatures of decision making. The first three talks will be dedicated to exploring different signals and models of decision-making. First, Redmond O'Connell will highlight how careful paradigm design can make it possible to infer key computational elements of the decision process from EEG signatures of evidence accumulation and motor preparation. Second, Tarryn Balsdon will present a novel decision-making model which aims to jointly capture cognitive processes associated with neural signatures of motor preparation and decision confidence. Gabriel Weindel will present a novel decomposition of the EEG signal and its relation to decision-making models. Michael Nunez will then discuss how we can use simultaneous modelling of EEG and behavior to arbitrate for or against different linking functions. Finally, Hu Chuan-Peng will present a registered report that examines the relationship between the centroparietal positivity (CPP) and evidence accumulation in more complex perceptual decision-making tasks. The symposium will end with a general discussion highlighting important challenges for the field as well as potential solutions. **Redmond O'Connell: Neural signatures of decision formation in the human EEG** With careful paradigm design, the EEG technique enables isolation of neural 'decision variable' signals that trace the evidence accumulation process that underpins decision formation in human subjects. This ability to probe and measure the human decision process as it evolves, has provided a new means of empirically testing model predictions. Across a series of experiments we have exploited these signals to identify the timescale of evidence integration during perceptual choices and pinpointed the computational adjustments that observers implement to account for contextual factors such as time pressure and expectation. **Tarryn Balsdon: Disentangling EEG**

sources of multiple latent computational decision-processes Behavioural efficiency means appropriately moderating the trade-off of speed for accuracy according to the constraints of the environment. Classically, this trade-off has been computationally described by moderating the quantity of evidence accumulated for a decision, with this accumulation process realised in associative cortex. Yet growing evidence suggests a more active role of motor processes in decision-making, as well as signatures of decision-confidence prior to decision-commitment. Here, we formalise an extension of evidence accumulation frameworks to computationally describe the involvement of motor and confidence processes in decision-making and capture the speed-accuracy trade-off as moderating how confidence is used to improve the quality of accumulated evidence. We show EEG evidence of these latent decision-processes, and use the EEG-predicted processes to make novel predictions about behaviour. **Gabriel Weindel: Decision-making components and times in the EEG** Deciding implies a chain of information processing from the onset of a choice situation to the decision. An example of such a chain is the detection of a stimulus, selecting relevant information, weighting evidence towards the alternatives and executing a response. It is unknown when and how these cognitive processes unfold over time and in the brain. We analysed the single-trial EEG of participants performing a perceptual decision task as a repeated sequence of EEG-events with varying latencies. We show that three events occur in the brain from stimulus onset to the production of a response and that each of these events contributes to different cognitive processes involved in decision making. **Michael Nunez: Using neurocognitive modeling to test theories of event-related potentials during decision-making** Drift-Diffusion Models are a widely used class of cognitive models that assume accumulation of evidence during a decision. These models are often used as measurement models to assess individual differences in cognitive processes. Meanwhile, event-related potentials (ERPs) as recorded by EEG are thought to reflect timing and computation of various cognitive processes during decision-making, including evidence accumulation itself. In this talk I review my work on neurocognitive modeling of ERPs and choice-response times recording during participants' decision-making. I show why these methods, applicable for trial-averaged as well as single-trial ERPs, are useful to test theories of neural computation without making strong assumptions. **Hu Chuan-Peng: Is CPP an ERP marker of evidence accumulation in complex perceptual decision-making?** The CPP was identified as an EEG signature of evidence accumulation among humans. However, the generalizability of CPP as an EEG signature of evidence accumulation remains uncertain, particularly for tasks that require information processing beyond low-level stimulus feature. Here we re-analyzed four publicly available datasets resulting from a variety of perceptual decision-making tasks (from random dots motion to emotion discrimination task), with joint modeling techniques that integrate the Drift Diffusion Model (DDM) with CPP data. The robustness of the results was tested with a multiverse analysis approach. These results provide insights into the neural ERP signal of evidence accumulation.

Symposium abstract [SY24]
Session: Consciousness & Cognition II
Date: 17 September 2025 (16h30)
Symposium Title: ***Integrating Distinct Viewpoints On The Neural Origins Of Metacognition***
Symposium organiser(s): Redmond O›Connell
Trinity College Institute of Neuroscience & School of Psychology, Trinity College Dublin, Ireland

Talk 1 – ***A neural basis for distinguishing imagination from reality***
Presenter: Nadine Dijkstra
Wellcome Center for Human Neuroimaging, University College London, UK
Co-authors: von Rein, T.[1], Kok, P.[1], Fleming, S.[2]

[1] Institute of Neurology, University College London, UCL

[2] Department of Experimental Psychology, University College London, UCL

Talk 2 – ***Reduced error awareness after sleep deprivation modulates meta-control adjustments***
Presenter: Hans Kirschner
Institute of Psychology, Otto-von-Guericke University, Germany
Co-Authors: Tegelbeckers, J.[1], Ullsperger, M.[1,2]

[1] Institute of Psychology, Otto-von-Guericke University, D-39106 Magdeburg, Germany

[2] Center for Behavioral Brain Sciences, D-39106 Magdeburg, Germany

Talk 3 – ***Introspecting influence in choice: accuracy of metacognitive reports in detecting choice bias***
Presenter: Lucie Charles
Queen Mary University of London, UK
Co-Authors: Tegelbeckers, J.[1], Ullsperger, M.[1,2]

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[2] Center for Behavioral Brain Sciences, D-39106 Magdeburg, Germany

Talk 4 – ***Neurally-informed modelling reveals a single evidence accumulation process for perceptual choices and subsequent confidence reports***
Presenter: Daria Monakhovych
Trinity College Institute of Neuroscience, Trinity College Dublin, Ireland
Co-authors: Grogan, J.[1], Vermeylen, L.[2], Desender, K.[2], O'Connell, R.[1]

[1] Trinity College Institute of Neuroscience & School of Psychology, Trinity College Dublin, Ireland

[2] Brain and Cognition, KU Leuven, Belgium

Talk 5 – *Computational and electrophysiological mechanisms of audiovisual confidence*

Presenter: Nathan Faivre
LPNC, Université Grenoble Alpes, France
Co-Authors: Porte, P.[1], Mazor, M.[2], Pereira, M.[3], Goupil, L.[1]

1 LPNC, Université Grenoble Alpes, France
2 All Souls College, University of Oxford, UK
3 GIN, Université Grenoble Alpes, France

Abstract

A central challenge for modern cognitive neuroscience is to establish how the brain monitors and evaluates its own mental operations. In recent years, substantial progress towards answering this question has been achieved using a variety of paradigms and brain imaging assays. However, these efforts have been distributed across what have tended to be parallel fields investigating processes such as mental imagery, error detection, and perceptual decision making. In this symposium we seek to contribute to the greater integration of these distinct viewpoints on the neural basis of metacognition. First, Nadine Dijkstra will outline advances in our understanding of the processes that determine whether the brain will successfully or unsuccessfully distinguish between perceptual experiences that are real versus imagined. Second, Hans Kirschner will describe how the combination of hidden markov modelling and functional magnetic resonance imaging reveals behavioural state transitions during task performance that modulate our capacity to detect and correct action errors. Third, Lucie Charles will present a series of experiments in which innovative task designs made it possible to probe the extent to which observers can introspect the influence of different information sources on their choices. Fourth, Daria Monakhovych will report that a novel neurally-informed modelling method reveals that the timing and accuracy of perceptual choices and subsequent confidence ratings can be jointly modelled as a single evidence accumulation process. Finally, Nathan Faivre will highlight how evidence accumulation models can account for confidence judgments and associated neural signals during multisensory decision making. **Nadine Dijkstra: A neural basis for distinguishing imagination from reality** Internally triggered perceptual experiences, such as during imagination, dreaming and memory retrieval, rely on activity in the brain's sensory systems. While an efficient use of neural resources, co-opting the same system for internal simulation and for perception of the external world leads to the potential for confusing imagination and reality. In the past few years, we have experimentally investigated confusion between imagery and perception in healthy participants. In this talk, I will present behavioural, neuroimaging and computational support for a 'perceptual reality monitoring' mechanism that keeps imagination and reality apart in the human brain. **Hans Kirschner: Reduced error awareness after sleep deprivation modulates meta-control adjustments** Sleep deprivation impairs cognitive functions, including attention lapses, yet its impact on meta-cognition and post-error control remains unclear. Here, we use a novel error awareness task to test how sleep deprivation modulates meta-cognition and meta-control adjustments. First, we show that sleep deprivation prolonged the time spent

in an "out of the zone state", characterized by increased error density and reduced error awareness, particularly in later task stages. Second, we demonstrate that post-error adjustments are stronger and more likely after errors that reached conscious awareness and in the "in the zone" state. Finally, we show that sleep-deprivation altered error-related pMFC activity in a complementary speeded reaction time task. Together, our results highlight sleep deprivation's effects on meta-cognition and control. **Lucie Charles: Introspecting influence in choice: accuracy of metacognitive reports in detecting choice bias** Can we successfully ignore information we deem irrelevant or unreliable? And can we become aware of how such information can bias our choices? The ability to introspect and evaluate the factors influencing our decisions constitutes a key metacognitive function but remains poorly understood. In this talk, I will present studies measuring participants' capacity to disregard biasing information. We found that even when labelled as irrelevant or unreliable, such information still influenced choices. Although participants became aware of some of these biases, they couldn't compensate for them, revealing a gap between metacognitive awareness and metacognitive control. **Daria Monakhovych: Neurally-informed modelling reveals a single evidence accumulation process for perceptual choices and subsequent confidence reports** In most experimental paradigms, the decision making process ends as soon as the observer has reported a choice. However, in daily living, we often have the opportunity to sample additional evidence after committing to a choice which can be used to update subjective confidence and, if necessary, trigger a change of mind. How these post-choice decision processes operate remains uncertain. For example, we do not know if post-choice evidence is sampled by the same process that guided the initial choice or if it is evaluated by a distinct process. Here, we leverage non-invasive electrophysiological signatures of evidence accumulation to constrain a model that was jointly fit to perceptual choices and subsequent confidence ratings. The results favour a model in which a single evidence accumulation process is subjected to two separate stopping rules that determine the timing and accuracy of the initial choice and the final confidence rating. **Nathan Faivre: Computational and electrophysiological mechanisms of audiovisual confidence** While much progress has been made in the study of perceptual confidence on visual discrimination tasks, how we estimate confidence in multisensory decisions, remains largely unexplored. In this talk, I will report on behavioural and stereo-electroencephalographic experiments in which participants were asked to judge the presence or absence of audiovisual stimuli, and then to indicate their confidence in their judgement, both in an amodal and modality-specific way. I will present an evidence accumulation model accounting for the amodal and modality-specific detection and confidence results we obtained.

Symposium abstract [SY25]
Session: Memory IV
Date: 18 September 2025 (9h00)
Symposium Title: ***Episodic Memory In The Alzheimer's Disease Continuum: Neural Correlates And Potential Interventions***
Symposium organiser(s): Santiago Galdo-Alvarez
Cognitive Neuroscience and Psychogerontology Research Group, Institute of Psychology, USC (IPsiUS), Santiago de Compostela, Spain
Department of Clinical Psychology and Psychobiology, University of Santiago de Compostela, Spain

Talk 1 – ***Intracortical Myelinization and Its Relationship with CSF Amyloid Levels Across Cortical Layers***
Presenter: Sara Basanta-Torres
Cognitive Neuroscience and Psychogerontology Research Group, Institute of Psychology, USC (IPsiUS), Santiago de Compostela, Spain
Department of Clinical Psychology and Psychobiology, University of Santiago de Compostela, Spain
Co-Authors: Rivas-Fernández, M.A.[3], Zurrón, M.[1,2], Lindín, M.[1,2], Díaz, F.[1,2], Galdo-Alvarez, S.[1,2]

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Talk 2 – ***Electrophysiological correlates of MCI due to Alzheimer's Disease during an episodic memory task***
Presenter: Santiago Galdo-Alvarez
Cognitive Neuroscience and Psychogerontology Research Group, Institute of Psychology, USC (IPsiUS), Santiago de Compostela, Spain
Department of Clinical Psychology and Psychobiology, University of Santiago de Compostela, Spain
Co-Authors: Lindín, M.[1,2], Díaz, F.[1,2], Zurrón, M.[1,2]

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Talk 3 – *Connectivity Patterns in Attentional and Default Mode Networks: Insights into Cognitive Performance and Complaints Across Healthy Aging and the Alzheimer's Continuum*

Presenter: Benxamín Varela-López
Cognitive Neuroscience and Psychogerontology Research Group, Institute of Psychology, USC (IPsiUS), Santiago de Compostela, Spain
Department of Clinical Psychology and Psychobiology, University of Santiago de Compostela, Spain
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Talk 4 – *Modulation of Episodic and Working Memory by Transcranial Alternating Current Stimulation (tACS): Effects of Theta and Gamma Stimulation on Cognitive Performance and Event-Related Potentials*

Presenter: Kenia Correa-Jaraba
Cognitive Neuroscience and Psychogerontology Research Group, Institute of Psychology, USC (IPsiUS), Santiago de Compostela, Spain
Department of Developmental and Educational Psychology, University of Santiago de Compostela, Spain
Co-Authors: Martínez-Regueiro, R.[1,2], Díaz, F.[1,3], Cid-Fernández, S.[1,2]

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Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that primarily affects cognitive functions, particularly episodic memory. Recent research has emphasized the critical importance of early detection to implement effective interventions that can slow the disease's progression. Achieving this requires a detailed characterization of the structural and functional integrity of the brain across the Alzheimer's continuum. This symposium aims to provide evidence on the structural and functional changes observed at different stages of the disease, while also exploring a novel, non-invasive brain intervention designed to improve performance in episodic memory tasks. The first study presented, titled "Intracortical Myelinization and Its Relationship with CSF Amyloid Levels Across Cortical Layers" investigated the relationship between intracortical myelin and cerebrospinal fluid (CSF) amyloid levels. The study's sample population consisted of 77 individuals with mild

cognitive impairment (MCI). The results revealed a negative correlation in the right hemisphere at the inner cortical layer in the Superior Frontal Cortex and at the medium layer in the Rostral Middle Frontal Cortex. Conversely, a positive correlation was observed at the inner layer in the Parahippocampal Cortex. In the left hemisphere, a positive correlation was identified at the inner layer in the Fusiform Cortex. These findings also support evidence suggesting a synergistic pathological interaction between amyloid-β (Aβ) and tau proteins in areas undergoing early demyelination, particularly in the inner cortical layers. This study highlights distinct layer- and region-specific relationships between intracortical myelinization and CSF amyloid levels, shedding light on early pathological changes in Alzheimer's disease. The second study, titled "Electrophysiological correlates of MCI due to Alzheimer's Disease during an episodic memory task"**,** focused on identifying potential biomarkers for the prodromal stage of AD through EEG recordings to obtain event-related potentials (ERPs). Participants included two groups of individuals with MCI: one group with biomarkers of Alzheimer's disease (n = 13), i.e. Aβ, phosphorylated tau, and total tau, and another group without these biomarkers (n = 23). Participants were asked to distinguish between new words and those learned during a coding phase conducted 20 minutes earlier. The findings revealed that MCI participants with AD biomarkers exhibited lower amplitude in the Late Parietal Component (LPC) at electrode Pz, associated with recollection processes. The reduced amplitude observed in this group suggests that the LPC could serve as a reliable biomarker for detecting the prodromal stage of Alzheimer's disease. The third presentation, "Connectivity Patterns in Attentional and Default Mode Networks: Insights into Cognitive Performance and Complaints Across Healthy Aging and the Alzheimer's Continuum", explored connectivity patterns across the AD continuum in the Default Mode Network (DMN), the Memory Retrieval Network (MRN), the Dorsal Attention Network (DAN), Salience Network (SAL), and Fronto-Parietal Control Network (FPCN). Participants consisted of healthy controls (n = 93), individuals with subjective cognitive decline (SCD; n = 26), and individuals with MCI (multidomain: n = 30, unidomain: n = 16). Participants with SCD and MCI exhibited hippocampal atrophy, which increases their risk of progressing along the Alzheimer's continuum. Among these participants, higher DAN connectivity positively predicted memory performance. However, an interaction between DMN and MRN connectivity was negatively associated with memory performance, suggesting maladaptive functional integration. Subjective cognitive complaints correlated positively with SAL connectivity and DMN connectivity, reflecting increased awareness of cognitive decline. In addition, Mini-Mental State Examination scores were positively associated with MRN connectivity, and reduced MRN connectivity in participants with multidomain MCI compared to the control group was obtained, while SAL connectivity was lower in the SCD and unidomain MCI groups relative to controls. These findings underscore the differential roles of attentional and DMN-related networks in memory performance, global cognition, and subjective complaints within the Alzheimer's continuum. The final presentation, *"Modulation of Episodic and Working Memory by Transcranial Alternating Current Stimulation (tACS): Effects of Theta and Gamma Stimulation on Cognitive Performance and Event-Related Potentials"* investigated the potential of transcranial Alternating Current Stimulation as a

neuromodulation technique. This study focused on theta (4–7 Hz) and gamma (30–80 Hz) oscillations, hypothesizing that gamma-tACS would enhance episodic memory (EM) performance and theta-tACS would improve working memory (WM) performance. In the study theta-tACS (6 Hz), gamma-tACS (60 Hz), and sham-tACS were applied over the left dorsolateral prefrontal cortex (DLPFC) during the encoding phase of a visual episodic memory task and during the WM task (a 3-back paradigm) across three sessions spaced one week apart. In addition, EEG was recorded during the retrieval phase of the episodic memory task (old/new recognition test) to analyze ERPs. Statistical analysis revealed that gamma-tACS impaired episodic memory performance, with lower d' scores observed in gamma-tACS sessions compared to sham-tACS. ERP analysis showed reduced P600 amplitudes in the "old" condition and lower LPC amplitudes in both "old" and "new" conditions for gamma-tACS compared to sham-tACS, indicating disrupted memory encoding or consolidation. Theta-tACS showed no significant effects on episodic or working memory performance under the tested conditions. These findings suggest that while gamma-tACS may interfere with memory processes, further research is needed to explore its specific effects. Theta-tACS did not produce measurable benefits in this study, though its potential for modulating cognitive processes warrants additional investigation. This symposium, therefore, aims to highlight structural and functional changes occurring across the Alzheimer's continuum, as well as innovative approaches for early detection and intervention. Together, these results offer valuable insights into the mechanisms of Alzheimer's disease and pave the way for more effective therapeutic strategies.

Symposium abstract [SY26]
Session: Sensory Systems & Perception V
Date: 19 September 2025 (13h45)
Symposium Title: ***Recent Developments in Bodily Self-awareness Research: neural and Cognitive Mechanisms***
Symposium organiser(s): Sara Coppi
Department of Neuroscience, Karolinska Institutet, Stockholm, Sweden, Solnavägen 9, 17165

Talk 2 – ***Ownership of a limb versus ownership of the full body***
Presenter: Heather Iriye
Department of Neuroscience, Karolinska Institutet, Stockholm, Sweden, Solnavägen 9, 17165

Talk 3 – ***Alpha frequency shapes own-body perception by temporally integrating bodily signals***
Author(s): Mariano D'Angelo
Department of Neuroscience, Karolinska Institutet, Stockholm, Sweden, Solnavägen 9, 17165

Talk 4 – ***Neural and computational mechanisms of access consciousness in bodily self-perception***

Presenter: Renzo Lanfranco
Department of Neuroscience, Karolinska Institutet, Stockholm, Sweden, Solnavägen 9, 17165

Talk 5 – ***The role of nociception in body ownership***

Presenter: Sara Coppi
Department of Neuroscience, Karolinska Institutet, Stockholm, Sweden, Solnavägen 9, 17165

Abstract

The sense of body ownership corresponds to the perceptual experience that our body belongs to us, and it is fundamental to everyday life, as it allows to distinguish between the outside world and ourselves. Researchers study it using multisensory illusions like the rubber hand illusion, where synchronous stroking of a rubber hand and a hidden real hand induces the sensation that the rubber hand is part of the body. Similarly, the full-body illusion uses virtual reality to evoke ownership of a mannequin's body, highlighting how the brain integrates sensory inputs to create a cohesive sense of self. Recent research has expanded the understanding of the sense of body ownership and the underpinnings of body representation. This symposium presents an update on body perception research, including methodological innovations that are currently leading to a broader understanding of how the brain creates, maintains, and updates the sense of bodily self. Six speakers will address new developments in the field: Marie Chancel will talk about computational approaches to study how the brain attributes different signals to a common cause – Bayesian causal inference model – and how these methods can shed light on the inferences that the brain must carry out. Mariano D'Angelo will talk about the role of brain oscillations – parietal alpha frequency specifically – in the temporal integration of sensory information driving body ownership perception, using EEG and brain stimulation. Renzo Lanfranco will talk about the relationship between multisensory signal processing and access to conscious awareness during body ownership perception using signal detection, computational modelling, and ECoG. Heather Iriye will talk about the neural underpinnings of body ownership during full-body and body part illusions of ownership. Sara Coppi will discuss how inputs through nociceptive fibers influence multisensory integration in the rubber hand illusion and how pain can be perceived outside the physical body. Finally, Valeria Peviani will discuss how touch and proprioception are combined to structure the space of the self. The speakers will discuss the theoretical contributions of these new developments and the benefits of their innovative methodological approaches. These advancements offer significant insights into the study of body ownership perception while also opening up new research opportunities. Speaker 2: Dr. Heather Iriye – "Ownership of a limb versus ownership of the full body" Based on behavioural evidence that local and global body percepts are mediated by distinct processes, Dr. Iriye and colleagues adapted

an innovative procedure for separately inducing body parts and full body ownership suitable for functional magnetic resonance imaging scanning to investigate whether they were linked to dissociable neural correlates. Whole-brain searchlight analyses indicated that full-body ownership was predicted by multivariate patterns of activity in the inferior parietal and posterior medial regions. The bilateral intraparietal sulci and left anterior insula were involved in both full-body and body-part ownership. Speaker 3: Dr. Mariano D'Angelo –" Alpha frequency shapes own-body perception by temporally integrating bodily signals" To generate the sense of body ownership, the brain must address the perceptual binding problem by integrating signals originating from one's body while treating signals from external events separately. Dr. D'Angelo and colleagues provide converging psychophysical, correlational (EEG), causal (brain stimulation) and computational evidence that alpha frequencies determine the temporal integration of somatosensory and body-related visual information, shaping body ownership perception. Computational modelling identified the mechanism for how alpha frequency influences multisensory perceptual inference, revealing that alpha frequency correlate with the reliability of the visuotactile signals in a probabilistic perceptual inference. Speaker 4: Dr. Renzo Lanfranco – "Neural and computational mechanisms of access consciousness in bodily self-perception" How does body ownership information enter awareness? Dr. Lanfranco's psychophysical experiments used signal detection analysis, metacognition modeling, and drift-diffusion modeling to study this. They found that body ownership emerges when visual and tactile signals integrate, independent of multisensory or evidence accumulation levels. Resting-state functional connectivity in the default-mode and sensorimotor networks predicted individual differences in body ownership and perceptual awareness. Intracranial electrode studies also revealed that interactions in the intraparietal sulcus underpin body ownership. These findings suggest body ownership is essential for self-awareness. Speaker 5: Sara Coppi – "The role of nociception in body ownership" The integration of multiple sensory inputs forms the basis of body ownership. However, our understanding of how nociceptive signals combine with other sensory modalities to create a unified sense of self remains limited. Coppi and colleagues have recently demonstrated that inputs from C and Aδ fibers interact with visual and proprioceptive signals in the rubber hand illusion. Furthermore, when the illusion is induced through either congruent visuo-tactile or visuonociceptive stimuli, nociceptive stimuli are perceived as originating from the rubber hand.

Symposium abstract [SY27]
Session: Emotions & Social Cognition I
Date: 16 September 2025 (9h00)
Symposium Title: ***Neural Circuits Of Emotion Regulation: From Mechanisms To Translational Applications***
Symposium organiser(s): Carles Soriano-Mas[1] & Maria Picó-Pérez[2]

1 University of Barcelona & IDIBELL, Barcelona, Spain

2 Jaume I University, Castelló de la Plana, Spain

Talk 1 – *Meta-analytical Insights on the Neural Correlates of Emotional Processing and Regulation*
Presenter: Maria Picó-Pérez
Jaume I University, Castelló de la Plana, Spain

Talk 2 – *How the Brain Regulates Fear*
Presenter: Miquel Àngel Fullana
Hospital Clínic & IDIBAPS, de Barcelona, Spain

Talk 3 – *Examining the Ventromedial Prefrontal Cortex-Amygdala Circuit in the Long-Term Trajectory of Anxiety and Depression Symptoms*
Presenter: Carles Soriano-Mas
University of Barcelona & IDIBELL, Barcelona, Spain

Talk 4 – *Emotion Regulation in OCD: Insights from a Tailored fMRI Task*
Presenter: Mafalda Machado de Sousa
University of Minho, Braga, Portugal

Abstract
In this symposium, we propose four presentations exploring how distinct neural circuits underpin emotional regulation processes. Emotion regulation encompasses a range of strategies, each linked to specific neural pathways. Traditional strategies rooted in classical psychological frameworks, such as conditioning and extinction, form the basis of behavioral therapies. In contrast, cognitively driven strategies, including cognitive reappraisal, are central to third-wave psychological therapies. The neural substrates associated with these strategies appear, at first glance, to be distinct. For instance, ventromedial prefrontal cortex (vmPFC) and amygdala connectivity has been consistently linked to extinction-based strategies. On the other hand, cognitive strategies involve additional networks, such as dorsolateral and dorsomedial prefrontal cortices in conjunction with inferior parietal regions. However, neuroimaging studies suggest that these distinctions may not be as rigid as previously thought. Shared circuits, including those involving salience-related regions such as the insula and dorsal anterior cingulate cortex (dACC), play a pivotal role in initiating regulation processes regardless of the specific strategy. Beyond identifying these regions as potential targets for intervention, such findings also challenge the dichotomy between extinction and cognitive strategies, suggesting a more integrated perspective. Functional neuroimaging, therefore, provides a powerful tool for reconceptualizing basic psychological processes and developing biologically informed interventions. These interventions go beyond the limitations of current empirically validated, yet descriptively driven, therapeutic techniques. A deeper understanding of the underlying mechanisms is essential to optimize their application across diverse contexts and conditions.

The symposium will begin with a talk by Maria Picó-Pérez, a postdoctoral researcher at Jaume I University in Castelló de la Plana, Spain. In her presentation, "Meta-analytical Insights on the Neural Correlates of Emotional Processing and Regulation," Maria will review her meta-analyses on the neural circuits underpinning emotional regulation in both healthy populations and individuals with anxiety and depression. Her findings highlight, for instance, the hypoactivation of the ventrolateral prefrontal cortex (vlPFC) in emotional regulation deficits seen in these disorders. Additionally, her work demonstrates that extinction and cognitive reappraisal strategies share common neuroanatomical substrates within the salience network, offering a novel conceptual framework for understanding the mechanisms underlying these seemingly distinct strategies. The second talk, "How the Brain Regulates Fear" will be delivered by Miquel Àngel Fullana, a clinical psychologist and researcher at Hospital Clínic de Barcelona, Spain. An expert in the processes of conditioning and extinction in humans, Miquel Àngel's research focuses on the neural mechanisms underlying these processes and their behavioral applications in clinical psychology, such as exposure therapy with response prevention. He will present findings from functional and metabolic neuroimaging studies investigating the neural circuits associated with fear conditioning and extinction, as well as related processes like extinction recall, reinstatement, and contingency reversal. These processes correspond to different aspects of the clinical response observed in patients benefiting from behavioral therapies. Understanding these mechanisms is critical for optimizing therapeutic approaches and integrating them with neuromodulation techniques. The third presentation, "Examining the Ventromedial Prefrontal Cortex-Amygdala Circuit in the Long-Term Trajectory of Anxiety and Depression Symptoms," will be given by Carles Soriano-Mas, a professor of psychology at the University of Barcelona. Carles will discuss the findings of a study conducted on a large cohort whose anxiety and depression symptoms were tracked daily over six months. The study demonstrates that baseline measures of structural and functional connectivity between the vmPFC and the amygdala are associated with the long-term evolution of these symptoms. By linking specific patterns of symptom trajectory with neural architecture and function, the research provides crucial insights not only into the mechanisms underlying mental health disorders but also into brain-based prediction of clinical outcomes, paving the way for more tailored interventions.

The final talk, "Emotion Regulation in OCD: Insights from a Tailored fMRI Task," will be presented by Mafalda Machado de Sousa, a clinical psychologist and doctoral researcher at the University of Minho, Braga, Portugal. Mafalda will share results from a study investigating the neural circuits underlying emotion regulation deficits in patients with obsessive compulsive disorder (OCD). This innovative approach to OCD aims to establish the groundwork for developing novel therapeutic strategies targeting emotion regulation processes and the associated neural circuits. Her talk will serve as an excellent conclusion to the symposium, showcasing how cutting-edge neuroscience can inform practical applications in mental health, particularly in addressing one of the most prevalent psychiatric disorders. Together, these presentations will offer a comprehensive perspective on the neural mechanisms of emotion regulation, highlighting their implications for the conceptualization of psychological

processes and the development of biologically informed therapeutic strategies. The symposium will bridge basic and translational research, emphasizing the importance of integrating neuroscience findings into clinical practice for the benefit of individuals affected by mental health disorders.

Symposium abstract [SY28]
Session: Attention II
Date: 19 September 2025 (13h45)
Symposium Title: ***Neuromodulatory Influences On Aging Cognition: Novel Measurement And Intervention Approaches In Health And Disease***
Symposium organiser(s): Martin J. Dahl
Max Planck Institute for Human Development, Germany

Talk 1 – ***Arousal self-regulation through pupil-based biofeedback: from its development to future directions***
Presenter: Marieke L. Weijs & Sarah N. Meissner ETH Zurich, Switzerland

Talk 2 – ***Thalamic contributions to cognitive and perceptual control***
Presenter: Julian Q. Kosciessa
Radboud University, Netherlands

Talk 3 – ***Dopaminergic and noradrenergic nuclei relate to different memory types in older adults***
Presenter: Martin J. Dahl
Max Planck Institute for Human Development, Germany

Talk 4 – ***Neurodegenerative diseases as a window into the noradrenergic system***
Presenter: Claire O'Callaghan
University of Sydney, Australia

Talk 5 – ***Temporal signatures of locus coeruleus dysfunction in preclinical Alzheimer's disease***
Presenter: Prokopis C. Prokopiou
Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital and Harvard Medical School, USA

Abstract
Neuromodulators such as noradrenaline and dopamine are critical regulators of arousal state and higher-order cognitive functions, including attention and memory. At the same time, their early accumulation of pathology renders neuromodulatory

systems vulnerable to age-related changes and implicates them in the cognitive symptoms of neurodegenerative diseases such as Alzheimer's and Parkinson's. The small size of neuromodulatory nuclei and their location deep in the subcortex has long impeded their non-invasive study in humans. However, novel methodological approaches allow the experimental modulation and measurement of neuromodulatory systems, providing unprecedented insights into their influence on cognition and behavior. This symposium bridges foundational, lifespan, and clinical cognitive neuroscience, fostering the exchange of ideas across disciplines. By interrelating findings from diverse experimental approaches, the symposium sheds light on how neuromodulation shapes cognition, contributes to age-related decline, and drives pathological changes in neurodegenerative diseases. Our interdisciplinary presentations span healthy and clinical populations, cross-sectional and longitudinal designs, and a range of measurement (e.g., EEG, (f)MRI, PET, pupillometry) and targeted intervention methods (e.g, TMS, pupil biofeedback, pharmacology, ultrasound, and vagus-nerve stimulation).

We begin by exploring cutting-edge research demonstrating how pupil-based biofeedback can influence neuromodulatory activity, cortical excitability, and cognition. Moving to lifespan studies, we present evidence for neuromodulatory dysregulation in aging and its impact on cognitive control and memory. Clinical investigations highlight pharmacological approaches targeting neuromodulatory systems to mitigate cognitive symptoms in Parkinson's disease. Finally, we reveal the role of the noradrenergic locus coeruleus in the progression of Alzheimer's pathology and its potential as a therapeutic target. First, Marieke L. Weijs and Sarah N. Meissner will discuss the applications of pupil-based biofeedback for arousal self-regulation. Their research, combining TMS, EEG, fMRI, and pupillometry, demonstrates that volitional control of arousal via pupil dynamics influences activity of the noradrenergic locus coeruleus and other brainstem nuclei, cortical excitability, and attention. Notably, their work extends to tracking pupil dynamics during wakefulness and sleep, offering important potential for translation to clinical applications across various domains. Next, Julian Q. Kosciessa will discuss neuromodulatory contributions to flexible control. Using a multimodal neuroimaging approach, his work indicates that uncertainty about taskrelevant features amplifies canonical neural control signatures, along with neuromodulatory drive (as indicated by concurrent phasic increases in pupil diameter). These uncertainty adjustments broadly dampen in older age, while older individuals with more young-like neuromodulation can more flexibly exert cognitive control. Ongoing work with transcranial ultrasound stimulation tests whether distinct uncertainty sources in the perceptual vs. cognitive domain are managed via neuromodulation along specialized thalamocortical circuits, promising novel intervention targets and approaches. Martin J. Dahl will then present findings from a multimodal longitudinal MRI study linking MRI proxies for the integrity of dopaminergic and noradrenergic brain regions to distinct aspects of late-life memory. Among younger and older adults, dopaminergic substantia nigra–ventral tegmental area integrity was found to support working memory, whereas noradrenergic locus coeruleus integrity was more closely associated with episodic memory. Notably, age-related declines in the integrity of dopaminergic and noradrenergic nuclei were observed longitudinally,

with locus coeruleus changes reliably forecasting future episodic memory loss. Ongoing work will show evidence for vagus-nerve stimulation-induced neuromodulatory activation, offering potential avenues into mitigating age-related cognitive decline. Transitioning to clinical research, Claire O'Callaghan will focus on the role of neuromodulatory systems in the cognitive symptoms of neurodegenerative diseases. Neuromodulatory systems, including the noradrenergic system, are among the earliest sites of pathology in Alzheimer's and Parkinson's diseases. Alterations in these systems contribute to apathy, impulsivity, and learning deficits, yet their relative contributions remain poorly understood. Using convergent evidence from pharmacology, pupillometry, and cognitive modeling, she will highlight the therapeutic potential of targeting the locus coeruleus–noradrenaline system to alleviate these symptoms in Parkinson's disease. These findings also provide an important testbed for advancing normative neuroscience theories of cognition and refining pharmacological interventions. Finally, Prokopis C. Prokopiou will explore the relationship between transient bursts of locus coeruleus activity, Alzheimer's-related tau pathology, and cognitive decline in preclinical Alzheimer's. Combining resting-state fMRI, tau-PET imaging, and longitudinal cognitive data from well-characterized older individuals, his research identifies lower locus coeruleus activity as a marker of greater entorhinal cortical tau deposition and steeper cognitive decline. Spontaneous locus coeruleus bursts, defined as high-amplitude BOLD-fMRI changes, elicited widespread synchronized activity in the entorhinal cortex and may serve a protective role against Alzheimer's-related cognitive decline. Together, these presentations comprehensively illuminate the mechanisms through which neuromodulatory systems shape cognitive function across the lifespan, both in health and during neurodegenerative disease progression. They emphasize the critical need for interdisciplinary approaches that integrate advanced imaging and stimulation techniques with longitudinal and cross-sectional designs to uncover the underlying principles of neuromodulatory function. The symposium fosters dialogue between researchers and clinicians, advancing our understanding of the neuromodulatory basis of cognition and paving the way for innovative therapeutic strategies aimed at preserving cognitive health.

Symposium abstract [SY29]
Session: Emotions & Social Cognition II
Date: 16 September 2025 (13h45)
Symposium Title: ***Exploring Dehumanization: Neural, Developmental And Computational Perspectives***
Symposium organiser(s): Federica Meconi[1] & Ermanno Quadrelli[2]

[1] University of Trento, Italy

[2] University of Milano-Bicocca, Italy

Talk 1 – *The functional role of interpersonal dehumanisation and associated brain networks*
Presenter: Lasana T. Harris
University College of London, UK
Co-Authors: Delgado, N.[1]

[1] University of La Laguna, Spain

Talk 2 – *Roots of dehumanization: physiological and social markers from infancy to childhood*
Presenter: Elisa Roberti
University of Milano-Bicocca, Italy
Co-Authors: Testa, A.[1], Nava, E.[1], Turati, C.[1], Quadrelli, E.[1]

[1] University of Milano-Bicocca, Italy

Talk 3 – *Intergroup dehumanization: neural and physiological markers of mind attribution in adults*
Presenter: Daniela Ruzzante
University of Trento, Italy
Co-Authors: Meconi, F.[1]

[1] University of Trento, Italy

Talk 4 – *Sexual objectification: Neural traces of dehumanization in gender relations*
Presenter: Jeroen Vaes
University of Trento, Italy

Talk 5 – *Understanding the relationship between dehumanisation and self-other similarity*
Presenter: Harry Farmer
University of Greenwich, UK

Abstract
Dehumanization, the process of perceiving others as less than human, shapes intergroup relations fuelling discrimination by denying mental states and human characteristics to certain individuals or groups. This symposium integrates multidisciplinary insights to examine how mind attribution is modulated by social categorization, from early perceptual biases in infancy to implicit biases in adulthood. We will present evidence from neurophysiological studies and computational modelling approaches to understand the mechanisms driving dehumanization in interpersonal relations.
The functional role of interpersonal dehumanisation and associated brain networks
Dehumanisation has been primarily studied from an intergroup perspective in social psychology, where it is operationalised by attributional, attitudinal, perceptual, and stereotype endorsement approaches. Yet interpersonal dehumanisation is heavily studied in social neuroscience where the engagement of social cognition can be more directly measured with cognitive neuroscience methods. This more subtle form of dehumanization occurs in daily interactions in a variety of contexts such as

medical and care settings. Moreover, sexual objectification and empathy avoidance show similar patterns of brain activity to interpersonal dehumanisation, suggesting an underlying broader psychological mechanism. Here, I discuss this mechanism and its functions, including protecting the self psychologically, avoiding emotions, and achieving goals that can be organised as dealing with past, present and future encounters with other people. I consider other contexts where this mechanism may also play a role to satisfy similar functions. **Roots of dehumanization: physiological and social markers from infancy to childhood** Early childhood offers a key period to examine the emergence of social categorizations and dehumanization precursors through social experiences and perceptual learning. Early perceptual biases evolve into childhood preferences for own-ethnicity peers, contributing to implicit dehumanization in adulthood, such as considering other-ethnicity faces similarly to inanimate objects. Our studies explored the early markers of dehumanization. The first used Fast Periodic Visual Stimulation to examine EEG responses to same- (White) and other ethnicity (Black) doll-like and human faces in adults and 9-month-olds. Findings showed heightened attention to Black faces across groups, but only adults categorized Black doll-like faces more than White ones. In the second study, we recorded zygomaticus and frontalis muscle activity in 5-year-olds observing White and Black emotional faces. Findings revealed heightened EMG responsiveness to Black, compared to White faces, indicating early biases in automatic facial mimicry. By incorporating parental and child implicit bias assessments, these data clarify how early social and perceptual processes shape the emergence of dehumanization. **Intergroup dehumanization: neural and physiological markers of mind attribution in adults** Recent research showed that dehumanization is shaped by a two-phase mentalization process, involving perceptual and contextual information processing about the other. Our first study explored whether dehumanization can be overcome by adding new contextual information within this two-phase process. We presented ingroup and outgroup human faces and their doll-like avatars in an oddball paradigm while recording EEG. Participants were exposed to faces before and after adding contextual information about them being criminal or charitable. The first phase showed that ingroup faces elicited stronger N170 with contextual information. In the second phase, group differences disappeared in the P3 as new information facilitated mind attribution. A second EMG study unveiled implicit social behavior showing that ingroup faces are automatically mimicked more than their outgroup counterparts. These results suggest a role for mentalizing in mitigating dehumanization, offering new insights into neural and physiological dimensions of social interaction. **Sexual objectification: Neural traces of dehumanization in gender relations** When sexual objectification occurs, a woman is primarily seen as a body or a collection of body parts. Therefore, objectified women are attributed less mind and implicitly associated with less uniquely human qualities compared to non-objectified female or male targets. Testing the idea that objectification can literally turn someone into something, three EEG studies using the oddball paradigm analysed participants' neural activity while they processed frequently presented male and female human stimuli amongst infrequently presented gender-matched doll-like objects. We observed that the objectified women are processed more similarly to the object stimuli, more so

than non-objectified women or male targets. Two additional EMG studies corroborated these findings demonstrating that objectified women who express an emotion are mimicked to the same extent as a doll-like version of themselves who expresses the same emotion. Overall, these data suggest how sexual objectification represents a powerful way in which we perceive and treat women more like mindless objects.
Understanding the relationship between dehumanisation and self-other similarity At the heart of dehumanisation is the establishment of a sense of dissimilarity between oneself and the dehumanised group. Here I highlight the cognitive mechanisms linking dehumanisation and perceived self/other similarity. I present two studies in which I manipulated perceived humanness in a similarity learning task. In this task participants gave their preference for a series of pairs of abstract art paintings and then had to predict the preferences of target others whose choices are manipulated to be either largely the same or different to their own. The first study investigates how similarity learning is modulated by humanness by comparing learning about human, humanoid robot or AI algorithms preference similarity. The second study manipulates humanness by introducing two groups of extraterrestrials who vary in the extent to which they are said to experience complex emotions (infrahumanisation). Computational models are fitted to participants' predictions to investigate the extent to which variations in the humanness of the target others modulate learning rates.

Symposium abstract [SY30]
Session: Sensory Systems & Perception VI
Date: 19 September 2025 (16h30)
Symposium Title: ***Exploring Self-Generation Effects Across Sensory Modalities: Neural Mechanisms and Clinical Implications***
Symposium organiser(s): Iria SanMiguel
Universitat de Barcelona, Spain

Talk 2 – ***From suppression to enhancement: Understanding the effects of action in the visual modality***
Presenter: Bianca van Kemenade
Justus-Liebig-Universität Gießen, Germany
Co-Authors: Carlo Cabato[1], Lars Muckli[2], Elena Witzel[1], Gizem Yildiz[1]

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[2] University of Glasgow

Talk 3 – ***Auditory self-generation effects: Linking neural correlates to perceptual outcomes***
Presenter: Iria SanMiguel[1,2,3]
Co-Authors: Carla Salgado[1,2], Stefanie Sturm[1,2], Marc Via[1,2,3]

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Talk 4 – *Perceiving voices through predictions and errors: from neural mechanisms to clinical implications*
Presenter: Ana Pinheiro
University of Lisbon, Portugal

Talk 5 – *Sensory attenuation, inner speech, and schizophrenia*
Presenter: Thomas Whitford
University of New South Wales, Australia
Co-Authors: Lawrence Chung[1], Oren Griffiths[2], Bradley Jack[3], Anthony Harris[4], Susanne So[1]

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Abstract
Perception is an active process, intricately tied to our actions. A critical aspect of this interaction is self-generation effects: the distinct perceptual and neural processing of stimuli directly resulting from one's own actions. These effects are key to understanding fundamental processes such as sensorimotor integration and complex cognitive functions like the sense of agency. This symposium brings together five talks to explore self-generation effects across sensory modalities, addressing their mechanisms, contextual dependencies, individual variability, and clinical implications. Dominant motor control theories propose that internal models predict sensory reafference and modulate responses to self-generated stimuli, enhancing the salience of less predictable, externally generated inputs. However, other work suggests that actions also modulate sensory processing in non-predictive contexts, pointing to alternative or complementary mechanisms. Through a diverse range of methodologies, including electrophysiology, neuroimaging, and pupillometry, this symposium will investigate the neural underpinnings of self-generation effects in different modalities and contexts, contrasting prediction-based models with proposals emphasizing diffuse neuromodulation mechanisms. While self-generated stimuli typically elicit attenuated neural responses and are perceived as less intense, emerging evidence challenges this paradigm, revealing instances of enhancement under specific conditions. This symposium will examine the factors influencing these contrasting effects, such as task difficulty, stimulus intensity, and predictability, comparing findings across sensory modalities. Finally, we will tackle the clinical relevance of dysfunctional self-generation effects, particularly along the continuum of psychosis. Presentations will highlight links between impaired predictive modeling and

self-generation effects in schizophrenia, focusing on symptoms such as auditory verbal hallucinations. Further, across modalities and contexts, individual differences in self-generation effects, and particularly their relationship to schizotypy, will be a central theme. Konstantina Kilteni will provide a brief overview of her work on somatosensory attenuation, focusing on how predictive mechanisms suppress, and not enhance, tactile perception. Employing psychophysics and neuroimaging methods, she will explore the neural implementation of these effects, and their relationship to schizotypal traits. Bianca van Kemenade will present behavioral and neuroimaging evidence from the visual modality, examining how task difficulty, stimulus predictability, visibility, and schizotypal traits influence action-related visual processing. Iria SanMiguel will extend the discussion to the auditory modality, exploring the interplay between electrophysiological and perceptual aspects of selfgeneration effects, their dependence on sound intensity, and their link to schizotypy. She will also present pupillometric findings to explore the possible role for arousal-related noradrenergic neuromodulation as an alternative to predictive forward models. Ana Pinheiro will delve into predictive coding mechanisms in voice perception, presenting behavioral and EEG data linking disruptions in prediction and error processing to auditory verbal hallucinations. Thomas Whitford will focus on the neural basis of inner speech production and how dysfunctional sensory attenuation in this unique form of action relates to positive symptoms in schizophrenia. Together, these talks will provide a comprehensive view of selfgeneration effects across visual, somatosensory, and auditory modalities. By integrating behavioral, neuroimaging, psychophysiological, and clinical perspectives, the symposium offers valuable insights into the mechanisms of active perception and their implications for sensory processing, the sense of agency, and psychopathology.

Symposium abstract [SY31]
Session: Development and Plasticity I
Date: 19 September 2025 (13h45)
Symposium Title: ***Individual Reading Skills And Learning Dynamics***
Symposium organiser(s): Ariane Tretow
Centre of Excellence for Learning Dynamics and Intervention Research, University of Jyväskylä, Finland

Talk 1 – ***Development of brain responses to speech sounds in the Jyväskylä Longitudinal Study of Dyslexia***
Presenter: Jarmo Hämäläinen
Centre of Excellence for Learning Dynamics and Intervention Research, University of Jyväskylä, Finland
Centre for Interdisciplinary Brain Research, Department of Psychology, University of Jyväskylä, Finland

Co-Authors: Sorsa, A.[1,2], Tretow, A.[1,2], Lohvansuu, K.[3], Leppänen, P.[1,2]

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Talk 2 – *Changes in brain activity during learning of audio-visual associations*

Presenter: Heidi Pesonen

Centre for Interdisciplinary Brain Research, Department of Psychology, University of Jyväskylä, Finland Co-Authors: Xu, W. [1], Hämäläinen, J.[1,2]

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Talk 3 – *Symbol-sound association learning, a relevant predictor of individual differences in reading?*

Presenter: Milene Bonte

Department of Cognitive Neuroscience, Faculty of Psychology and Neuroscience, Maastricht University, Maastricht, Netherlands

Co-Authors: Turri, C.[1], Borska, F.1, Zinke, L.[1], Tijms, J.[2], Tool, M.[1], van Atteveldt, N.[3], Kievit, R.[4], Bonte, M.[1]

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Talk 4 – *Implicit print tuning after a brief symbol-sound training emerges first in the inferior parietal lobule*

Presenter: Rahel Wombacher

Department of Child and Adolescent Psychiatry and Psychotherapy, University Hospital of Psychiatry, University of Zurich, Switzerland

Co-authors: Wombacher, R.[1,2], Fraga-González, G.[1], Haugg, A.[1], Brem, S.[1,2]

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Talk 5 – *Diverse learners and their diversity in skill and EEG-ET features during Reading*

Presenter: Ariane Tretow
Centre for Interdisciplinary Brain Research, Department of Psychology, University of Jyväskylä, Finland
Centre of Excellence for Learning Dynamics and Intervention Research, University of Jyväskylä
Co-Authors: CoE Inter Learn brain research team, Astikainen P.[1,2], Hämäläinen, J.[1,2], Tuulari, J.J.[2,3], Leppänen, P.[1,2]

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Abstract

Learning to read relies heavily on phonological awareness and later on learning correct associations between written symbols and spoken language. Longitudinal studies and examination of learning dynamics can therefore reveal possible bottlenecks in the process of acquiring written language skills. Further, it is important to understand the individual variability in processing speech, audio-visual association learning, and reading skills as well as other aspects of cognitive development to provide efficient support for struggling learners. Studies are presented from infancy to adulthood in longitudinal design and examination of short-term learning dynamics during measurements of brain activity with EEG, MEG and combined EEG and eye-tracking. **Jarmo Hämäläinen: Development of brain responses to speech sounds in the Jyväskylä Longitudinal Study of Dyslexia** Phonological processing deficits are the most common cognitive factor impacting reading difficulties or dyslexia. It is likely that phonological deficits would manifest in how speech sounds are processed as shown by a large body of prior literature. In the Jyväskylä Longitudinal Study of Dyslexia (JLD) EEG responses to speech sounds have been studied in overlapping samples at the ages of 6 months, 6.5 years, 9.5 years and most recently at the age of 26 years. At 26 years combined EEG-MEG measurements were used. Differences between individuals from the family risk group for dyslexia and those who developed reading difficulties in school show differences from typically reading individuals from the control group at each age. However, the pattern of differences change with age. **Heidi Pesonen: Changes in brain activity during learning of audio-visual associations** Learning to read requires mapping of written symbols to spoken language. The developmental trajectory of this grapheme-phoneme correspondence has been studied earlier. However, the processes at the brain level utilized during audio-visual association learning are not well known. We used EEG, MEG and combined EEG-MEG measurements to examine changes in brain activity as they occur while the participants were learning to match novel graphemes to their corresponding speech sounds. Changes in brain activity are observed from the start of the learning session to the

end of the session. These occur both at early and late time windows corresponding to processes related to automatic attention allocation and processing of incongruent information. **Milene Bonte: Symbol-sound association learning, a relevant predictor of individual differences in reading?** Children's reading development shows large variability. Reading problems (dyslexia) are currently diagnosed and treated after a child has failed to respond adequately to reading instruction, i.e., around 8-9 years. This is problematic because early intervention is crucial for optimal (reading) development and social opportunities. In this talk we will explore whether symbol-sound association learning tasks can be employed to improve early prediction of reading problems. While we have a fairly good understanding of how children processes already learnt letter-sound associations and how this may differ in individuals with dyslexia, we know very little about the actual behavioral and brain changes that occur during the learning process itself. Using behavioral, EEG data, and gamification, we characterized individual differences in children's learning trajectories by modelling their performance and brain activity. Together these data provide first evidence for diverging learning trajectories for symbol-sound associations in children with different (pre)reading skills. With this knowledge, we aim to develop a digital learning test that predicts who will learn to read fluently and who will need extra support to prevent reading problems. **Rahel Wombacher: Implicit print tuning after a brief symbol-sound training emerges first in the inferior parietal lobule** Successful mapping of letters to speech sounds comprises an important part of reading acquisition and is impaired in dyslexia. While numerous studies have investigated how children's brains become tuned to print during letter-speech sound learning, less is known about how flexibly the adult reading network adapts to a new orthography. We investigated how the implicit processing of visually presented artificial symbols changes after they become associated with speech sounds, hypothesizing that even a brief training would enhance activation to the learned artificial script. 39 healthy adult participants (21 females; age 25.19 ± 3.12 years [range 18.14–32.51]) learned 12 new symbol speech sound associations during an audiovisual feedback-learning paradigm. Immediately before and after learning, participants performed an fMRI implicit print processing task, responding to visually presented symbols by pressing a button when a symbol appeared in blue. Four different stimuli were presented: (1) Latin letters, (2) learned symbols, (3) familiar symbols presented both pre- and post-training, and (4) new symbols. Pre-to-post training changes were first assessed on a whole-brain level using paired t-tests separately for each condition. Furthermore, linear mixed models (time point × condition) were conducted for six key regions of the reading network. The whole-brain fMRI analyses revealed increased activation in a cluster in the left angular gyrus to the learned symbols from pre- to post-training (pFWEc<.05). In the ROI analyses, the left inferior parietal lobule showed a significant pre-to-post increase after FDR correction for six ROIs (estimate = 0.233, SE = 0.083, t = 2.798, pFDRc = .02). Furthermore, post-training differences between conditions emerged in the ROIs visual word form area, left inferior frontal gyrus, and left inferior parietal lobule. Our results suggest that the left inferior parietal lobule, including the angular gyrus, is the first region to adapt to newly learned prints. Given its role in attention, working memory, and linking letters with speech sounds, the observed

activation pattern may imply rapid recognition and increased attention towards the newly learned symbols which might enable the later development of print tuning in further reading regions. **Ariane Tretow: Diverse learners and their diversity in skill and EEG-ET features during reading** Within the Centre of Excellence for Learning Dynamics and Intervention Research (InterLearn) diverse learners were recruited at the beginning of formal education. A proportion of the pupils joined EEG measurements during Grade 1. The Grade 1 data of the longitudinal examination presents insights into individual skill development within the first year of schooling, the overlap of indicators of different learning risks (eg. math and reading skills, attention deficits) and the alignment of neural and eye movement features with the individuals' learning risks. Parallels and differences are displayed cross-sectionally between the diverse readers in Grade 1 and diverse readers at ages 26-28 (JLD26).

Symposium abstract [SY32]
Session: Motor System & Functions I
Date: 16 September 2025 (13h45)
Symposium Title: ***Neuroscience and Architecture: A Conversation about the Impact of Built Environments on Cognition and Behaviour***
Symposium organiser(s): Giovanni Vecchiato
Institute of Neuroscience, National Research Council of Italy, Parma; Department of Theoretical and Applied Sciences, eCampus University

Talk 1 – ***Architectural experience influences the processing of others' body expressions***
Presenter: Giovanni Vecchiato
Institute of Neuroscience, National Research Council of Italy, Parma; Department of Theoretical and Applied Sciences, eCampus University

Talk 2 – ***The impact of the architectural experience on interaction possibilities***
Presenter: Giorgia Guerra
Department of Medicine and Surgery, Università degli Studi di Parma

Talk 3 – ***Navigating physical and memory spaces through reference frames***
Author(s): Giorgia Committeri
Department of Psychology, Università degli Studi "G. d'Annunzio" Chieti-Pescara,

Abstract
Since infancy, the human brain seamlessly integrates different kind of information, simultaneously appearing at different spatial locations, to construct a coherent representation of the world. Hence, architecture is the main stage for daily human interactions to investigate the neurophysiological mechanisms influencing social

cognition, and executive functions such as attention and memory. The aim of the present symposium is to provide evidence on the role that architecture plays on cognitive processing, advocating for the importance to improve naturalistic paradigms for a deeper comprehension of the neurophysiological mechanisms shaping human behavior in everyday life, and a novel approach to architectural design. Several studies demonstrated that architectural features modulate cerebral regions devoted to emotion perception, aesthetic appreciation and affordance. However, despite the increasing number of works in the field, the interaction among individuals within architectural spaces and their movement through such environments has been largely overlooked, failing to provide a unified view of architecture's capability to broadly modulate cognition. The first talk will address this gap by showing how architectural experience in virtual reality alters the sensorimotor and cognitive mechanisms involved in the observation of others' body expressions. We will describe how low-arousing architectural environments promote the early recruitment of premotor cortices, indicating enhanced motor preparation and attentional processes during the perception of body expressions. Such architectural experiences also engage the prefrontal and orbitofrontal cortices at later stages of social processing, revealing a link between low-arousing environments and affective responses as well as motivational tendencies. Finally, low-arousing architectures support sustained visuospatial processing through the activation of occipito-parietal regions. These results demonstrate that the manipulation of architectural space alone is sufficient to influence human social cognition. **(Giovanni Vecchiato, Architectural experience influences the processing of others' body expressions)** By leveraging the properties of the multisensory integration processes, we assess how architecture shapes interaction possibilities. Preliminary results reveal that the motor system differently codes near (<100cm) and far space ([100, 200] cm), as already known, but strikingly it is also sensible to architectural differences in the very far space (>200cm). Moreover, human interactions depend on sensorimotor experiences (i.e., static vs dynamic), shaping a larger interaction space in indoor environments, when compared to the outdoor experience. Remarkably, indoor environments result in a facilitation of multisensory integration at each spatial location. We will discuss how these results tight the processing of architecture with motor mechanisms and social cognition. **(Giorgia Guerra, The impact of the architectural experience on interaction possibilities)** In the case of memory, the "phylogenetic continuity hypothesis" proposes that the mechanisms supporting mental navigation within episodic and semantic memory would have respectively evolved from self-based (i.e. egocentric) and map-based (i.e. allocentric) spatial navigation mechanisms. We will show how, consistent with the model predictions, performance of route-based navigation specifically predicted episodic memory performance (self-based, egocentric components), while survey navigation performance specifically predicted the ability to acquire new semantic memory (map-based, allocentric components). We will also present an ALE meta-analysis conducted on fMRI studies involving spatial navigation (i.e. egocentric or allocentric) or declarative memory (i.e. episodic or semantic) tasks, by showing that the retrosplenial cortex is a main hub and transitional zone within and across cognitive domains and reference frames. We will propose that the neural algorithms originally dedicated to apply a

first-person perspective within the environmental map and establishing relationships among landmarks may have been up-cycled to non-spatial cues, leading to a possible impact of architecture on higher-order mnestic functions. **(Giorgia Committeri, Navigating physical and memory spaces through reference frames)**.

Symposium abstract [SY33]
Session: Development and Plasticity II
Date: 19 September 2025 (16h30)
Symposium Title: ***The Learning Brain Across The Lifespan: Neural Resources, Imaging Indicators And Relevance For Cognitive Competence***
Symposium organiser(s): Tiina Parviainen
University of Jyväskylä, Department of Psychology and Center for Interdisciplinary Brain Research

Talk 1 – ***Markers of cortical responsiveness, thickness and surface area and their role for cognitive competence in middle childhood years***
Presenter: Tiina Parviainen
University of Jyväskylä, Department of Psychology and Center for Interdisciplinary Brain Research, Finland

Talk 2 – ***Enhancing language learning capacity in the adult brain***
Presenter: Riikka Möttönen
University of Helsinki, Faculty of Arts, Department of Digital Humanities, Finland

Talk 3 – ***Neural correlates of retrospective memory confidence during face–name associative learning***
Presenter: Weiyong Xu
University of Jyväskylä, Department of Psychology and Center for Interdisciplinary Brain Research, Finland

Talk 4 – ***The dynamics of local and global predictive processing as we age***
Presenter: Yi-Fang Hsu
National Taiwan Normal University, Department of Educational Psychology and Counseling, Taiwan

Abstract
The brain and its evolving networks form the foundation for learning throughout life. This process relies on the nervous system's ability to reshape its connections in response to experience. While this plasticity is particularly crucial in early childhood, neuroscientific research highlights that the nervous system retains the capacity to

adapt its networks throughout the lifespan. This adaptability underpins our ability to respond to environmental changes at any age and to acquire new skills and competencies.

Neuroimaging offers valuable insights into the neural mechanisms underlying learning, but its findings gain true significance only when integrated with data on cognitive functions and behavioral changes associated with learning. Recent advances in experimental paradigms and signal analysis methods have allowed researchers to explore the more detailed properties and dynamics of the learning brain. This knowledge enhances our understanding of individual and age-related variations in learning capacity and cognitive performance at large. In this symposium, we will present our new research findings on the learning brain across the lifespan, focusing on neuroimaging markers, their relationship with cognitive performance, and the age-related changes in the brain basis of learning. First, Parviainen will review their studies on unique cortical properties and their age-related changes in the child brain, discussing how these changes support learning and cognitive competence. Then, Möttönen will show how cognitive depletion can enhance adults' implicit statistical learning abilities, offering insights into language learning. Xu will present findings on neural activity patterns underlying memory confidence and accuracy during associative learning in adults. Finally, Hsu will review their studies on how ageing impacts the learning of environmental regularities and its connection to cognitive decline. **Tiina Parviainen: Markers of cortical responsiveness, thickness and surface area and their role for cognitive competence in middle childhood years** The child brain has a remarkable capacity to adapt its connections in response to environmental input, reflecting its unique electrophysiological responsivity and structural properties. Age-related changes in these properties likely provide meaningful insights into the development of cognitive competence. We have utilized magnetoencephalography (MEG) to investigate cortical electrophysiological responsivity and magnetic resonance imaging (MRI) to assess cortical thickness and surface area in children during middle-to-late childhood. Additionally, we employed biophysically realistic modeling of MEG data to explore the circuit-level determinants underlying cortical responses in children. Robust age-related changes in cortical responsivity reveal particularly pronounced reactivity in 9–10-year-olds. Brain-behavior correlations suggest distinct neural bases for behavioral competence in children compared to adults. In this talk, I will review our recent and ongoing studies on the specific properties of the child brain and discuss how these properties are linked to emerging cognitive competence, particularly inhibitory control. **Riikka Möttönen: Enhancing language learning capacity in the adult brain** Adults do not learn languages as effortlessly as children do, although they outperform children in many demanding cognitive tasks. We have recently proposed that the adult cognitive architecture constrains effortless, experience-based, learning of new patterns and regularities from linguistic input, explaining challenges in learning languages in adulthood. This Cognitive Cost Hypothesis is supported by evidence from experimental studies using non-invasive brain stimulation or demanding cognitive tasks to temporarily deplete adults' higherlevel cognitive system. These cognitive depletions enhance adults' ability to acquire linguistic knowledge from language input, demonstrating that it is possible to unlock

adults' implicit statistical language learning abilities. In this talk, we will discuss our recent and on-going studies aiming to enhance statistical language learning in adults, and their implications for lifelong language learning. **Weiyong Xu: Neural correlates of retrospective memory confidence during face–name associative learning** The ability to accurately assess one's own memory performance during learning is essential for adaptive behavior. However, the brain mechanisms underlying this metamemory function remain poorly understood. We have investigated the neural correlates of memory accuracy and retrospective memory confidence during a face–name associative learning task using magnetoencephalography (MEG) in healthy young adults (n = 32). In this talk, I will present findings on the distinct neural activity patterns associated with memory confidence and accuracy during associative learning, examining both event-related fields responses and neural oscillations. Furthermore, I will demonstrate how single-trial representational similarity analysis (RSA) provides complementary insights into the neural dynamics underlying associative learning and metamemory processes. **Yi-Fang Hsu: The dynamics of local and global predictive processing as we age** Recent research in cognitive neuroscience showed that senescence is associated with a shift from sensorium to predictions in predictive processing, manifesting as the age-related attenuation of prediction errors to violations of environmental regularity. Such attenuation was found to correlate with measures of working memory, suggesting a link between the predictive processing of environmental regularity and higher-level cognition. However, it remains unclear how ageing impacts the accumulation of statistical information for the extraction of environmental regularity. To examine the dynamics of predictive processing to assess its potential role as a marker for cognitive ageing, we will analyse the electroencephalography data with an auditory local-global paradigm from the Longitudinal Study of Auditory Prediction, a medium-sized sample (N=406) spanning from adolescence to late adulthood (15-82 years of age). We will discuss how ageing might modulate the variation in neural responses during statistical learning of local and global regularities.

Symposium abstract [SY34]
Session: Emotions & Social Cognition III
Date: 16 September 2025 (16h30)
Symposium Title: ***Transdiagnostic Processes relevant to Mental Health Disorders: Exploring Psychophysiological and Neural Markers for Treatment Implications***
Symposium organiser(s): Joana Coutinho
University of Minho, Braga, Portugal

Talk 1 – ***Recalling an Anger Incident Shifts Autonomic Balance Toward Sympathetic Dominance in Men prone to Anger***
Presenter: Liliana Capitão
University of Minho, Braga, Portugal

Co-Authors: Catarina Fagundes[1], Maarten Verbecke[2], Alkistis Stavropoulou-Deli[2], Davide Folloni[4], Alexandra Pike[5], Stefan Van Duijvenboden[6], Peter Taggart[7], Ben Hanson[7], Philip J Cowen[2,3], Susannah E Murphy[2,3], Catherine J Harmer[2,3]

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Talk 2 – ***The Relationship Between Heart Rate Variability and Affective Disorders: associations with symptomatic improvement and therapeutic alliance***

Presenter: Joana Coutinho
University of Minho, Braga, Portugal
Co-Authors: Alexandra Gonçalves[1], Eugénia Ribeiro[1], Natividade Couto-Pereira[1], Pedro Moreira[1], Adriana Sampaio[1]

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Talk 3 – ***Adolescent Vulnerability to Fronto-Striatal Circuit Alterations: Insights from Binge Drinking and Institutionalized Youth***

Presenter: Sónia Sousa
University of Minho, Braga, Portugal
Co-Authors: Adriana Sampaio[1], Marlene Nogueira[1], Pedro Moreira[1], Paulo Marques[2,3], Óscar F. Gonçalves[1,4,5], Clothilde Bec[1], Alberto Crego[1], Eduardo López-Caneda[1], Isabel Soares[1,7], R. Magalhães[2], Ana Raquel Mesquita[1,7], S. Bouix[6]

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Talk 4 – *Neural Signatures of Social Experience: Default Mode Network Connectivity in Residentially Reared Adolescents*

Presenter: Marlene Nogueira University of Minho, Portugal
Co-Authors: Sónia Sousa[1], Pedro Moreira[1], Isabel Soares[1,2], Adriana Sampaio[1], Ana Raquel Mesquita[1,2]

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Talk 5 – *Mechanisms of antidepressant drug response*

Presenter: Beata Godlewska
University of Oxford, United Kingdom

Abstract

This symposium will delve into mechanisms relevant to several mental health disorders, moving beyond traditional diagnostic boundaries. *Recalling an Anger Incident Shifts Autonomic Balance Toward Sympathetic Dominance in Men prone to Anger* (Liliana Capitão, Minho) Excessive anger is linked to adverse outcomes, including increased cardiovascular disease risk; however, the psychophysiological mechanisms underlying this relationship are not fully understood. This study examined the effect of anger on autonomic nervous system activity in male participants scoring high on trait anger. Participants underwent a laboratory-based anger induction by recalling an intensely anger-provoking event, during which heart rate variability (HRV) was recorded. The ratio of low to high-frequency HRV (LF/HF-HRV) was used to assess sympathovagal balance. Results showed a significant increase in LF/HF-HRV during anger recall relative to baseline, suggesting heightened sympathetic activation. Higher self-reported symptoms of anger and aggression pre-induction were associated with greater LF/HF-HRV reactivity during anger recall, while better anger control was linked to reduced LF/HF-HRV. This study provides novel insights into the psychophysiological mechanisms that may underlie the broader relationship between anger and cardiovascular health. The Relationship Between Heart Rate Variability and Affective Disorders: associations with symptomatic improvement and therapeutic alliance (Joana Coutinho, Minho) HRV reflects individuals' ability to regulate physiological activation and has been linked to several psychological conditions, including affective disorders. We examined the relationship between HRV, major depressive disorder (MDD), and social anxiety disorder (SAD), exploring how this association impacts clinical improvement and the therapeutic alliance (TA). We hypothesized that lower symptomatology levels would correlate with higher HRV, and that symptom reduction over time would relate to HRV changes. We also predicted that higher HRV would correspond to stronger TA ratings. This study involved 42 participants— 21 with MDD or SAD and 21 healthy controls. HRV was measured during a baseline task and throughout therapy sessions. The Outcome Questionnaire and Working Alliance Inventory assessed clinical outcomes and TA at the start and end of each session. The results showed baseline HRV differences between groups and an HRV increase during therapy. However, the hypothesized link between increased HRV and stronger TA was not confirmed. These findings highlight HRV's potential as

a psychophysiological marker for distinguishing emotional disorders and monitoring symptom changes over time. Adolescent Vulnerability to Fronto-Striatal Circuit Alterations: Insights from Binge Drinking and Institutionalized Youth (Sónia Sousa, University of Minho) Adolescence is a critical period of brain development, with the fronto-striatal circuit particularly susceptible to environmental influences. These influences can result in lasting changes to brain structure and function, contributing to behavioral and emotional challenges. We examined alterations in the fronto-striatal circuitry of adolescents exposed to two environmental stressors: binge drinking and institutionalization. We focused on the prefrontal cortex and striatum -regions essential for executive functions, selfregulation, and reward processing. In college students with a history of binge drinking, we observed alterations in the middle frontal gyrus and nucleus accumbens, potentially contributing to deficits in self-regulation. Similarly, institutionalized adolescents exhibited changes in the nucleus accumbens. Structural connectivity measures indicated better white matter integrity in the fronto-striatal pathway of institutionalized adolescents, reflected by lower trace values, which may suggest a potential for resilience in the circuit. These findings underscore the vulnerability of the fronto-striatal circuit to environmental stressors during adolescence while also highlighting the potential for resilience, providing valuable insights into the neural mechanisms linking these exposures to altered brain function and behavior. Adolescents (Marlene Nogueira, Minho) Residential rearing represents a prolonged form of early adversity with lasting effects on brain development. While prior research has documented structural and functional brain changes linked to institutional care, little is known about resting-state network alterations—particularly involving the default mode network (DMN), which plays a central role in self-referential thought and emotion processing. We assessed DMN functional connectivity (FC) in adolescents raised in residential care compared to peers raised in family environments. Results revealed increased FC between the DMN and the nucleus accumbens in residentially reared adolescents, suggesting neural adaptations to social and emotional deprivation. This altered connectivity may reflect reduced exposure to affective and social rewards, often leading to difficulties in emotion recognition, empathy, and social communication. These findings highlight a potential neurobiological marker of caregiving deprivation and underscore the importance of addressing transdiagnostic socioemotional deficits in this population through targeted interventions. Mechanisms of antidepressant drug response (Beata Godlewska, Oxford) I will explore the mechanisms underlying response to antidepressant medications and recent findings on biomarkers and neural predictors of treatment efficacy. I will argue that early events at the neural level in response to antidepressant treatments are crucial to further response. I will present studies showing that one week of antidepressant treatment produces changes in the processing of emotionally salient information across the brain areas responsible for emotional function (including the amygdala and anterior cingulate cortex), and that these changes are predictive of treatment response after 6 weeks. I will also discuss the predictive potential of the baseline activity across the networks, explored with resting state fMRI, and the connection between the baseline brain activity and its early changes under antidepressant treatment. I will then talk about the implications of the findings for personalised mental health care.

Symposium abstract [SY35]
Session: Emotions & Social Cognition IV
Date: Friday, 19 September 2025 (16:30)
Symposium Title: ***Social Cognition: From interpersonal distance to Social dynamics through a neuroscience approach*.**
Symposium organiser(s): Adriana Sampaio[1] & Jean Louis Nandrino[2]

[1] Psychological Neuroscience Lab, CIPsi,,University of Minho, Braga, Portugal.
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Talk 1 – ***Peripersonal space representation and object ownership: a neuroimaging study***
Presenter: Lucie Lenglart
University of Lille, SCALab Laboratory UMR CNRS 9193, France.
Co-Authors: Adriana Sampaio[1], Yann Coello[2]
[1] Psychological Neuroscience Lab, CIPsi, University of Minho, Braga, Portugal.
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Talk 2 – ***The Influence of Social Context and Gender Dynamics on Physiological Responses to Gesture Observation***
Presenter: Angela Bartolo
University of Lille, SCALab Laboratory UMR CNRS 9193, France.
Co-Authors: Fabrizia Gallo[1], Laurent Ott[1], Alberto González-Villar[2], Jean-Louis Nandrino[1], Adriana Sampaio[2]
[1] University of Lille, SCALab Laboratory UMR CNRS 9193, France.
[2] Psychological Neuroscience Lab, CIPsi, University of Minho, Braga, Portugal.

Talk 3 – ***Adolescents' mentalization and emotional regulation skills: Is there a relationship with regions of the "social brain"?***
Presenter: Natividade Couto Pereira
Psychological Neuroscience Lab, CIPsi, University of Minho, Braga, Portugal
Co-authors: Jean-Louis Nandrino[1], Liliana Capitão[2], Manuel Gomes[3], Carolina Araújo[3], Adriana Sampaio[2], Carla Martins[3]
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Talk 4 – ***The cost of using emotion regulation strategies in people who are sensitive to social rejection***
Presenter: Louise Ramadas
University of Lille, SCALab Laboratory UMR CNRS 9193, France.
Co-Authors: Ana Mesquita[1], Natividade Couto Pereira[2], Laurent Ott[3], Adriana Sampaio[2], Jean Louis Nandrino[3]
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Abstract

This collection of studies investigates the interplay between social dynamics, emotional regulation, and neural mechanisms, offering a neuroscience perspective on human behaviour across diverse interpersonal contexts. Together, these studies illuminate the neural and physiological bases of social interactions, revealing how interpersonal distance, ownership, emotional resilience, and contextual factors shape social dynamics. Peripersonal space representation and object ownership: a neuroimaging study (Lucie Lenglart, Adriana Sampaio & Yann Coello) Peripersonal space (PPS), as opposed to extrapersonal space (EPS), refers to the area surrounding the body within which individuals can interact with objects or conspecifics. However, objects in PPS can belong to oneself or to others, which could influence how these objects are encoded. We analyzed the performances of 22 participants in a reachability judgment task involving self-owned and other-owned objects presented either in PPS or EPS, as well as their neural correlates using fMRI. Behavioral data showed that reachability judgments were shorter and longer for self-owned objects compared to other-owned objects in PPS and EPS, respectively. The analysis of fMRI data revealed specific activations in the anterior part of the right intraparietal sulcus for objects presented in the PPS, as compared to EPS. Furthermore, different patterns of activation were found for selfversus other-owned objects presented in the PPS, located bilaterally in the superior and inferior parietal lobules for self-owned objects and in the pre-supplementary motor area for other-owned objects. In addition, we observed activations in the ventral part of the medial prefrontal cortex (mPFC) during the processing of objects in the EPS, which was higher for self-owned objects. Altogether, the results provide new insights into the neural substrates underlying objects processing in the PPS and EPS in a social context when object ownership interferes with location in space. The Influence of Social Context and Gender Dynamics on Physiological Responses to Gesture Observation (Angela Bartolo, Fabrizia Gallo, Laurent Ott, Alberto González-Villar, Jean-Louis Nandrino, & Adriana Sampaio) This study aimed to investigate how the presence of another person influences an observer's physiological responses when observing gestures. Sixty healthy participants (aged 19–25 years, 32 females) observed 60 gesture stimuli, categorized into three types: Meaningless, Pantomime, and Intransitive gestures (20 per type). Half of the gestures were oriented towards the body (TB), while the other half were directed away from the body (AB). Physiological responses, including pupil dilation and high-frequency heart rate variability (HF-HRV), were recorded during gesture observation. The experiment consisted of two phases. In the solo phase, participants completed the task alone. A week later, they repeated the task in the presence of a confederate, who was another volunteer. Four groups were formed based on the gender combinations of the participant and confederate: same-gender groups and mixed-gender groups. The results revealed gender-specific responses during gesture observation in the presence of a male confederate. For intransitive gestures TB, pupil dilation patterns diverged: females showed reduced pupil dilation, while males exhibited increased pupil dilation. Additionally, changes in Delta HF-HRV suggest that the presence of a person of the opposite gender alters vagal suppression. Specifically, males exhibited reduced vagal suppression in the presence of females, whereas females showed increased

vagal suppression in the presence of males. These findings indicate that interactions with individuals of the opposite gender engage distinct emotion regulation mechanisms. Adolescents' mentalization and emotional regulation skills: Is there a relationship with regions of the "social brain"? (Natividade Pereira, Jean-Louis Nandrino, Liliana Capitão, Manuel Gomes, Carolina Araújo, Adriana Sampaio& Carla Martins) Mentalization and emotional regulation are at the cornerstone of adolescence and their underlying neural substrates undergo a period of significant maturation during this developmental period. Regions of the "social brain" demonstrate a unique pattern of development during adolescence, with regions such as the amygdala showing increased sensitivity in response to threat, whilst others showing protracted neural development, particularly those involved in mentalizing and emotional regulation, such as the temporo-parietal junction and prefrontal cortex, respectively. The goal of this talk is to explore how mentalizing and emotion regulation skills are related to adolescents' brain areas activated during a peers' acceptance and rejection task. Twenty adolescents filled in questionnaires to assess their mentalizing and emotional regulation skills and performed a task involving social acceptance and rejection by peers during an fMRI. Results will concentrate on characterizing which brain structures are activated during the task and whether there is any relationship between those and their mentalizing and emotion regulation skills. The cost of using emotion regulation strategies in people who are sensitive to social rejection (Louise Ramadas, Ana Mesquita, Natividade Pereira, Laurent Ott, Adriana Sampaio & Jean Louis Nandrino) Rejection sensitivity, the tendency to anxiously anticipate, detect, and overreact to rejection, is a transdiagnostic factor in various mental disorders. A key contributing factor is the capacity to regulate emotions in rejection scenarios, as highly sensitive individuals often experience distress and rely on maladaptive strategies. This study investigated physiological and regulatory responses during emotion regulation tasks in rejection-sensitive individuals. 150 participants with high or low rejection sensitivity used strategies like reappraisal, distraction, or catastrophizing while viewing social rejection scenarios. HRV and skin conductance were analyzed across conditions. High-sensitivity participants showed lower resting heart rate variability, reflecting reduced regulatory capacity, and greater electrodermal responses during reappraisal, indicating increased effort. Low sensitivity participants exhibited greater heart rate variability, reflecting more adaptive emotional regulation. These findings highlight the physiological costs of regulation in sensitive individuals and the importance of effective strategies for managing social rejection.

Symposium abstract [SY40]
Session: Memory VI
Date: 18 September 2025 (13h30)
Symposium Title: ***Fast Dynamics Of Episodic Memory Representations: Evidence From Human Intracranial EEG***
Symposium organiser(s): Manuela Costa[1] & Daniel Pacheco-Estefan[2]

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Present address: Department of Psychobiology and Health, Faculty of Psychology, Autonoma University of Madrid, Madrid, Spain.

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Talk 1 – *Gamma amplitude is coupled to opposed hippocampal theta-phase states during the encoding and retrieval of episodic memories in humans*.

Presenter: Lluís Fuentemilla[1,2,3]

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Co-Authors: Ludovico Saint Amour di Chanaz[1,2], Alexis Pérez-Bellido[1,2], Xiongbo Wu[1,2,3], Diego Lozano-Soldevilla[4], Daniel Pacheco-Estefan[5], Katia Lehongre[6], Estefanía Conde-Blanco[7], Pedro Roldan[7], Claude Adam[8], Virginie Lambrecq[6,8,9], Valerio Frazzini[6,8,9], Antonio Donaire[7], Mar Carreño[7], Vincent Navarro[6,8,9,10], Antoni Valero-Cabré[6,11,12,13]

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Talk 2 – *Aversive memory retrieval triggers hippocampal reactivation of encoding related amygdala gamma patterns*.

Presenter: Manuela Costa
Laboratory for Clinical Neuroscience, Center for Biomedical Technology, University Politécnica de Madrid, IdISSC, Madrid, Spain.
Co-Authors: Daniel Pacheco-Estefan[2], Antonio Gil-Nagel[3], Rafael Toledano[3], Lukas Imbach[4,5], Johannes Sarnthein[5,6], Bryan A. Strange[1]
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Talk 3 – *Replay of factorized temporal journey.*

Presenter: Sze Chai Kwok
Phylo-Cognition Laboratory, Division of Natural and Applied Sciences, Digital Innovation Research Center, Duke Institute for Brain Sciences, Duke Kunshan University, Kunshan, Jiangsu, China.
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Talk 4 – *Representational dynamics during extinction of fear memories in the human brain*.

Presenter: Daniel Pacheco-Estefan
Department of Basic, Developmental and Educational Psychology, Faculty of Psychology, Autonomous University of Barcelona, Spain.
Co-Authors: Antoine Bouyeure[2], George Jacob[2], Marie-Christin Fellner[2], Katia Lehongre[3], Virginie Lambrecq[3,4,5], Valerio Frazzini[3,4,5], Vincent Navarro[3,4,5,6], Onur Güntürkün[7], Lu Shen[8,9,10], Jing Yang[8,9,10], Biao Han[8,9,10], Qi Chen[8,9,10], Nikolai Axmacher[2]

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Talk 5 – *Emotional amnesia in humans with focal temporal pole lesions.*

Presenter: Robin Hellerstedt

Laboratory for Clinical Neuroscience, Center for Biomedical Technology, University Politécnica de Madrid, IdISSC, Madrid, Spain

Co-Authors: Manuela Costa[1], Diana Ortega-Cruz[1], Alba Peris-Yagüe[1,2], Lukas Imbach[3,4], Johannes Sarnthein[4,5], Debora Ledergerber[3], Philip Grewe[6,7], Johanna Kissler[8], Friedrich G. Woermann[6], Christian G. Bien[6], Antonio Gil-Nagel[9], Rafael Toledano[9], Bryan A. Strange[1]

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Abstract

How are rich, emotionally salient, and temporally structured experiences transformed into lasting memories? This symposium brings together new evidence from human intracranial recordings, computational models, and clinical studies to reveal rapid representational dynamics underlying memory encoding, retrieval, and consolidation. A central focus is on oscillatory mechanisms and neural reactivation coordinating interactions between the hippocampus, amygdala, and neocortical regions supporting episodic and emotional memory. Topics include how phase-specific theta–gamma coupling underpins memory formation, how hippocampal reactivation of amygdala-driven gamma patterns supports aversive memory retrieval, and how cortical–hippocampal replay structures the temporal organization of experience. Another study reveals shared representational features between fear extinction learning and episodic memory. Evidence from ventral temporal pole (vTP)-lesioned patients shows a modality-specific role for this region in emotional memory. Together, these findings reveal how fast neural dynamics and replay shape memory, linking neuronal mechanisms, systems integration, and clinical insight. 1. Computational

models and rodent studies suggest that gamma activity during memory encoding and retrieval is coupled to opposing phases of hippocampal theta rhythm. Whether this phase opposition exists in humans remains elusive. We recorded hippocampal local field potentials from 10 epileptic patients during a memory task involving unique picture sequences and recall 24 hours later. We found hippocampal theta-to-gamma cross-frequency coupling during encoding and retrieval. Gamma activity was coupled to opposing theta phases in these two processes. The degree of theta-gamma phase opposition between encoding and recall correlated with memory performance. Gamma power was modulated by theta phase for both remembered and forgotten trials, but dominant theta phase differed only for remembered trials. These findings provide direct human evidence for hippocampal theta-gamma phase opposition in memory and align with mechanistic models from computational and animal research. 2. Aversive memory retrieval triggers hippocampal reactivation of encoding related amygdala gamma patterns. Emotional memory formation and retrieval rely on dynamic interactions between the amygdala and hippocampus. Human intracranial studies revealed aversive memory encoding involves phase coupling between amygdala theta and hippocampal gamma oscillations, but mechanisms of transformation into lasting memories remain unclear. We simultaneously recorded from human amygdala and hippocampus. Successful retrieval of aversive scenes is associated with increased hippocampal gamma activity. Gamma patterns originally observed in the amygdala during encoding are reactivated in the hippocampus — but not amygdala — during encoding and retrieval of aversive scenes. Hippocampal gamma patterns resembling trial-specific amygdala activity at encoding are reactivated during retrieval. These findings highlight phasic hippocampal gamma activity's role in retrieving aversive memories. 3. Time is a fundamental dimension of episodic memory, structuring the sequence of events that form our experiences. Retrieval and consolidation of episodic memories are thought to rely on the replay of past experiences. While replay of spatial paths and item sequences has been extensively studied, the role of temporal replay remains unclear. Here, we recorded intracranial electrophysiological signal from 18 epilepsy patients performing a temporal order judgment task, decoded abstract temporal states from videos with varied content and identified content-general temporal trajectories replayed both during memory retrieval and post-retrieval rest, with on-task replay supporting immediate recall and off-task replay contributing to the consolidation of weaker memories. Furthermore, distinct temporal coordination between cortical replay and sharp-wave ripples at different stages suggests that hippocampal-cortical communication may serve as an underlying mechanism for the replay of "where", "what", and "when" in episodic memory. 4. Representational dynamics during extinction of fear memories in the human brain. Rodent studies reveal amygdala theta oscillations' roles in fear learning and extinction, with extinction relying on novel, context-dependent memory traces. Mechanisms of fear extinction in humans remain largely unknown. Intracranial EEG recordings in epilepsy patients provide direct access to extinction network deep brain structures; representational similarity analysis characterizes memory traces of cues and contexts. Combining these methods, we investigated human extinction learning representational dynamics. Amygdala theta oscillations signaled safety,

not threat, during extinction. Extinction memory traces showed stable, context-specific neural representations coordinated across the extinction network. Extinction memories' representational features resemble episodic memory properties. Context specificity during extinction predicts fear reactivation. These results describe neurophysiological mechanisms and representational signatures of context-dependent extinction learning in humans. 5. Emotional amnesia in humans with focal temporal pole lesions. Memory is enhanced for emotional vs. neutral events via amygdala modulation of hippocampal activity. These structures form part of a larger emotional brain network including the temporal pole, whose role in emotional cognition is poorly understood. We studied verbal and visual emotional memory in patients with left ventral temporal pole (vTP) lesions, while measuring amygdala and hippocampus function with intracranial recordings. Left vTP lesion patients were selectively impaired in recalling verbal emotional memories compared with control patients. Memory for neutral words and performance on standard verbal comprehension tests were preserved, indicating no general episodic or semantic impairment. Left vTP lesioned patients showed no difference in amygdala or hippocampal iEEG responses to emotional vs neutral words, compared with control patients, isolating vTP's role in emotional memory. Unlike verbal emotional recall, left vTP lesioned patients showed memory enhancement for aversive vs. neutral pictures. Two right vTP lesion patients showed the opposite: impaired emotional picture memory but intact verbal emotional memory. These observations establish a crucial role for human vTP in emotional memory, imply deficits in neurological conditions affecting this region, and suggest the vTP as a candidate for neuromodulation interventions in diseases with maladaptive emotional memories.

Symposium abstract [SY41]
Session: Language & Music III
Date: Wednesday, 17 September 2025 (09:00)
Symposium Title: ***Social And Embodied Language Learning***
Symposium organiser(s): Piia Astikainen[1] & Hyeonjeong Jeong[2,3]

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[2] Graduate School of International Cultural Studies, Tohoku University, Japan.

[3] The Department of Human Brain Science at the Institute of Development, Aging, and Cancer, Tohoku University, Japan.

Talk 1 – ***How Social Experiences Shape the Bilingual Brain: fMRI Studies of L2 Learning***
Presenter: Hyeonjeong Jeong
Graduate School of International Cultural Studies, Tohoku University, Japan.
The Department of Human Brain Science at the Institute of Development, Aging, and Cancer, Tohoku University, Japan.

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Talk 2 – ***Phonetic and Word Learning in Adulthood: Effects of Social Interaction and Audiovisual Input***

Presenter: Xueqiao Li

Department of Psychology and Center for Interdisciplinary Brain Research, University of Jyväskylä, Finland.

Co-Authors: Piia Astikainen[1]

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Talk 3 – ***How Social Cues Shape Second Language Learning: Evidence from Pupillometry, EEG, and Eye-Tracking***

Presenter: Ana Zappa

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Talk 4 – ***Learning abstract concepts in social interaction: an investigation of behavioural and brain dynamics***

Presenter: Gal Rozic

Department of Experimental Psychology, University College London, London, United Kingdom.

Co-Authors: Sara De Felice[1,2], Antonia Hamilton[1], Gabriella Vigliocco[3]

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Abstract

Hyeonjeong Jeong: How Social Experiences Shape the Bilingual Brain: fMRI Studies of L2 Learning. This talk explores how socially enriched environments enhance second language (L2) learning and how such effects are realized in the brain. Drawing on social cognitive neuroscience, I present two fMRI studies. The first compares L2 vocabulary learning through real-life social interaction versus translation-based

methods. Learners who engaged brain regions involved in integrating verbal and non-verbal information (e.g., theory of mind and multimodal integration areas) showed more effective L2 acquisition and retention. The second study examines how social experiences shape emotional processing in L2. Learners with immersive experiences (e.g., study abroad, close friendships) exhibited stronger activation in emotion-related brain areas when processing L2 emotional words. Together, these findings highlight the embodied, socially grounded nature of L2 learning and offer implications for pedagogy and language policy. **Xueqiao Li: Phonetic and Word Learning in Adulthood: Effects of Social Interaction and Audiovisual Input.** Adult language learning can be challenging, underscoring the need for effective and engaging training methods. In this talk, I present two studies using short-term training protocols to support foreign phonetic and word learning, assessed through behavioral, neural, and physiological measures. The first study investigated Mandarin tone learning over 4 hours, comparing individual and paired learners. Both groups showed improved categorization accuracy and response times, with increased P3a amplitudes post-training. Paired learners showed earlier sensitivity to tones, suggesting social interaction supports early learning. The second study examined word learning through video-based training with varying social richness (speaking tutor, silent tutor, or no tutor). EEG data revealed enhanced attention (P2) and semantic processing (N400) for mismatched word-picture pairs. Faster responses in the word identification task after learning in the speaking tutor condition suggest audiovisual social input boosts learning efficiency. These findings show that brief, socially enriched training can lead to measurable gains in adult language learning. **Ana Zappa: How Social Cues Shape Second Language Learning: Evidence from Pupillometry, EEG, and Eye-Tracking.** Social interaction is fundamental to language development and may continue to support word learning in adulthood. Across two studies, we examined how social cues – particularly referential gaze and feedback – shape L2 word learning and comprehension. In the first study, participants learned novel word-object associations on a flatscreen display while receiving social (video) or symbolic (image) feedback, varying in reliability. Reliable feedback (both social and symbolic) led to better learning outcomes. EEG and pupillometry revealed distinct neural and physiological signatures: stimulus-preceding negativity and pupil dilation reflected increasing feedback expectation, while late positive components indexed context updating. In the second study, we used immersive virtual reality (iVR) with interactive virtual agents to examine whether referential gaze supports word recognition and learning under noisy learning conditions. Eye-tracking and behavioral results showed that learners more accurately identified unfamiliar spoken words when the agent's gaze reliably cued the referent – and when they followed it. Together, these studies demonstrate that social signals such as feedback and gaze reliability influence word learning by engaging attentional and motivational processes. These findings underscore the value of multimodal cues and situated interaction in adult word learning.

Gal Rozic: Learning abstract concepts in social interaction: an investigation of behavioural and brain dynamics. Abstract concepts like "fraud" and "inflation", detached from concrete physical experience, are crucial for advanced reasoning and the exploration of phenomena beyond immediate sensory perceptions. These concepts

are typically learned during middle childhood in rich, dynamic face-to-face communication with more knowledgeable people, such as caregivers and teachers. Thus, learning abstract concepts is a fundamentally social and embodied process. Recent advances in neuroimaging, particularly fNIRS hyperscanning, enable the study of such interactive, social language learning in more naturalistic contexts. Adopting an embodied approach to social neuroscience, we investigate how verbal and non-verbal behavioral coordination and brain-to-brain synchronisation that occur in interactive dyads of caregivers and children support the learning of abstract concepts. In a multimodal fNIRS hyperscanning study, 29 caregiver-child dyads (children aged 8-9) participated in a novel interactive abstract concept learning task. Preliminary findings suggest that longer durations of mutual gaze and greater brain-to-brain synchronisation over the left MTG during the caregiver-child interaction significantly predicted children's abstract concept learning. In our talk, we will present the full analysis revealing the links between behavioural coordination, brain-to-brain synchronisation and abstract concept learning.

Symposium abstract [SY42]
Session: Language & Music IV
Date: Wednesday, 17 September 2025 (16h30)
Symposium Title: ***Language And Music Processing: From Speech Perception To Reading Development***
Symposium organiser(s): Aino Sorsa
Centre for Interdisciplinary Brain Research (CIBR), Department of Psychology, University of Jyväskylä, Finland
Centre of Excellence for Learning Dynamics and Intervention Research (InterLearn), University of Jyväskylä, Finland

Talk 1 – ***Brain's rhythmic activity during spoken sentence processing in children with varying reading skills***
Presenter: Aino Sorsa
Centre for Interdisciplinary Brain Research (CIBR), Department of Psychology, University of Jyväskylä, Finland.
Centre of Excellence for Learning Dynamics and Intervention Research (InterLearn), University of Jyväskylä, Finland.
Co-Authors: Xu, W.[1], InterLearn WP[2] team, InterLearn WP5 team, Leppänen, P.[1,2], Parviainen, T.[1], Hämäläinen, J.[1,2]

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Talk 2 – ***Effects of musical rhythm structures on cortical encoding of speech in bilingual adults***

Presenter: Nicola Molinaro
Basque Center on Cognition, Brain and Language, San Sebastian, Spain.
Ikerbasque, Basque Foundation for Science, Bilbao, Spain.
Co-Authors: Fernandez, L.[1], Lizarazu, M.[1], Kalashnikova, M.[1,2]

1 Basque Center on Cognition, Brain and Language, San Sebastian, Spain.

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Talk 3 – ***Regular rhythmic primes improve reading fluency of children in grade 3***

Presenter: Erika Godde
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Co-Authors: Mandernach, Z.[1], Tillmann, B.[1]

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Abstract

Processing of both language and music engages the brain's capacity to track temporal patterns in sound, suggested to reflect a shared neural and cognitive resource for both domains. Growing evidence suggests that musical abilities and training may be linked to enhanced language skills, such as improved sensitivity to rhythm and prosody. This symposium aims to explore how sensitivity to temporal elements in music and speech manifests across different populations, and how these abilities relate to language development, from speech perception through prosody acquisition to reading skills. Using both brain and behavioral methods, the symposium investigates the cognitive and neural mechanisms underlying these processes. In addition, the symposium offers practical tools for assessing children's musical abilities and points to the beneficial effects of rhythmic priming on reading skills. Together, these presentations offer a perspective on how temporal processing in music and speech supports language development, with implications for both research and educational practice. **Talk 1: Brain's rhythmic activity during spoken sentence processing in children with varying reading skills.** This presentation explores the oscillatory dynamics engaged in native and foreign spoken sentence processing, with a focus on children with varying reading abilities. Using time-frequency analysis of EEG data, we examine how power in specific frequency bands (theta, alpha, beta, gamma) differs across language conditions and in relation to continuous measure of reading and related skills during both auditory perception and mental rehearsal of spoken sentences. This presentation shares preliminary results on frequency band engagements across different conditions and reading skills. These findings are discussed in the context of the Temporal sampling framework, which links atypical rhythmic processing to phonological deficits in dyslexia. Additionally, we present how musical exposure is related to behaviorally assessed reading skills in individuals with dyslexia in a longitudinal sample. This presentation contributes to understanding the link

between language processing and reading development. **Talk 2: Effects of musical rhythm structures on cortical encoding of speech in bilingual adults.** Musical training may enhance cortical tracking of speech, the synchronization of brain oscillations with the temporal structure of auditory stimuli. We examined whether musical sequences with different rhythmic structures influence this tracking in Basque – Spanish bilingual adults. In Experiment 1 (N=33), participants heard Basque and Spanish sentences preceded by musical sequences that either (1) matched the syllabic structure of the sentences, (2) followed a regular but non-matching rhythm, or (3) had an irregular rhythm. EEG recordings showed stronger delta-band speech-brain coherence for Spanish sentences in the syllable-matching condition. Experiment 2 (N=20) further tested whether language-specific features explained the weaker effects for Basque. Results confirmed enhanced delta and theta coherence when musical rhythms matched sentence syllables. Findings suggest that both rhythm regularity and its alignment with native language structure enhance cortical tracking. Rhythm in music can scaffold auditory processing by aligning brain oscillations with the rhythmic patterns of speech. **Talk 3: Regular rhythmic primes improve reading fluency of children in grade 3.** While children in grade 3 reach sufficient decoding expertise to focus on reading prosody (phrasing, expressivity), they still tend to favor speed at the expense of adequate pauses and breathing. Our study investigated the potential role of rhythm as a tool to support fluency acquisition in reading. For music and language, temporal properties provide information to delineate syllabic and syntactic boundaries. The hypothesis that music with its strong temporal regularities could influence language processing has been supported by research showing that rhythmically regular musical primes benefit language perception and production in children with or without developmental language disorders (versus various control conditions). Our study extends this rhythmic priming effect to reading in grade 3 children. Results reveal a beneficial rhythmic priming effect on smoothness, phrasing, and expressivity. Data for children with developmental language disorders are currently analyzed. Findings are discussed in the framework of domain-general dynamic attending and shared resources across music and language processing.

Symposium abstract [SY43]
Session: Emotions & Social Cognition V
Date: Wednesday, 17 September 2025 (09:00)
Symposium Title: ***The Social Brain In Context: Neural Mechanisms Of Intergroup Morality, Memory, And Interaction***
Symposium organiser(s): Paulo Sérgio Boggio
Social and Cognitive Neuroscience Laboratory, Center for Health and Biological Sciences, Mackenzie Presbyterian University.
National Institute of Science and Technology on Social and Affective Neuroscience (INCT-SANI), CNPq, Brazil.

Talk 1 – ***Neuroscience of Morality: A Brain Wired for Cooperation and Conflict***
Presenter: Paulo Sérgio Boggio
Social and Cognitive Neuroscience Laboratory, Center for Health and Biological Sciences, Mackenzie Presbyterian University; National Institute of Science and Technology on Social and Affective Neuroscience (INCT-SANI), CNPq, Brazil.

Talk 2 – ***Racial Bias on Moral Judgment: A Behavioral and Electroencephalographic Investigation***
Presenter: Fernanda Naomi Pantaleão
Social and Cognitive Neuroscience Laboratory, Center for Health and Biological Sciences, Mackenzie Presbyterian University; National Institute of Science and Technology on Social and Affective Neuroscience (INCT-SANI), CNPq, Brazil.
Co-Authors: Paulo Sérgio Boggio[1]
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[1] Social and Cognitive Neuroscience Laboratory, Center for Health and Biological Sciences, Mackenzie Presbyterian University; National Institute of Science and Technology on Social and Affective Neuroscience (INCT-SANI), CNPq, Brazil.

Talk 3 – ***Emotions and Social Memories: The Emotional Impact on the Recall of Social Exclusion Experiences***
Presenter: Bruna Eugênia Ferreira Mota
Social and Cognitive Neuroscience Laboratory, Center for Health and Biological Sciences, Mackenzie Presbyterian University; National Institute of Science and Technology on Social and Affective Neuroscience (INCT-SANI), CNPq, Brazil.
Co-Authors: Melissa Neves[1,2], Beatriz B. de Souza[1,2], Tuíla Felinto[1,3], Paulo Sérgio Boggio[1,2]
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[3] Federal University of Rio Grande do Sul

Talk 4 – ***Naturalistic Approachesin Social and Affective Neuroscience: From Individual Brains to Social Synchrony*** **Presenter:** Claudinei Biazoli Jr.
National Institute of Science and Technology on Social and Affective Neuroscience (INCT-SANI), CNPq, Brazil; Center for Mathematics Computation and Cognition, Federal University of ABC, Brazil.
Co-Authors: Thariny Oliveira Rocha[1,3], Tiago Duarte[1,2], Rodrigo da Motta[2], Claudia Berlim de Motta[1,3]
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Abstract

Studies from social and affective neuroscience have illuminated how the brain dynamically engages with morally and socially charged intergroup contexts. This symposium brings together four contributions from the National Institute of Science and Technology on Social and Affective Neuroscience (INCT-SANI, CNPq, Brazil), offering multimethod approaches to understanding how individuals perceive, evaluate, and remember others in socially relevant scenarios. Spanning moral judgment, social memory, affective processing, and naturalistic social interaction, these talks employ electroencephalography (EEG), functional Magnetic Resonance Imaging (fMRI), functional Near Infrared Spectroscopy (fNIRS), peripheral physiological measures, and behavioral measures to explore the neural bases of cooperation, conflict, and connection across different groups and emotional contexts. Together, the presentations provide an integrative perspective on how intergroup phenomena are shaped by neural mechanisms, and how these insights can inform socially grounded interventions and models of mental health care. Opening the session, "Neuroscience of Morality: A Brain Wired for Cooperation and Conflict" (Paulo Sérgio Boggio) will provide a comprehensive overview of the neural architecture supporting moral cognition. Synthesizing findings from neuroimaging and electrophysiological studies, this presentation addresses five domains: moral decision-making, moral identity, fairness, hypocrisy, and moral emotions such as guilt, shame, and schadenfreude. Findings reveal that moral judgments are not fixed traits but emerge from context-sensitive interactions across brain regions including the ventromedial prefrontal cortex, temporoparietal junction, insula, and anterior cingulate cortex. Importantly, neural responses vary based on framing, intentionality, and group identity, suggesting that our moral compass is a flexible, socially tuned system. Turning to experimental evidence, "Racial Bias on Moral Judgment: A Behavioral and Electroencephalographic Investigation" (Fernanda Naomi Pantaleão) presents data showing how racial information influences both behavioral and neural responses. In an EEG study, White participants (N = 73) judged the severity of morally wrong actions involving White or Black agents and victims. Results demonstrated a consistent pattern of harsher judgments toward White perpetrators harming Black victims, accompanied by greater P2 and P3 ERP components, suggesting enhanced attention and evaluative processing. These results may reflect increased awareness of racial injustice, shifting social norms, or efforts to regulate explicit bias. Findings also suggest that interventions promoting awareness of social bias may help reduce explicit racial prejudice in moral evaluations. Shifting the focus to memory and affect, "Emotions and Social Memories: The Emotional Impact on the Recall of Social Exclusion Experiences" (Bruna Eugênia Ferreira Mota) investigates how emotional states influence the encoding and retrieval of social exclusion experiences. In this ongoing study, participants are primed with positive, negative, or neutral emotional stimuli prior to engaging in the Cyberball task, a well-established paradigm for inducing social ostracism. During the task, psychophysiological responses – including electrocardiography (ECG), facial electromyography (EMG), and electrodermal activity (EDA) – are recorded to capture real-time affective changes. One week later, participants complete a free-recall task assessing memory accuracy, emotional tone, and confidence. The study also includes

self-report measures of anxiety, depression, loneliness, and rejection sensitivity to explore individual differences in susceptibility to emotional and mnemonic bias. It is hypothesized that positive priming will attenuate the emotional impact of exclusion and promote more accurate, less negatively biased recall, whereas negative priming and higher psychological vulnerability will intensify distress and memory distortions. Concluding the symposium, "Naturalistic Approaches in Social and Affective Neuroscience: From Individual Brains to Social Synchrony" (Claudinei Biazoli Jr.), calls for a paradigm shift in social neuroscience – from isolated and artificial experimental setups to real-life, interactive contexts. This presentation highlights theoretical and methodological innovations in naturalistic neuroscience, including movie-watching fMRI, fNIRS-based hyperscanning, and interpersonal synchrony analysis. These tools allow researchers to explore affective processes, social cooperation, and brain-to-brain coupling in ecologically valid settings. For example, fNIRS hyperscanning studies reveal that interpersonal synchrony is associated with increased cooperation, an effect moderated by the quality of friendship in adolescents, with implications for group performance and conflict resolution. Additionally, analyses of idiosyncratic neural responses during naturalistic viewing paradigms can uncover neural signatures related to emotion, self-relevance, and social engagement. The talk concludes with implications of these new perspectives in affective and social neurosciences for clinical applications, particularly in conflict affected populations facing extreme vulnerability. Together, these presentations deepen our understanding of how moral evaluation, emotional memory, and interpersonal coordination are shaped by the brain in intergroup contexts. By bridging theoretical synthesis with empirical evidence, and uniting traditional methods with naturalistic designs, the symposium illustrates the promise of interdisciplinary neuroscience in informing socially responsive research and practice. These insights pave the way for interventions grounded in social neuroscience to promote empathy, fairness, and psychological well-being in diverse and unequal societies.

Symposium abstract [SY44]
Session: Emotions & Social Cognition VI
Date: Saturday, 20 September 2025 (09:00)
Symposium Title: ***The Many Faces Of Anger: Exploring Its Cognitive, Subjective, And Psychophysiological Dimensions***
Symposium organiser(s): Liliana Capitão
Psychological Neuroscience Lab, CIPsi,,University of Minho, Braga, Portugal

Talk 1 – ***Angry Lens: Exploring Biases in Conscious Emotion Recognition*** **Presenter:**
Marlene Nogueira
Psychological Neuroscience Lab, CIPsi,,University of Minho, Braga, Portugal

Talk 2 – *Hidden Threats: Trait Anger and Unconscious Emotional Detection* Presenter:
Fátima Saraiva
Psychological Neuroscience Lab, CIPsi,,University of Minho, Braga, Portugal

Talk 3 – *Snap Reactions: Impulse Control and Trait Anger*
Presenter: Natividade Couto Pereira
Psychological Neuroscience Lab, CIPsi, University of Minho, Braga, Portugal

Talk 4 – Stuck on Anger: Comparing Autonomic and Cognitive Recovery in High and Low Anger Ruminators
Presenter: Catarina Fagundes
Psychological Neuroscience Lab, CIPsi, University of Minho, Braga, Portugal

Abstract
Anger is a core human emotion with significant psychological and social consequences, yet it remains comparatively under-investigated in emotion science — often described as the "forgotten emotion" (Potegal & Stemmler, 2010). While moderate anger can be adaptive in promoting assertiveness and goal pursuit, excessive or chronic anger is linked to interpersonal conflict, occupational difficulties, and aggressive behaviour (Deffenbacher, 2011). Cognitive models propose that anger is sustained by attentional biases toward threatrelated cues (Cisler & Koster, 2010), and that individuals with high trait anger (HTA) are particularly vulnerable to these cognitive distortions, leading to maladaptive interpretations of social situations (Wilkowski & Robinson, 2008). However, much remains unknown about how these processes operate across different domains — conscious and unconscious, cognitive and physiological — and how they influence the unfolding of anger episodes. This symposium brings together four empirical studies that address these critical gaps by examining lesser-known mechanisms of anger. The research collectively investigates how anger is processed and maintained across conscious emotion recognition, nonconscious perception, executive functioning, and physiological recovery. Each study adopts a distinct methodological lens — ranging from facial emotion tasks to autonomic monitoring — to build a multidimensional understanding of trait anger and its correlates. The Angry Lens: Exploring Biases in Conscious Emotion Recognition (Marlene Nogueira) This study investigates whether individuals high in trait anger show biased interpretation of emotional facial expressions in conscious awareness. Using the Facial Emotional Recognition Task (FERT), 70 participants classified as high or low in trait anger (via the STAXI) were asked to identify six basic emotions: anger, fear, happiness, sadness, disgust, and neutral. By focusing on performance differences across these categories, the study explores whether HTA individuals demonstrate enhanced detection of anger or increased misinterpretation of neutral and ambiguous expressions as threatening. Results aim to clarify how conscious perception biases may contribute to interpersonal conflict and emotional dysregulation in anger-prone individuals. Hidden Threats: Trait Anger and Unconscious Emotional Detection (Fátima Saraiva) Despite growing interest in automatic emotional processing,

the unconscious dynamics of anger remain poorly understood. This study addresses that gap using Continuous Flash Suppression (CFS), a technique that renders stimuli temporarily invisible until they "break through" into awareness. Seventy participants (HTA vs LTA) viewed facial expressions (angry, fearful, happy, neutral), and detection speed was recorded. While previous research suggests HTA individuals may be more sensitive to anger cues, our prior findings in general samples suggest that anger might modulate detection relative to other threats, such as fear. This study tests whether HTA alters unconscious emotional processing, potentially shaping reflexive reactions before conscious regulation can occur. Snap Reactions: Impulse Control and Trait Anger (Natividade Pereira) This study explores how impulsivity contributes to maladaptive anger expression by assessing inhibitory control under affective interference. Participants completed an Affective Interference Go/No-Go Task, which required them to inhibit responses to emotional faces, alongside an Anger Recall Protocol to measure subjective anger across baseline, induction, and recovery. HTA individuals are expected to show greater difficulty inhibiting responses to anger cues and report higher anger intensity during recall. By linking cognitive control deficits to subjective emotional outcomes, this study provides insight into how impulsivity may exacerbate the experience and regulation of anger. Stuck on Anger: Comparing Autonomic and Cognitive Recovery in High and Low Anger Ruminators (Catarina Fagundes) Anger rumination (AR) involves the persistent mental replay of anger-inducing events, which can sustain emotional arousal and interfere with recovery. This study examined whether high AR individuals differ in physiological and subjective recovery from anger. Forty-seven participants completed a recall paradigm with continuous heart rate and blood pressure monitoring, and self-reported anger across phases. High AR participants showed stronger physiological reactivity during recall but not during recovery. However, they reported more intense, lingering anger and difficulty letting go of anger-related thoughts. These findings suggest that AR sustains anger primarily at the cognitive level, not through prolonged physiological activation. Together, the studies in this symposium offer a richer understanding of the multifaceted nature of anger. By investigating anger across conscious and unconscious perception, cognitive control, and physiological regulation, the findings illuminate understudied mechanisms that contribute to anger dysregulation. This work highlights the importance of integrating multiple levels of analysis to inform the development of more targeted and mechanism-driven interventions for individuals with heightened anger reactivity.

Symposium abstract [SY45]
Session: Methods I
Date: Tuesday, 16 September 2025 (16:30)
Symposium Title: ***The Value of Methods of Analysis in Electrophysiology***
Symposium organiser(s): Monica Wagner
St. John's University, Queens, New York, United States of America

Talk 1 – *Language-specific sensory processing in auditory cortex*

Presenter: Monica Wagner
St. John's University, Queens, New York, United States of America.
Co-Authors: Rusiniak, M.[1]

[1] BESA GmbH, Gräfelfing, Germany

Talk 2 – *The power of EEG signal analysis*

Presenter: Mateusz Rusiniak
BESA GmbH, Gräfelfing, Germany. Co-Authors: Bornfleth, H.[1]

[1] BESA GmbH, Gräfelfing, Germany.

Talk 3 – *Beyond averaging: Single-Trial ERPs through trial-by-trial detection of cognitive events*

Presenter: Gabriel Weindel University of Groningen, Netherlands.
University of Utrecht, Netherlands.
Co-Authors: Borst, J. P.[1] & van Maanen, L.[2]

[1] University of Groningen, Netherlands.

[2] University of Utrecht, Netherlands.

Abstract

In this symposium, our panel will demonstrate, using experimental data, the value of various methods of analysis in electrophysiology. While conventional techniques, such as averaging ERPs, have brought many seminal discoveries in this field, a variety of newer analysis methods have become instrumental in improving our understanding of cortical-level cognitive mechanisms. **Monica Wagner: Language-specific sensory processing in auditory cortex.** Dr. Monica Wagner will demonstrate the potential and value of time-frequency and connectivity analyses of electroencephalograms (EEGs) from brain source-level channels using cross-linguistic results from native speakers of English and Polish. EEGs were recorded while participants listened to spoken nonwords pairs within counterbalanced attend and passive-listening conditions. The spoken nonwords contained native and non-native speech sound sequence onsets. In addition to behavioral measures and auditory evoked potentials, time-frequency (T-F) measures of spectral power revealed involvement of the right auditory cortex to nonnative onsets in the low gamma band, supporting right hemisphere involvement in phonemic-level processing. Measures of inter-trial phase locking in theta revealed increased values to phonological sequence contrasts experienced in one's native language compared to non-native contrasts. Additional analyses suggested involvement of alpha oscillations to unfamiliar phonotactic patterns. Finally, measures of connectivity indicate pathways supporting novel spoken word form learning during testing sessions. Brain Electrical Source Analysis (BESA) software was used for EEG processing and analysis. Principles underlying BESA methods will be described in the second presentation. The cost of an EEG lab is relatively low and available to many users. By using multiple analyses, we can improve the potential for understanding cortical processing. **Mateusz Rusiniak: The power of EEG signal analysis**.

Electroencephalography (EEG) provides millisecond-level resolution of brain activity, but its true value lies in the analysis. In this talk, Dr. Mateusz Rusiniak will describe two EEG analysis workflows — continuous data and event-related potentials (ERP) — with a strong emphasis on how source montages influence interpretation and outcomes. In the continuous workflow, we explore spectral methods such as FFT and qFFT, as well as trend analysis – often overlooked, yet rich in physiological information. In the ERP workflow, we move from classical averaging and latency comparisons toward waveform contrasts and condition-specific effects. Both workflows converge in time-frequency analysis, which, combined with beamforming, allows localization of both evoked and induced responses. Throughout, we place source montages at the center of the analysis. Whether derived from dipole fitting or distributed inverse solutions, source montages are not just visual tools – they provide anatomically meaningful references that reshape interpretation, guide statistical testing, and serve as the foundation for connectivity analysis. By shifting to source space, we link surface recordings with brain-level processes. Finally, we highlight the importance of robust preprocessing and flexible pipelines. Ultimately, using source montages as a structural backbone enables deeper, more reproducible insight into brain function. **Gabriel Weindel: Beyond averaging: Single-Trial ERPs through trial-by-trial detection of cognitive events.** Dr. Gabriel Weindel will discuss how to go beyond classical eventrelated potentials (ERPs). Although ERPs work well for events close to a fixed time point, this is not the case when moving further away from stimulus onset, as there will be increased temporal variation between trials. In this case, averaging will result in a broader ERP with lower amplitude than is warranted. In this talk, the Hidden Multivariate Pattern (HMP) method will be introduced, which can circumvent this problem. The HMP method discovers sequences of cognitive events on a trial-by-trial basis in multivariate neural signals such as EEG recordings. This sequence of events is assumed to be represented by multivariate patterns in the neural time-series, with the by-trial inter-event intervals following probability distributions. To determine the multivariate patterns and the probability distributions, HMP integrates the data from all trials of all participants. Next, the discovered events can be used as time points in single trials to calculate very sharp single-trial ERPs, independent of whether they are close to or far away from stimulus onset. The results show that classically reported ERPs can be 1) much broader than the underlying signal warrants and 2) that amplitude differences between conditions might be only due to differences in temporal variation between conditions.

Symposium abstract [SY46]
Session: Executive Functions IV
Date: Tuesday, 18 September 2025 (9:00)
Symposium Title: ***Brain Signatures of Alcohol Use: From Prediction to Intervention***
Symposium organiser(s): Eduardo López-Caneda
Psychological Neuroscience Lab, CIPsi, School of Psychology, University of Minho, Braga, Portugal

Talk 1 – *Neurophysiological Connectivity Predictors of Alcohol Use in Adolescents: A Longitudinal MEG Study*

Presenter: Alberto del Cerro-León
Center for Cognitive and Computational Neuroscience (C3N), Complutense University of Madrid, Madrid, Spain
Co-authors: Uceta, Marcos[1]; Spakivshka-Bilán, Danylyna[1]; García-Moreno, Luis Miguel[1]; Maestú, Fernando[1]; Anton-Toro, Luis F.[1]
[1] Center for Cognitive and Computational Neuroscience (C3N), Complutense University of Madrid, Madrid, Spain

Talk 2 – *Altered Neurocognitive Processing of Risk Evaluation and Reward Sensitivity in Young Binge Drinkers*

Presenter: Rui Rodrigues
Psychological Neuroscience Lab, CIPsi, School of Psychology, University of Minho, Braga, Portugal
Co-authors: Sousa, Sónia[1]; López-Caneda, Eduardo[1]; González-Villar, Alberto[1]; Sampaio, Adriana[1]; Crego, Alberto[1]
[1] Psychological Neuroscience Lab, CIPsi, School of Psychology, University of Minho, Braga, Portugal

Talk 3 – *Exploring Resting-State Functional Connectivity in Model-Based Addiction Networks in Abstinent Alcohol-Dependent Individuals*

Presenter: Sónia Sousa
Psychological Neuroscience Lab, CIPsi, School of Psychology, University of Minho, Braga, Portugal
Co-authors: Magalhães, Ricardo[2], Rodrigues, Rui[1], Crego, Alberto[1], Sampaio, Adriana[1], López-Caneda, Eduardo[1]
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[2] Life and Health Sciences Research Institute (ICVS), University of Minho, Braga, Portugal

Talk 4 – *Brain-Based Markers of Alcohol Use Disorder: Insights from EEG, fMRI, and Twin Studies*

Presenter: Jorge Martins
William James Center for Research, ISPA – Instituto Universitário, Lisboa, Portugal

Talk 5 – *Suppress to Resist: Memory Suppression as a Mechanism for Reducing Substance Use and Craving*

Presenter: Eduardo López-Caneda
Psychological Neuroscience Lab, CIPsi, School of Psychology, University of Minho, Braga, Portugal

Talk 6 – *Effects of Alcohol-Specific Memory Inhibition Training Combined with tDCS in Young Binge Drinkers: Insights from Functional Connectivity*

Presenter: Natália Almeida-Antunes
Psychological Neuroscience Laboratory (PNL), Research Center in Psychology (CIPsi), School of Psychology, University of Minho, Braga, Portugal

Center for Translational Health and Medical Biotechnology Research (TBIO), Health Research Network (Rise-Health), E2S, Polytechnic University of Porto, Porto, Portugal
Co-authors: Luis Antón-Toro[3], Alberto Crego[1], Rui Rodrigues[1], Adriana Sampaio[1], Eduardo López-Caneda[1]

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Abstract

Alberto del Cerro-León: **Neurophysiological Connectivity Predictors of Alcohol Use in Adolescents: A Longitudinal MEG Study** Adolescence is a critical period of neurodevelopment, particularly sensitive to external influences, including alcohol use. Emerging evidence suggests that neurophysiological alterations — such as changes in spectral power and functional connectivity (FC) – can be detected even before alcohol use begins. These early differences may reflect risk profiles grounded in distinct neurodevelopmental trajectories. To investigate these predispositions, we conducted a longitudinal study using eyes-closed resting-state magnetoencephalography (MEG) in adolescents assessed at ages 14 (first stage) and 16 (second stage). In the first analysis, we examined oscillatory activity and found increased low beta-band power (12–20 Hz) in participants before initiating alcohol use. These increases persisted over time and were negatively correlated with the excitation-inhibition ratio, suggesting a higher inhibitory tone among those predisposed to consume alcohol. Moderation analyses revealed a sex-specific effect: this pattern was statistically significant only in females. In a second study (n = 60), we analyzed FC and found a positive correlation between future alcohol use and increased connectivity in frontoparietal networks across all frequency bands. Follow-up analysis indicated that group differences in the theta band remained partially stable over time, whereas differences in the alpha band diminished. This reduction was due to a compensatory increase in connectivity among nonusers. Together, these findings highlight distinct patterns of brain activity and connectivity that precede alcohol use and may signal neurodevelopmental vulnerability. **Rui Rodrigues: Altered Neurocognitive Processing of Risk Evaluation and Reward Sensitivity in Young Binge Drinkers** Binge drinking in adolescence and early adulthood has been linked to cognitive impairments and alterations in brain networks underlying executive control and decisionmaking. This fMRI study aimed to investigate the neural mechanisms associated with risky vs. conservative decision-making and reward processing in young binge drinkers (BDs) compared to abstinent controls. Participants performed a monetary gambling task during scanning. Behaviorally, BDs were significantly more likely to make risky decisions and exhibited faster reaction times, reflecting reduced inhibitory control and increased impulsivity. At the neural level, significant group differences emerged during conservative choices: the control group showed greater activation in visual processing areas and in regions involved in inhibitory control and decision-making (e.g.,

fusiform gyrus, inferior frontal gyrus, and insula). During reward outcomes, only the control group showed increased activation in reward-related areas (dorsal striatum and thalamus) when gaining versus losing money. This pattern was absent in BDs, suggesting a blunted neural sensitivity to reward. These findings suggest that young BDs may display changes in the neural activation patterns underlying conservative decision-making and reward sensitivity, which may contribute to persistent risky behaviors and vulnerability to addiction. **Sónia Sousa: Exploring Resting-State Functional Connectivity in Model-Based Addiction Networks in Abstinent Alcohol-Dependent Individuals** Alcohol Use Disorder (AUD), the most severe form of problematic drinking, is a prevalent and debilitating condition associated with substantial health consequences. Despite extensive research into its neurotoxic effects, neuroimaging-based biomarkers that can reliably identify alcohol dependence and predict relapse remain limited. Resting-state network analysis offers a powerful approach to uncover network-level disruptions underlying psychiatric disorders, including addiction. In this study, we applied a customized analysis pipeline using FSL tools to examine resting-state functional connectivity (rsFC) via functional magnetic resonance imaging (fMRI) in 59 adults (30 individuals with AUD and 29 matched controls; M = 48 years). We analyzed the FC of four addiction-relevant networks – Executive-Go, Executive-Stop, Incentive Salience, and Negative Emotionality – as conceptualized by Koob's model of addiction. Our findings revealed significantly increased rsFC in the left superior frontal orbital region within the Executive-Stop network in the AUD group compared to controls. These results suggest persistent alterations in brain regions involved in inhibitory control and emotional regulation in individuals with a history of alcohol dependence, even after prolonged abstinence – potentially reflecting vulnerability to relapse. **Jorge S. Martins: Brain-Based Markers of Alcohol Use Disorder: Insights from EEG, fMRI, and Twin Studies** Alcohol use disorder (AUD) is a major public health concern due to the significant societal burden it imposes worldwide. This presentation synthesizes findings from three neuroimaging studies aimed at enhancing our understanding of the underlying neurobiological mechanisms that promote (or reduce) risk for AUD, relapse, and treatment failure. First, EEG data from nondependent young drinkers (N=160) revealed that individuals at risk for problematic alcohol use exhibit heightened neural responses to alcohol-related cues and blunted responses to natural reinforcers. Second, a longitudinal twin study (N=173), which followed adolescents from age 12 to 20, showed that neural reactivity to alcohol-related cues is an acquired neural marker of AUD risk shaped by unique individual experiences with heavy episodic drinking. Third, in a clinical sample of AUD patients (N=17), fMRI data collected before and after outpatient treatment demonstrated that altered neural responses to stress in AUD patients recovered with treatment. These findings shed light on patterns of neural cue reactivity implicated in the development, maintenance, and remission of AUD. Unresolved questions and future research directions will be discussed, with an emphasis on the implications of these findings for the development of personalized prevention and treatment strategies targeting specific neurobiological mechanisms. **Eduardo López-Caneda: Suppress to Resist: Memory Suppression as a Mechanism for Reducing Substance Use and Craving** Intrusive thoughts and memories play a central role in the

maintenance and relapse of addictive behaviors. Several addiction theories propose that involuntary memory retrieval fuels desire and substance use by triggering affective and physiological responses. While substantial research has focused on attentional biases, cue reactivity, and response inhibition, less is known about the cognitive mechanisms that enable individuals to intentionally regulate or suppress such intrusive content. This presentation explores memory suppression – studied through the Think/No-Think paradigm – as a potential mechanism for downregulating craving and maladaptive consumption. We argue that the ability to inhibit the retrieval of substance-related memories may reduce their salience, weaken associative links, and dampen automatic affective responses. Drawing on evidence from both basic memory research and emerging studies in clinical populations, we outline a framework in which memory control acts as a form of top-down regulation that may protect against relapse. **Natália Almeida-Antunes: Effects of Alcohol-Specific Memory Inhibition Training Combined with tDCS in Young Binge Drinkers: Insights from Functional Connectivity** Previous research has shown that binge drinkers (BDs) exhibit impaired memory inhibition (MI) and disrupted functional connectivity (FC) between inhibitory control (IC) and memory networks, including during attempts to suppress alcohol-related content. However, it remains uncertain whether MI-targeted interventions can effectively modulate these neural dynamics. This study examined whether an alcohol-specific MI training protocol, combining cognitive training (CT) with transcranial direct current stimulation (tDCS) over the right dorsolateral prefrontal cortex, can enhance MI abilities and reshape FC patterns in young adult BDs. Forty-one BDs were randomly assigned to one of three groups: a combined group (CT + active tDCS, n=13), a control group (sham CT + sham tDCS, n=15), and a cognitive-only group (CT + sham tDCS, n=13). Participants completed pre- and post-intervention EEG assessments while performing the Think/No-Think Alcohol task. The three-day intervention aimed to strengthen inhibitory processes over alcohol-related memories. FC will be estimated using Phase Locking Value across multiple frequency bands. To capture trainingrelated changes, symmetrized percent change will be computed for each participant. Cluster-based permutation tests will then be applied to detect significant alterations in FC between regions associated with IC and memory-related regions. This study is expected to provide novel insights concerning MI networks and alcohol use/misuse as well as the capacity of targeted MI training to promote more effective suppression of maladaptive alcohol-related memories.

Invited talks from poster abstract submissions

IT 1 | Pinging Reveals Hidden Neural Representations During The Intertrial Interval That Relate To Switch Costs: An MEG/EEG Decoding Study

Presenter: Yuena Zheng
MRC Cognition and Brain Sciences Unit, University of Cambridge
Co-authors: Daniel Mitchell[1], Alexandra Woolgar[1]

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Humans are capable of flexibly switching between different tasks and stimuli in response to environmental demands. However, such switching often comes at a behavioural cost, manifested as increased reaction times and error rates. Many theories suggest that lingering neural representations from the previous trial might be a potential source of these switch costs. However, as these lingering representations may be weak and difficult to see in human neuroimaging, direct investigation has been methodologically challenging. In this study, we employed an emerging technique known as "pinging", which uses a neutral visual impulse to reactivate or amplify latent representations, in order to address this challenge. Specifically, we asked: (1) whether residual representations from the previous trial can be revealed through pinging during the intertrial interval (ITI), and (2) if so, whether these representations are related to behavioural switch costs. Twenty-eight adults completed a cognitive task involving two distinct rules, each mapping three oriented gratings (stimuli) to three response buttons. Each trial began with a rule cue, followed by a stimulus, to which participants responded as quickly and accurately according to the cued rule. In half of the trials, a brief visual impulse was delivered during the ITI between the response and the onset of next trial. Simultaneous magnetoencephalography (MEG) and electroencephalography (EEG) signals were recorded, and multivariate pattern analysis (MVPA) was used to decode rule and stimulus representations. Behaviourally, rule and stimulus switches both led to increased reaction time and error rates, consistent with prior findings. Neural decoding showed no difference between ping and no-ping conditions during active task phase; however, during the intertrial interval, stimulus representations were significantly enhanced by the ping, whereas rule representations showed no reliable difference in decoding between the two conditions. Furthermore, we found a significant positive correlation between the level of stimulus representation enhancement and the reaction time cost of stimulus switching. Together, these findings suggest the neural representational states maintained between trials influence subsequent processing and highlight the utility of pinging in uncovering latent neural dynamics underlying intertrial effects.

IT 2 | You Should Also Take Cognitive Effects Into Account When Evaluating Motor Cortical Excitability In Parkinson's Disease

Presenter: Pierre Cabaraux

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Background and Objective: Emerging evidence suggests that the cerebellum may play a key role in Parkinson's disease. Cerebellar transcranial direct current stimulation (ctDCS) has been shown to reduce motor cortical excitability in healthy individuals, as measured by transcranial magnetic stimulation. This study aimed to evaluate the effects of ctDCS on motor cortical excitability and motor symptoms in individuals with Parkinson's disease. Methods: Twenty-two participants with Parkinson's disease (10 men, 12 women; mean age: 64 years) received a single 20-min session of either real (0.071 mA/cm^2) or sham ctDCS in a cross-over design. Motor symptoms were assessed using the MDS-UPDRS before and after stimulation. Motor evoked potentials (MEPs) were recorded before, during, and after stimulation. Repeated-measures ANOVAs were conducted on MDS-UPDRS scores and on MEP amplitude and latency (group: sham or real; time: before, during or after), followed by post hoc comparisons where appropriate. Results: A significant main effect of time ($F(1, 42) = 48.78$, $p < .001$) and a significant group × time interaction ($F(1, 42) = 19.44$, $p < .001$) were found for MDS-UPDRS scores. Post hoc analysis revealed a significant reduction of 2.36 points ($p < .001$) after real ctDCS, compared to a non-significant 0.55-point reduction after sham ($p = .068$). For MEP amplitude, a significant main effect of time was observed ($F(2, 84) = 4.52$, $p = .014$), without a significant interaction with group. Post hoc tests indicated a significant decrease in MEP amplitude from pre- to during-stimulation in both groups ($t(43) = 2.97$, $p = .005$). No significant effects of group or time were found for MEP latency. Conclusion: these findings suggest that ctDCS may have therapeutic potential in Parkinson's disease by improving motor symptoms. However, the reduction in MEP amplitude observed in response to both real and sham ctDCS highlights the influence of non-specific cognitive effects, including placebo effect, even in objective physiological motor cortical measures.

IT 3 | Large-scale Cortical Networks Are Organised In Structured Cycles

Presenter: Mats W. J. van Es
University of Oxford
Co-authors: Cameron Higgins[2], Chetan Gohil[3], Andrew J. Quinn[4], Diego Vidaurre[5], Mark W. Woolrich[1]

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The brain must perform a diverse set of cognitive functions essential for survival, but it is unknown how it is organized to ensure that each of these functions is fulfilled in a timely manner. It is widely believed that these cognitive functions arise from dynamic switching in coherent activity within large-scale cortical networks, yet whether these networks evolve in a structured or random manner is unknown. We investigated the temporal evolution of canonical large-scale cortical networks using MEG. First, we inferred cortical networks from resting-state MEG data via a time-delay embedded hidden Markov model (TDE-HMM) [Vidaurre et al., 2018]. This established approach identifies transient activations of synchronized (i.e. phase coupled) brain networks, each lasting about 50ms, which align with resting-state networks observed in fMRI. Next, we developed a novel method — temporal interval network density analysis (TINDA) — to study asymmetries in network transitions. TINDA examines all intervals of a reference state and compares the activation likelihood of other states in the first versus second half of the interval. This determines whether a state is more likely to precede or follow the reference state, independent of time delay. Based on these asymmetries, we can then assess if there is a preferred sequence of state activations. Using this approach, we showed [Van Es et al., 2025] that although network dynamics are stochastic, their overall ordering becomes increasingly structured at longer timescales, forming robust cyclical patterns with typical durations of 300–1000 ms. This cyclical structure groups states with similar function and spectral content at specific cycle phases, consistently across datasets. Furthermore, an individual's position within the cycle predicts cognition, including spontaneous memory replay [Higgins et al., 2021]. We also found that individual cycle strength and speed are heritable and predict individual traits, with stronger and slower cycles in older adults. These results suggest cortical network activations are inherently cyclical, providing the organization needed for different cognitive functions. Behaviour may be constrained by this cyclical structure; preliminary evidence shows that distance to the optimal phase for a button press predicts response speed. These findings open new avenues for understanding brain network dynamics and suggest that cycle summary metrics could serve as biomarkers for cognitive disease.

IT 4 | Cognitive Performance Across Pregnancy: A Longitudinal Mixed-model Study With Never-pregnant Comparisons

Presenter: Cristiana Júlio Oliveira

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Pregnancy involves significant biological and social-psychological changes. While some studies suggest subtle declines in memory and attention during pregnancy, findings remain inconsistent. This longitudinal study examined cognitive changes across pregnancy and compared cognitive performance in pregnant women with never-pregnant controls. Participants included primigravid women assessed during the first (T1; n=10; mean 11 weeks), second (T2; n=12; mean 22 weeks), and third (T3; n=10; mean 32 weeks) trimesters, and a control group of age and education-matched never-pregnant women assessed once (n=9). Data collection is still ongoing and we expect to include approximately 15-20 participants in each group. Participants completed a battery of cognitive tasks (CANTAB) assessing sustained attention, multitasking, spatial working memory, response inhibition, facial emotion recognition and perception bias. Linear mixed models were used to assess changes in cognitive performance over time, with participant as a random effect and timepoint and group as fixed effects. Preliminary results indicated that pregnant women performed better than controls in sustained attention at T2 (p=.035), with a similar trend at T3 (p=.056). At T3, controls also had higher multitasking costs (p=.006), performed worse on spatial working memory (8-box stage; p=.028), and had significantly higher strategy scores (p=.005), indicating that pregnant participants showed a more planned/strategic approach. Pregnant participants showed a small but significant improvement in target detection (sustained attention) by T3 compared to T1 (p=.016) and T2 (p=.002). Significant differences in multitasking reaction latency were observed,

with pregnant participants responding faster in T3 compared to T1 (p<.001) and T2 (p=.001). Additionally, significant changes in spatial working memory strategy use were observed, with more consistent strategy use in T3 compared to T1 (p<.001). No significant differences between the pregnant and never-pregnant groups or across trimesters were found for response inhibition, emotion recognition and bias outcomes. Contrary to existing literature, these findings suggest that cognitive performance may improve subtly throughout pregnancy, particularly in tasks involving sustained attention, multitasking, and strategic memory use. Thus, pregnancy could be associated with adaptive cognitive changes to prepare mothers for the new demands of parenting.

IT 5 | The effects of respiration-locked TMR on the consolidation of memories

Presenter: Esteban Bullón Tarrasó
Ludwig-Maximilians-University Munich
Co-authors: Tobias Staudigl[1], Thomas Schreiner[1]

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Recent findings suggest that respiration may act as a pacemaker for key non-rapid eye movement (NREM) sleep oscillations — specifically, slow oscillations and sleep spindles. In parallel, previous studies have demonstrated that memory consolidation during sleep can be enhanced by the delivery of reminder cues, a technique known as targeted memory reactivation (TMR). In this study, we investigated the functional relevance of respiration-coupled sleep oscillations for memory consolidation by aligning the timing of TMR cues with specific phases of the breathing cycle. We hypothesized that presenting reminder cues during the respiratory phase most strongly coupled to sleep oscillations would enhance the reactivation of associated memory traces and improve recall performance, compared to cueing during the opposite phase. Before sleep, participants (N = 26) learned word – image associations, with words presented auditorily and images depicting objects or scenes. Memory was assessed both before and after sleep. Throughout the experiment, EEG and respiratory signals were recorded. Prior to the main session, we identified each participant's respiratory phase that exhibited the strongest coupling with SO-spindle events. During sleep, one-third of the learned words were replayed during this preferred phase (in-phase condition), another third during the opposing phase (anti-phase condition), and the final third remained uncued (control condition). Behavioural results revealed significantly better memory performance for in-phase cues compared to anti-phase cues, highlighting the functional importance of respiration-coupled sleep oscillations in memory consolidation. Ongoing analyses aim to clarify whether in-phase and anti-phase cueing differentially influence the induction of sleep oscillations and memory reactivation processes.

IT *6* | *Differential Connectivity Of The Theory Of Mind Network During Social Perception Of Geometric Animations In Autism*

Presenter: Teresa Sousa
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Autism spectrum (AS) is a complex condition characterized in which difficulties in social interaction are a core feature. Such challenges can significantly impact daily life because of the reduced ability to interpret social cues. This has been hypothesized to relate to altered brain dynamics in networks supporting social cognition, particularly the Theory of Mind (ToM) network, critical for inferring others' intentions. However, there is no clear consensus on the underlying neurobiology. Some theoretical accounts suggest that difficulties arise from an altered interpretation of low-level social cues, indicative of weakened action perception, while others argue that it is linked to deficits in mentalization and top-down modulation from prefrontal brain regions. To investigate this question, we conducted a task-based functional magnetic resonance imaging (fMRI) study with adult autistic individuals (11 males, 22 ± 7 years) and matched neurotypical controls (11 males, 23 ± 3 years). Participants were presented with a visual paradigm designed to elicit the interpretation of social interactions using simple geometric animations, thus minimizing bias from high-level cue confounds. Both autistic and neurotypical individuals viewed four types of interactions — positive, negative, indifferent, and linear — during fMRI acquisition. Functional connectivity analysis, based on weighted correlation coefficients between several regions of the ToM, salience, and frontoparietal networks, revealed TPJ (temporoparietal junction) hypoconnectivity in autism. This difference may contribute to difficulties in understanding the surrounding environment and integrating social cues. Group comparisons by condition showed that the most notable differences emerged while interpreting positive and negative interactions. Specifically, autistic individuals exhibited reduced functional connectivity between the supramarginal gyrus (SMG)/TPJ and the middle temporal gyrus (MTG), as well as with the inferior frontal gyrus (IFG) — part of the mirror neuron system and critical for understanding others' actions. Our results thus suggest that diminished connectivity between the TPJ and the IFG may be linked to a disruption in integrating low-level social cues into broader social context understanding. These findings align with previous

literature indicating that autism is associated with hypoconnectivity across key regions involved in social cognition but go a step further by providing evidence that such differential connectivity patterns are not solely a result of complex social scenarios, and emerge even when ascribing a social interpretation to simple dynamic geometric scenarios.

IT 7 | Characterizing Word Processing On The Individual Subject Level With Multi-echo fMRI

Presenter: Eva Steckermeier
University of Salzburg
Co-authors: Martin Kronbichler[1], Florian Hutzler[1], Mario Braun[1]

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Although language is central to human life, our understanding of the neural mechanisms involved in its processing remains limited. Traditional group studies have contributed significantly to the field but often obscure critical interindividual differences by averaging across subjects. This blurring not only reduces the anatomical accuracy of functional brain regions but also overlooks variability that may be crucial for explaining differences in behavior. So far, these limitations of group studies have barely been addressed in research on individual variability of language processing. We contribute to filling this gap by investigating individual variability in neural activity during word processing with precision fMRI. Our dataset comprises four scanning sessions per participant, including multiple runs of auditory and visual word discrimination tasks, resting-state fMRI, and high-resolution T1-weighted anatomical scans. We further acquired diffusion-weighted images, T2-weighted anatomical scans, and naturalistic viewing data to enrich the dataset. To optimize functional data quality, we utilized multi-echo fMRI sequences. Approximately 161 hours of MRI data were collected per participant, ensuring a deep, individual-specific characterization. In addition to imaging, we assessed participants' reading performance and conducted screenings for general cognitive ability and mental health. A state questionnaire was administered prior to each session to capture session-by-session variability. Data were collected from 28 participants, with 23 completing all sessions. Comprehensive metadata accompanies the dataset to maximize reproducibility and reuse, fully adhering to the FAIR principles of open science: Findability, Accessibility, Interoperability, and Reusability. We shared the dataset within the Austrian NeuroCloud. By emphasizing individual variability, our work challenges traditional group-based models of language processing and refines our understanding of the neural activity underlying word processing. Precision MRI offers a powerful tool, opening new avenues for research into cognitive mechanisms and individual differences.

IT 8 | The Social Mind On A Timeline: Neural Signatures Of Mentalization

Presenter: Carolina Biasiotti
University of Trento, Italy
Co-authors: Daniela Ruzzante[1], Federica Meconi[1], Jeroen Vaes[1]

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Navigating the social world requires attributing mental states — such as thoughts, intentions, and emotions — to others. Neural evidence reveals a similar temporal sequence between emotion recognition and mentalization: an initial perceptual phase marked by the N170 component, followed by a phase where both perceptual and contextual information are integrated, reflected in the P3 component. This study examined how these factors influence the attribution of emotional mental states along a temporal timeline of mentalization. We hypothesized that both perceptual (human vs. doll-like faces) and contextual factors (ingroup vs. outgroup) would influence mentalization at different stages. Using an oddball paradigm, we manipulated perceptual cues by presenting "mindful" human faces and "mindless" doll-like faces, and contextual cues by labeling faces with one of two nationalities. Stimuli were neutral or smiling Caucasian faces, organized into four blocks — two per nationality — with emotional and neutral expressions presented within each block. Electroencephalography (EEG) was recorded while participants (N = 34) completed a categorization task, judging the humanity of each face using two keyboard keys. Additionally, we administered a modified Implicit Association Test (IAT) to measure the strength of associations between mind-related and body-related attributes with ingroup and outgroup faces. Event-related potentials revealed a clear differentiation between human and doll-like categories on the N170 component (160-210 ms), reflecting early perceptual discrimination. Later, the P3 component (300–600 ms) showed a stronger differentiation between mindful and mindless stimuli when faces displayed an emotional expression, especially for ingroup faces. This suggests a bias in attributing mental states in an intergroup context. Interestingly, an intermediate stage of mental state encoding emerged, characterized by the P2 component (160-220 ms), which showed sensitivity to emotional expressions, particularly for doll-like faces. The IAT revealed stronger associations between mind-related words and ingroup faces, and body-related words and outgroup faces — specifically when faces displayed an emotional expression — confirming the pattern observed in the P3. These findings advance our understanding of the neurocognitive mechanisms underlying mentalization by mapping a temporal sequence shaped by both perceptual and contextual factors, shedding light on the roots of social biases in human cognition.

IT *9* | *Harnessing the Hippocampus: Feasibility and Mechanisms of Real-time fMRI Neurofeedback Training for Activity Upregulation*

Presenter: Sterre C.N. van de Langenberg
Institute of Psychology, University of Hamburg
Co-authors: Guy Gurevitch[2], Taly Markovitch[2], Neomi Singer[2], Talma Hendler[2], Lars Schwabe[1]

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Our lives are composed of stories — sequences of remembered and imagined experiences that shape who we are and how we relate to the world. Central to narrative construction is the hippocampus: a brain region relevant not only for forming and retrieving memories but also embedding them in context — in time, space, and meaning. When repeated stress, illness, or injury impair hippocampal functioning, the result can be a fragmented experience of reality: traumatic memories intrude without context, the present traps a loved one, or fears of the future overwhelm what is now. While the role of the hippocampus in memory and beyond has been thoroughly investigated, not much is understood about whether and how individuals could actively modulate its activity. In a first study (n = 43), we demonstrate the feasibility of hippocampal upregulation using real-time fMRI neurofeedback with explicit process-specific strategy instructions in a single training session. A second study (n = 100) replicated the observed regulation effect while controlling for NF-general task effects (i.e., control- and reward-related processes). Individuals in the experimental group received active neurofeedback and were significantly better able to increase hippocampal activity than those in the sham group receiving 'yoked' feedback (i.e., randomized feedback values from a participant in the experimental group), specifically at later training runs. In addition, the mental strategies used to regulate hippocampal activity differed significantly across groups and training runs despite uniform task instructions. Finally, we reveal that successful hippocampal upregulation is consistently accompanied by activation in a network of brain regions including the medial and dorsolateral prefrontal cortex, the supplementary motor area, the temporoparietal junction, and the posterior cingulate cortex. Together, these findings demonstrate that individuals can learn to upregulate the hippocampus through contingent feedback, a capacity that appears to be associated with specific mental strategies, and supported by a broader neural network. Despite an unchangeable history, individuals may be better equipped to reshape the tone and structure of their internal story through self-modulation of this narrative network. This potential may hold significant promise for future research and novel, process-based routes to therapeutic transformation.

IT 10 | Leveraging Open-source M/eegs To Identify Oscillatory Changes In Parkinson's Disease

Presenter: Hamzeh Norouzi
Division of Psychology, University of Stirling
Co-authors: Gemma Learmonth[1], Magdalena Ietswaart[1], Jason Adair[2]

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Parkinson's disease is characterised by a range of motor and non-motor changes that can negatively impact quality of life. Many studies have identified potential clinical electrophysiological biomarkers of Parkinson's disease with an aim of developing new methods of identifying at-risk patients, and to form the basis of therapeutic interventions. However, there are logistical challenges in recruiting large clinical groups for cognitive neuroimaging research studies. Such limitations reduce statistical power, increase the risk of misinterpretation, and may fail to account for the substantial heterogeneity in symptom presentation and disease progression that is characteristic of Parkinson's disease. Publicly available datasets offer a powerful solution to these challenges and enable data aggregation and meta-analysis. In our recent study, we conducted a re-analysis and meta-analysis of open-source M/EEG datasets and aimed to identify consistent electrophysiological markers of Parkinson's disease. We compared periodic and aperiodic characteristics of 6 resting-state M/EEG datasets (4 EEG and 2 MEG) in 390 patients with Parkinson's disease and 607 age-matched healthy controls. Compared with controls, Parkinson's patients showed consistently higher peak alpha power and slower peak alpha frequency, along with heightened aperiodic offset and exponents, but no difference in peak beta power or frequency. This large cohort meta-analysis points to a relatively consistent pattern of both periodic and periodic changes in M/EEG signal that may be used to develop diagnostics and interventions in the future.

Poster Abstracts

TUESDAY 16/09
10:45 POSTER SESSION 1 P 1.1 – 1.68

P1.01 | Eeg Functional Connectivity In Force-field Motor Adaptation After Stroke

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This study analysed functional connectivity accompanying motor adaptation in stroke patients. Motor adaptation is a process of learning a previously known skill in presence of an environmental perturbation and is hypothesised to be a model of recovery/rehabilitation (Dipietro et al., 2012). Method Nine recovered stroke patients with a stroke affecting their right hand function (median age 57 [34-78], 1 female, 1-12 months post stroke) and 9 healthy adults (median age 56[38-63], 5 female) participated. A 64 channel EEG system (ANT Neuro, Enschede, Netherlands) was used to measure brain activity whilst subjects performed a reaching task with a robotic arm (InMotion Technologies, Cambridge, MA, USA). The protocol was based on 2 reaching conditions (96 trials each). Familiarization trials were performed in a zero force-field followed by motor adaptation trials where the robot applied a force-field in the clockwise direction. Connectivity was compared between trials in late familiarisation (low reaching error) and early motor adaptation (high reaching error) using EEGlab (Delorme & Makeig, 2004). EEG data were band-pass filtered between 0.5 Hz and 100 Hz, notch filtered at 50 and 25 Hz, segmented into epochs from -950 ms to 2750 ms with respect to the movement onset. Baseline was defined between -950 ms and -700 ms and removed from the data. The data were re-referenced to a common average and decomposed using Independent Component Analysis (ICA) to remove stereotypical artefacts. Maximum velocity in each trial averaged over trials served as a kinematic velocity measure, whereas summed error (distance between the movement and straight line connecting start and target) served as an accuracy measure. Phase locking value of each seed electrode to all other electrodes (averaged) served as the connectivity measure. Delta-theta connectivity (2-7Hz) is reported here based on literature (Popovych et al 2016, Rosjat et al., 2018). The time of interest (TOI) was refined as +/-250ms around movement onset to analyse the specific movement preparation and execution time. Permutation-based statistics with TFCE correction as implemented in LIMO toolbox (Pernet et al., 2011) were used to compare connectivity between stroke and control groups using a permutation t test and permutation correlation test to correlate connectivity with kinematic measures (results report significant frequency-time-channel clusters after TFCE correction). Results Both stroke and control groups exhibited increased connectivity over the left sensorimotor cortex in both conditions compared to baseline ($p<0.0125/4$ multiple comparisons against baseline). It was weaker in the stroke group compared to the control group ($p<0.0125$). There was higher frontal connectivity in the stroke

group during movement preparation in motor adaptation condition whereby frontal electrodes had higher connectivity with other frontal and also parieto-occipital electrodes ($p<0.0125$). In motor adaptation, stroke group had a higher maximum velocity than controls ($t(16) = -2.3724$, $p = 0.0305$, CI [-0.0702 -0.0039]) and showed a cluster of positive correlation between connectivity and maximum velocity ($p<0.001$). Controls exhibited a cluster of negative correlation with maximum velocity ($p<0.001$). Summed error did not differ between groups ($t(16) = -1.2799$, $p = 0.2188$, CI [-9.1551 2.2619]) and correlated positively with connectivity in controls ($p<0.001$). In stroke group, it correlated positively with LEFT frontal and central and RIGHT parietal connectivity and negatively with RIGHT frontal-central and LEFT parieto-occipital connectivity ($p<0.001$). Discussion The increased connectivity pattern around movement onset reflects movement preparation and execution processes. This pattern appeared less efficient in stroke. Higher frontal connectivity in stroke suggests employing additional frontal regions in the process of motor preparation in learning. A different pattern of relationship between behavioural measures and functional connectivity arose in stroke and control participants which is in line with a hypothesis that velocity modulation contributes significantly to the motor adaptation process (Seidler, 2006).

P1.02 | Low Attentional States Trigger Perceptual Filling-in

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Filling-in refers to the perceptual replacement of a figure by its background after a period of steady fixation. Here, we studied the effect of attention on the perceptual filling-in of a grey figure presented on a dynamic texture background. Current models of perceptual filling-in are based on a two-stage process where the representation of the background spreads into the region representing the figure, once the representation of the figure boundary is sufficiently weakened by a period of adaptation. The spreading of the background texture into the region representing the figure may be mediated by long-range horizontal connections in early visual cortex and/or feedback from higher areas. Attention is thought to suppress horizontal connectivity in early visual cortex and thus may suppress filling-in. Here we present three separate studies to support this hypothesis. First, in a preliminary study, we found that filling-in was preceded by pupil constriction, which according to existing literature is related to reduced arousal and selective attention. Second, we used electroencephalography (EEG) during a filling-in task to track alpha band power and lateralization, as neural correlates of attention. We found decreased alpha lateralization in the seconds immediately prior filling-in onset, consistent with attention shifting away from the figure just before filling in occurred. In the third study, we used a novel gradual continuous performance task (gradCPT) to track behaviourally attentional states during the filling-in task. We found an increase in gradCPT response-time-variability,

indicating low attentional states immediately prior to filling-in onset. Taken together, all results point to low attentional states predicting perceptual filling-in, in line with a facilitation of horizontal connectivity in the absence of directed attention, which may promote spreading of the background representation into the region occupied by the figure.

P1.03 | Exploring The Interplay Between Oculomotor Activity And Memory Trace Consolidation In Working Memory Under Transcranial Direct Current Stimulation

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Transcranial direct current stimulaton (tDCS) on prefrontal cortex has evidenced to modulate working memory (WM) performance, particularly under high cognitive demand conditions. In parallel, pupil dilation and ocular response patterns have risen as reliable psychophysiological marker for cognitive effort. Despite this aligned evidence, it remains unclear how tDCS-induced cortical modulation affects ocular response and interacts with WM processes. This study hypothesized that bilateral tDCS targeting the left dorsolateral prefrontal cortex (dlPFC) would facilitate memory trace consolidation through the modulation of oculomotor patterns that optimize stimulus information encoding. In a randomized, double-blind, parallel-group design, 80 cognitively matched participants were enrolled to receive either real (1.5 mA) or sham bilateral tDCS (anode over left, cathode over right dlPFC) in a single session, comprising 10 minutes offline and 10 minutes online concurrent with the Stenberg task performance. The Sternberg task assessed visuoverbal working memory by varying stimulus congruency and cognitive load during online tDCS. Pupil dilation and oculomotor patterns were simultaneously recorded via eye-tracking across the encoding, consolidation, maintenance, and retrieval phases. In line with previous studies, bilateral tDCS significantly enhanced working memory performance under high cognitive load, without affecting response times. Compared to sham, real stimulation

also significantly increased pupil dilation and the number of fixations during the consolidation phase, both of which correlated positively with task accuracy. These findings underscore that a single session of bilateral tDCS over the left dlPFC can enhance WM performance by strengthening the memory trace, which may be linked with increased pupil dilation and ocular fixation patterns. Our results further support the potential of bilateral dlPFC tDCS to modulate either intracortical and/or interhemispheric mechanisms involved in cognitive resource allocation – as indexed by pupil and ocular responses – thereby facilitating more efficient encoding and consolidation processes. This line of research offers translational relevance for clinical interventions targeting WM deficits in psychiatric and neurological populations.

P1.04 | Age-related Differences In Familiarity-based Memory: Cognitive Patterns And Neural Mechanisms Across The Lifespan

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Familiarity-based memory has generally been considered to be spared across the lifespan. Converging evidence suggests that memory performance is better maintained for semantically rich stimuli. A recent meta-analysis from our group further highlighted hemispheric specialisation for memory content within the bilateral inferior parietal lobule (IPL) (Gray et al., 2021), supporting the view that patterns of memory ageing, relating to memory content, may be underpinned by the reorganization of brain lateralization beginning in middle age. In this study, we used a cross-sectional structural neuroimaging dataset to investigate age-related differences in familiarity-based memory and the associated brain mechanisms. 71 cognitively healthy participants (age range 25–70, with most over 50) completed a Familiarity-Only Rating Task (FORT) across four stimulus types including faces, scenes, objects and words, which is designed to isolate familiarity processes without any emphasis on recollection. High-resolution T1-weighted and diffusion tensor imaging (DTI) data were collected for all participants. Brain volume and diffusion-based indices were extracted from predefined regions of interest: bilateral hippocampus, fusiform gyrus, IPL, and medial temporal lobe cortices. We found that scene familiarity significantly predicted object memory performance even after controlling for age, with mediation analysis identifying the right fusiform volume as a shared structural substrate. Furthermore, an asymmetry index of radial diffusivity (RD) underlying the right fusiform showed an inverse relationship with object memory between middle-aged and older adults, suggesting a preserved right-hemisphere advantage in midlife that reverses in older age. A similar pattern emerged in the IPL across both scene and object

memory. In addition, in older adults, face memory performance was negatively associated with an index of difference between scene and word memory. We found an age-dependent reversal in the association between face memory performance and mean diffusivity (MD) in the left anterior hippocampus. These findings highlighted distinct age-related mechanisms underlying familiarity-based memory, suggesting a compensatory reorganisation which emerges in middle age and supports the maintenance of familiarity into later life.

P1.05 | Are You Heartbroken Or Devastated? Distinct Neural Substrates Of Visceral Expressions Of Emotion And General Emotion Labels

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A growing body of evidence suggests that emotion is a fundamentally embodied experience, grounded in discrete bodily sensations. The rich yet precise feeling states find nuanced expressions in language which transparently reflect the given underlying sensation (e.g., crushed, squeezed, or sinking heart). Using functional magnetic resonance imaging, we investigated whether emotions grounded in bodily sensations through language differ at the neural level from emotion labels non-specific to the body. We used language-guided induction of highly arousing emotional pain told in the first-person narrative (e.g., Upon hearing that my mom has been diagnosed with Alzheimer's, I felt my heart being squashed.). Twenty-eight participants (Mage = 26.4; five females) silently read each sentence as the narrator. Contextually implausible catch trials were included to ensure the participants' attentiveness without artificial attention towards their internal sensations. Whole-brain analyses were conducted using SPM12 with a random effects model. To specifically investigate interoception grounding emotion concepts, we compared it to when a non-emotional context precedes the target expression (e.g., After running twenty laps without a break, I felt my heart being squashed.), that is, a general affective state. We observed heightened activity in the precuneus and anterior cingulate cortex specific to the expression of emotional experience, suggesting increased demands for emotion and homeostatic regulation. To distinguish body-driven emotion induced by expressions of internal state, we compared it to general emotion labels (e.g., Upon hearing that my mom has been diagnosed with Alzheimer's, I felt devastated.) and found heightened activity within left inferior frontal gyrus which suggests semantic costs associated with metaphor processing. Notably, this activity was accompanied by right anterior insula and thalamic nuclei activations. We attribute this difference – despite the identical emotional context and matched emotional arousal in post-scan rating – to simulation of visceral sensations denoted by language and its neural consequences. The results suggest that language expressions of emotional pain in the viscera functionally

map onto the brain's representation of internal sensations in real time, giving rise to embodied experiences of emotion. The findings signify the role of language in linking the somatic to the psychological, beyond the exteroception-focused discussion on embodied concepts.

P1.06 | The role of the amygdala in Intimate Partner Violence: a neuroimaging study with offender and non-offender males

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The neural determinants of Intimate Partner Violence (IPV) remain poorly understood. This represents an ecological model to study the neural correlates of violent behaviour. Focus has been changing to offenders, but neuroimaging studies on male perpetrators are still scarce. The aim of this study was to investigate the neural correlates of aggression related triggers in IPV offenders and non-offenders using fMRI. Participants were 65 heterosexual males: 32 Offenders, followed at the Family Violence Unit-UVF and 33 Non-offenders from the general population. The fMRI paradigm included 60 blocks, comprising the visualization of IPV-related or neutral sentences and then emotional rating using a 5-point scale, followed by a numerical distractor-task. Within and between-subject GLM analysis in whole-brain was conducted. ROI-based hypothesis driven analysis was done (hippocampus and amygdala). For the IPV-related vs. Neutral sentences contrast, offenders showed higher BOLD

activation in the posterior cingulate gyrus, superior frontal gyrus, temporoparietal junction, and right-hippocampus than non-offenders (RFX, t(63)>1.998 p<.05-cluster corrected:387 contiguous voxels minimum, Monte Carlo simulations:1000 iterations). ROIbased analysis showed that, in the right-hippocampus, non-offenders presented similar deactivation for both types of sentences, while offenders showed a dichotomic pattern: greater deactivation for neutral stimuli and activation in response to IPV sentences. For the Main task (Sentences+Rating+ISI) vs. Distractor-task contrast, offenders revealed higher BOLD signal in the anterior cingulate gyrus, right-posterior insula, brainstem, basal ganglia, and right-amygdala than non-offenders (t(63)>1.998 p<.05-cluster corrected). Hypothesis driven ROI-based analysis in the right-amygdala showed that offenders differentially activated this region during both type of sentences/rating phases irrespective of stimulus type (IPV/neutral). A positive correlation between activation elicited by IPV stimuli visualization in the right-amygdala and the anger expression index measured by the State-Trait Anger Expression Inventory-2 was present in offenders (r=.425, p=.024, n=61). In conclusion, offenders showed greater activation in autobiographical memory, emotion and theory of mind related regions during the IPV-related task compared to non-offenders. Also, they showed differential patterns hippocampal and amygdala responses (even for neutral stimuli, in the latter), suggesting altered emotional/memory processing. Offenders' activity in the right-amygdala correlated with general anger expression, suggesting a potential neural mechanism underlying violence and/or emotional regulation deficits in IPV.

P1.07 | Dissociating Prosodic From Syntactic Delta Activity During Natural Speech Comprehension

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Decoding speech involves segmenting the acoustic signal into linguistic units, with prosodic cues playing a role in this process. However, the neural interplay between these cues and the processing of higher-level linguistic structures, such as multiword chunks, is not fully understood. We employed magnetoencephalography (MEG)

to disentangle the neural tracking of prosodic pauses from the segmentation of multi-word chunks (defined by inter-word dependencies). In line with our hypothesis, our results show that irregular pauses disrupt slow (<2 Hz) speech-brain coupling bilaterally in the auditory cortex. Concurrently we observed a striking left-lateralized increase in coherence at higher frequencies (25-45 Hz) at irregular speech onsets. Then we proceeded with the investigation of auditory responses of the multi-word chunks onsets, without discernible acoustic onsets. As a first observation, we find that the processing of multi-word chunks is underpinned by independent bilateral low-frequency (<2 Hz) activity. Moreover, the phase alignment of these lowfrequency oscillations at chunk onsets enhances the accuracy of an encoding model in auditory and frontal areas, while controlling for acoustic features. Overall, this study offers novel insights into the neural basis of speech perception, revealing independent contributions of delta-band activity to the processing of both acoustic prosody and abstract multiword linguistic units.

P1.08 | Testing The Flexible Adaptation Of Task Representations Under Shifting Demands

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To achieve behavioral goals, cognitive control relies on task sets: internal models of current demands that include the relevant parameters. While most studies use static task requirements, recent work suggests that the format in which information is coded in the brain is dynamically adjusted to meet changing demands. Under high interference, coding seems to follow a conjunctive format, generating unique, segregated representations for each task combination, thought to shield the ongoing processing from competing information. In our work, we propose that contextual volatility further modulates the strength of such conjunctive coding. In a pre-registered online study, we collected behavioral data from 79 participants using a spatial-rule paradigm: participants indicated the upcoming position of a stimulus (a dot in a 2x2 quadrant) according to one of four directional rules. We manipulated the proportion of task rule switching across blocks, creating high-volatility (70%) and low-volatility (30%) contexts. Linear mixed models revealed that volatility influenced partial overlap costs between task rules and stimulus-response mappings, a behavioral signature of conjunctive coding. Contrary to our hypothesis, partial overlap costs were larger in the low-volatility context. Hence, our results indicate flexible tuning of encoding format to overarching demands, together with increasingly conjunctive task representations in more stable contexts. Extending these behavioral findings, we are collecting EEG and eye-tracking data from an independent sample (N=40). Our first goal is to replicate the observed partial overlap costs in behavior. We will then

investigate the representational format of neural patterns and its modulation by volatility. Model-based Representational Similarity Analysis will be applied per context, with models for task rules, stimulus-response mappings and conjunctive codes. We hypothesize a stronger fit of the conjunctive model in high-volatility blocks. Additionally, we expect this context to exhibit higher neural dimensionality and lower abstraction, as measured by decoding-based analyses, consistent with event-specific coding. Exploratorily, we will apply spatio-temporal decoding to microsaccade data to assess whether they are structured by different task rules, and affected by volatility. In sum, this multimodal project aims to elucidate how shifting demands shape the coding of task-relevant information and how volatility may serve as a hallmark of conjunctive processing.

P1.09 | Non-friends In Shared Social Networks Produce Greater Force And Attentional Engagement Relative To Friends During Triadic Coordination

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To fully grasp the underlying behavioral and neural processes of social cognition, it has been argued that interactive experimental paradigms and multi-person neuroimaging are needed. However, few studies have examined real-time group interactions, beyond the dyad, as well as how higher-level social properties map onto coordination dynamics. Here, we investigated the role of friendship in social group coordination, i.e., how people integrate themselves with friends and non-friends during real-time social interaction. After mapping undergraduate student social networks from seven study programs, we assembled groups of participants by manipulating their friendship strength. Participants (n = 93) were tasked with pressing their own individual pressure measuring (force) device to reach a designated target force together in groups of three (two friends, one non-friend, all from the same study program), with or without continuous visual feedback, while their brain activity was recorded with three-person EEG hyperscanning. Non-friends consistently contributed greater force relative to the friends during group interactions. Additionally, the non-friends exhibited greater alpha/beta event-related desynchronization (ERD), and higher intersubject correlation (ISC) of neural rhythms estimated using Correlated Component Analysis (CorrCA). These results indicate that non-friends contribute more physical effort to the joint task, potentially driven by increased engagement and attention, which may be explained by them compensating for the disparity in social standing. On the other hand, the friends might have stronger priors about the social dynamics, which could lead to social loafing. Hence, friendship status is embodied in group coordination, modulating how people integrate themselves with others.

P1.10 | Mid-level Arousal Facilitates Optimal Behavioral State In Humans And Mice

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Behavioral responses to sensory inputs are highly variable, even upon repeated presentations of an identical stimulus. Traditional behavioral analyses (e.g., Signal Detection Theory) assume that this variability stems from uncorrelated noise whose average magnitude is static over time. However, a recent insight, afforded by generalized linear hidden Markov models (GLM-HMMs), is that humans and rodents alternate between discrete and persistent behavioral states during perceptual decision-making. For example, experimental trials can be clustered in states of engaged, disengaged, and biased decision-making strategies. In mice, the probability of being in an engaged behavioral state exhibits an inverted-U relationship to baseline pupil size (a proxy of tonic arousal), consistent with the Yerkes-Dodson Law. By analyzing behavioral, pupil, and neural data from mice (N=9; audio-visual change detection task) and humans (N=69; auditory detection task), the current study investigated 1) whether this relationship generalizes to human participants and 2) what neural mechanisms it is governed by. Mice and humans alternated between several discrete behavioral states and engaged behavioral state probability exhibited an inverted-U relationship with baseline pupil-linked arousal. In mice, preliminary neural analyses further suggest that for visual change detection, this relationship was mediated by pre-change V1 firing rates of putative GABAergic interneurons but not putative pyramidal neurons. These findings imply a general mechanism by which arousal dynamically modulates the cortical state of a primary sensory region to optimize perceptual decision-making. This study furthermore highlights the important insight that perception is governed by discrete and persistent states of altered sensory processing.

P1.11 | Thalamic Oscillations Distinguish Natural States Of Consciousness In Humans

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The thalamus is uniquely suited to act as a hub that regulates the global state of the brain due to its extensive connectivity with other brain regions. However, the difficulty of directly recording from the human thalamus has meant that very little is known about the connection between its electrophysiology and global brain states that correlate with natural states of consciousness. In this project, we use the rare opportunity to directly record the thalamic field potential in epilepsy patients implanted with Deep Brain Stimulation electrodes in their thalamus. We identified a hitherto unreported and brain-state-specific oscillatory signal at ~20-45 Hz that is present only during Rapid Eye Movement (REM) sleep and wakefulness, while being entirely absent during Non Rapid Eye Movement (NREM) sleep. The oscillation further distinguishes microstates in REM sleep, with elevated occurrence probability during phasic REM, correlating strongly with bursts of eye movements. Finally, we find that the detection probability of the oscillatory signal is the highest in the Central Thalamus, a structure that has been causally implicated in regulating states of consciousness. Overall, our discovery of a distinct oscillatory signature in the Central Thalamus that distinguishes conscious states opens up new avenues to further investigate how the thalamus contributes to consciousness and potentially refine therapeutic interventions to treat disorders of consciousness.

P1.12 | Environmental Uncertainty Modulates Pavlovian Bias Over Decision Making

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Humans heavily rely on environmental reward-predictive stimuli to guide day-to-day actions. Such guidance can be highly adaptive; the predictive properties of stimuli can aid rapid decision making and help us navigate a complex world. However, stimulus influences can be problematic when environmental conditions change and the behaviors provoked by stimuli are no longer appropriate at the expense of flexible, goal-directed control. Here, we ask whether the uncertainty — or volatility — of the context in which decisions take place determines the degree to which Pavlovian stimuli subsequently bias instrumental choice. More specifically, the present study aims to compare and contrast two contexts: a lowvolatility context, where reward probabilities remain stable or reverse infrequently, and a high-volatility context, where contingencies shift often, increasing uncertainty about which actions will pay off. We base this prediction on the notion that in highly uncertain environments, individuals preferentially engage stimulus-driven mechanisms elicited by environmental cues to guide behavior. Accordingly, we anticipated that under high volatility, participants would rely more heavily on Pavlovian cues predicting reward—even at the expense of selecting the objectively optimal action. To test this, participants completed a Pavlovian-to-Instrumental Transfer (PIT) task. First, in Pavlovian conditioning, two stimuli were paired with rewards (CS+) and one signaled no

reward (CS-). Then, in instrumental learning, participants chose between two actions yielding those rewards with 80% vs. 20% probability in two contexts: low volatility, in which action–reward probabilities reversed only once, and high volatility, in which they reversed five times. Finally, in the transfer stage, participants repeated the choice task under both volatility conditions while CS+ and CS- appeared as task-irrelevant stimuli. Preliminary data confirm our hypothesis: only in the high-volatility condition did conflictual CS+ presentations — i.e., Pavlovian cue predicting the low-probability action — disrupt optimal choice behavior, whereas CS- (control condition) and CS+ aligned with high-probability action trials showed no difference across volatility contexts. This demonstrates that uncertainty during instrumental learning increases the influence of Pavlovian cues over decision-making, shedding light on how environmental uncertainty shapes the balance between stimulus-driven and goal-directed control.

P1.13 | Plasticity Induction By Targeting White Matter With Transcranial Ultrasound Stimulation

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Transcranial Ultrasound Stimulation (TUS) for neuromodulation involves focusing pulses of ultrasound through the skull. To date, TUS neuromodulation research in human and animal models has targeted grey matter and has demonstrated effects on inhibitory and excitatory neurons, depending upon the pulse repetition frequency, that persist beyond the sonication. Plasticity was observed following 5 Hz TUS to primary motor cortex (M1), with motor evoked potentials increased for > 60 minutes (Zeng et al., 2022). In this study, we investigated the effects of TUS deliberately targeting the corticospinal tract emanating from the hand region of M1. We hypothesised that 5 Hz TUS to the corticospinal tract would induce plasticity, quantified with transcranial magnetic stimulation (TMS) as an increase in corticospinal excitability. Participants (N = 15) first underwent an MRI to obtain highresolution T1 anatomical images, and a diffusion weighted scan for white matter tractography. The T1 image was used to generate a pseudo-computed tomography image of the skull bone for k-Wave acoustic simulations of the TUS focus through the skull, and for TUS neuronavigation using the Brainsight system. Participants then completed three sessions involving 5 Hz TUS (20 ms ultrasound pulses every 200 ms for 80 s) with TMS measures obtained at baseline, and for 50 minutes post-TUS. In each session, TUS was targeted at i) the same hand region of M1 as stimulated with TMS (left-M1hand), ii) the same corticospinal tract as stimulated with TMS (left-CST), or iii) the opposite corticospinal tract (rightCST) as an active control condition. We observed a sustained increase in motor evoked potential amplitude following 5 Hz TUS targeting the same corticospinal tract as TMS. Critically, we demonstrate anatomic specificity: white matter plasticity occurred when TUS targeted the same corticospinal tract (left-CST)

as TMS but was absent when TUS was directed to the opposite hemisphere (right-CST, control), with a significant interaction effect ($p = .036$). These results support the premise that 5 Hz 'theta' TUS can modulate networks via effects on myelinated axons and aligns with studies demonstrating effects of TUS on mechanosensitive ion channels at nodes of Ranvier.

P1.15 | The Impact And Timing Of Gender Expectations During Face Perception Is Modulated By Task Contexts

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The impact and timing of gender expectations during face perception is modulated by task contexts. Francisco Gutiérrez-Blanco, Ana F. Palenciano, Carlos González-García and María Ruz. Mind, Brain and Behavior Research Center (CIMCYC), University of Granada, Spain. Face perception happens through a reconstructive process, where the bottom-up encoding of sensory information (faces features) interacts with and is modulated by higher-order social cognitive processes, including sex/gender stereotypes. Such stereotypes, in line with predictive encoding models, can be operationalized as high-level implicit expectations about which face features are more likely to be associated with one sex or the other. Previous fMRI studies have shown that neural pattern encoded sex/gender expectations (SGE) were reflected in both perceptual areas associated with processing faces and prefrontal areas involved in generating predictions. However, the sluggish fRMI signal is agnostic regarding the early and/or late stages affected by these modulations. In addition, the role that task goals may have in the operation of these expectations is also unclear. In the current study, we (1) examine the temporality with which SGE modulate face perception, using electroencephalography (EEG) and analysis of behavior. Then, (2) we further explore whether such modulation is determined by task contexts and (3) study the similarity in the patterns of neural and behavioral modulations of SGE reflect. To this end, we employed a Mouse Tracking paradigm and EEG recordings during sex/gender (male vs. female) and emotion (angry vs. happy) categorizations of faces congruent (angry male and happy female) or incongruent (happy male and angry female) with SGE. Mouse tracking results showed congruency effects, with both the maximum degree of curvature of the trajectories and their latency being significantly higher when categorizing incongruent faces. Furthermore, these effects were significantly larger during the emotion blocks. Time-resolved Representational Similarity Analysis (RSA) of EEG and mouse data revealed that patterns of activity in both modalities reflect SGE at intermediate-late stages of face processing. Finally, a time-resolved EEG-Mouse Fusion Analysis indicated similarities between EEG and Mouse patterns.

Overall, our results stress the role of task goals in modulating the extent of the effect of expectations on face perception. Importantly, and in contrast with predictions of the dynamic interaction (DI) model of face perception, our results suggest that activity patterns encoding SGE operate at intermediate-late stages of face processing, well after the coding of sex/gender perceptual features.

P1.16 | The Interplay Between Experimental Heat Pain And Non-invasive Stimulation Of The Medial Prefrontal Cortex On Reinforcement Learning With Manipulated Outcome Contingencies

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Pain negatively affects several cognitive abilities, but knowledge about its effect on reinforcement learning is limited. During reinforcement learning, instrumental choices can be influenced by heuristic tendencies to approach rewards or inhibit actions when facing potentially aversive events, introducing “Pavlovian bias” in choice behavior. Recent studies suggest that compromised outcome controllability enhances Pavlovian bias, a phenomenon that may be linked to suboptimal decisionmaking in learned helplessness. Since learned helplessness is common in chronic pain syndromes, this study sought to establish a link between experimental heat pain (EHP), disrupted reward/loss contingencies and RL performance in healthy adults. In addition, we investigated if intermittent theta burst stimulation (iTBS) above the medial prefrontal cortex (mPFC) alleviates the deleterious effects of EHP on task performance. In a pre-registered, 2x2 between-group, double-blind study (N = 100), healthy adult participants underwent 3 blocks of an orthogonalized Go/NoGo task with two interleaved bouts of active or sham iTBS, and either EHP or warm skin stimulation combined with manipulated response-outcome contingency during the task. Although EHP did not impact response accuracy, it invigorated actions for rewards, reflecting enhanced Pavlovian bias. While two bouts of iTBS attenuated Pavlovian tendencies, this effect was counteracted by EHP, indicating antagonistic effects of pain and iTBS-modulated mPFC activity on Pavlovian-instrumental interactions. Surprisingly, EHP and iTBS exerted largely similar effects on other latent parameters of reinforcement learning (go-bias, learning rate, exploration) in a manner that resembled learned helplessness. These findings shed light on the role of experimental pain and mPFC activity in choice behavior that may be linked to learned helplessness in chronic pain.

P1.17 | Voices From Within — Auditory Feedback Control Of Speech Can Be Modulated Using Classical Conditioning

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Background: The brain monitors sensory feedback to test how well produced speech sounds match the expected sensory targets. When it detects a mismatch in the sensory feedback, it issues corrections to the motor commands. This process, therefore, requires integrating two different sources of information: internal, top-down expectations and external, bottom-up sensory feedback. Here, we test to what extent classical Pavlovian conditioning — which can be used to modulate top-down expectations — can be used to modulate speech feedback control. Can changes in top-down expectations be used to modulate how participants hear and correct sensory feedback errors in their own vocalization? Methods: Healthy young participants (N=59) sustained vowel /u/ for ~4 secs, and heard their voice through headphones while fixating on a black cross. During each trial, the pitch of auditory feedback was unexpectedly shifted up for 200 ms. The magnitude of the pitch shift varied between 65–0.1 cents. During the pitch shift, the fixation cross changed color, that is, the participants were conditioned to associate a change in the fixation color with an upward pitch shift in their auditory feedback. Participants' task was to report if they noticed a pitch shift. As the experiment progressed, trials with no pitch shifts became gradually more frequent so that the change in fixation color often happened without any noticable pitch shift. Results: To examine if conditioning modulated the participants' perception of the pitch shift, we first analyzed solely the trials where no artificial pitch shift was applied (but the condioning stimulus suggested a pitch shift). The frequency of false-alarm responses (where a participant reports noticing a pitch-shift even though no pitch-shift was applied) increased from ~6% to ~15% during the experiment ($p < .002$). Comparison of false-alarm with correct-rejection trials indicated that false-alarm responses were associated with minor natural upward shifts (~2 cents) in the pitch of the participant's own voice right before the conditioning stimulus appeared ($p = .002$). Analyzes on trials with artificial pitch shifts showed that conditioning also affected how the participants' modulated their speech after the pitch shift ($p = .004$). Conclusion: The results show that through conditioning the participants became sensitized to detect miniscule natural shifts in the pitch of their own voice. Conditioning also influenced the corrections that the brain issued to vocalization after the pitch shifts. The results thus indicate that top-down conditioning can be used to modify feedback control of speech. The results help understand speech feedback control and could open possibilities for novel means of rehabilitation.

P1.18 | Construction Of A Simulation-based Dual-task Mental Fatigue-induction Paradigm For Pilots

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Flight fatigue directly impacts aviation safety. Current laboratory fatigue induction models either require complex experimental setups or prolonged durations (up to 48 hours), making them impractical for experimental implementation. We constructed a fast mental fatigue-induction paradigm for pilots based on a simulated task on the ground. Evaluation of the effectiveness of the paradigm was assessed by subjective and objective biomarkers of mental fatigue induced by the paradigm. Given that the fatigue induction task needs to closely resemble pilots' daily work while incorporating cognitive behaviors such as multitasking, precise control, memory recall, and information processing. Therefore, we adopted a quadruple-task superimposed flight simulation task (simultaneously controlling aircraft pitch, roll, and yaw axis attitudes while performing adaptive-number digit summation operations) as the fatigue induction paradigm. 50 pilots participated to perform the 100-minute task. Preand post-simulation measurements were collected including subjective fatigue assessments, flash fusion frequency, cognitive task behavioral metrics (reaction time and reaction time-related parameters), and electroencephalographic (EEG) indicators (contingent negative variation, CNV) to evaluate the reliability of the flight simulation task in inducing mental fatigue. After the task, subjective fatigue ratings increased significantly after the task ($t = 4.16$, $p < 0.001$), flash fusion frequency differentiation for red and blue light decreased significantly($t = -3.16$, $p = 0.015$), variance at the reaction time increased significantly($t=6.083$, $p< 0.001$), rates of response times exceeding 300ms and 400ms were increased significantly(exceeding 300ms: $z = 2.527$, $p < 0.001$; exceeding 400ms : $z = 2.207$, $p < 0.001$), and CNV amplitude in FCz, Cz, CPz, and Poz decreased . The data demonstrates that after the 100-minute flight task, significant alterations occurred in mental fatigue-related metrics among participants. This establishes the protocol as a validated experimental paradigm for ground-based mental fatigue induction. Notably, the earliest observed changes occurred in EEG CNV indicators (contingent negative variation), suggesting that EEG parameters may demonstrate higher sensitivity to fatigue onset. Furthermore, marked changes in flash fusion frequency and omission rates not only reflect cognitive fatigue but also indicate vigilance decrement, suggesting for future investigation.

P1.19 | Creative Minds At Work: Oscillations Signature Of Associative And Dissociative Thinking

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Creative cognition emerges from the interplay between fast, associative processes and slower, controlled mechanisms. These processes are supported by large-scale brain networks; notably, the Default Mode Network (DMN), associated with spontaneous thought and the subjective experience of forming and retrieving memories, and the executive control network (ECN), linked to top-down regulation. While associative ideation primarily engages the DMN, dissociative ideation is believed to rely on executive mechanisms that override automatic semantic associations. Nevertheless, these networks dynamically interact during creative tasks, modulated by task demands and stages of creative thinking. EEG studies have linked alpha and theta oscillations to creative processes such as divergent thinking, remote association, and improvisation. However, the neural dynamics differentiating associative and dissociative creativity processes remain unexplored, particularly in relation to rich, naturalistic visual experiences offered by the arts. The present study examines the dynamic engagement of declarative memory and control systems during creative ideation, as reflected in EEG oscillatory patterns across associative and dissociative creativity tasks with paintings in contrast to a baseline condition (passive art-viewing). We hypothesized that associative processing would show increased alpha power (8–12 Hz) over posterior and fronto-medial areas, reflecting greater DMN involvement and conceptual access. In contrast, dissociative processing would display higher frontal-midline theta power (4–7 Hz), indicating stronger ECN engagement for top-down control and episodic retrieval. Participants (N=45) viewed a set of normalized paintings depicting people, places, and objects and were asked to generate three-word chains under each condition (associative, dissociative, and baseline). We collected task-related EEG data alongside behavioural performance and response times. EEG data were analysed using time-frequency decomposition (Morlet wavelets), and power activity of alpha and theta bands across regions and conditions. Results explored neural activation patterns across conditions, reflecting the multifaceted nature of creative cognition and its sensitivity to the cognitive demands of each task. By capturing the dynamics of associative and dissociative ideation, this study aims to advance understanding of how oscillatory patterns serve as neural indicators of the interplay between memory and control systems underpinning creative cognition. Keywords: creative cognition, associative thinking, dissociative thinking, memory, EEG.

P1.20 | Delta-band Inter-brain Synchrony Tracks Shared Audience Engagement With Live Dance Performances

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Evolutionary theories claim that the live performing arts – dance, music and theatre – allow for cultural transmission though collective experience sharing. Watching live dance, theatre, or music events is an inherently social activity in which people often share a highly emotional experience. Yet, neuroscientific studies of these inherently social art forms are almost exclusively conducted on individual people watching video or sound recordings alone in a laboratory. Across three live dance performances, we simultaneously measured real-time dynamics between the brains of large audience groups of up to 23 members using mobile wet-electrode EEG (N = 69). We computed inter-subject correlations and phase lag values between the EEG of audience members relative to an active resting-state baseline. In a separate study (N = 28), individuals watched a recorded video of the performance alone in a laboratory condition. Interpersonal neural synchrony (INS) in the delta band (1-4 Hz) varied systematically with the dancers' movements and the audiences' collective engagement as predicted by the choreographer. INS was reduced when people watched a video of the performance on their own in a laboratory. Choreographic sections with higher INS were also rated as more engaging by an independent sample of viewers. Our study shows that live experiences are measurable as dynamic brain synchrony between co-present spectators and reflects artistically directed collective engagement with a live dance performance.

P1.21 | The Influence of Rehearsal on Memory Precision and Stability

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The more you repeat information, the better you will remember it later. Fittingly, it has recently been shown that rehearsal can accelerate the process of memory consolidation by rapidly forming stable neocortical memory traces. However, there is limited understanding of how this process affects memory quality. Here, we report preliminary findings from a novel task designed to assess the influence of rehearsal on memory precision and stability, both in behavior and functional brain activity. Healthy, young adult participants (planned n=60) encode and recall new associations between a cue and a target stimulus in two spatial locations presented on a specific background scene either once (single items) or four times (rehearsed items) during fMRI. We test memory performance both 60 minutes and three days after learning along four dimensions: Memory for target category, target exemplar, target location and scene. Additionally, stimulus material was designed to enable classification and similarity analyses on fMRI data. Preliminary data of n=8 participants suggest that memory for detailed item features and spatial precision is higher in rehearsed items compared to single items in both delays and that memories for single items degrade significantly over time. Preliminary fMRI results confirm a higher neocortical contribution for rehearsed vs. single items already during the learning session. Together, our data indicate that rehearsal might rapidly engender not only more stable, but also more precise memory traces in the neocortex, contradicting traditional systems consolidation theories of a slow learning neocortical system, which stores information in a semantic, gist-like format.

P1.22 | Identifying brains through natural frequency fingerprinting

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Neural oscillations play a fundamental role in supporting brain function and cognitive processes. Thus, identifying the brain's inherent oscillatory activity, or natural frequencies, is crucial for understanding its functional organization. A recently introduced data-driven approach based on k-means clustering of power spectra enables the mapping of natural frequencies across the entire cortex without relying on predefined anatomical regions or frequency bands. Nevertheless, a key drawback of this method is that its applicability is restricted to the group level, due to the low resolution of individual maps. In this study, we sought to refine this technique to enhance the quality of natural frequency brain maps at the single-subject level. To achieve this, we implemented two main adjustments to the original method: (1) increasing the number of individual power spectra assigned to each k-means cluster, and (2) applying spatial smoothing across neighboring voxels. We assessed the effectiveness of these modifications using the fingerprinting technique to determine whether individuals could be consistently identified based on their intrinsic oscillatory activity. To construct the individual natural frequency maps, we used magnetoencephalography

(MEG) data from 128 individuals with a single recording session from the Open MEG Archive (OMEGA), comprising the within-session group, and a subset of 27 participants with more than two sessions, comprising the between-session group. The fingerprinting procedure was based on the correlation between the first and second instances of each participants' data, with the highest correlation coefficient indicating the correct match. Our results show a high degree of accuracy in individual identification, both within a single recording session (95%) and across separate sessions (74%). Furthermore, we were able to identify individuals by their natural frequency fingerprints, even with a gap of over four years between sessions. This demonstrates the robustness of the single-subject mapping of natural frequencies and opens new opportunities for detecting individual variations in intrinsic oscillatory brain activity, with potential applications in identifying pathological conditions.

P1.23 | The compositional structure of the alpha rhythm

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Alpha activity is one of the most dominant and extensively studied features of brain function, both in fundamental neuroscience and clinical research. Many studies have focused on variability in the speed of alpha oscillations, often using it as a proxy for perceptual and cognitive functions, as well as neurological conditions. Typically, this involves estimating a single parameter — the individual alpha peak frequency — from all electrodes or a subset of them. However, several studies suggest that multiple distinct alpha rhythms coexist, which may be overlooked when considering only global measures. This raises the possibility that brain functions or conditions commonly linked to the overall speed of alpha activity may instead depend on how multiple alpha components interact and contribute to global alpha dynamics. In other words, associations with alpha rhythms may reflect the combinatorial effects of distinct components rather than a single, continuous frequency measure. To investigate this, we conducted a large-scale analysis of alpha activity across multiple resting-state EEG datasets, totaling more than 800 participants. We applied a frequency-PCA framework to extract multiple alpha components and derived metrics to quantify their combinatorial nature as a stable feature of the human brain. Additionally, we examined their relationship with age and individual differences in IAPF, ultimately proposing an approach for alpha profiling.

P1.24 | Attention and Explicit Knowledge Drive Sharpening in Early Visual Processing

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Perception is increasingly understood as an inferential process, wherein sensory inputs are integrated with predictions derived from prior knowledge. However, there is conflicting evidence regarding how such predictions modulate neural representations in sensory regions. Two contrasting mechanisms have been proposed: sharpening, which enhances neural selectivity, and dampening, which broadly suppresses activity. We hypothesized that sharpening specifically arises when individuals possess explicit knowledge of, and attend to, predictive associations, whereas dampening may reflect a lower-level mechanism characteristic of more implicit, statistical learning contexts. To test this, we developed a novel multisensory predictive cueing paradigm in which human participants were exposed to concurrent visual (oriented gratings) and auditory (pure tones) stimuli. Each modality maintained independent probabilistic associations (75% validity). Attention was manipulated by instructing participants to make perceptual judgments selectively on either the visual or auditory stimuli. Our behavioral modelling revealed that the predictive system is capable of simultaneously tracking predictions across different sensory modalities. Notably, these predictions do not operate in isolation; rather, they interact to satisfy behavioral goals. In a subsequent fMRI study, we found that sharpening of expected stimuli occurred in early visual cortex, but only when participants attended to the visual modality. Critically, the degree of sharpening increased with explicit knowledge of the associations. Together, our findings offer a novel framework for reconciling discrepancies in the sensory prediction literature by highlighting the top-down modulatory influences on predictive processes that were previously considered purely automatic and implicit.

P1.25 | Long-term Dynamics of Neuronal Representations of Natural Stimuli in Human 7T fMRI

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Recent advances in fMRI data analysis have enabled the examination of activation patterns from a population of voxels in human subjects. These patterns are meaningful and contain more information regarding the perception and mental state of the subject than the activity of individual voxels. Although much effort in the field has been made to characterize the neural patterns that correlate with specific stimuli or

mental states and decode them, the understanding of how the neural representation of a specific perceptual experience evolves over time in humans is still lacking. Previous studies in mice have shown that while neuronal responses to any given stimulus exhibit time-dependent changes, known as 'representational drift', the structure of relationships between population activity patterns remains stable over time. To investigate representational drift in human participants, we collected longitudinal high-resolution functional data using 7T fMRI of participants viewing repeating movie clips across multiple scanning sessions. The movie stimuli consisted of three five-minute movie clips from familiar TV series. We examined the dynamics of the population activity patterns and their relationships in response to repeated presentations of the same stimulus in a withinsubject approach, focusing on both the repetitions within a scanning session and between different sessions. Our preliminary results show that the structure of population activity patterns remains stable in response to different viewings of the same movie within a scanning session. We will also present an initial exploration of the long-term dynamics of the code across days.

P1.26 | Inner Speech Propensity Predicts Phase-locked and Non-phase-locked Electrophysiological Activity During Cued Object Recognition

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Language has been shown to influence visual functions like object detection and recognition. However, little is known about how these functions might be affected by individual differences in the subjective experience of covert language, i.e., inner speech, particularly at the neural level. In this study, we examined how inner speech propensity, measured with the Internal Verbalization scale of the Internal Representations Questionnaire - German, relates to EEG activity during object recognition. Participants viewed a word cue followed by a target image and indicated whether the two matched. Stimulus pairs varied in semantic and phonological similarity. We hypothesized that inner speech experience would augment cue perception and interpretation, leading to more selective/categorical mental representations. Thus, we predicted relatively higher post-cue alpha and beta power in individuals with higher Internal Verbalization scores. We also expected inner speech propensity to impact target-locked P1 amplitudes depending on image typicality, following previous reports of typicality-modulated language effects on early object recognition. Additionally, we expected response times to relate to EEG activity to the extent it reflected functions relevant to participants' same/different decisions. Finally, we expected inner speech to modulate the relationship between EEG measures if inner speech induces categorical warping of cue representations that serve as a prior context within which target images are processed. Single-trial linear mixed model analyses broadly supported our predictions. Higher vs. lower Internal Verbalization scores were associated with reduced alpha (8–12 Hz; ~200–500 ms) and beta (13–20 Hz; ~400–800 ms) power decreases following the cue, particularly at first presentations.

Additionally, higher scores were associated with enhanced P1 amplitudes for less typical images but reduced P1 for more typical ones. Significant links between response times and EEG measures and between the two types of EEG activity were also found, with effects varying according to Internal Verbalization scores and stimulus characteristics. Our findings provide novel evidence that self-reported inner speech propensity shapes the neural dynamics of cued object recognition at multiple stages, highlighting this trait as a meaningful dimension of individual variability in language-guided perception.

P1.27 | Arithmetic-Responsive Regions do Not Respond Differently to Nominal and Cardinal Numeral Processing

Shermine Lau (Nanyang Technological University); **Ngieng Shih Yang** (Nanyang Technological University); **Darren Yeo** (Nanyang Technological University)

Numerals are versatile symbols, processed nominally (e.g., identification number) or cardinally (e.g., 528 > 285). In particular, place-value processing (e.g., 528 as 5 x 100 + 2 x 10 + 8 x 1) is essential for understanding cardinal numbers but not nominal ones. Interestingly, behavioural studies show that place-value processing is automatic and obligatory even when it is task-irrelevant, suggesting that brain regions involved in arithmetic processing may be automatically engaged when we encode numerals. Yet, other evidence indicates that parsing the place-value structure of multi-digit numerals and representing them as whole quantities do not depend on explicit arithmetic computations. The present study investigated whether multi-digit numerals engage an arithmetic-responsive network more when processed as cardinal numbers than nominal numbers, and whether the engagement of the arithmetic-responsive network is lateralized. Ten adults completed four sessions of 3T fMRI scans using a dense-sampling approach. Participants completed same-different identity judgments on digit strings (nominal) and magnitude comparisons of multi-digit numerals (cardinal) in a mixed block/event-related, delayed-match-to-sample task. Control conditions included words and nonwords. An arithmetic network localizer (addition versus sentence reading) was used to define subject-specific arithmetic regions functionally. We extracted activation responses to nominal and cardinal processing of multi-digit numerals and control stimuli from selected arithmetic-responsive regions in the intraparietal, inferior temporal and middle frontal cortices. Except in the middle frontal regions, we found no evidence of above-baseline activation for both nominal and cardinal processing of multi-digit numerals in the arithmetic-responsive regions. Crucially, responses did not differ between nominal and cardinal processing or between the left and right hemispheres. Similar results were found for words and nonwords, suggesting that the frontal activation observed was not specific to arithmetic processing. Overall, the findings are consistent with a model of a dedicated number-syntax processor that is functionally and anatomically distinct from arithmetic networks. This study provides the first neuroimaging evidence

that arithmetic regions do not automatically handle place-value parsing or nominal-versus-cardinal distinctions, reinforcing the view of separate numeral-syntax and calculation pathways.

P1.28 | A Comparative Study of Eeg Protocols for Sensory Processing Investigation: Frequency Tagging Versus Component Analysis

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An evoked potential (EP) is the time-locked average of the cortical response to a specific sensory, motor, or cognitive event. Due to their low signal-to-noise ratio (SNR), multiple stimuli must be recorded and averaged for reliable identification. This can lead to long recording times, as seen in mismatch negativity (MMN) protocols, which can be challenging for clinical or pediatric populations. As an alternative approach, frequency tagging (FT) involves periodic modulation of a stimulus at specific frequencies, eliciting steady-state evoked potentials (SSEPs) with higher SNR. Despite limited temporal resolution, FT offers faster execution, making it more suitable for these populations. This study compares FT-derived SSEPs with traditional EP and MMN components to evaluate their complementarity and improve understanding of evoked brain activity. It also investigates whether FT can offer a more detailed view of sensory processing and potentially serve as an alternative to MMN protocols in clinical and pediatric populations. Twenty adults participated in auditory and visual oddball tasks involving pure tones and schematic faces. For each modality, three stimuli were used: one standard and two deviants (small and large differences from the standard). In the FT paradigm, the standard stimulus was presented at 6 Hz and the deviant at 1.2 Hz in 60-second sequences, repeated four times. MMN and EP paradigms used the same stimuli with equiprobable or oddball sequences. Sequence order was counterbalanced across participants and modalities. In the auditory FT paradigm, peak amplitudes and SNR were higher at the stimulation frequencies (1.2 and 6 Hz) than at harmonics. The larger deviants elicited stronger responses than the smaller one, indicating sensitivity to deviance magnitude. In contrast, MMN amplitude and latency did not differ between deviants, and no significant correlations were found between parameters extracted from FT, MMN, and EP paradigms. These preliminary results suggest that FT may offer greater sensitivity to subtle auditory deviance compared to MMN, while requiring shorter recording times. As such, FT could represent a promising alternative for evaluating discrimination processes in clinical or pediatric populations. Results from the visual modality are currently under analysis. Key words: EEG, frequency tagging, MMN, evoked potential, sensory systems.

P1.30 | Eeg/erp Visualization Package Unfoldmakie.jl and Uncertainty Visualisation in Topoplots

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UnfoldMakie.jl is a Julia package designed for visualizing electroencephalography (EEG) data, particularly event-related potentials (ERPs) and regression-ERPs (rERPs). As one of the few specialized EEG visualization libraries, it stands out for its ease of use, high customizability, speed, and comprehensive documentation. The package supports both interactive exploration (e.g., zooming and panning) and export of publication-ready vector graphics. This is made possible through multiple Makie.jl backends: CairoMakie.jl for vector graphics, GLMakie.jl for GPU-accelerated interactive visualization, and WGLMakie.jl for browser-based rendering. In a previous study (Mikheev et al., 2024), we gathered insights from novice and expert practitioners about their ERP visualization workflows, using this feedback to refine and enhance UnfoldMakie.jl. While the package is independent of any specific analysis framework, it integrates well with Unfold.jl, a toolkit for rERP analysis. UnfoldMakie.jl is intended for researchers and practitioners working with EEG, MEG, ERP, iEEG, or other time-series data. After the initial publication of UnfoldMakie.jl at JOSS (Mikheev, 2025), we are now preparing the next step: 1) The integration of uncertainty visualization techniques for scalp topography plots (topoplots); 2) online user study to evaluate which technique is more informative. For first goal we will implement such methods as Adjacency representation, Animation (Hypothetical Outcome Plot), Bivariate colormaps, Value Suppressing Colormaps, Marker size, Parametric texture, Contouring. For second goal, we plan to ask some questions about presented EEG figures. Possible survey questions could be: 1) Is there any activation on this topoplot? If so, identify the boundaries of this activity and draw them on the scalp image.

P1.31 | Memory Through an Empathic Lens: Investigating the Relationship Between Trait Empathy and Episodic Memory

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Memory Through an Empathic Lens: Investigating the Relationship Between Trait Empathy and Episodic Memory The evolution and survival of the human species has been profoundly shaped by our advanced social cognition, underpinned by two interrelated cognitive faculties: empathy and episodic memory. While empathy enables us to understand and resonate with the emotions of others, episodic memory

allows us to mentally revisit past experiences. In this study, we investigated the underexplored association between empathy and episodic memory, and hypothesised that highly empathic participants would also exhibit enhanced episodic memory performance, which would be underpinned by shared neural circuitry. Data were collected from 150 healthy, right-handed participants, aged 18–40. Trait empathy was measured using the Interpersonal Reactivity Index (IRI). To assess episodic memory, participants watched 24 socially themed videos while undergoing fMRI scanning. The participants recalled the videos silently inside the scanner, and then aloud in a post-scan retrieval task. Memory reinstatement effects were measured by correlating brain activity during video watching and during silent recall. For an objective memory measure, the verbal recollections were coded and scored for correct central and peripheral details, as well as errors. Subjective memory strength was also recorded based on participants' self-ratings for each video. Our findings suggest that empathy is associated with subjective evaluations of memory for social contexts, as a positive correlation was found between the IRI and the video ratings. We expect this finding will be reflected with objective episodic memory, when the IRI and the memory recall scores are correlated. Significant memory reinstatement effects were also found in brain regions associated with social and empathic processing. Further analyses will investigate if these effects are related to our behavioural measures of empathy and episodic memory. Our preliminary findings suggest that there are links between trait levels of empathy and how social contexts are remembered. This may reflect individual differences in how people focus their attention on social and emotional cues when observing characters interacting.

P1.32 | Vocal Smile Processing in Autism: Intact Representation But no Facial Reactivity

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Atypical production of emotional prosody have been reported in autism. However, it remains unclear whether these differences stem from atypical mental representations of vocal emotions or from altered motor resonance. This study aimed to investigate the mental representation and contagion process of vocal smiles in autistic adults. Twenty autistic and twenty neurotypical participants completed an auditory

reverse correlation (RevCor) task, allowing extraction of the acoustic features underlying their mental representations and the variability in these representations (internal noise). Additionally, facial electromyographic (fEMG) responses of the Zygomaticus major and Corrugator supercilii were also recorded during a prosody recognition task to assess facial motor resonance. The majority of autistic participants (11/20) based their mental representation of vocal smiles on acoustic features similar to those used by neurotypical individuals, with no group differences in internal noise levels. Cluster analyses revealed that differences in representational typicality were driven by a small subset of autistic participants (5/20) who displayed less typical representations. Importantly, some neurotypical participants were also found to have a different representation of the vocal smile. In terms of facial reactivity, autistic adults showed no significant motor response — neither to emotional perception nor to explicit judgement — despite preserved internal representations. In contrast, neurotypical adults exhibited a dissociation between implicit and explicit motor resonance: Zygomaticus major activity reflected perception (with greater activation for smiling voices), while Corrugator supercilii activity was linked to explicit judgment of emotion. A qualitative analysis of the facial reactivity in each cluster will be provided. Thanks to this integrative approach, it was possible to disentangle atypical motor resonance from atypical mental representation of vocal smile in autism. These findings suggest that while most autistic adults have intact mental representations of vocal smile, reduced motor resonance may contribute to the observed social difficulties. This study highlights the importance of jointly exploring and describing mental representations and motor resonance processes in understanding emotion processing in autism.

P1.33 | Shaping Defensive Peripersonal Space and Comfortable Space Around the Feet: The Role of Affective Valence

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Peripersonal space and comfortable distance represent distinct yet overlapping spatial constructs that support defensive actions and social regulation, respectively. While PPS is defined as a body-centered multisensory space enabling rapid responses to proximal threats, comfortable distance reflects affectively guided interpersonal boundaries. However, the relationship between these spaces remains poorly understood. This is especially true for the lower limbs, which play a central role in locomotor avoidance. This study investigates how motion dynamics (looming vs. static) and emotional valence (neutral vs. aversive) jointly shape lower-limb PPS and comfortable distance. Participants in a virtual reality environment performed either a visuotactile detection task (PPS) or a distance judgment task (comfortable distance), both under the same stimulus conditions. We test three hypotheses: (1) aversive stimuli expand both PPS and comfortable distance; (2) looming stimuli bring greater spatial expansion, especially for aversive content; and (3) PPS and comfortable distance are

modulated in parallel, suggesting partially shared mechanisms. These findings aim to advance our understanding of how emotional and motion-related cues jointly coordinate sensorimotor and social boundaries near the lower limbs.

P1.35 | The Effects of Attentional Engagement on Eeg Markers of Boredom

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In our previous electroencephalography (EEG) study, we examined the neural activity associated with boredom during repetitive stimulation. Participants listened to a uniform auditory sequence and indicated when they experienced boredom. We found a significant increase in frontal theta activity preceding these responses, which may reflect a state of attentional disengagement. This result is consistent with earlier studies linking frontal theta oscillations with internally directed attention and mind-wandering. While this activity appeared to accompany boredom, its relationship to subjective awareness of the experience remained unclear. In the present study, we examined whether attentional engagement could influence both neural activity and subjective ratings of boredom in a similarly repetitive context. Fourteen participants repeatedly consumed identical stimuli while instructed to maintain focused attention on their sensory and bodily experiences. EEG was recorded throughout the session, and participants rated their boredom using a visual analogue scale (VAS 1–10). The results showed that this attentional manipulation was associated with lower boredom ratings and a reduction in frontal theta activity compared to patterns observed in our previous data ($p < .05$). These findings suggest that attentional focus may modulate the degree of boredom experienced during repetitive tasks, as well as associated neural dynamics. Although further research is needed to generalize these findings, the results provide preliminary support for the role of attentional strategies in altering subjective experience and underlying brain activity.

P1.36 | Alterations in the Microscopic Organization of Movement in Psychosis and Cannabis Use

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Submovements appear as pseudo-rhythmic (~2-3 Hz) discontinuities in kinematic signals during continuous movement. They are thought to reflect the integration of pre-programmed (open-loop) and feedback-based (closed-loop) control mechanisms and represent a microscopic signature of intermittent sensorimotor control. Previous studies have reported motor impairments in individuals with psychosis and chronic cannabis users, suggesting similar dysfunctions in corticostriatal and cortico-cerebellar circuits. However, the organization of movement at the microscopic, submovement level, has not been specifically investigated in these populations. Individuals with psychosis (n=19), healthy regular cannabis users (n=19), and healthy controls (n=19) performed a visuomotor task involving flexion-extension movements of the index finger. Participants synchronised their movements with a moving dot, executing either in-phase or anti-phase movements. The dot followed either a sinusoidal or a pre-recorded human trajectory, the latter exhibiting natural submovements. Kinematic data were recorded using accelerometers, and submovements were identified as peaks in band-pass filtered signals (1-4 Hz). Submovement probability was computed relative to the timing of submovements in the dot, and compared with surrogate datasets in which participants' movements were shuffled in time. Additionally, the intersubmovement interval – the time between consecutive submovements – was calculated across the full kinematic trace. Regression analysis was conducted to explore associations between submovement markers and psychiatric symptom load, neuroleptic dosages, and extrapyramidal symptoms. Healthy controls generated submovements that systematically followed those observed in the dot, suggesting effective co-modulation and integration of visual feedback. In contrast, participants with psychosis and cannabis users exhibited a more irregular and inconsistent pattern. This alteration was more pronounced in the psychosis group, who demonstrated a significantly lower probability of generating a submovement following the observed one, as well as reduced temporal consistency compared to both control groups. These findings suggest an early disruption of feedback-based motor control in individuals with psychosis, and to a lesser extent in cannabis users. The reduced and inconsistent submovement generation suggests impaired sensorimotor integration and a tendency toward openloop control, even during tasks requiring continuous feedback-based adjustments. Future studies are needed to clarify whether current or historical neuroleptic treatment causally contributes to the observed motor alterations.

P1.37 | Harnessing Generative AI for Mnemonic Pattern Separation Research: A Novel Stimulus Set Featuring Naturalistic Images With Systematically Varied Similarity

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Remembering overlapping but distinct events relies on pattern separation, a process commonly studied using the Mnemonic Similarity Task (Stark et al., 2019). Performance on this task is influenced by stimulus features, including the degree of perceptual overlap between targets and lures and overall scene complexity. However, no validated stimulus set currently exists that uses complex, naturalistic images with systematically controlled similarity. Here, we introduce a novel stimulus set created using Midjourney, a state-of-the-art generative artificial intelligence (AI) platform for producing high-quality synthetic images. For each scene category, the set includes image pairs varying in degree of similarity, allowing systematic investigation of how target-lure perceptual similarity affects mnemonic discrimination. A total of 180 unique urban and natural scenes (e.g., "Bedroom", "Canyon") were generated. For each category, three batches of four images were created to represent different similarity levels by systematically adjusting Midjourney parameters. Low and moderate similarity pairs were generated by adjusting the "chaos" parameter, which modulates adherence to prompts, to low (0) and moderate (30). High similarity pairs were generated using the "variation" feature, which produces subtle variants of a specific image. Each batch was manually reviewed, and the two most representative images were selected to form a pair, yielding 3 × 180 image pairs covering three similarity levels per category. To assess perceptual similarity, two independent raters evaluated all pairs using a 5-point Likert-type scale. Based on these initial ratings, some pairs were replaced to improve differentiation between the high, moderate, and low similarity levels. The refined set was then rated by 15 additional independent raters recruited both locally and via Prolific. Scene categories were included to ensure that average similarity scores for each image pair followed the intended ordinal pattern: high > moderate > low. The final set included 156 scene categories, with grand average similarity rating of: high = 4.1 (SD = 0.39), moderate = 3.22 (SD = 0.57), low = 2.27 (SD = 0.52). This image set is currently being further validated using a modified Mnemonic Similarity Task to assess its utility in memory research targeting pattern separation.

P1.38 | Assessing the Preferred Route of Breathing for Coordinating Sleep Oscillations and Memory Consolidation

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While respiration is essential for maintaining metabolic homeostasis, it also plays a direct role in shaping brain activity. This influence is not limited to changes in blood gases but includes the modulation of rhythmic neural dynamics across multiple brain regions and states. Prior research has demonstrated that respiration modulates both the emergence and the interplay of the cardinal NREM sleep-related oscillations – namely, slow oscillations (SOs) and spindles – which are central to systems-level memory consolidation. However, the mechanisms underlying these modulations in humans remain largely unknown. It has been proposed that nasal breathing stimulates mechanoreceptors in olfactory sensory neurons, generating breathinglocked oscillations that propagate to the olfactory cortex as well as to neocortical and hippocampal regions. In parallel, respiratory rhythm generators in the brainstem may also contribute to the entrainment of neuronal oscillations within their innervated regions. To disentangle the contributions of the two proposed pathways in coordinating SOs and spindles, we experimentally manipulate the breathing route during sleep by selectively blocking nasal airflow while keeping respiratory rhythm generation intact. After completing an associative memory task, participants sleep either with the nasal airway being kept open and enforced with mouth tapes, or with the airway blocked by modified nasal clips to enable mouth breathing. EEG and respiration are recorded throughout sleep. In the next step, we will examine whether the integrity of the nasal route influences the coordination of sleep oscillations and memory consolidation. Slow oscillations and spindles will be detected offline; their phase relationship and coupling strength with respiration will be quantified. If nasal breathing is critical for modulating neural activity, its absence should weaken the coupling between respiration, SOs, and spindles. It should also impair the behavioral expressions of subsequent memory consolidation. This study aims to elucidate how respiration shapes neural dynamics during sleep, contributing to our understanding of brain-body interactions in cognitive and neurophysiological processes.

P1.39 | Sensorimotor Integration During Grasping is Mediated by Distinct M1 Circuits

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Motor control relies on the dynamic interplay between excitatory and inhibitory influences shaping sensorimotor integration during hand movements. In this study, we

investigated short-latency afferent inhibition (SAI) — a neurophysiological marker of sensorimotor integration — during different isometric grasping behaviours (precision vs. power grip). We applied transcranial magnetic stimulation (TMS) with different coil orientations [antero-posterior (AP) vs. postero-anterior (PA)] to engage distinct neuronal populations within the primary motor cortex (M1). We found increased SAI in the AP direction during grasp execution and enhanced corticospinal excitability for precision grip when tested with AP stimulation. These findings provide evidence that distinct cortical circuits within M1 are differentially engaged during different hand configurations. Notably, we observe no grip-specific modulation of SAI, which may reflect less topographically precise distribution of thalamocortical afferents — along with their lower temporal resolution, potentially shaped by cholinergic modulation. In addition, the execution of a grasping action engages a complex parieto-frontal network, with the ventral premotor cortex (PMv) playing a crucial role in motor planning by transforming objectrelated visual properties into motor plans. PMv may play a more prominent role than primary somatosensory cortex in distinguishing between precision and power grips, as recent findings suggest a preferential involvement of superficial M1 populations — targeted by PMv input — during precision grip execution. Future studies should investigate SAI dynamics across different phases (i.e. preparation vs. execution) of naturalistic prehension.

P1.40 | The Influence of Musicianship on Selective Attention to Acoustic Features of Speech and Music in Noisy Environments

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Music expertise has been associated with enhanced cortical tracking of acoustic features in speech, and better perception of speech in noisy environments. Past research mostly used speech distractors such as babble noises, single syllables, or speech segments. However, it is unclear whether the modality of the competing auditory streams also influences speech-in-noise detection in musicians. Here we examined whether musicians could transfer their advantage in auditory processing across domains, enhancing cortical tracking of the attended speech with music distractors, as compared to non-musicians. We recorded MEG activity as 25 professional musicians and 20 non-musicians listened to auditory stimuli of the following six conditions: two single streams (clear speech, clear music), two simultaneous streams with the

same modality (speech-in-speech, music-in-music) and two simultaneous streams with mixed modalities (speech-inmusic, music-in-speech), all ~6-minute long. Participants needed to attend to one stream and ignore the other in the simultaneous-stream conditions. To enhance task engagement, they were asked if some segments were present in the attended stream after each audio was played. We applied multivariate temporal response functions (mTRF) to estimate subject-specific linear kernels to predict MEG responses in the bilateral superior temporal gyrus. Models were estimated using acoustic envelopes and onsets of the stimuli, both verified as significant predictors in single auditory streams. TRF weights and prediction power, i.e., correlation, were compared across groups and attended/unattended streams in each condition using cluster-based permutation tests. Our results showed that musicians had enhanced M50TRF for speech onsets in the speech-in-music condition, and M200TRF for music envelopes in the music-in-speech condition, than non-musicians. Additionally, musicians showed enhanced M200TRF for envelopes in clear speech and clear music than non-musicians. In contrast, non-musicians showed enhanced M50TRF for acoustic onsets in clear music than musicians. No group differences were found in the same-modality conditions. In musicians, musical acoustic features predicted the MEG responses equally well as speech acoustic features did in both mixed-modality conditions, reflecting enhanced encoding of musical acoustic features regardless of attention. Our findings suggest that musicians have enhanced selective attention to the attended speech acoustic features with music distactors, supporting the cross-domain transfer hypothesis.

P1.41 | The Dynamics of Learning: The Role of Predictability and Stimulus Type

Magda Gawłowska (Jagiellonian University)

The way individuals process information and adjust their learning strategies is strongly influenced by the predictability of the learning environment. In addition, the emotional content of learning material can also affect how learning unfolds. This study examined how learning dynamics vary across deterministic (predictable) and probabilistic (unpredictable) conditions within a unified experimental design, incorporating both emotional and non-emotional stimuli. Participants completed a task in which they evaluated the correctness of stimuli associations, some emotionally charged and others neutral, while receiving either deterministic or probabilistic feedback. EEG was recorded using a high-density 256-channel system across four stages of learning. Analyses revealed significant differences in the temporal dynamics of Error-Related Negativity (ERN) and Feedback-Related Negativity (FN) amplitudes between conditions. These distinct patterns suggest that the brain engages different neural strategies depending on both the predictability of the environment and the emotional content of the stimuli. The results highlight how the brain adapts error-processing mechanisms in response to environmental certainty and stimulus type, offering key insights into adaptive learning strategies.

P1.42 | Clinical Expertise Modulates the Anticipation of Others' Pain Expressions

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Humans have a strong ability to automatically perceive and anticipate others' facial expressions, useful to infer emotional states and respond appropriately in social interactions. This is crucial when interpreting pain expressions, where quick assessments can guide empathic concern and action. This ability is studied through the Representational Momentum paradigm, within which observers tend to remember a moving object's final position as further along its trajectory (Freyd & Finke, 1984). This reflects a memory bias resulting from anticipation. There is variability in how people anticipate others' pain expressions (Dozolme et al., 2018). Interestingly, anticipation is modulated by domain-specific expertise (Hiroki et al., 2014). Repeated exposure to others' suffering, as in clinical contexts, has been shown to modulate empathic responses (Cheng et al., 2007). These findings suggest that prior exposure to emotionally charged cues may influence anticipatory processes, leading us to investigate whether clinical expertise contributes to interindividual variability in pain expressions' anticipation. 149 participants viewed 3 videos of a virtual agent's facial pain expression, varying in the number of activated pain-related Action Units (AUs; Ekman & Friesen, 1978), each associated with different perceived pain intensities (Prigent et al., 2018). Each trial involved a video (1, 2, or 3 AUs activated), followed by a mask and a static pain expression. For each video, this expression varied across five intensities (-30%, -15%, 0%, +15%, +30%) relative to the final frame of the video (70%). Participants were asked to judge whether this pain expression was more or less intense than the last frame of the video. We used a logistic cumulative distribution (sigmoidal) function to fit the proportion of "more intense" responses, which allowed us to estimate anticipation through the last facial expression intensity memorized by participants. Clinical expertise was self-reported via academic training or consultation frequency. Participants were categorized as naive (no clinical experience), novice (student clinician) or expert (professional clinician). Linear mixed models tested the interaction between pain expression intensity and expertise on anticipation. Preliminary results showed that anticipation gradually varied with pain expression intensity. This pattern differed by expertise, suggesting that clinical experience shapes how pain expressions are anticipated.

P1.43 | Auditory Mismatch Negativity Can Identify Patients With Alzheimer's Disease From Healthy Controls and Track Disease Progression Over Time

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Alzheimer's Disease (AD) is characterised by accumulation of amyloid (Aβ) and τ proteins, which are in turn associated with synaptic dysfunction and cognitive impairments. Neural activity as measured by magnetoencephalography (MEG) is dependent on synaptic functioning and may therefore be sensitive to disease (progression). Here, we examined neural signatures of AD with an auditory mismatch negativity (MMN) task. The MMN is an early event-related potential component reflecting automatic detection of a change ('deviant') following a sequence of standard sounds. Its automaticity makes it particularly suited to study clinical populations. We tested if the MMN showed: 1) between-group differences between patients with AD and healthy controls (identifying disease), and 2) within-participant changes over time (tracking progression). We analysed data from 34 healthy controls and 69 patients with AD or mild cognitive impairment from the New Therapeutics in Alzheimer's Disease study cohort. All patients showed evidence of substantial amyloid accumulation ('amyloid-positive') as established by positron emission tomography images or cerebrospinal fluid. MEG was recorded at baseline during a 10-minute MMN task, in which participants passively listened to a tone every 500 ms. The tones varied in frequency every 3-11 trials. Fifty-one patients repeated the task in a follow-up session (ranging 10-24 months after baseline, mean = 14 months). We extracted the root mean square across the gradiometers (1-40 Hz) and calculated the average wave form across trials, separately for each tone type. Next, we calculated the difference in evoked MMN amplitude (140-160ms post-stimulus) between the deviant and each repetition. These differences scores were averaged – resulting in one overall MMN score for each participant. A one-sided Bayesian independent sample t-test showed that patients had on average larger MMN compared to controls (BF10 > 1000). Furthermore, a paired t-test showed that patients on average had larger MMN at baseline compared to their follow-up session (BF10 = 6.3). Overall, our first set of analyses suggest that the MMN can distinguish patients from healthy controls, and is sensitive to progression of disease over time. Next steps include further analysis of the waveforms as well as source localisation of the MEG data.

P1.44 | Short-reaching Prediction and Long-reaching Integration in Response to Negative Polarity Items During Sentence Comprehension

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Sentence processing unfolds in time and includes the possibility to predict upcoming information at multiple levels of linguistic processing. Yet, the degree to which predictive processing occurs in specific domains has been debated. Here, we focus on a dependency relation between a negative polarity item (NPI) and its licenser. Crucially, German sentence structure allows some NPIs to precede their licenser at short or long distances, and thus provides a good testing ground for predictive processing. Prediction during sentence processing may i) increase efficiency of processing but ii) also come along with processing costs. Therefore,we hypothesized to find oscillatory and ERP correlates for prediction and integration to vary depending on distance between the NPI and its licenser. In a 2x2 design, we manipulated the presence of a NPI (vs. a control non-NPI) and the distance of the negation (obligatory to license NPIs) within sentences that were otherwise identical. We applied a wavelet analysis to i) the early and late prediction periods before the negation position and ii) to the negation position in order to target integration. ERPs were analysed only at the points of integration. For both measures we compared sentences with and without forward-looking dependencies. Cluster-based permutation tests for the ERPs revealed an anterior negativity for the negation in the NPI condition only in case of a short-reaching prediction. Correspondingly, we observed increased power in the beta-band in the region before the short-reaching negation but not in the region before the long-reaching negation. Instead, beta power increased when the long-distance negation actually occurred and had to be integrated. In case of the short-distance negation beta power decreased at the position of the negation. The results provide indication for active prediction only over a short distance during NPI processing as reflected by anticipatory modulations of beta power. Further, integration processes, reflected in ERPs and time-frequency results, vary across distance. In sum, the results are in line with a role of predictive mechanisms during dependency processing in sentences. However, the cognitive system may uphold predictions only across relatively short distances and re-allocate processing load to bottom-up integration as sentences are getting longer.

P1.45 | The Role of Robo1 in Shaping Interhemispheric White Matter Pathways

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The corpus callosum (CC) is essential for interhemispheric communication and supports numerous cognitive functions. Evidence of its functional specialization suggests that different regions are involved in distinct cognitive processes (Fabri & Polonara, 2023). For example, the posterior CC connects areas critical for language processing and may be particularly important for reading-related functions. Dyslexia-related gene ROBO1 regulates axonal crossing (Andrews et al., 2006), suggesting that genetic variation may contribute to altered hemispheric lateralization of linguistic functions in dyslexia, potentially as a result of atypical CC development. This study explored the relationship between ROBO1 variation and white matter (WM) organization in interhemispheric tracts using diffusion weighted imaging (DWI). Participants (n = 153) were 13–25-year-olds and had typical reading abilities. DWI-based tractography was conducted using MRtrix (Tournier et al., 2019) to extract tract count across the whole CC and in its five segments (anterior, mid-anterior, central, mid-posterior, posterior) separately. To assess WM microstructure, we also extracted fractional anisotropy (FA) values from the whole CC and each segment. We analysed the effect of five ROBO1 single nucleotide variants (SNVs) on these metrics. While ROBO1 SNVs were not linked to the number of tracts, three variants showed significant associations with microstructure of the CC. Specifically, rs6770755, rs7631357 and rs7651370 were each associated FA in central (analyses of variance: $F_{2,147}=4.58$, $p = .012$, $F_{2,147}=4.10$, $p = .019$, $F_{2,147}=4.08$, $p = .019$, respectively) and mid-posterior ($F_{2,147}= 3.79$, $p = .0125$, $F_{2,147}=4.34$, $p = .015$ and $F_{2,147}=3.80$, $p = .024$, respectively) segments. This study provides evidence that variation in ROBO1 is associated with the microstructure of the CC, specifically in the central and midposterior segments. Our findings suggest that ROBO1 contributes to the WM organization of the CC, without affecting overall tract count. This provides insight into the potential mechanism by which genetic variation may influence the development of linguistic brain networks and contribute to developmental dyslexia.

P1.46 | Does Music Training Change Brain Structure? A Systematic Review and Meta-analysis

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It has been widely suggested that musicians develop distinctive neuroanatomical profiles through intensive training and practice. The findings of individual studies

are heterogeneous, however, and most evidence is correlational, precluding causal inferences. In this work, we conducted a systematic review and meta-analysis of neuroimaging studies examining how music training relates to the structure of gray and white matter. We included 21 cross-sectional and 8 longitudinal studies, with a total sample of 1671 participants — 813 musicians and 701 nonmusicians. For cross-sectional studies on gray matter (16 studies), no significant group differences were found between musicians and nonmusicians, as evaluated in a seed-based d mapping meta-analysis combining original full statistical parametric maps and peak coordinates. Moderator analyses further showed that these null results were not influenced by participants' age, age of onset of training, duration of music training, or primary instrument (ratio of piano players in each study). A narrative synthesis of cross-sectional studies on white matter (five studies) did reveal tentative evidence for an association between music training and the structure of the right corticospinal tract, including increased fractional anisotropy and directional diffusivity, but the small number of studies limits confidence in this finding. Finally, a narrative synthesis of longitudinal evidence showed that five of the eight studies reported training-related structural changes. Yet in two of these, effects were not clearly music-specific (one showed similar changes in an active control group; the other lacked active controls), and the remaining three shared overlapping samples and results were significant for only a minority of the predicted effects. Methodological limitations, such as small sample sizes or inconsistent reporting, further temper conclusions. Altogether, our findings suggest that associations between music training and brain structure are more modest than often assumed, both in cross-sectional and longitudinal studies. Observed group differences in individual studies might reflect methodological artifacts or preexisting individual factors (e.g., genetic predispositions for music) rather than training.

P1.47 | Implicit Print Tuning After a Brief Symbol-sound Training Emerges First in the Inferior Parietal Lobule

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While numerous studies have investigated how children's brains become tuned to print during letter-speech sound learning [2], [3], [4], [5], [6], less is known about how flexibly the adult reading network adapts to a new orthography. We investigated how the implicit processing of visually presented artificial symbols changes after they

become associated with speech sounds, hypothesizing that even a brief training would enhance activation to the learned artificial script. 39 healthy adult participants (21 females; age 25.19 ± 3.12 years [range 18.14–32.51]) learned 12 new symbol speech sound associations during an audiovisual feedback-learning paradigm. Immediately before and after learning, participants performed an fMRI implicit print processing task, responding to visually presented symbols by pressing a button when a symbol appeared in blue. Four different stimuli were presented: (1) Latin letters, (2) learned symbols, (3) familiar symbols presented both pre- and post-training, and (4) new symbols. Pre-to-post training changes were first assessed on a whole-brain level using paired t-tests separately for each condition. Furthermore, linear mixed models (time point × condition) were conducted for six key regions of the reading network [7], [8]. The whole-brain fMRI analyses revealed increased activation in a cluster in the left angular gyrus to the learned symbols from pre- to post-training (pFWEc<.05). In the ROI analyses, the left inferior parietal lobule showed a significant pre-to-post increase after FDR correction for six ROIs (estimate = 0.233, SE = 0.083, t = 2.798, pFDRc = .02). Furthermore, post-training differences between conditions emerged in the ROIs visual word form area, left inferior frontal gyrus, and left inferior parietal lobule. Our results suggest that the left inferior parietal lobule, including the angular gyrus, is the first region to adapt to newly learned prints. Given its role in attention, working memory [9], and linking letters with speech sounds [10], [11], the observed activation pattern may imply rapid recognition and increased attention towards the newly learned symbols which might enable the later development of print tuning in further reading regions.

P1.48 | The Influence of Left Anodal dLPFC Stimulation on Effective Connectivity During Emotional Word Processing: A Combined 7T fMRI and HD-tDCS Study

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The dorsolateral prefrontal cortex (dlPFC) plays an important role in encoding emotional memories through its top-down influence on affective and memory processes. The left dlPFC and its network partners, such as the anterior cingulate cortex (ACC), the amygdala, and the hippocampus may be particularly relevant for the encoding of positive memories. Building on previous findings suggesting that anodal high-definition transcranial direct current stimulation (HD-tDCS) over the left dlPFC may enhance memory formation for positive content, this study aims to investigate the underlying neural mechanisms. To this end, we test whether HD-tDCS over the left dlPFC modulates effective connectivity between the left dlPFC and its network partners during encoding of emotionally valenced content. Healthy participants are randomly assigned to receive either real or sham HD-tDCS over the left dlPFC during ultra-high-field 7T fMRI (1mA for 20 min). While being stimulated, participants complete an incidental encoding task, in which emotionally valenced words are presented and subjectively rated as positive or negative. To assess their retrieval performance, an unannounced free recall follows a short pause. Preprocessing and first-level analysis will be performed using SPM12. A general linear model (GLM) will model brain activity associated with subsequent memory of positive words (remembered vs. forgotten), followed by a whole-brain group-level analysis to identify regions showing significant effects. These results, together with regions identified in prior literature, will guide region-of-interest (ROI) selection for the effective connectivity analysis. Next, we will use dynamic causal modeling (DCM) to examine effective connectivity among these regions, with memory outcome (remembered vs. forgotten positive words) modeled in the analysis. Group differences in effective connectivity between real and sham stimulation will be assessed using Parametric Empirical Bayes (PEB) method. We hypothesize that anodal tDCS over the left dlPFC will increase the influence of the left dlPFC on other brain regions involved in emotional memory encoding, reflecting enhanced control during the successful encoding of positive words. These results could advance our understanding of how left dlPFC stimulation modulates neural circuits involved in emotional memory encoding, offering a foundation for future research in clinical populations with altered emotional memory processing.

P1.49 | Inter-individual Differences in the Development of Visual Perception in Children

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Performances in most visual tasks do, surprisingly, not correlate with each other. For example, spatial acuity tasks, such as Landolt C and Vernier Offset, and spatial visual illusions, such as Müller-Lyer and Ebbinghaus, are only weakly related to each other. Hence, there is no common factor in vision. Here, we asked the question whether

experience and visual development lead to the large individual differences or whether these differences are already present in children. To this end, we tested 52 children in a longitudinal experiment of 3 visits, six months apart each, with a battery of 8 visual tasks and 10 visual illusions. To evaluate testretest reliability, each test was administered twice during each visit. We first analyzed the correlations between visual tests to verify the inter-individual differences of children within a single visit. Then we examined individual differences in performance change trajectories using Linear Mixed Models and Latent Difference Models to determine whether correlations exist among visual abilities in terms of their developmental or deteriorative rates. Out of 45 test pairs, 44 showed Spearman correlations smaller than 0.4, below the moderate range, suggesting a lack of underlying common factors for vision. While the results were stable across 12 months, there were only weak correlations in the slopes between different tests and in the different latent difference scores, indicating a substantial interindividual variability even in the longitudinal change in children's visual capabilities.

P1.50 | The Relationship Between Reading Ability and Cortical Tracking to Speech and Music

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Musical experience and training have long been associated with improved cognitive development, particularly in children. Among various cognitive domains, language development and reading ability have frequently been linked to musical ability. However, recent research challenges this connection, suggesting that music experience and reading ability operate independently with little direct influence on one another. In the current study, we tested whether cortical tracking of speech and music predicted reading ability in adults. Cortical tracking refers to the alignment of the neural signal to slow amplitude fluctuations in the acoustic signal (usually quantified using the speech envelope), which has been shown to vary based on language and music skills. In the current study, participants were 32 native English speakers ranging from 19 to 28 years old. Participants first completed an online session in which they performed a word recognition task to assess their reading skills. This consisted of concrete neutral words and non-words such as "oval" and "stip". The online session was followed by an electroencephalography (EEG) session to collect data on neural tracking ability where participants listened to a short story and a music track of 5 minutes in length each. Using a mutual information framework, we showed that neural activity aligned to both speech and music in a wide range of frequencies (0.5 – 12 Hz). Cortical envelope tracking was stronger for speech than music at slow frequencies (< 1 Hz), while it was stronger for music at higher frequencies (2 – 10 Hz). Furthermore, speech tracking at slow frequencies predicted word recognition speed: participants who showed stronger speech tracking in the delta

and theta band showed faster reaction times. In contrast, we found no relationship between music tracking and word recognition times. These findings are in line with the notion that far transfer (the transfer of skills across domains that differ substantially) is unlikely. However, our results suggest a link between speech tracking and reading skills in neurotypical, adult participants.

P1.51 | Interactions Between Motor and Declarative Memory Sequences on the Basis of Order and Timing

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Classical theories posit that memories for actions and skills (motor memories) and memories for daily events (episodic memories) are characterised by distinct cognitive and neural substrates. However, when actions and events occur successively, these different memory sequences can be similarly characterised by the order and timing of their elements. Strikingly, Mosha and Robertson (2016) (Current Biology) found that a shared ordinal structure between semantic categories of words in a list and an implicit motor sequence led to generalisation between these memories, whereby learning and recall were facilitated when both sequences shared a common order, compared to when they did not. This finding suggests that ordinal information may be shared or processed by overlapping neural networks across classical declarative and procedural memory taxonomies. However, this effect has only been documented once. In this study, we aimed to: (1) replicate this earlier finding by Mosha and Robertson; and (2) determine whether cross-domain generalisation can occur on the basis of a shared timing structure. We hypothesised that a shared ordinal and temporal structure will facilitate learning and recall of successively encoded motor and declarative sequences, relative to when those structures are different. Our study involved 125 healthy adults and had a factorial design comprising 2 Task Orders (Motor or Declarative task first) and 2 Structure (Same or Different structure between memory sequences). Contrary to expectations, motor sequence learning did not differ between participants who had learned a preceding declarative sequence with either the same or different order and timing (ps > .05). Instead, we found that declarative sequence recall was in fact poorer when encoding was preceded by a motor sequence with the same order and timing, compared to when these aspects differed between sequences (Cohen's ds ⩾ .5). Together, these results suggest that cross-domain memory facilitation is not a robust phenomenon. Alternatively, these effects may be influenced by subtle differences in task parameters or participant states. Future research is therefore required to elucidate the factors that may influence the occurrence and direction of cross-domain interactions.

P1.52 | Ocular Exploration of Social Scenesin ADHD Children

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Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by inattention and/or hyperactivity-impulsivity symptoms. ADHD affects individuals in all aspects of their everyday life, with troubles in concentration, organization and motor restlessness for example. These troubles in attentional and inhibition processing can translate on oculomotor functions, with difficulties in holding fixation and suppressing unwanted saccades. While these oculomotor differences between ADHD and neurotypical (NT) individuals have been well documented, it is less clear how they can affect spontaneous ocular exploration of visual scenes. Ocular exploration reflects both attentional saliency (bottom-up and top-down) and oculomotor programming, and in turn affects globally visual perception. In this study, we investigated how ADHD and NT children spontaneously explored social scenes. Based on the literature, we hypothesized ADHD children would explore visual scenes with more saccades and shorter fixations than NT children. 44 NT (m=9 years, 23 girls) and 33 ADHD (m=9.9 years, 7 girls) 6-12 years-old children were recruited in Tours Hospital. ADHD diagnosis followed DSM-5 or CIM-10/11 criteria and was assessed by trained clinicians. Ocular exploration data were acquired with a Tobii Pro Fusion 250Hz eye-tracking device. Following a 5-points calibration procedure, children were recorded while spontaneously watching 2 silent videos of about 45s displayed on a 1920x1080px screen at around 70cm. One video (human scenes) consisted of close-up clips of people being interviewed on the street. The other video (city scenes) consisted of street clips displaying mainly moving vehicles. For both videos, we analyzed saccades, fixations, and time spent in Areas Of Interests (AOI) defined by bottom-up saliency or top-down expectations. Our preliminary analyses revealed no significant difference in the number of saccades or the number of fixations as a function of group (NT vs. ADHD) or condition (human vs. city scenes). We observed a general effect of age, with more fixations for older children. Our two conditions evoked significantly different exploration patterns, with larger saccades

for our city scenes, identical for both groups. Gaze location (AOI) analysis is ongoing. Our preliminary findings suggest that overall oculomotor exploration of social scenes is not different in ADHD compared to NT children.

P1.53 | The Interplay Between Affective Touch and Interoception

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The affective dimension of touch has been linked to the activation of C-tactile (CT) afferents — low-threshold mechanoreceptors that respond preferentially to slow, caress-like stimulation of the skin. Given the emotional significance of CT-optimal touch, it is important to examine its influence on the awareness of internal bodily states, helping us understand how external touch and internal physiological signals are integrated In this work we combined electrophysiological (heartbeatevoked potentials; HEPs), behavioral (Heartbeat Detection Task), and self-report (Multidimensional Assessment of Interoceptive Awareness; MAIA) measures to assess interoceptive processing. HEPs were recorded during somatosensory evoked potentials (SEPs) elicited via electrical stimulation of the left median nerve across four conditions: (1) robotic CT-optimal stimulation of the left forearm, (2) vibrotactile stimulation of the same region, (3) no concomitant tactile stimulation, and (4) manual CT-optimal stimulation delivered by the experimenter. Although data analysis is ongoing, we hypothesize that CT-optimal touch will enhance HEP amplitude compared to control conditions, reflecting increased cortical sensitivity to cardiac signals. We also expect this effect to be stronger in individuals with a better performance in the HBD and higher score in the MAIA questionnaire. These findings may clarify how affective touch dynamically engages interoceptive and somatosensory systems, offering insights into the embodied mechanisms that support socio-emotional touch and bodily self-awareness.

P1.54 | Visual Attention and Decision-making in Aging: Eye-tracking Biomarkers for Early Detection of Mild Cognitive Impairment

Alexandra Wolf (RIKEN Center for Advanced Intelligence Project (AIP)

Major neurocognitive disorders, such as Alzheimer's disease (AD), represent a growing burden to healthcare systems worldwide, with early detection remaining a critical yet challenging goal (Wolf and Ueda, 2021). Traditional screening tools, such as the Mini-Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA), require trained personnel and standardized environments, limiting their

scalability for population-wide screening. Recent advances in eyetracking technology offer promising alternatives by enabling the non-invasive measurement of visual attention and cognitive processing. This project aims to develop novel gaze-based biomarkers for the early detection of cognitive decline, specifically mild cognitive impairment (MCI), a prodromal stage of AD. This study investigates differences in gaze behavior between cognitively healthy older adults and those with MCI, using a Tobii eye-tracker integrated with a naturalistic behavioral paradigm. Fifty community-dwelling older adults participated in the experiment, undergoing a multi-domain assessment protocol including the MMSE, MoCA, Geriatric Depression Scale (GDS), Pittsburgh Sleep Quality Index (PSQI), and a nutritional status screening. The experimental paradigm involved three ecologically valid tasks designed to simulate real-world decision-making (Wolf et al. 2018&2019) and memory processes: (1) a Shopping Task requiring valuebased decisions on food items; (2) a Liking Task assessing subjective preferences; and (3) a Post-Shopping Task, which tested recognition memory for previously viewed items. All tasks were presented visually on a screen while participants' gaze behavior was recorded. Each trial was preceded by a fixation cross and followed by a task-dependent question. Preliminary findings revealed an intriguing, counterintuitive result; participants with MoCA scores between 20 and 25 demonstrated higher accuracy in the memory recall task compared to those with scores between 26 and 30. This suggests that individuals with borderline cognitive performance may employ compensatory attention strategies, exerting more cognitive effort due to heightened awareness of potential deficits. In contrast, those with higher cognitive scores may under-engage, relying on their baseline abilities and possibly experiencing an effort-performance tradeoff. This phenomenon aligns with compensation theory in cognitive aging and may also be influenced by the overconfidence effect observed in high-functioning individuals. Moreover, eye-tracking metrics such as fixation duration, number of saccades, and total viewing time were analyzed in relation to decision-making behavior. By capturing subtle, moment-to-moment shifts in visual attention, these gaze parameters offer valuable insights into the cognitive strategies employed across the aging spectrum. Reaction time analysis further complements these findings by quantifying the cost of cognitive effort across tasks. In conclusion, this study demonstrates the potential of integrating eye-tracking data with cognitive and behavioral assessments to detect early signs of cognitive impairment. Notably, gaze metrics combined with naturalistic paradigms may provide a scalable and non-invasive framework for early dementia screening (Wolf et al. 2023). Hence, this work contributes to a growing body of research seeking to translate laboratory-based cognitive neuroscience into practical tools for early diagnosis and personalized intervention in neurodegenerative disease.

P1.55 | Metacognition Reduces Confirmation Bias and Facilitates Changes of Mind in Perceptual Decision Making

Alexis Pérez Bellido (Universitat Autonoma de Barcelona); **Rubén Moreno-Bote** (Universitat Pompeu Fabra); **Lluis Fuentemilla** (Universitat de Barcelona)

How do individuals revise their judgments after forming a first impression of the same event? While perceptual decision-making research has predominantly examined how sensory fluctuations influence choices within single trials, real-world decisions often require re-evaluating the same event across time. Here, we investigate the mechanisms underlying decision revision in perceptual tasks, revealing that repeated exposure to the same stimulus systematically biases subsequent judgments toward prior responses. Using drift diffusion modeling, we tested competing decision models that incorporate different assumptions about how prior choices affect evidence accumulation. Our results indicate that these biases emerge from asymmetric sensory weighting, selectively amplifying information consistent with previous choices—a phenomenon akin to confirmation bias. Crucially, individuals with higher metacognitive efficiency exhibited weaker confirmatory biases and more flexible integration of repeated sensory information, enabling greater adaptability in decision-making. These findings highlight the continuous nature of perceptual inference and underscore metacognition's pivotal role in mitigating bias and optimizing decision flexibility.

P1.57 | Breathing Phase Modulates Perception of Affective Touch

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Respiration has been shown to modulate neural and mental activity. Across visual, auditory, and cognitive domains, inhalation enhances performance, while in tactile perception, sensory detection is enhanced during exhalation. Pain studies show mixed findings. Our study investigated whether respiration influences the perception of interpersonal interaction and bodily self-awareness via affective touch, which activates C-tactile (CT) afferents — unmyelinated nerve fibers responsive to gentle, slow strokes and associated with pleasant sensations. We hypothesized that respiratory phases modulate the perceived pleasantness of both affective and non-affective touches, with the difference in their perception serving as a proxy for bodily self-awareness. 31 healthy young adults followed auditory breathing instructions and received CT optimal (i.e. affective) and CT non-optimal (non-affective) touches on the forearm during inhalation and exhalation. After each stroke, they rated their perceived pleasantness of touch on a 1–100 scale. Respiration was continuously recorded. A 2×2 repeated-measures ANOVA showed affective touch was rated more pleasant than non-affective as expected. Exhalation increased pleasantness ratings overall. Preliminary data also showed that perceived pleasantness of affective and non-affective touch was significant only during exhalation. Interestingly, higher resting breathing rate in a mixed effects model amplified the perceived difference between touches during exhalation. Our findings indicate that exhalation enhances affective appraisal of touch, potentially due to increased parasympathetic

(vagal) activity during this phase. Although the respiratory phase did not modulate the perceived difference between touch types overall, exhalation modulated it for 'faster-breathers', suggesting respiration-related individual differences in bodily self-awareness. Present findings highlight exhalation as a salient window for positive tactile experiences and provide evidence that breathing dynamics shape the affective dimension of bodily self awareness.

P1.58 | The Dimensionality of Positive Valence

Gabriel Brandolini (University of Melbourne); **Olivia Carter** (University of Melbourne); **Peter Koval** (University of Melbourne)

Positive valence is the intrinsic positivity or pleasantness of an emotion, feeling, or mood. Emotion researchers disagree on whether positive valence is unidimensional – a single spectrum ranging from minimally positive to maximally positive – or multidimensional – a complex construct that accommodates multiple distinct ways an emotion can be experienced as positive. To test whether positive valence is unidimensional or multidimensional, we provided participants (N=292, Female=61%, Age: M=19.96, SD=5.66) choices between video stimuli from different emotion categories (Admiration, Amusement, Awe, Romantic-Love, and Surprise) while utilising a film+instructions mood induction procedure. Participants selected the response option which resembled their more ideal emotional state, and also rated the videos on valence, emotional-intensity and novelty (adapted from Affect Rating Dial). Results showed participants reliably chose the option with higher valence, regardless of emotional category (Predictions=2113/2308, Accuracy=91.55%, WAIC=1.258). This provides evidence that valence functions as a 'common currency' across these different positive emotions, pointing towards the unidimensionality of valence by suggesting a shared form of positivity. We also generated stimuli with response options combining videos from multiple emotional categories to explore how valence was operationalised in the decision-making process. Rather than using a lexicographic, winner-takes-all, or loser-takes-all strategy, results showed participants usually summed the valence of individual videos to determine decision outcomes (Predictions=2121/2906, Accuracy=73%, WAIC=1.635). This suggests individuals tend to aggregate the valence of complex stimuli in an additive process when determining their ideal emotional state.Finally, participants made judgements about their experience of 11 positive emotions in terms of 15 candidate valence dimensions (e.g., pleasure, goal-congruence, action-tendency, morality, object-appraisal, inner-reinforcer). We utilised factor analysis to discern whether valence emerged as a single unified factor (unidimensional) or whether distinct elements of valence emerged as multiple factors (multidimensional). Parallel analysis, a reliable method for determining how many factors to retain, indicated that only one of these factors was statistically significant beyond random chance. This finding lends further support in favour of the unidimensional view of positive valence.

P1.61 | Predicting Temporal Reproduction From Brain Activity during Sustained Motor Exertion

Lorenzo Guarnieri (Hebrew University of Jerusalem); **Ayelet N. Landau** (Hebrew University of Jerusalem)

Accurate timing is critical for perception, decision-making, and action. Multiple models, from pacemaker-accumulator frameworks to population dynamics theories, have been proposed to explain how organisms encode temporal information. A common feature across models is the role of attention in modulating time perception. The Attentional Gate Theory (Zakay & Block, n.d.), for example, suggests that perceived duration increases with greater attentional load. However, less is known about how attention dynamically operates across the encoding and retention of temporal intervals when attentional resources are affected by momentary motor exertion. To address this, we employed a classical time reproduction paradigm while recording electroencephalography (EEG), manipulating attentional load through continuous force exertion. Participants reproduced three different time intervals (2, 3, or 4 seconds) under force and no-force conditions. We analysed the data using a linear mixed-effects model. We found that reproduced durations increased with interval length across both conditions ($p < .001$), confirming accurate encoding. However, reproductions were overall shorter during force exertion ($p < .001$), especially at longer intervals (interaction $p = .002$). This indicates significant under-reproduction under high attentional demand. Variance in reproduction scaled with interval length ($p < .001$), consistent with Weber's Law, but was unaffected by force. EEG analysis revealed that alpha (8–12 Hz) desynchronization increased with interval length during encoding, peaking before the offset of the to-be-timed interval ($p < .0001$). This aligns with prior literature that associates such patterns with temporal anticipation (Rohenkohl & Nobre, 2011). Crucially, alpha desynchronization during both encoding and retention predicted the final reproduced durations, especially for longer intervals ($p < .001$). Additionally, analysis comparing the force conditions during the encoding of time revealed higher alpha desynchronization during sustained force, in EEG channels ipsilateral to the effector hand ($p < .01$). These findings suggest that alpha oscillations serve as a neural marker of temporal attention and play an ongoing role in both the encoding and maintenance of temporal information in visual areas, as well as in motor areas. Our results refine theoretical models of time perception by highlighting the sustained contribution of attention and alpha desynchronization and its interaction with physical motor control. Keywords: Timing, memory, EEG, alpha, reproduction, force exertion

P1.62 | Assessing Neural Entrainment Dynamics During Transcranial Alternating Current Stimulation With EEGC

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Neural entrainment — the synchronization of neural oscillations to rhythmic external input — is thought to play an important role in how the brain processes and predicts environmental rhythms. Entrainment can arise not only from natural stimuli, but also from artificial sources, such as transcranial alternating current stimulation (tACS). As tACS artifacts are frequently orders of magnitude larger than the EEG signal, many studies have focused on after-effects or behavioral proxies of neural entrainment in humans. However, since neural coupling rapidly decays after stimulation, after-effects provide limited insights into entrainment dynamics, making it preferable to assess entrainment during stimulation or immediately after. The Kuramoto coupling model provides a framework for assessing how neural oscillations entrain to ongoing stimulation. According to the Kuramoto model, when stimulus intensity and frequency offset are insufficient for full entrainment, tACS will pull and push the frequency of the intrinsic oscillator. Shifts in intrinsic instantaneous frequency provide a way to assess entrainment dynamics without relying on the direct measurement of the stimulation frequency, which is masked by the tACS artifact in EEG recordings. We recorded EEG from 35 participants while delivering amplitude-modulated tACS (220 Hz carrier) at four intensities (0.8-3.2 mV peak-to-peak) and frequency offsets of ±1.5 Hz and ±2.5 Hz relative to each participant's individual alpha frequency. We employed spatial source separation filters to suppress the stimulation artifact and isolate cortical signals during tACS. Our analysis focuses on testing the Kuramoto model's prediction, which follows an Arnold Tongue pattern: distinct pushing/pulling patterns of the instantaneous frequency depending on the stimulation intensity and frequency offsets. We anticipate that these entrainment effects should decay towards the natural intrinsic frequency once stimulation ceases.

P1.63 | Disruptive And Resistant: The Impact of Negative Distractors in Visual Search

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In visual contexts saturated with information, maintaining focus on goal-relevant input is often challenging. Even when our objectives clearly define what to attend

to, irrelevant stimuli are likely to interfere. The question of why this happens has multiple answers, but they can largely be encompassed by one concept: salience. Although individuals may successfully complete a task, the presence of salient but irrelevant information can lead to longer response times and increased errors, which may, in turn, have negative consequences. While the impact of physically salient distractors is well-documented, the influence of emotionally salient stimuli, especially those with negative valence, remains relatively understudied. Thus, we investigated whether emotionally salient stimuli disrupt attention in a manner similar to physically salient ones and hypothesized that their distracting effects would be more resistant to suppression despite learned control mechanisms. As a first step, we conducted a standardization study in which participants rated peripherally presented pictures on valence, arousal, and complexity. This ensured that peripheral presentation did not significantly alter perceptual evaluations and allowed us to match neutral and negative images for complexity. In the second experiment, we assessed the impact of salient distractors during a visual search task. Participants identified a target with a distinct outline shape and indicated whether a dot appeared above or below it. Displays included either simple geometric shapes or pictures, with a salient distractor present in 60% of trials. As expected, response times increased in the presence of distractors, and this effect was stronger for negative images than for physically salient items. The third experiment examined whether increasing the spatial predictability of distractors would reduce their impact. Distractors appeared more frequently in one location. While response times improved when the physical distractor appeared in the high-probability position, this effect was attenuated for emotional distractors, suggesting reduced learned suppression. In conclusion, our findings demonstrate that salient stimuli, whether physical or emotional, can involuntarily capture attention, impairing visual search performance. Notably, emotionally negative distractors exert a stronger and more persistent effect, highlighting the difficulty of ignoring emotionally charged stimuli, even with repeated exposure or predictable spatial presentation.

P1.64 | Cognitive Control, Cognitive Bias, and Emotional Regulation in Caregivers of Patients Diagnosed With Chronic Diseases Attending the Jordanian Hospitals

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Medicine, The Hashemite University, Zarqa, Jordan); **Mahmoud Sadaqa** (Medical Students, Faculty of Medicine, The Hashemite University, Zarqa, Jordan); **Zuheir Hasan** (Department of Anatomy, Physiology and Biochemistry, Faculty of Medicine, The Hashemite University, Zarqa, Jordan)

Caregivers of patients with chronic illnesses face profound psychological and cognitive challenges, yet their experiences remain underexplored, particularly in Jordan. This study aimed to assess emotional regulation, cognitive biases, and psychological characteristics, including anxiety, depression, and stress, in caregivers of patients diagnosed with chronic diseases attending Jordanian hospitals. Additionally, it investigated caregivers' cognitive control and tendencies for perseverative thinking compared to a matched control group. Data were collected from two groups: 211 caregivers and 211 matched controls, with participants interviewed directly after providing informed consent. Using validated tools such as the Cognitive Biases Questionnaire (CBQp), Cognitive Emotion Regulation Questionnaire (CERQ), Beck Depression Inventory (BDI), Coping Flexibility Questionnaire (COFLEX), and Perseverative Thinking Questionnaire (PTQ). Data collection included demographic, therapeutic, and caregiving variables to identify correlations with cognitive and emotional measures. By emphasizing culturally relevant methodologies and strict ethical standards, this research aimed to advance understanding of the psychological burden on caregivers in Jordan, supporting the development of targeted interventions to alleviate their challenges. Keywords: Caregiver, emotion, cognition, preservation, depression, flexibility.

P1.65 | Motor Cortex Activity Preceding Movement. Preparation to Act or Expectancy for Movement?

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It is well known that movements are preceded by slow cortical (readiness) potentials and modulation of ongoing beta activity in primary motor cortex (MI), followed by evoked responses related to proprioceptive and sensory feedback. Their magnetic equivalents can be precisely localized to the sensorimotor cortex using MEG [1] and similar modulation of brain activity has been observed during the simple anticipation of somatosensory input [2]. Passive (externally generated) movements have been less studied but likely involve sensorimotor changes related to both movement-related feedback as well as anticipated sensory input. We recorded MEG in 10 healthy adults during passive movements of the index finger under conditions of predictable (constant 2 s) and unpredictable (random 3-7 s) movement intervals, in

addition to self-generated movements and (predictable) tactile stimulation of the same finger. Beamformer source analysis was used to extract the time course of time-locked evoked responses and beta activity (15-30 Hz) in the contralateral sensorimotor cortex. Slow pre-movement brain activity resembling the self-generated movement readiness field was observed in the predictable, but not unpredictable, passive movement condition. Conversely, early modulation of sensorimotor beta prior to movement onset was observed only during self-generated movement. EMG recordings from extrinsic hand muscles confirmed absence of muscle activity during passive movements. These results suggest that expectation for passively generated movements generates premovement activity in MI in the absence of active muscle contraction that is not related to the anticipation of sensory input. Furthermore, onset of this activity was decoupled from beta suppression in the same cortical areas related to active movement planning and predictable sensory input. We conclude that the observed readiness fields prior to passive movement reflect pre-movement activity in MI independent of descending output to the agonist muscles [3,4] suggesting a reinterpretation of the role of the readiness potential in sensorimotor control.

P1.66 | Does Implicit Biological Motion Processing Affect Visuo-spatial Attention? A Behavioral Study With Multiple Sclerosis Patients

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The perception of Biological Motion (BM) is critical for understanding social cues. A limited number of moving light dots resembling a moving individual can suggest social intention information, providing an attentional orienting. This ability to predict other's intentions from BM cues refers to social cognition, an ability impaired in several neurological diseases. As in people with Multiple Sclerosis (PwMS) an impairment in visuo-spatial attention and social cognition has been observed, we aim to investigate the possible differences in the visuo-spatial attention between

MS patients and healthy individuals by using BM stimuli as cues. We tested 37 PwMS and 40 healthy controls (HC), who performed a modified central cue Posner task, using BM stimuli as cues that are not always predictive of the target location. They were represented by Point Light Walker (PLW) configuration, a series of dots arranged at the human joints and walking through the left or right of the screen, presented in the global (whole body) or local (two dots, indicating the feet of the PLW) configuration. For each participant, the Inverse Efficiency Score (IES) was calculated as the ratio between mean RTs and accuracy. We tested the significance of fixed effects performing an ANOVA analysis; we also assessed the magnitude of the found effects as the Effect Size (ES) estimated by Cohen's coefficient. Furthermore, Pearson's correlational analysis was conducted to test the possible relationship between IES and individual or disease-related characteristics, finding no significant differences. MS patients exhibited overall slower responses compared to HC. In PwMS, a weaker advantage of valid trial over invalid ones was evident when cue had a local than global BM configuration. Also, PwMS showed a slower performance than HC in valid trials with local BM cues. The difference between groups was reduced when the cue had a global BM configuration. These findings suggest possible impairment of local BM cue processing in PwMS, possibly due to delays or deficits in interpreting feet motion as biological information, reducing the cue's predictive power.

P1.67 | Stress-induced Shifts in Dynamic Brain States: Linking Task and Resting-state Fmri With Childhood Adversity Using Hmm

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Adaptive response to stressors is central for maintaining mental and physical well-being (Russell & Lightman, 2019; Sinha et al., 2016). Yet, the dynamics of brain response to acute stressors, its relationship to the brain states at rest, and the modulatory influence of prior stress experiences, such as childhood adversity, remain insufficiently explored. This study aimed to address this gap by identifying the brain states during the ScanStress task (Noack et al., 2019) and then examining its changes across the task, as well as before and after the task via resting state functional resonance imaging (rs-fMRI) at 3 Tesla in 41 healthy male participants (M = 43.74; SD = 9.68). Data were collected with following parameters (TR = 2000 ms; TE = 30 ms;

voxel size = 2.5 × 2.5 × 3 mm3; 34 axial slices covering the whole brain; Task: 220 volumes; Rest: 355 Volumes). Moreover, the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 2003) was administered as a measure of childhood adversity. Task fMRI data were preprocessed using standard fmriPrep pipeline (Esteban et al., 2020) and brain were parcellated into 51 regions based on the YEO-2011 atlas (Yeo et al., 2011), from which five distinct states were identified using the Hidden Markov Model (HMM; HMM-MAR; (Vidaurre et al., 2016)). Each block of control or stress was divided into consecutive windows using sliding windows (Two different window sizes were used; window sizes of 4 and 5; step-size = 1) and the fractional occupancy (FO) of each state was calculated for each participant at each window. A regression model was used to estimate the slope of changes in FO of each state for each condition for each participant. Then a mixed effect model was used to compare the slope of changes in FO between two conditions. Four out of five states showed significant differences in slope of change ($p < .05$). These states were projected to rs-fMRI data and slope of changes were compared between pre- and post-stress data. Three states were found to show a significant difference between slope of changing in FO between pre- and post-stress in line with control vs stress differences (State 1: $p = .007$; state 2: $p = .010$; state 4: $p = .018$). Next, the interaction effect of CTQ subscales were evaluated in this relationship. Emotional neglect was found to have a significant interaction with conditions in predicting changes in the FO of state 1, where the higher the emotional neglect the higher the difference between pre vs post stress slope of FO changes. Together, these preliminary findings underscore the importance of understanding the stress dynamics and its relationship to resting state dynamics and behavioral characteristics and suggest that these dynamics may be modulated by past adverse experiences.

P1.68 | Neural Oscillations Distinguish Sequential and Simultaneous Working Memory

Alexandra Andersson (Neuroscience Center, Helsinki Institute of Life Science, University of Helsinki); **Judith Sattelberger** (Neuroscience Center, Helsinki Institute of Life Science, University of Helsinki); **Aniol Santo-Angles** (Neuroscience Center, Helsinki Institute of Life Science, University of Helsinki); **Satu Palva** (Neuroscience Center, Helsinki Institute of Life Science, University of Helsinki; School of Psychology and Neuroscience, University of Glasgow)

Visual working memory (VWM) is the ability to retain and manipulate a limited amount of visual information for a brief period of time. It has been widely studied using both delayed-match-to-sample (DMS) tasks, in which visual stimuli are presented simultaneously as well as with Sternberg-like tasks, in which stimuli are presented sequentially. In both tasks, the maintenance of information in VWM has been linked to oscillatory synchronization in multiple frequencies from theta to gamma frequency bands in prefrontal, parietal, and sensory cortices. However, it has remained uncharted whether the oscillatory activity would differ between the

two types of VWM tasks. Here we studied differences in brain oscillatory activity for simultaneous (DMS task) and sequential (Sternberg-like tasks) VWM tasks. We recorded concurrent magneto- and electroencephalography (M/EEG) from 29 healthy subjects (17 males, mean age: 28.38, age range: 21 to 40) while subjects performed a multi-item working memory task. In two randomized task conditions, 2, 4, or 6 items were either presented simultaneously in a circular array, or sequentially at an interval of 1 second. After a retention period of 2 seconds, participants were shown a new set of stimuli and indicated whether identity or location were the same or different. Data was preprocessed, source-reconstructed using a minimum-norm estimate (MNE) and collapsed to a neuroanatomically labeled cortical parcellation of 200 parcels (Schaefer et al., 2018). Time-resolved amplitude information was obtained by filtering the parcel time series with Morlet wavelets separately for each parcel and frequency between 3 and 100 Hz. We found that encoding of stimuli was associated with load-dependently increasing amplitudes in the theta band (5-8 Hz), this effect being stronger in the simultaneous condition compared to the sequential condition. We further observed stronger sustained alpha band (8-10 Hz) and delta band (3-5 Hz) amplitudes during the retention period for the sequential compared to simultaneous trials. These effects were positively modulated by VWM load. Our results establish that local delta and alpha oscillations are associated with the maintenance of order of visual items maintained in VWM.

TUESDAY 16/09
15:30 POSTER SESSION 2 P 2.1 – 2.69

2.01 | Towards Personalized Neuroscience: Evaluating Individual-level Information in Neural Mass Models

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Macro-scale brain modeling using neural mass models (NMMs) provides crucial insights into brain dynamics by simulating whole-brain activity. Despite the promise of connectome-based NMMs for personalized neuroscience, their full potential to capture individual-specific neural signatures is limited by sample size and computational efficiency constraints. This study seeks to quantify the individual-level information captured in personalized NMMs by leveraging extensive datasets. Our approach involves simulating brain dynamics for a large cohort to determine if NMM parameters can effectively capture individual-specific information. We assessed the accuracy of these models in identifying subjects and explored the correlation between model parameters and phenotypic traits. We applied a differentiable Reduced Wong-Wang (RWW) model [1] to resting-state fMRI data from 1,444 samples in the Marburg-Münster Affective Disorders Cohort Study (MACS) [2]. We optimized three model variations: a globalized model (GM) with four parameters, a localized model (LM) comprising 658 parameters, and a connectivity model (CM) with 23,875 parameters. Model performance was judged by the explained variance between simulated and empirical functional connectivity (FC) and subject reidentification accuracy. Statistical methods, including ANOVA and OLS regression, were used to examine associations between parameters and demographic factors (age, gender, BMI, education, IQ). Machine learning (ML) techniques further evaluated the predictive power of these parameters. The explained variance in empirical FC was 4.12% for GM, 19.16% for LM, and 56.57% for CM. The accuracy of subject reidentification improved significantly, from less than 1% with GM to 99.79% with CM, indicating increased individual specificity with more parameters. However, correlations with demographic traits were weak (effect sizes: $\eta 2_{partial} \leqslant 0.03$, standardized $\beta \leqslant 0.234$), highlighting a limited ability for personalized trait predictions. ML analyses confirmed that NMM parameters do not effectively predict individual cognitive or behavioral traits. While NMMs simulate resting-state dynamics effectively, their parameters lack the precision needed to predict individual characteristics. Future research should explore

alternative NMM frameworks and longer rs-fMRI sequences to better capture personal neural signatures, essential for advancing personalized neuroscience and clinical applications.

P2.02 | Exploring the Role of Feedback Valence in Modulating the Late Positive Component (LPC) During Probabilistic Reward Learning

Charlotte Dsouza (University of Groningen); **Carlotta Mathiske** (University of Groningen); **Liset Harink** (University of Groningen); **Emma Van Leckwyck** (University of Groningen); **Dr. Mark Span** (University of Groningen); **Prof. Dr. Monicque Lorist** (University of Groningen)

Feedback in the form of reward or punishment guides behaviour by reinforcing actions that lead to desirable outcomes and reducing behaviours associated with undesirable ones. This reinforcement mechanism helps prioritise certain behaviours crucial for goal-directed decision-making. Rewards are also an affective phenomenon: receiving one may elicit positive emotions whereas its absence, or punishment, may evoke negative emotions. The Late Positive Component (LPC), a centro-parietal event-related potential (ERP) peaking between 400 and 800 ms post-stimulus onset, has been extensively studied in emotional stimulus processing and, to a lesser extent, reward outcomes. This study used a probabilistic reward learning task with gain- and loss-focused task conditions to investigate the role of feedback valence (positive vs. negative outcomes) and the task context in modulating the LPC as stimulus-reward associations are learned. We hypothesised that LPC amplitudes would either reflect general emotional salience or show preferential processing of negative outcomes, with potential modulation by task condition and learning. Twenty-two participants learned reward associations (0.7, 0.5, or 0.3) of three stimuli through trial-and-error decision-making, guided by feedback. Learned associations were tested in a subsequent phase where they selected one of two stimuli without feedback. EEG was recorded using 64 channels and preprocessed with EEGLAB and ERPLAB. Data was filtered (0.1-30Hz), ICA was performed to eliminate eye blinks, and epoched around feedback. Average LPC amplitudes post-feedback (400-800ms) were extracted and averaged across CPz, Pz, P1, and P2. Behavioural data was analysed using generalised linear mixed modelling (GLMM), and neural data with linear mixed modelling (LMM). Participants successfully learned the highest reward stimulus. Consistent with our prediction of preferential processing, LPC amplitudes were more pronounced following negative feedback, evidenced by larger amplitudes. However, this sensitivity was not influenced by the task context. The learning process did not significantly influence the LPC amplitudes, and learning trajectories did not differ across task conditions. These findings highlight the role of affective valence attributed to reward-related feedback in its processing and suggest that the LPC reflects a stable neural response to negative feedback, independent of task context or learning dynamics.

P2.03 | Electrophysiological Power-spectra of Deductive and Inductive Reasoning: A Meg Study

Del Cerro-León, Alberto (Center for cognitive and computational neuroscience (C3N – UCM)); **Antón-Toro, Luis F.** (Center for cognitive and computational neuroscience (C3N – UCM)); **Uceta, Marcos** (Center for cognitive and computational neuroscience (C3N – UCM)); **Spakivshka-Bilán, Danylyna** (Center for cognitive and computational neuroscience (C3N – UCM); **Maestú, Fernando** (Center for cognitive and computational neuroscience (C3N – UCM); **Salto-Alemany, Francisco** (Department of psychology, sociology and philosophy (ULE); **Requena, Carmen** (Department of psychology, sociology and philosophy (ULE)

Understanding and reasoning about the world largely depend on our ability to use basic forms of deduction to uncover the underlying rules that govern the situations we encounter. While both deductive and inductive reasoning have been widely studied, the differences between these two cognitive processes — and their respective neural mechanisms — remain insufficiently understood. This study explores whether deductive reasoning is characterized by distinct electrophysiological features that can differentiate it from inductive reasoning. To investigate this, we designed a stimulation paradigm that contrasted deductive and inductive reasoning in a sample of 20 young adults. While undergoing magnetoencephalography (MEG), participants completed tasks that required either inferring internal rules (inductive reasoning) or applying explicitly stated rules (deductive reasoning). Each participant performed both types of tasks, allowing within-subject comparisons. MEG signals were preprocessed using automated pipelines and manually reviewed for artifacts by a neuroimaging expert. Spectral power in the theta, alpha, beta, and gamma bands was computed every 100 ms using the multitaper method (mtmfft), with discrete prolate spheroidal sequences (DPSS) as the windowing function. Given the exploratory nature of the study, statistical analyses focused on differences in spectral power across brain regions, corrected for multiple comparisons using a cluster-based permutation test (CBPT). Our results revealed significant late-stage differences between conditions, beginning around 700 ms post-stimulus. These differences emerged in the alpha and theta bands and were primarily located in frontoparietal and temporal regions. This temporal and spatial pattern suggests that deductive and inductive reasoning engage distinct neural processes at later stages of cognitive evaluation. These findings contribute to the understanding of the electrophysiological underpinnings of human reasoning and provide preliminary evidence for the neural differentiation between deductive and inductive processes. This distinction has potential implications for both cognitive theory and the development of neurocognitive interventions.

P2.04 | Referencing the Self in Empathy for Pain

Federica Meconi (University of Trento, Italy); **Alessia Zuriati** (University of Trento, Italy)

Recent evidence showed that empathy, the ability to feel or understand others' inner states, is drawn upon one's own autobiographical memories (AM). However, this raises a critical question: is the empathic response a genuine synchronization with another's emotional state, or is it a mere reactivation of autobiographic emotions, misattributed to the other? We collected EEG from 45 young adults to investigate this question. Participants were asked to represent in their mind's eye an event that causes physical pain for which they did or did not have an associated AM. The task was to represent the scenes as vividly as possible from a first- or a third-person perspective and rate the vividness of the details, participants' ease in taking the assigned perspective and their empathy for the scene. Repeated measures ANOVA carried out on the mean subjective rates showed that participants represented more vividly and were more empathic towards AM than non-AM scenes and when represented from a first- compared to a third-person perspective. Critically, participants found it easier to take the first- compared to the thirdperson perspective for AM scenes but showed comparable ease in taking the first- or the third-person perspective in non-AM scenes. Cluster-based permutation analyses showed a significant difference on the P3 amplitude between the first- and the third- person perspective for non-AM scenes but not for AM scenes. In other words, we observed a more pronounced perspective-switching for non-AM scenes, as participants, having no personal experience of the event, represented the scenes adopting either a first- or third-person perspective. In contrast, AM scenes made it more challenging for participants to detach from their own experience and fully adopt the other's perspective. In a second study, we collected EEG from 36 participants while performing a similar paradigm. We used a multivariate pattern analyses approach and determined that when personal past experience is not helpful to understand the other, it is however possible to inhibit one's own subjective experience to empathize. Our results suggest that empathy uses an autobiographic emotion as a reference and involves a genuine and active effort to adopt another person's point of view.

P2.05 | Piecing Together Time: The Role of Sampling Frequency in the Construction of Narrative Time From Sparse Fragments

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Event memory reflects a combination of both episodic and semantic components. We have previously shown that sparse but chronologically ordered fragments of an unfamiliar narrative can be exploited to build its temporal structure. However, the quantity of information needed to create an efficient temporal representation is still unclear. Specifically, we investigated whether temporal memory reconstruction depends more on the amount of information conveyed by each fragment or on the number of fragments available. To answer this question, we asked different groups of participants to judge the time of occurrence, relative to the story time, of 80 2-sec videoclips, extracted from an unseen movie and presented in random order, using a visual analog scale representing the whole movie duration. The task was repeated three times, separated by two cueing phases in which participants were exposed to additional clips from the same movie, this time presented in the correct order. We systematically manipulated the information provided in the cueing phase, both in terms of clip duration (1, 2, 3 sec; EXP1) and clip sampling frequency (39, 79, 139 cues; EXP2), across groups. We computed two indices: (i) absolute positioning error, and (ii) correlation between the objective order of the clips in story time and the subjective ordering derived by participants' judgments. In EXP1, a mixed-effect repeated-measures model ANOVA, with repetitions as a within-factor and conditions as a between-factor, revealed only a significant main effect of repetition on precision and clip ordering ($p < .001$). This result suggests that the length of the individual fragments is not crucial for forming a temporal representation of the whole narrative. In contrast, the same ANOVA performed on the data from EXP2 showed a significant main effect of both repetition and condition ($p < .001$) and a significant interaction effect ($p < .05$) on temporal precision, indicating that performance positively increases with sampling frequency. A similar result was observed for clip ordering ($p < .001$). Overall, the present results suggest that the ability to construct a temporal representation of the narrative from sparse fragments is influenced by the sampling frequency, rather than by the duration of the fragments.

P2.06 | The Dynamic Experience of Architecture Influences the Processing of Body Expression

Giovanni Vecchiato (Institute of Neuroscience, National Research Council of Italy, Parma; Department of Theoretical and Applied Sciences, eCampus University); **Paolo Presti** (Institute of Neuroscience, National Research Council of Italy, Parma); **Fausto Caruana** (Institute of Neuroscience, National Research Council of Italy, Parma); **Pietro Avanzini** (Institute of Neuroscience, National Research Council of Italy, Parma); **Giacomo Rizzolatti** (Institute of Neuroscience, National Research Council of Italy, Parma)

The built environment plays a fundamental role in shaping human cognition and affective states. Despite a growing body of research in this field, the role of individuals and their movement within architectural space has often been overlooked, limiting a comprehensive understanding of architecture's capacity to modulate social cognition. Our research bridges this gap combining Virtual Reality (VR), subjective measures, and high-density electroencephalography (EEG) to investigate how dynamic architectural experiences modulate behavioural and brain responses for social interactions. We developed a parametric VR model generating architectural environments with controlled variations in sidewall distance, ceiling and window height, and color. EEG was recorded while participants navigated through such architectural spaces, and collected their emotional report to measure the architectural experience, as well as fixation times and arousal judgements upon the observation of an avatars' emotional expressions to explore the impact on social cognition. Our findings show that spatial form variations significantly affect valence and arousal: narrowed sidewalls were associated with increased arousal and more negative valence, indicating that architectural features influence emotional states. A time-frequency analysis of EEG data showed a gamma-band desynchronization in the left parietal cortex in high-arousing environments compared to low-arousing ones. These effects emerged during changes in walking speed and spatial transitions, suggesting that motor systems respond to movement and architectural variation by modulating attentional neural dynamics. Event-related potential (ERP) analyses showed that low-arousing environments enhanced P200 amplitudes in response to emotional body expressions, reflecting increased early attentional engagement toward social cues. Source localization implicated the dorsal premotor cortex, highlighting a motor-social coding of space. Additionally, participants fixated longer on the avatars' heads and rated their postures as less arousing. Overall, our results demonstrate that architectural space modulates social cognition through neural motor representations. This interdisciplinary approach highlights the potential of neuroscience-informed design in creating built environments that support well-being and favor human interaction.

P2.07 | Oscillatory Dynamics Of Predictive Coding In Motion Perception

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When estimating the position of moving objects, observers continuously predict their future positions, as portrayed by the phenomenon of Representational Momentum (RM). In RM, an object's position is perceived as shifted in the direction of its motion after it disappears. This study investigates the oscillatory dynamics underlying sensory processing, predictive model construction, and exploitation during motion perception. Using an RM paradigm with continuous rotational motion,

participants viewed a rotating bar (inducer) for 1000 ms at three different speeds. After a 250 ms gap, the bar reappeared (probe) in a static position, but tilted clockwise or counterclockwise. Participants reported whether the probe bar was positioned the same as the last frame of the inducer or not, while EEG was recorded. The results revealed that both the magnitude of the RM effect and parieto-occipital alpha (8-12 Hz) desynchronization during the induction period increased with rotational speed. During the probe period, stronger parieto-occipital beta (15-25 Hz) synchronisation was observed when participants effectively experienced the RM effect, i.e. when they reported the same position compared to when they reported a different position. Directional connectivity patterns within the fronto-parieto-occipital network, primarily in the alpha and beta bands, indicated that parietal sites constantly receive input from frontal and occipital regions throughout the whole trial duration, while occipital sites receive input exclusively from frontal sites. These findings suggest that parieto-occipital alpha-band activity encodes sensory evidence during motion perception, while beta-band activity is involved in evidence accumulation and model exploitation during perceptual decision making. Additionally, parietal sites may play a key role in constructing predictive models by integrating sensory input from occipital areas, guided also by frontal areas, and subsequently using these models to influence perceptual decision-making via feedback to occipital cortices.

P2.08 | Anxiety Modulates Semantic-affective Integration in the Anterior Temporal Lobe

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Previous literature suggests that semantic processing may be altered in heightened anxiety, yet the neural mechanisms that integrate emotion and semantics remain unclear. Understanding these mechanisms may help elucidate anxiety-related processes. A left-lateralized semantic network, including the inferior frontal gyrus (IFG), posterior superior temporal gyrus (pSTG), and middle temporal gyrus (MTG) supports lexico-semantic functions, whereas affective processing recruits the hippocampus, amygdala, anterior insula (AI), and ventromedial prefrontal cortex (vmPFC). The anterior temporal lobe (ATL) has been proposed as a convergence hub for semantics, mediating emotional and conceptual cognition. We hypothesize that the ATL plays a central role in the integration of emotional and semantic information. Specifically: (1) the ATL will show greater involvement in semantic judgement of negatively evaluated social stimuli (e.g. bossy, arrogant) compared to neutrals; (2) trait anxiety will modulate ATL engagement, (3) leading to altered functional connectivity (FC)

to emotional areas. 131 healthy participants with varying anxiety levels performed a semantic association task: given a target word, they selected the semantically related option between two negatively valenced words. For the control condition, participants identified shared symbols between character strings. fMRI data were acquired. Trait anxiety and positive affect were assessed using the STAI-T, BIS, Sensitivity to Punishment (SP), BAS, and Sensitivity to Reward (SR) scales. fMRI data were preprocessed with fMRIPrep. Whole-brain and ROIs analysis were performed with SPM12, NiLearn and NiBabel. FC analyses are still ongoing. Psychometric scores were synthesized via principal component analysis into composite anxiety and positive-affect factors. Whole-brain analysis (semantic [negative] > symbols [neutral]) show bilateral implication of the AI, and more left-lateralized in the pSTG, MTG and IFG. Exclusively left signal in the inferior temporal gyrus (ITG), temporal pole (TP) and orbitofrontal cortex is reported. Significant correlations are found in the ROIs analysis between anxiety and signal in bilateral hippocampus and MTG, and left middle and inferior TP when controlling for positive affect. FC analyses will provide further insights in the emotional-semantic systems relationship and the mediation role of the ATL. This work advances knowledge of the semantic-emotional interaction and how it is altered by high trait anxiety in a subclinical population.

P2.09 | Redundant Prediction Error Encoding Across Species

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Predictive processing theories propose that the brain maintains a model of current and future external states and updates it with new sensory data. Hierarchical predictive-coding (HPC) posits that inference is implemented via feedforward routing of unpredicted signals (prediction errors, PEs). The inference principle is widely accepted, but debate continues over its implementation and whether it varies across mammals. One possible approach to answering this question is to employ the mathematically robust framework of information theory to quantify whether PEs across species share information about the predicted stimulus. To this extent, we recorded intracranial electrophysiology (EcoG/ sEEG) across cortical hierarchies of three cats, marmosets, and humans during an identical auditory roving oddball task known to elicit PEs. To analyse these data, we employed two information-theoretic metrics. Firstly, mutual information (MI), which was used to capture the shared information

between the PEs (ERP: mismatch negativity) and stimulus identity (standard/oddball), and thus to identify the electrodes that encoded PE-information within species. Secondly, co-information (co-I), which was used to decompose the information content between three signals. We computed co-information between stimulus identity and the ERPs recorded from matched electrodes in corresponding brain areas between species (e.g., marmoset A1 and cat A1). This analysis reveals what kind of information the ERPs from all species encode about the oddball in relation to each other. In other words, is the information redundant across species: positive co-I indicates shared information (redundancy) between the signals. Our results show that ERPs from temporal areas encode redundant information between species, but to differing extents depending on the comparison: human/marmoset ERPs share the most information and cat/human ERPs display least redundancy, with cat/marmoset ERPs falling in the middle. Based on evolutionary logic, we suggest that redundant encoding in related species likely reflects similar underlying neural circuitry. This proposition is supported by our finding that closely related species (humans/marmosets) share more redundancy than species that are more evolutionary distinct (humans/cats). To our knowledge, our study is the first to employ the framework of information theory for comparing PE-information across mammalian brains.

P2.10 | Oscillatory Signatures of Top-down Control of Internal Representations in Working Memory: An M/eeg-guided Tms Study

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Working memory (WM) and short-term memory (STM) are often used interchangeably in cognitive neuroscience literature, yet they denote different cognitive processes. Short term memory refers to the temporary storage of information, whereas working memory involves additional goal-directed manipulation of this information. Previous studies have shown correlational as well as causal evidence for involvement of brain oscillations at alpha (8-12Hz) and theta (4-8Hz) frequencies in the maintenance stage of visual WM/STM but without explicit differentiation of these two processes. Here, we investigate the causal relationship between oscillatory neural activity and behavioural performance in a task where participants had to either mentally manipulate maintained information (WM) or not (STM). In a change detection task, participants were retro-cued to maintain all stimuli (polygons and gratings) during a delay period (STM condition) or only stimuli belonging to one feature category (polygons or gratings), while ignoring non-cued stimuli (WM condition).

Importantly, the retro-cue indicated the stimulus category, but not the visual field, to remember, thereby engaging feature-based memory processing. In the first part of this study, we recorded brain activity with simultaneous M/EEG from a sample of 50 participants. Source localized oscillatory power in the high-frequency alpha (10-14 Hz) band in parieto-occipital regions was increased during the maintenance (post-retrocue) period for WM compared to STM trials, while prefrontal theta power was decreased. We used these results to design the second part of the study, where rhythmic transcranial magnetic stimulation (rhTMS) was applied at alpha-frequency (11 Hz) to intraparietal sulcus and theta-frequency (7 Hz) to prefrontal cortex during the maintenance stage of the task, in a subset of the same participants (N = 26) (M/EEG-guided rhTMS). Rhythmic TMS had little effect on behavioural performance measured with accuracy or reaction times, when compared against sham stimulation. However, compared with performance in the first (M/EEG) part of this study, TMS stimulation at alpha but not theta frequency led to improvement in WM-accuracy, specifically in mid-range performers. Similarly, biggest TMS-induced improvements in accuracy were related to mid-range task-related M/EEG alpha power, suggesting an optimal level of alpha oscillations relevant for behaviour and TMS-efficacy.

P2.11 | Time-resolved EEG Decoding Reveals A Shift From Stronger Expected to Unexpected Action Outcome Representations

Kirsten Rittershofer (UCL, UK); **Daniel Yon** (Birkbeck, University of London, UK); **Clare Press** (UCL, UK)

Time-Resolved EEG Decoding Reveals a Shift from Stronger Expected to Unexpected Action Outcome Representations Kirsten Rittershofer1,2,3, Daniel Yon3, Clare Press1,2 1Experimental Psychology, Division of Psychology and Language Sciences, UCL, UK 2Functional Imaging Laboratory, Department of Imaging Neuroscience, UCL, UK 3School of Psychological Sciences, Birkbeck, University of London, UK It is widely proposed that our brains must use expectations about what is likely in order to perceive, but it remains unclear how exactly they shape perception and neural processing. Bayesian accounts propose that perception is biased towards expected events, ensuring quick and veridical experiences, whereas cancellation accounts argue that unexpected inputs are perceptually prioritized because they are more informative. The opposing process theory reconciles these views, outlining how expectations can render perception both veridical and informative: Initially, perception is biased towards what we expect, followed by reactive enhancement of only particularly surprising inputs that are informative for model updating. Here, we tested this account using time-resolved decoding of EEG data. Participants (N = 36) performed index and little finger abductions while observing an avatar hand on the screen executing movements either congruent (expected) or incongruent (unexpected) with their own action. Participants' task was to identify the observed action outcome, and they were more accurate but slower to do so on expected compared to unexpected trials,

indicating that our expectation manipulation was effective. To examine how the neural representations of these action outcomes evolved over time, we trained a linear classifier to discriminate between observed index and little finger abductions using EEG data from a localizer condition where action outcomes had been simply observed. This classifier was then applied in a time-resolved manner separately to both expected and unexpected trials. Cluster-based permutation tests revealed that decoding accuracy was initially higher for expected action outcomes (from approximately -60 to -15 ms before stimulus onset), consistent with preactivation of expectations. This pattern subsequently reversed, with decoding accuracy becoming significantly higher for unexpected outcomes from approximately 160 to 235 ms after stimulus onset. These findings are in line with the opposing process theory: Enhanced neural representations of expected outcomes early in time, which later reversed to favour unexpected ones. Such a temporal dynamic may explain how expectations can make perception veridical, while still allowing for the accurate perception of particularly unexpected events that are important for learning - bridging gaps between earlier conflicting studies and accounts.

P2.12 | Temporal Dynamics of Prediction Errors on Perceptual Content and Awareness Of Content

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Current theories of perception struggle to reconcile cases where perceptual information influences behaviour but fails to reach conscious awareness (Dehaene & Changeux., 2011; Graziano, 2019; Lau & Rosenthal., 2011). Computational proposals have suggested a hierarchical generative model of perception where awareness is implemented as a second-order inference on first-order perceptual content (Fleming 2020). A recent fMRI study showed that the neural signatures of prediction errors (PE) at both levels are spatially segregated (Dijkstra et al., 2024), with PEs on content being tracked in the early visual cortex (EVC) and PEs on awareness (detection of content) in the prefrontal cortex (PFC), in line with a hierarchical architecture. In this study, we sought to characterize the temporal dynamics of awareness and content PEs using magnetoencephalography (MEG). Given the proposed hierarchical relationship between inferences on content and awareness, we hypothesised content PEs would precede awareness PEs. To experimentally tease these two types of PEs apart, we used compound cues that generated expectations about both whether a stimulus is likely to be detected (awareness) and what that stimulus is likely to be (content). Participants (N=40) learned the statistical regularities between cue-stimulus: the shape of a cue indicated whether a stimulus or pure noise would be more likely to be presented (detection expectation), and the colour signalled whether the stimulus would more likely be a face or house (content expectation). We first showed

that both awareness and content PEs resulted in longer RTs and that the content PE effect was stronger when stimulus presence was expected. Next, participants completed a no-report version of the task during MEG scanning. We used the Higher Order State Space (HOSS) model (Fleming 2020), to compute the KL divergences, the degree of belief updates, as proxies for both content and awareness PEs for each cue-stimulus pairing. We performed a multiple linear regression on the MEG data using the model derived KL divergence for both content and detection PEs. Preliminary univariate analyses suggest content PEs occur earlier in time than awareness PEs. Further multivariate decoding and RSA aim to elucidate the temporal dynamics of these two types of PE.

P2.13 | Autism Spectrum Disorders and Developmental Prosopagnosia: Investigating Gender Asymmetry

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Developmental prosopagnosia (DP) is a neurodevelopmental condition characterised by lifelong difficulties in social functioning, specifically impaired face recognition. Intriguingly, while females are overrepresented in prosopagnosia studies, they are often neglected when seeking a diagnosis of autistic spectrum disorder (ASD), which is also characterised life lifelong difficulties in social functioning. Given the high rate of occurrence of DP within ASD, it is possible that many females self-reporting prosopagnosia are high-functioning individuals with autism whom traditional approaches to diagnosing the condition have missed. We hypothesised that individuals with ASD would exhibit elevated levels of prosopagnosia and that females reporting prosopagnosia would show higher levels of autistic traits than males. This preliminary study includes 138 participants (50 males, 88 females) who self-reported a diagnosis of ASD (N=39) or as neurotypical controls. This 60-minute online study consisted of: (i) standardised questionnaires assessing traits related to autism (CATI), prosopagnosia (PI20), alexithymia (TAS-20), and social anxiety (LSAS) and (ii) validated behavioural tasks assessing face memory (CFMT and FFT), face perception (CFPT), and emotion recognition, with object memory (CCMT) as a control. The study aims to recruit 250 participants, with an equal number of males and females A multiple linear regression analysis was run on a model with CATI score as the outcome variable and the following as predictors: Formal.asd*pi20 + cfmt + fft + cfpt + ccmt + tas + Sex.at.birth + Age + LSAS, (Adjusted $R^2 = .71$, $p < .001$). We found a significant interaction between ASD diagnosis and PI20 score ($\beta = -.57$, $p = .018$), suggesting that the effect of PI20 score on CATI score differed based on ASD diagnosis, and association was significantly stronger in the undiagnosed group. Other significant predictors include formal diagnosis, PI20, FFT, CFPT, TAS, and LSAS. Interestingly, there is no interaction effect between PI20 and sex at birth ($\beta = -0.14$, $p = .386$) on the same model. Preliminary findings suggest PI20 is predictive of autistic traits, particularly in those without

ASD diagnosis. However, no significant sex differences were found in the preliminary analyses. The implications of our findings suggest that reporting lifelong difficulties with face recognition should lead to screening for ASD.

P2.14 | Inter-hemispheric Envelope Coupling Between Sensorimotor Beta Oscillations Leaves a Trace in Peripheral Recordings

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Inter-hemispheric envelope coupling between sensorimotor beta oscillations leaves a trace in peripheral recordings Nicolas Yanguma Muñoz[1,2], Chrisitian Georgiev[1,2], Scott J. Mongold[1,2], Armin Hakkak Moghadam Torbati[1,2], Daria Digileva[1,2], Gilles Naeije[2,3,4], Pierre Cabaraux[1,2,3], Mathieu Bourguignon[1,2,5]

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Introduction: Beta oscillations within the primary sensorimotor cortices (SM1) are coupled in amplitude between the left and right hemispheres. Such coupling has been hypothesized to reflect effective communication across hemispheres. Interestingly, during steady muscle contractions, beta SM1 oscillations leave a trace in muscle and contraction force signals. Therefore, this study aims to determine whether the coupling between hemispheres gives rise to a similar beta envelope coupling between peripheral signals. Methods: Fifteen healthy young adults performed a bilateral steady pinch-grip contraction for ten minutes at 10% of their maximum voluntary contraction. MEG and force were recorded simultaneously at 1 kHz. MEG signals were source-reconstructed in bilateral SM1. Then, SM1 and force signals were filtered through 5-Hz-wide frequency bands centred on 5–40 Hz. The burstiness of the signals was assessed using the coefficient of variation of their envelope (CVenv). We also assessed the correlation between left and right force envelopes (Rforce) and between the left and right SM1 envelopes (RSM1). Results: The 13–30-Hz Cvenv of the force signals was 0.55 ± 0.05 for both hands, which was significantly higher than the

value expected for a random noise (0.50). Force 13–30-Hz Cvenv were significantly lower ($p < 0.05$) than those for source-reconstructed SM1 oscillations in the right (0.60 ± 0.05) and left (0.58 ± 0.04) hemispheres. The left-hand force 13–30-Hz Cvenv was significantly correlated with that for the right SM1 ($r = 0.69$, $p = 0.0044$), but such a relationship was not significant between right-hand force and left SM1 ($r = 0.35$, $p = 0.20$). Rforce values (0.11 ± 0.06) were significantly smaller ($p < 0.0001$) compared with RSM1 values (0.21 ± 0.06). Still, both were strongly correlated ($r = 0.69$, $p = 0.0047$). Conclusions: Our results revealed the presence of a significant coupling between the envelope of the ~20-Hz fluctuations in left- and right-hand contraction force during steady muscle contraction, akin to that seen between left and right SM1. This finding demonstrates the feasibility of using peripheral recordings to inform on SM1 inter-hemispheric communication, opening novel perspective for affordable, large-scale monitoring of this process in health and disease.

P2.15 | Interpreting Sentences While Whispering 'da ba ga da': An fMRI Study of Plausibility-Based Processing under Phonological Loop Load

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Introduction: Humans interpret sentences by integrating various information, such as syntactic cues and plausibility. Previous research indicates that when working memory resources are limited, as in dual-task conditions, participants tend to rely more on plausibility information than syntactic cues (Gibson et al., 2013). Neuroimaging evidence has shown that grammatical processing decreases during whispering (Rogalsky et al., 2008). However, it remains unclear whether neural activity supporting plausibility-based interpretation increases or decreases. The current study investigates the neural correlates of plausibility-based sentence processing under phonological loop interference using functional magnetic resonance imaging (fMRI).

Methods: We recruited 49 native Japanese speakers, excluding 4 due to excessive head motion (> 5 mm or > 10 degrees) or low accuracy (< 80%). During fMRI scanning, participants either silently repeated meaningless syllables "da ba ga da…" (dual-task condition) or remained silent (single-task condition) while listening to sentences. We additionally manipulated plausibility (e.g., "The baby was gently lifted by the mother" in plausible conditions vs. "The mother was gently lifted by the baby" in implausible conditions). After each sentence, participants answered a two-choice comprehension question. Participants listened to 48 target stimuli and 48 filler sentences (all plausible) per person. Results: We analyzed the accuracy of comprehension questions and brain activity using R and SPM12, respectively. First, behavioral analysis using generalized linear mixed models revealed significantly lower accuracy for implausible sentences compared to plausible sentences ($p < .001$). Next, the brain analysis

focused on 13 predefined regions of interest (ROIs), including bilateral inferior frontal gyrus (IFG; pars opercularis, pars orbitalis, pars triangularis). Under the single-task conditions, implausible sentences elicited greater activation than plausible ones in Right IFG opercularis, Left IFG orbitalis, and Left IFG triangularis (FWE corrected $p < .05$). However, under dual-task conditions, no regions showed significantly greater activity for implausible sentences relative to plausible sentences.

Discussion: These findings suggest that domain-general IFG regions, which are also involved in phonological loop processing, exhibit reduced activation for plausibility-based sentence processing during the dual task (Nishida et al., 2017). Our results provide novel neurological evidence that plausibility-based processing weakens when working memory resources are limited.

P2.16 | Lifespan Functional Changes in Papez Circuit Interactions Supporting Item and Relational Episodic Memory

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Human episodic memory relies on binding individual elements to create contexts, attending to associative, spatial, and temporal dimensions of events. These relational memory dimensions have rarely been examined together and their neural substrates remain to be ascertained. Higher-order thalamic nuclei are essential in modulating the interplay between the medial temporal lobe (MTL), critical in binding processes, and the prefrontal cortex (PFC) which supports mnemonic control processes during retrieval. Moreover, anterior and mediodorsal thalamic nuclei might be differentially involved in recollective- and in familiarity-related processes, with stronger influence of anterior thalamic nuclei in recollection, and of mediodorsal nuclei in familiarity. Here, we investigated the involvement of these thalamic nuclei in episodic memory and their interactions with MTL and PFC across the lifespan. Thirty-eight children, thirty-seven young adults and thirtyseven older adults underwent high-resolution functional MRI scanning during a memory retrieval task comprising item memory (i.e., mainly dependent on familiarity processes), and associative, spatial, and temporal relational memory (i.e., requiring recollective processes). NORDIC was used to reduce thermal noise, increasing the signal-to-noise ratio. Behaviorally, children and older adults performed worse than young adults, and associative relational memory was the most difficult condition, followed by temporal relational memory. Whole-brain contrasts showed MTL involvement in relational memory, while item memory engaged more perceptual regions. As expected, we found higher hippocampal recruitment in relational than item memory. Region-of-Interest analyses also revealed stronger recruitment of dlPFC and IFG in older adults, particularly in item memory, on which they seem to rely stronger than children and young adults. Results also

revealed a stronger involvement of anterior thalamus in recollection-related and of mediodorsal in familiarity-related retrieval processes in children and young adults in line with Aggleton and Brown's model, but not in older adults. Older adults exhibited tighter functional connectivity between dlPFC and IFG than children and young adults. Thus, while a pattern in line with Aggleton and Brown's model was found in both children and young adults, older adults showed a differential involvement of thalamic nuclei in episodic memory. Older adults also performed worse behaviorally, with prefrontal hyperactivation and hyperconnectivity, suggesting a cortical compensation mechanism.

P2.17 | Flattened Spectra, Dilated Pupils: Neural Markers of Cognitive Load

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Adaptive allocation of attention has been proposed to emerge from the concerted action of locus-coeruleus noradrenergic (LC-NE) arousal and cortical excitation– inhibition balance. To test this framework, we recorded high-density electroencephalography (128 channels) and 1 kHz pupillometry while thirty healthy adults (18–35 yr) performed a multiple-object-tracking task in which attentional load varied parametrically with the number of targets. Continuous EEG was band-pass filtered (0.5–40 Hz), down-sampled to 250 Hz, cleaned via independent component analysis, and epoched around the 10 s tracking period. Power spectral density was estimated with Welch tapers and decomposed with FOOOF to isolate the aperiodic exponent. Pupil traces were blink-corrected, band-pass filtered (0.05–2.5 Hz), z-normalised per trial, and aligned to stimulus onsets. Statistical inference proceeded in two stages. Repeated-measures ANOVA confirmed significant load effects on the aperiodic exponent and mean pupil dilation. Linear mixed-effects models demonstrated that both indices robustly predicted trial-level accuracy. Cluster-based permutation tests localized load-sensitive EEG changes to medial frontal and occipito-parietal electrodes after motion onset. Heavier tracking demands elicited progressively larger phasic pupil dilations, validating the task's efficacy at recruiting the LC-NE system. Concurrently, attentional load flattened the aperiodic exponent. Across participants and trials, greater phasic pupil responses co-varied with flatter exponents, and epochs in which both signals were maximally engaged coincided with superior behavioral performance. A combined arousal–aperiodic model accounted for accuracy significantly better than either predictor alone. By integrating pupillometry with parametric decomposition of EEG spectra, this study demonstrated how neuromodulation and cortical excitability cooperated to sustain visuospatial attention, advancing mechanistic models of brain-state regulation under demanding cognitive conditions.

P2.18 | Approach-avoidance Conflict in Social Contexts: Neural and Behavioral Correlates in Internalizing Disorders

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Conflict approach-avoidance (CAA) refers to situations involving the simultaneous presence of both rewarding and aversive stimuli, posing a motivational dilemma: whether to pursue a reward despite the potential cost of experiencing something aversive. Theoretical models of approach-avoidance behavior have been proposed as a valuable framework for understanding internalizing disorders such as depression and anxiety, which are typically characterized by reduced approach and increased avoidance. Notably, it has been emphasized in the literature the importance of studying CAA in the context of social interactions, as these are highly salient domains for humans with relevance in mental health. In the present study, we developed a socially framed CAA task, in which participants were required to choose between a social option (offering the prospect of a reward coupled with having to compete with a rival) and an individual option (which entailed neither a reward nor social competition). Using this paradigm in combination with fMRI, we assessed a sample of 116 participants with varying levels of depressive and anxiety symptoms. Behaviorally, results showed that as the perceived status or "category" of the rival increased, participants were more likely to avoid the social option and reported elevated negative emotions such as shame and nervousness. Neurally, higher rival category was associated with increased activation in conflict-related regions, including the anterior cingulate cortex, while greater reward magnitude elicited increased activity in reward-related regions such as the striatum. Importantly, participants with higher levels of depression and anxiety symptoms showed a trend to avoid high-status rivals and reported stronger negative emotional responses. Moreover, greater symptom severity was linked to increased activation within regions of the default mode network (DMN) in response to the rising social threat posed by high-category rivals. These findings suggest that internalizing psychopathology is associated with enhanced negative emotions towards socially stressful contexts, which could lead to increased avoidance even at the cost of foregoing rewards. Maladaptive processes linked to the DMN such as rumination may underlie these emotional and behavioral patterns.

P2.19 | Neurophysiological Responses to Different Types of Uncertainty in Information in a Reversal Learning Task

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Information has been proposed to function as a reinforcer, engaging the brain's reward circuitry. However, the role of different types of uncertainty — both in the environment and in the availability and reliability of information — on neural and behavioural responses remains unclear. If the value attributed to information depends on uncertainty, it should modulate the activation of the reward network and its associated oscillatory components. To investigate it, we used a probabilistic reversal learning paradigm with two distinct conditions: volatile and stable. Moreover, in each trial, participants could pay a fee to receive a hint regarding the correct option, and the hint could be either possibly not available (information not provided) or possibly not reliable (false information). 30 participants performed the task while undergoing 64-electrodes EEG recording. Behavioural results showed that participants were more likely to pay in the availability of information compared to the reliability of information condition, and in volatile contexts compared to stable ones. Time-locked ERPs and timefrequency analyses were performed using a cluster-based permutation approach, and they revealed that Feedback-Related Negativity (FRN) amplitudes differed significantly between the volatile and stable conditions, suggesting that information has greater relevance when the environment is unpredictable. Additionally, the feedback-locked P3 component and theta power were reduced when participants had prior access to information about the correct response, indicating attenuated reward processing. These findings support the hypothesis that the brain tracks not only whether information is useful, but also how it is useful, highlighting that distinct forms of uncertainty modulate both decision-making and neural feedback processing.

P2.20 | Neural Correlates of Evidence Accumulation in an Expanded Judgement Task With Alternating, Choice-specific Tokens

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A solid body of work has investigated how people make decisions on the basis of noisy, continuous evidence in contexts where sensory information is hard to discriminate. However, less is known about how people process competing, unambiguous pieces of evidence that distinctly favour a particular choice. In this electroencephalography (EEG) study (N = 20), we used an expanded judgement task to investigate 1) how decisions are made in a context where discrete evidence tokens supporting competing choices are presented in an alternating sequence, and 2) the role of a

prominent neural decision signal, the centroparietal positivity (CPP), during evidence accumulation in such a context. In our task, participants saw a sequence of tokens containing a cloud of static coloured dots (0.4s per token, maximum 16 tokens per trial). Dots in each token were either all blue or all yellow, and colours alternated in contiguous tokens. The number of dots displayed in each token was drawn from partially overlapping distributions with different means, and participants' task was to determine, for each trial, which coloured dots were displayed, on average, in higher numbers (i.e. blue, or yellow). They were free to respond with a keypress as soon as they made up their minds, and the response-mapping (left/right hand for blue/yellow choices) was counterbalanced across participants. We found that participants' accuracies and reaction times could be explained by a model with two mutually-inhibiting accumulators (one for blue, one for yellow dots) and a collapsing bound, where belief updates after each token were computed as a function of the number of coloured dots it contained, but were additionally modulated by the state of the competing (i.e. other colour) accumulator. Further, we found that the CPP following each token scaled with the discrete belief updates predicted by this model. These results shed new light onto the neurocomputational mechanisms potentially underpinning the CPP, and align with recent findings suggesting that, in expanded judgement tasks, token-evoked centroparietal potentials may reflect momentary belief updates.

P2.21 | Blinking vs. Winking: Comparing Electromyographic Signals From Both Eyes Suggests Involvement of High-level Mechanisms

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Blinks are bilateral eye closures that occur through the antagonistic actions of orbicularis oculi (OO) and levator palpabrae superioris muscles. However, eye closure is not necessarily bilateral and can be lateralized to permit either eye to be winked. Does this behaviour involve a specialized cognitive program which breaks the innate coupling between the eyes to permit singular eye closure? Or are the eyes independently controlled? Here we present EMG data recorded from OO muscles in 22 healthy participants (11 females, aged 18-24 years) performing a structured task involving voluntarily blinking or winking when cued by an auditory tone. Surface electrodes were placed directly beneath each eye and data were simultaneously recorded on an Eyelink-1000 video-based eye-tracker. The goal of this project is two-fold: (1) to compare the EMG activity during blinks and winks, and (2) to determine the accuracy of blink onset and duration measures obtained from Eyelink-1000 in support of eye-tracking projects. Firstly, we observed stronger bilateral OO-EMG activation during voluntary blinks than during spontaneous blinks which occur passively without our conscious control. During winks, the winking eye OO was more strongly activated than on voluntary blinks, while the opposite was true for the non-winking eye. Notably, however, the non-winking eye OO revealed stronger activation during winks

than during spontaneous blinks. We also found that the timing of right and left OO bursts was tightly coupled at blink onset, suggesting strong binocular coordination. Altogether, these findings lead us to believe that a bilateral command is sent from the cortex during both blinks and winks, and therefore a unique oculomotor program is required to break the binocular coupling to produce a wink. We speculate that this occurs through an additional command sent from the cortex during a wink which weakens the bilateral signal and augments the signal to the winking eye. Lastly, we found remarkable consistency in the timing of blink onset between EMG and eye-tracking: the OO-EMG burst started ~50ms before pupil data loss, and blink durations were strongly correlated between modalities. This result will strengthen the precision of blink onset and durations calculated from video-based eye-tracking data.

P2.22 | Blocking Orexin A and B Receptors Impairs Alertness But Enhances Measures of Cognitive Control

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Cognitive control is crucial for adaptive behavior in complex environments but the neurochemical systems modulating these processes are only incompletely understood. Among these systems is orexin (also known as hypocretin), a neuropeptide produced by the lateral hypothalamus. Orexin has gathered interest due to its multifaceted role in promoting arousal, reward processing, and sleep-wake regulation. Prior research indicates that orexin receptors are distributed across various brain regions implicated in cognitive control, including the prefrontal cortex, basal ganglia and hippocampus. This study seeks to elucidate the role of orexin in cognitive control utilizing pupillometry and electroencephalography (EEG) to capture the dynamic neural activity associated with alertness, response inhibition and error processing. In a randomized double-blind placebo-controlled procedure thirty healthy young participants completed a modified Simon task in two sessions spaced one week apart. On one of these days, we used daridorexant to block orexin A and B receptors. We found that self-ratings of sleepiness were increased when participants received the verum compared to placebo. In line with this, we found longer response times and more missed responses. On the other hand, the interference effect on response times was reduced and post error slowing was enhanced for daridorexant versus placebo. Finally, an increase in pupil dilation following errors was only observed in the placebo condition but not when daridorexant was administered. Taken together these results point toward an auxiliary role for orexin in general alertness and potential interactions with noradrenergic (up)regulation. Surprisingly, blocking orexin receptors increased post error adaptations and reduced interference, both suggesting increased cognitive control. Potentially, cognitive control mechanisms were employed to overcome tiredness induced by blocking the orexin system. EEG data is currently being processed and will help to further illuminate the neurophysiological

mechanisms through which orexin might influence alertness and cognitive control. Understanding the involvement of orexin in these processes will not only provide valuable insights but could inform the development of targeted therapeutic interventions.

P2.23 | Dissociable Effects of Uncertainty in Perceptual and Cognitive Control

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The ability to manage uncertainty is a hallmark of flexible cognitive control, yet uncertainty arises from distinct sources that challenge both perceptual and executive systems. To disentangle how the brain manages different uncertainty sources, we adapted a dynamic perceptual decision task. Participants were asked to sample up to four visual features (color, movement direction, size, and saturation) from compound stimuli and, following stimulus offset, were tasked to report the prevalence of a probed feature via two-alternative forced choice. Perceptual uncertainty was manipulated by varying the relative choice evidence for each feature, individually titrated to yield 65% and 90% accuracy, while task uncertainty was manipulated by cueing either one or four possible target features, thereby varying the set size from which a probe was drawn. Three experiments tested uncertainty effects in healthy adults (age 16–36): a single-session EEG study (N=15), a multi-session EEG and fMRI study (N=23), and a behavioral control experiment (N=26). Across these experiments, we observed a robust behavioral double dissociation: increased perceptual uncertainty selectively reduced choice accuracy, whereas increased task uncertainty reliably slowed response times, independent of response conflict. fMRI analyses during stimulus presentation revealed that task, but not perceptual, uncertainty, increased activation in a multidemand fronto-thalamic network, and decreased activation in medial prefrontal cortex (task PLS; permuted $p < 0.001$). Notably, these neural effects were most pronounced when perceptual uncertainty was low, indicating dependencies between uncertainty sources. These findings replicate and extend prior work, demonstrating that thalamocortical circuits track uncertainty in a differentiated, source-specific manner to exert domain-specific control. Ongoing analyses leverage multimodal fMRI and EEG to characterize neural adjustments to uncertainty and test the effects of thalamic ultrasound stimulation on behavior, decision computations, and neural dynamics. By establishing robust and dissociable effects of uncertainty sources on neural activation and behavior, this research provides a foundation for understanding how the human brain flexibly manages diverse uncertainties.

P2.24 | Physiological and Behavioral Markers of Fatigue

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Fatigue has remarkable effects on human information processing and can lead to (fatal) errors. Here we looked at the effects of fatigue on information processing in the lab environment. We focused on simple pre-attentional information processing, operationalized by characteristics of mismatch negativity (MMN) in visual and auditory modalities. We examined the dynamics and correlates of fatigue throughout a 2-hour experimental series by using the following fatigue measures: self-ratings, critical flicker fusion (CFF), eye blink amplitude, frequency and duration. Participants (n=66, M_age=28.29, SD_age=8.68) completed a cognitive battery comprising stop-signal, reaction time, memory, and pre-attentional information processing (with 1000 Hz and 1200 Hz for auditory, and letters “T” and “B” for visual mismatch negativity, 20:80 reversed design) tasks. All tasks were carried out twice, at least one week apart. A robust ANOVA main effect indicated that participants’ subjective fatigue ratings increased during both lab visits($F(1.71, 95.87)=65.41$, $p<0.001$). The difference between CFF ascending and descending thresholds increased during both lab visits ($F(1,64)=5.84$, $p<.05$) reflecting fatigue buildup. Blink frequency did not change consistently neither within ($F(3.29, 203.70)=1.66$, $p=0.17$) nor between recording sessions ($F(1.90, 117.62)=2.36$, $p=0.10$), however, the frequency was lower in visual modality ($F(1.91, 118.37)=11.52$, $p<.001$). Blink amplitudes decreased both within ($F(2.11, 130.84)=21.64$, $p<.001$) and across recording sessions ($F(1.76, 109.15)=24.87$, $p<0.001$), while blink durations increased both within ($F(3.38, 209.60)=15.29$, $p<.001$) and across sessions ($F(1.45, 89.63)=4.67$, $p=.021$). Blink frequency and duration went up between two lab visits ($F(1, 62)=7.53$, $p=.008$, and $F(1, 62)=4.32$, $p=0.042$, respectively), while blink amplitudes went down ($F(1, 62)=11.64$, $p=.001$). MMN amplitudes increased within experimental sessions in both visual ($F(1, 64)=4.29$, $p<.05$) and auditory ($F(1, 64)=10.66$, $p<.01$) modality. Overall, the results imply that MMN amplitudes increase with fatigue, suggesting in turn compromised inhibition processes and diminished ability to ignore distractors. The study is a part of a project that aims to compare different measures of fatigue and relate them to objective cognitive performance measures and was funded by the Estonian Research Council grant PRG1151.

P2.25 | Neural and Episodic Memory Features During Free Recall of Naturalistic Film Scenes Show Divergent Associations With Intrusive Memories

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Unwanted memory intrusions are a core symptom of posttraumatic stress disorder (PTSD), yet it remains unclear why certain trauma-related experiences later intrude into awareness. Here, we use the trauma film paradigm and a free recall task while measuring functional magnetic resonance imaging (fMRI) data to examine whether (1) trauma-related experiences alter the episodic memory structure, such as the precision of item and spatial context encoding, (2) whether these differences shape vulnerability to intrusive recollections and (3) how intrusive memory content is represented in the brain. Participants watched film clips of traumatic material and content-matched neutral episodes in the MR scanner. Subsequently, they reported involuntary memory intrusions during a resting phase and voluntarily recalled each film scene in as much detail as possible. Voluntary recall of trauma-analog experiences was associated with more remembered items and more detailed memories of those items compared to neutral experiences. In contrast, trauma-analog memories were related to less accurate spatial context memory compared to neutral memories. Crucially, remembering more details per item was related to higher memory intrusion frequency on an intra- and intersubject level, whereas remembering spatial context information was related to fewer intrusive memories. Moreover, encoding trauma-analog experiences was associated with higher neural activity in the precuneus and lateral occipital cortex compared to neutral film scenes. Neural activity in these areas was modulated by the number of remembered items and the number of item-specific details. In contrast, encoding spatial context was related to neural activity in the parahippocampal gyrus. Our results suggest diverging effects of trauma-analog experiences on episodic memory content. While trauma-analog experiences enhance encoding of sensory detailed item memories related to higher neural processing in visual areas, trauma-analog experiences disrupt spatial context memory. In turn, these dissociative alterations on memory content jointly contribute to the development of intrusive memories. In other words, participants with more detailed item memory but low spatial context memory reported more intrusive memories. These findings demonstrate how free recall tasks can reveal underlying memory alterations associated with intrusive memories, offering a potential avenue for developing interventions aimed at reducing their frequency.

P2.26 | Does Increased Postural Task Difficulty Improve Sustained Attention in Healthy Participants?

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Introduction: Numerous studies have investigated the various mechanisms involved in postural control. Among these mechanisms, the influence of divided attention has been widely examined; however, sustained attention — essential for the initiation and execution of any movement — has rarely been explored in the context of postural control. To our knowledge, only one study has evaluated different types of

attention and reported increased alertness levels (reflected by shorter reaction times) during more complex postural tasks. Based on these findings, we hypothesized that attentional task performance would improve under conditions of increased postural difficulty. Materials and Methods: To test this hypothesis, we assessed sustained attention in 22 participants (aged 21 to 31 years) using an auditory version of the Continuous Performance Test (CPT) during three postural tasks of increasing difficulty performed on a force platform: sitting, the two-foot stance and the one-foot stance. For each postural condition, we recorded mean reaction time and the number of commission errors (CE) and omission errors (OE) during the CPT. Additionally, we measured the center of pressure (CoP) displacement velocity in the anteroposterior and mediolateral directions, according to two interstimulus intervals (ISI): one second and four seconds. Results: A decrease in mean reaction time and number of omission errors was observed, alongside an increase in commission errors, but only under the one-second ISI condition and during the two-foot stance and the one-foot stance compared to the seating position. No differences were observed between the two-foot stance and the one-foot stance. Minimal changes were observed in the foursecond ISI condition. Discussion/Conclusion: Postural control and sustained attention appear to interact through a heightened state of alertness, as evidenced by the reduced reaction time and fewer omission errors, which in turn enhance attentional task performance until a plateau value.

P2.27 | The Left Lateral Prefrontal Cortex Supports Proactive Control Over Prepotent Conceptual Responses and Intrusions

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Semantic control refers to the cognitive and neural mechanisms that guide goal-directed retrieval of conceptual knowledge, often altered in neurodivergent populations. While neuroimaging consistently implicates the left lateral prefrontal cortex (PFC) in controlled semantic processing, its precise functional role remains unclear. In a double-blind, randomized controlled trial, we applied anodal or sham transcranial direct current stimulation (tDCS) over the left lateral PFC to participants from two experimental groups (anodal: n = 49; sham: n = 50), who performed automatic-associative and controlled-dissociative word retrieval tasks before and during stimulation. We found that anodal tDCS selectively impaired dissociative retrieval fluency — requiring executive inhibition of dominant associations — while leaving free-associative fluency unaffected. Crucially, prefrontal stimulation also increased the rate of conceptual intrusions during dissociative trials, and this effect substantially

mediated the observed decline in retrieval fluency. These findings provide causal evidence that the left lateral PFC supports proactive inhibitory control over semantic memory, suppressing context-inappropriate activations and intrusions to enable flexible, goal-relevant retrieval. Disruption of this mechanism impairs executive regulation of semantic retrieval, shedding new light on the neural architecture of semantic control and highlighting the potential of neuromodulatory approaches for addressing disordered conceptual processing. Grant support: APVV-23-0145, VEGA (2/0052/23 and 2/0067/25).

P2.28 | Respiration Modulates Excitation-inhibition Balance In Temporal Lobe Epilepsy

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Epilepsy often involves dysregulation of excitation-inhibition (E:I) balance, reflected in alterations of aperiodic brain activity (1/f slope). Recent research highlights respiratory modulation of neural signaling, with one case study reporting differences in respiration phase-locked cortical excitability in epilepsy versus neurotypical controls. The present study aims to characterise breathing-related power spectral abnormalities, including periodic and aperiodic activity, in a large epilepsy cohort. Fifty epilepsy patients underwent presurgical EEG monitoring with respiratory recordings. After extracting and cleaning one hour of resting-state-like data, respiration phases were obtained. To relate aperiodic brain activity to respiration, the SPRiNT algorithm was applied: a moving window approach estimated the aperiodic component of Fourier-transformed neural data every 250 ms, aligning it with respiration phases. Phase-binned slope values were computed for each channel and then averaged to produce mean time series for the hemispheres ipsilateral and contralateral to the seizure onset zone (SOZ). To assess significance, 1000 surrogate respiration traces were generated using the iterated amplitude-adjusted Fourier transform (IAAFT), creating a null distribution for comparison against empirical slope values. A final sample of 30 unilateral temporal lobe epilepsy (TLE) patients with clean EEG and respiration data was selected. Linear mixed-effects models (LMEMs) were used to predict 1/f slope as a function of clinical variables and respiration phase angle (sine

and cosine). Consistent with prior studies, the ipsilateral (to SOZ) hemisphere exhibited greater inhibition compared to the contralateral (to SOZ) hemisphere. Extending earlier findings, we found that LMEM revealed an influence of respiration on cortical excitability. Circular permutation testing identified two significant clusters: steeper slopes during late inspiration and flatter slopes during expiration, suggesting transient shifts in cortical excitability around the inspiration-expiration transition. This study integrates observations of pathological excitability in epilepsy and hyperventilation-triggered seizures within a unified framework. Recent theoretical advancements propose that bodily rhythms - like respiration - coordinate brain-body systems, providing insights into neurological disorders. Specifically, respiration appears to differentially modulate aperiodic and periodic brain activity. Aperiodic activity is likely influenced by pH-dependent adenosine fluctuations, driven by changes in CO2 levels.

P2.29 | Brain Oscillations and Fluid Intelligence: Insights From Eeg Analysis of the Graph Mapping Task

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Fluid intelligence (Gf) is the individual capacity to think abstractly, reason logically, and solve new problems. Gf is measured by tasks that require to identify complex patterns and apply abstract rules. Recent research suggests that brain activity, particularly in the form of oscillatory brain waves, is closely linked with individual differences in Gf. To further explore this relationship, we analyzed EEG data from 207 typical young adults (mean age: 23) during performing the Graph Mapping task, a measure of relational reasoning highly relevant for Gf (Jastrzębski et al., 2020). Gf of the participants was assessed using six standardized intelligence tests. Our EEG analysis revealed a significant negative correlation between Gf and the alpha power change relative to the resting-state baseline EEG data, in both the frontal ($r = -0.1723$, $p = 0.0133$) and parietal regions ($r = -0.1558$, $p = 0.0261$). These results support the findings of Ociepka et al. (2023), and suggest that more intelligent participants perform relational reasoning with lesser mental effort, as reflected by alpha power more resembling resting state, compared to less intelligent participants, in line with the neuronal efficiency hypothesis. Moreover, we observed a novel result in EEG data: a significant negative correlation between Gf and the theta power change relative to the baseline ($r = -0.1839$, $p = 0.0081$), a finding not previously reported in the literature. This unexpected result suggests that theta oscillations may play a more complex role in cognitive processing than previously understood. While alpha activity is often associated with attentional control and inhibition in working memory, the negative correlation with theta power may reflect distinct processes, potentially related to task engagement, error correction, or the integration of novel information. These results contribute to the growing body of evidence linking brain oscillations with cognitive performance, emphasizing that both alpha and theta rhythms may

independently influence fluid intelligence. Further research is needed to better understand the underlying mechanisms of these oscillatory patterns and their role in complex cognitive tasks.

P2.30 | Long-term Social Isolation Induces Memory Deficit and Depressive Behavior in Rats of Different Social Status

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Chronic stress is a major risk factor for the development of mental disorders in humans, including depression. The quarantine regulations during the COVID pandemic have further promoted interest in the behavioral and cognitive effects of chronic social stress induced by prolonged social isolation. The character and results of stress development depend on individual peculiarities of the nervous system. The studies have shown that the dominant rats appear to be more resistant to stress. According to our earlier results short-term social isolation impairs memory especially in the submissive rats. The aim of the current research was to study the impact of long-term social isolation on behavior and short-term memory in rats of different social status. Experiments were performed on 60 white male rats weighing 200-250g. Animals were divided into experimental and control groups. Each group consisted of 3 male and 2 female rats. In order to reveal dominant and submissive rats in groups we used two methods enabling the stronger animal to gain a victory during food and water obtaining process. The selection of animals was made via dominant and submissive according to the recorded behavioral parameters. For the purpose of stressing, social isolation of dominant and submissive individuals were used. Rats were placed in small individual cages for 30 days. Only rats in experimental groups were subject to stressing procedure. Short-term spatial memory was assessed with a Y-maze apparatus. In order to study depressive behavior “forced swim” and “elevated cross maze” tests were used. The concentration of serotonine in the hypothalamus and hippocampus were determined using an immunoenzyme analyser (ELISA reader). The data were processed statistically by two-way factorial analysis (ANOVA). After stressing procedure, in Y-maze, indicator of actual alternations reduced in rats of different social status. According to the behavioral tests dominant and submissive rats demonstrated depressive behavior. Anxiety level was particularly high in submissive rats which showed increased serotonine concentration in the hypothalamus. The obtained results show that long-term social isolation induces short-term memory deficit and depressive behavior in both dominant and submissive individuals. This work is supported by Shota Rustaveli National Science Foundation of Georgia, grant FR-23-2770

P2.31 | Developmental Mechanisms of Anticipatory Inhibition During a Bimanual Postural Task in Children

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Developmental mechanisms of anticipatory inhibition during a bimanual postural task in children Motor anticipation is essential for accurate, coordinated hand movements in humans which takes considerable time to mature during ontogenesis. A valuable framework to study this process is the Bimanual Load-Lifting Task (BLLT), where voluntarily lifting a load supported by the opposite forearm is preceded by anticipatory inhibition of the elbow flexors in the supporting arm, preventing forearm instability. In adults, this inhibition occurs reliably 20–50 ms before unloading onset and is associated with supplementary motor area (SMA) suppression mediated by inhibitory beta bursts, as shown in our recent work (Manyukhina et al., 2025, bioRxiv). In this magnetoencephalography (MEG) study, we examined anticipatory muscle inhibition mechanisms in 25 children (9.78 ± 1.58 years, 17 boys) to determine whether similar or distinct mechanisms underlie this process during development, and to investigate the source of variability in inhibition timing. Among the participants, only 10 children exhibited early, adult-like inhibitions in at least 20% of trials; the remainder demonstrated predominantly later inhibitions, either shortly after unloading onset or reflexive responses occurring 80–100 ms post-unloading. Notably, these groups did not differ in age or physical parameters. Preliminary results indicate that inhibition timing subtypes are underpinned by distinct neural mechanisms. Early inhibitions resembled adult patterns, involving clear SMA activity suppression. However, both early and late inhibitions in children showed a stronger contribution of alpha-band (8-12 Hz) activity than we observed in adults. Specifically, both early and late inhibitions were preceded by a decrease in alpha power in the right cerebellum and an increase in the premotor area, primary motor cortex (M1), lateral prefrontal cortex, and supramarginal gyrus. Additionally, early inhibitions were associated with

enhanced theta-band (3–6 Hz) inter-trial coherence in the SMA, while late inhibitions showed a similar effect in M1. These findings suggest that more mature patterns of anticipatory muscle inhibition during a bimanual postural task in children rely on SMA-mediated mechanisms, while less mature, delayed inhibitions increasingly recruit M1-related activity. This developmental shift highlights the gradual maturation of cortical control networks responsible for anticipatory motor adjustments.

P2.32 | The Impact of Social Rejection Feedback on Self-presentation: An Fmri Study

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Social rejection often occurs in real-life social interaction, such as interviews. Sense of rejection has been linked to mentalizing during self-evaluation in a specific domain, which is defined by: domain (morality vs. competence) and valence (positive vs. negative). Mentalizing processing (e.g., temporal pole and precuneus) may help individuals understand rejection and better anticipate how to avoid it. However, empirical evidence is lacking on how mentalizing responds to rejection in later self-evaluations, particularly in the context of different domains. This study aimed to investigate whether mentalizing processing was engaged during domain-specific self-evaluation, following rejection. We hypothesized that mentalizing processing occurred during subsequent self-evaluation in the competence domain, given the experimental context. It would clarify how individuals interpret social rejection to adjust their self-evaluation. We recruited 35 participants under the guise of a collaboration experiment. Participants evaluated themselves and a celebrity across four domains defined by dimension (morality & competence) and valence (positive & negative) in the presence of two two-person teams. In the rejection group, participants received false feedback indicating that the first team had excluded them from a later game. In contrast, participants in the control group received no feedback and were told it would be provided after all tasks were completed. They then repeated the self-evaluation task in front of a second team. We modeled self- and other-evaluations across four domains: Moral-Positive, Moral-Negative, Competent-Positive, and Competent-Negative. For each participant, we computed the contrast Post (self > other) > Pre (self > other). Results revealed a significant three-way interaction among dimension, valence, and group in the right temporal pole. ROI analysis indicated that

control group exhibited greater activation than rejection group in the negative moral domain, whereas rejection group showed greater activation in the negative competence domain. Additionally, a significant interaction between valence and group was observed in the right precuneus, with greater activation in rejection group under negative condition. These results suggested that mentalizing processing is engaged in response to feedback (rejection & no feedback) during subsequent self-evaluation. It may imply that feedback selectively modulates self evaluation processing, with domain-specific neural responses.

P2.33 | Temporal Dynamics and Neural Correlates of Exogenous Feature-based Attention to Color

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While endogenous feature-based attention (FBA) has been extensively characterized, the temporal dynamics and neural basis of its exogenous counterpart remain largely unexplored. This study investigates whether non-predictive, feature-based cues can automatically direct attention to color, modulate perceptual decisions, and elicit electrophysiological responses. 30 participants completed a visual attention task under two distinct cue-response contingencies. In the contingent condition, they reported which color (red or green) increased in saturation. In the non-contingent condition, they indicated the visual hemifield where the color change occurred, regardless of its identity. Each trial was preceded by an exogenous, non-informative cue (congruent, incongruent, or neutral relative to the target). The stimulus-onset asynchrony (SOA) between cue and target was systematically varied (e.g., 140 ms and 600 ms) to probe the temporal dynamics of attentional effects. Accuracy and reaction time were measured. Mass univariate ERP analyses (50–300 ms) revealed significant cue-driven modulations, with early negative components (~51–115 ms) where invalid cues evoked stronger negativity compared to neutral, and later positive components (~143–299 ms) where both valid and invalid cues showed enhanced positivity relative to neutral ($p < .01$). Post hoc contrasts indicated that invalid and valid cues engage distinct neural signatures, despite the absence of significant interactions with task. In the later window (300–750 ms), significant clusters emerged (~301–391 ms and ~467–600 ms), where valid cues elicited stronger negativity than both neutral and invalid cues, while neutral cues showed greater positivity than invalid cues in some comparisons ($p < .01$). Although Cue × Task interactions did not reach significance, trends ($p \approx .10$) suggest potential combined effects in both contingent and non-contingent tasks. These results provide robust evidence that exogenous feature-based attention modulates early sensory and later cognitive ERP components, highlighting differential neural responses to valid, invalid, and neutral cues.

P2.34 | Does Attention to Cardiac Sensations Modulate Heartbeat-Evoked Potentials Even After Controlling for Cognitive Demands?

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Heartbeat-evoked potentials (HEP) have been shown to be modulated by attentional focus (cardiac vs. exteroceptive attention), suggesting that HEP are a neural correlate of interoceptive prediction errors. However, this effect has not been consistently replicated, and differences in cognitive effort when contrasting interoceptive vs. exteroceptive attention may be a confounding factor. We devised a modified Heartbeat Attention Task to examine whether cardiac attention can modulate HEP amplitude even when cognitive demands are matched across interoceptive and exteroceptive conditions. In exteroceptive blocks, subjects were required to count subtle bursts of volume increase embedded within a continuous white noise. The bursts' volume was individually tailored for each participant (near absolute threshold) and were presented in a rhythmic pattern replicating a typical heart rate. In interoceptive blocks, participants were asked to count their heartbeats, whilst the white noise was still presented, ensuring that the neural effects were driven by the attention shift rather than sensory changes. The task was first completed by 50 participants (25F; 28.44y) during a 9-electrode EEG recording: frontal, central and parietal sites. No significant differences were found regarding counted heartbeats (M=122.00) vs white noise bursts (M=118.86) as well as on perceived attentional efforts (heart M=65.00 vs bursts M=67.00), indicating similar task demands across conditions. No significant differences between conditions were found on HEP amplitude across all electrodes ($p > .137$ for all), suggesting no attentional modulation of HEP amplitude after accounting for cognitive demands. Due to the reduced number of electrodes, a follow-up sample of 26 participants (13F; 21.73y) completed the task using a new EEG geodesic 64-channel sensor net. This dataset is currently under processing and will allow for a more comprehensive data-driven analytic approach (cluster-based permutation test) to ensure whether the attentional modulation of HEP amplitude is indeed absent when accounting for cognitive demands.

P2.35 | Individualized Beta-Band iTBS Enhances Excitability of Interneurons and Pyramidal Neurons in the Human Motor Cortex

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Intermittent theta burst stimulation (iTBS) noninvasively induces long-lasting changes in corticospinal excitability through the activation of layer-2/3 interneurons, yet its effects vary considerably across individuals. Although iTBS typically delivers three bursts of 50 Hz repeated at 5 Hz intervals, this frequency does not match endogenous beta oscillations from interactions between pyramidal neurons and interneurons in layer 5 (Otsuka et al., 2021). Thus, we aimed to investigate whether iTBS patterned with an individualized beta frequency (individualized beta-band iTBS) enhances corticospinal excitability changes more effectively than conventional iTBS. Eleven healthy participants received three types of stimulation in a randomized order on separate days: individualized beta-band iTBS, conventional iTBS, and sham iTBS. The stimulation was applied to the left M1. For the individualized condition, the 50 Hz bursts in iTBS were replaced by each participant's peak beta-band frequency, derived from corticomuscular coherence (CMC). CMC was measured between EEG (C3 and 2 cm anterior) and EMG from the first dorsal interosseous (FDI) muscle during a 2-minute isometric thumb-index finger pinch. Motor-evoked potential (MEP) amplitude from the FDI muscle served as an index of corticospinal excitability. Single-pulse transcranial magnetic stimulation was delivered to probe different descending pathways with coil currents in posterior-anterior (PA) and latero-medial (LM) directions. PA-directed currents preferentially evoke I-waves through transsynaptic activation of interneurons, while LM-directed currents predominantly elicit D-waves via direct activation of pyramidal neurons (Hamada et al., 2013). MEPs under both conditions were assessed before (Pre) and immediately after (Post) stimulation. Significant interactions between stimulation and time were observed on MEP amplitudes in both PA- and LM-directed current (PA: $F2, 20 = 6.91$, $p < 0.01$; LM: $F2, 20 = 3.81$, $p < 0.05$), as revealed by two-way repeated measures linear mixed models. Post hoc analyses revealed that MEP amplitudes significantly increased from Pre to Post in individualized beta-band iTBS for both PA- and LM-directed current (PA: $p < 0.05$; LM: $p < 0.05$), while no significant changes were observed in the conventional iTBS or sham iTBS. These findings suggest that individualized beta-band iTBS facilitated corticospinal excitability by activating the interneurons and pyramidal neurons in healthy individuals.

P2.36 | A systematic review and multilevel meta-analysis of transcranial Alternating Current Stimulation (tACS) effects in the visual domain

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Transcranial Alternating Current Stimulation (tACS) has emerged as a promising non-invasive brain stimulation technique for modulating cognitive and perceptual processes. Despite the growing number of studies applying tACS to the visual domain, the extent and reliability of its behavioral effects in healthy adults remain unclear, mostly due to considerable methodological heterogeneity. Such variability challenges the generalizability of findings and highlights the need for methodological harmonization, including standardized reporting practices and protocol preregistration.To quantitatively assess the impact of tACS on visual functions (comprising visual attention, perception, and working memory), a pre-registered systematic review and multilevel meta-analysis (PROSPERO: CRD42024494029) was conducted following PRISMA guidelines. 41 peer-reviewed, sham-controlled tACS studies (N= 1.179) seeking to modulate visual performance met the inclusion criteria. Primary outcome measures (i.e., accuracy, reaction time, d', threshold, slope) were extracted, standardizing effect sizes as Hedges' g. To accommodate non-independent outcomes and design heterogeneity, we implemented both frequentist (random-effects and multilevel metaanalyses) and Bayesian hierarchical models. Offline and online stimulation protocols were analyzed separately, given their distinct neurophysiological underpinnings.Online tACS investigated across all visual functions yielded a small, statistically non-significant modulation of visual performance ($b = 0.036$, $SE = 0.026$, $p = .17$), with Bayesian models converging on similar null estimates. When investigated separately for each specific domain, we found a small but statistically significant effect on visual working memory ($b = 0.110$, $SE = 0.052$, $p < .05$); contrarily, no reliable effects were observed for visual attention or perception (all $p > .3$). Offline tACS effects across all domains were generally weaker and less consistent ($b = 0.118$, $SE = 0.089$, $p = .20$). Specific analyses on visual attention, perception, and working memory domains also revealed non-significant outcomes, although a trend toward a significant offline modulation of visual perception was observed ($b = 0.26$, $p = .06$). Thus, online tACS confer modest, task-specific benefits, particularly for visual working memory, while offline stimulation had more limited and variable effects. Thus, evidence for the efficacy of tACS in modulating visual performance remains limited.

Future research should prioritize standardized protocols, precise control of stimulation parameters, and high-powered designs to fully harness the cognitive potential of tACS in both basic and translational contexts.

P2.37 | Effect of Emotion on Hippocampal-dependent Associative Binding Through the Lens of the Weather Prediction Task

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We investigated the impact of negative emotion on hippocampal-dependent associative memory through the "weather prediction task", which distinguishes between hippocampal (declarative) and striatal (procedural) memory systems. This is achieved by comparing the 'paired-associates' condition, where participants memorise patterns and outcomes, and the 'feedback' condition, where they learn associations between patterns and outcomes through trial-and-error. We hypothesized that negative emotions would impair hippocampal-dependent memory. However, across three experiments, the third of which employed sequential design with Bayesian statistics and a sample of 800 participants, the findings did not support this hypothesis. Negative emotion did not reduce associative memory accuracy in the hippocampal-dependent 'paired-associates' condition, nor did it decrease reliance on simpler learning strategies, which are thought to be hippocampal-dependent. These results challenge the Dual Representation Theory's (DRT) application in non-traumatic, controlled laboratory conditions, suggesting that DRT may not generalize to less intense emotional experiences. This research provides insight into how emotion influences different memory systems and offers implications for understanding emotional influences on learning.

P2.38 | Biomarkers of Stroke Recovery Using Eeg-based Functional Connectivity: A Systematic Review

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EEG-based resting-state functional connectivity (FC) has been largely used in studies investigating prognosis in stroke recovery. This approach offers a costeffective

alternative to other techniques like fMRI while providing valuable insights into mechanisms underlying neural plasticity. To date, it remains unclear whether FC measures represent reliable biomarkers for predicting stroke recovery. This systematic review aims to provide a comprehensive overview of existing EEG-based FC measures and evaluate their clinical relevance in stroke recovery. Specifically, this study aims to identify the most reliable and predictive FC measures of recovery, by examining their relationship with longitudinal changes, clinical outcomes, and the effects of specific neurorehabilitation protocols. Results show inconsistencies across studies, including differences in the level of analysis, whether sensor-based or source-based, variations in study design and methodology, a predominant reliance on correlational rather than predictive approaches, and significant variability in the connectivity measures employed. Overall, these inconsistencies raise concerns about the reliability of EEG-based FC measures as biomarkers of stroke recovery. Moreover, while the majority of studies focused on motor recovery, emerging evidence also highlights the potential relevance of FC measures for predicting cognitive recovery. Future research should prioritize predictive models tailored to clinical needs, expand the scope to encompass multidimensional recovery domains, and establish standardized protocols to enhance methodological consistency. By addressing these challenges and harnessing advanced computational techniques, EEG-based FC could transform personalized rehabilitation strategies, optimizing outcomes for stroke patients. Given the wide range of analytical scenarios and the absence of a clearly superior method, we propose that a "multiverse" analytical approach could offer valuable insights into the most promising pathways for establishing connectivity as a biomarker for stroke recovery.

P2.39 | Understanding Motivations in Moral Judgment of Black and White People

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Race is an important social category that helps social navigation, but simultaneously fosters biases, stereotypes, and prejudice. It can shape perception, interactions, and even our moral cognition. This study investigates how race influences moral judgments across two contrasting sociohistorical contexts – Brazil and the United States – employing a multi-method approach that combines quantitative and qualitative behavioral measures. Our research examines how Black and White participants (N=900) evaluate intergroup moral violations, with particular attention to how judgments are shaped by the racial identity of both agents and victims. The study comprises three online behavioral experiments presenting stories of moral violations

between Black and White individuals, in which we investigate judgments in a control condition, and in two other conditions manipulating: i) social proximity and ii) agents' motivation (whether someone was motivated by prejudice or not). Participants will provide moral evaluations, assign punishments, and subsequently reflect on their own judgment patterns when presented with feedback about potential biases in their decisions. We hypothesize that White agents perpetrating against Black victims will receive harsher judgments, which will be attributed to perceived prejudiced motivation, except when the agent is socially close to the participant. Additionally, Brazilian participants will demonstrate overall stricter judgments compared to their American counterparts, reflecting cultural differences in racial perception and moral reasoning. Analyses integrate mixed-design ANOVAs examining interactions between agent/victim race and participant nationality/race, and computational text analysis of open-ended motivation reports. Regression analyses will be used to explore how sociodemographic variables, including education, gender, and income moderate these effects. By evaluating two distinct cultural contexts, this research provides novel insights into the psychological mechanisms underlying racial biases in moral cognition.

P2.40 | The Role of Cortically-Tracked Spectral Modulations of Speech Under Mimicry

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The brain processes leading us to credit a person's voice as genuine and real, or a fake simulation, remain unclear. As imitators deploy impersonation strategies to approximate a target's characteristics through speech, a reliable guide to speaker identity lies in the spectral features of the vocal tract. We recently showed that spectral contour dynamics within the formant frequency range may be partly decodable from low-frequency (1-8 Hz) scalp activity measured through electroencephalography (EEG). Moreover, this decodability may predict the ability of listeners to report basic speaker identity features. We hypothesise that, by tracking the changes in spectral patterns in the vocal tract, listeners can better tell who is speaking when they hear voice imitations. We recorded speeches from professional imitators reading original short scripts from celebrities ('targets'). They performed impersonations using free characterisation ('caricatures') and replications of the target's original audio recordings ('replicas'). After an online survey, we determined the most convincing imitations. We conducted a separate EEG study using short (1-2 second) clips of these sounds to see if recognising targets is connected to how well we track vocal tract spectral contours. We used stimulus reconstruction methods to assess how much information about the vocal tract contours could be retrieved from the EEG signals. Here, vocal tract contour means the variation in separations between leading spectral components in the formant range of speech over time. As a control acoustic

feature, we decoded the broadband speech envelope. We evaluated the ability of EEG responses to track changes in vocal tract contours or the sound envelope during each trial. We quantified neural prediction performances using Spearman's rank correlation coefficient. Using linear mixed effects modelling, we examined the single-trial neural data (decoding performances) and the participants' binarised yes-or-no choices about identities across the two imitation styles. Preliminary results suggest that as spectral tracking increases, listeners become less convinced by imitations that emulate voice quality (replicas). By contrast, decisions on free impersonations (caricatures) appeared unaffected by spectral tracking. The results might show that experienced impersonators help listeners discount spectral evidence by producing additional cues that influence how they judge identity.

P2.41 | Emotional and Personal Relevance in Self-face Processing: Evidence From Erp and Oscillatory Dynamics

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The sense of self plays a fundamental role in shaping cognition and social behaviour. A key manifestation of this is the self-reference effect — enhanced processing of self-related information, such as one's own face. In this study, we disentangled the contributions of emotional content and personal relevance in self-referential face processing by independently manipulating emotional expression (neutral, happy, angry) and identity (self, friend, stranger). We tested two competing hypotheses: if self-referential processing is partly driven by emotional information, then emotional expressions should interact with facial identity, enhancing ERP or ERD/ERS responses for emotional self-faces. Alternatively, if self-prioritization is based solely on personal relevance, then identity effects should emerge independently of emotional content. EEG was recorded while participants performed an identity discrimination task on facial images varying in identity and emotional expression, ensuring engagement without explicitly focusing on emotional content. We analysed event-related potentials (N170, N2, N250, EPN, P3, LPC) and time-frequency dynamics (ERD/ERS). Our results show that personal relevance exerts a robust influence on self-related processing, with no significant interaction between identity and emotion. Self-faces elicited smaller N2 and larger N250 amplitudes than other-faces, indicating reduced cognitive demands and facilitated recognition for self-stimuli. Moreover, self-faces evoked increased P3 and LPC responses, reflecting enhanced cognitive prioritization. Time-frequency analysis revealed a late alpha ERD and increased theta power for self-faces, suggesting sustained attentional engagement and the involvement of

memory-related processes. While emotional expressions and identities both modulated early posterior negativity (EPN), no interaction was found between the two, suggesting distinct but complementary processing streams. Altogether, these findings reveal a neural prioritization of self-relevant information that appears to operate independently of overt emotional content. This pattern likely reflects the rapid interplay between stimulus-driven orienting and top-down mnemonic mechanisms. By characterizing the time course of these effects, our study contributes to a more refined understanding of how the brain distinguishes self from others in the context of facial identity and affect. Key terms: Self identity, ERP, emotion, self-reference, oscillatory activity.

P2.42 | Judging Action-outcome Intensifies Motor Preparation: Evidence From Readiness Potentials And β-band Desynchronisation

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Motor preparation can be tracked in scalp EEG by the readiness potential (RP)—a slow pre-movement negativity — and by β-band event-related desynchronisation (β-ERD, 13–30 Hz) over sensorimotor cortex. Previous studies have shown that anticipating an action's consequence can modulate the RP. However, whether motor-preparatory activity changes further when the consequence must be explicitly evaluated rather than merely anticipated remains not answered. We addressed this question using a virtual-reality Libet-clock paradigm that presented stimuli at near and far viewing distances to examine spatial-proximity effects. EEG was recorded while participants completed the righthand key-press tasks. One of the tasks involved no consequence after the keypress (Active-only), another involved the mere presence of a consequence (No-report-outcome), and the last involved reporting the timing of the outcome (Report-outcome). A graded pattern emerged from the preliminary analysis. The Report-outcome task produced the largest early and late RP amplitudes, the steepest RP slope, and the deepest β-ERD. The No-report-outcome task was intermediate; Active-only was smaller. Thus, the largest RP and β-ERD emerged when participants were required to judge the timing of the tone caused by their key-press. Because greater action-outcome precision is thought to heighten the sense of agency over an action's consequence, the convergent RP + β-ERD pattern could constitute a neural signature of the prospective agency. These findings support precision-weighted, hierarchical models of motor control and highlight neural markers that could guide feedback-based rehabilitation and improve intent detection in brain-computer interfaces.

P2.43 | Neural Correlates of Predictive Processing of Word Order and Thematic Roles in Korean Sentence Comprehension: An fMRI Study

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During real-time sentence comprehension, the brain rapidly integrates syntactic predictions (e.g., word order-based structure building) with semantic predictions regarding who is doing what to whom (i.e., thematic role assignments). To investigate the neural mechanisms underlying this integration, we conducted an fMRI study using a visually presented picture-sentence verification task previously employed in an ERP experiment (Lee & Nam, 2022). Twenty-nine native Korean speakers viewed a picture followed by a written sentence consisting of two noun phrases and a verb. Their task was to judge whether the sentence accurately described the depicted event. Each trial manipulated two factors: Word Order (canonical SOV vs. non-canonical OSV) and Thematic Role Mapping (True vs. False). In the True condition, grammatical markers assigned the agent and patient roles in a manner consistent with the visual scene (e.g., subject marker on the agent). In the False condition, case markers conflicted with the scene-based expectations (e.g., subject marker on the patient), resulting in thematic-role mismatches that conflicted with comprehenders' semantic predictions despite being grammatically acceptable. Whole-brain analyses using SPM12 revealed distinct neural responses. A conjunction analysis for word order (OS-T > SO-T and OS-F > SO-F) showed increased activation in the left precentral gyrus, indicating greater syntactic processing demands for non-canonical structures. A second conjunction targeting False conditions (SO-F > SO-T and OS-F > OS-T) identified the left angular gyrus, associated with increased processing effort in resolving thematic-role mismatches. Critically, an interaction contrast examining how word order effects differ depending on thematic-role predictability [(OS-T > SO-T) > (OS-F > SO-F)] revealed significant activation in the left inferior frontal gyrus (opercular part) and left middle temporal gyrus—regions implicated in syntactic unification and semantic integration. These areas were most active in conditions involving either non-canonical word order or mismatched thematic roles. In contrast, the SO-T condition, where both syntactic structure and thematic roles matched comprehenders' predictions, elicited the lowest neural activation, suggesting facilitated sentence processing. This study provides compelling neural evidence that structural expectations dominate real-time sentence processing in Korean, highlighting how the left-lateralized language network is dynamically engaged in resolving prediction errors in syntax and thematic roles.

P2.44 | Down-regulating Effect of Affect Labeling on Negative Emotions During Re-exposure After Different Time Intervals

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Affect labeling is a promising implicit emotion regulation strategy, with self-report supporting its effectiveness in reducing negative emotion responses. However, it remains unclear whether this regulatory effect is sustained across different reexposure after different intervals. In a first behavioral study, participants viewed emotion pictures and selected emotion words (affect labeling) or emotion images (affect matching) that best fitted their emotional response. Arousal and valence ratings were collected immediately after the picture presentation, after a short-term delay (approximately 10 minutes), and again after a long-term delay (one or two weeks). Our results showed that affect labeling immediately reduced the perceived intensity and unpleasantness of negative emotions compared to affect matching. This effect persisted during short-term and long-term reexposure. Building on these findings, our follow-up EEG study aimed to replicate the lasting effect of affect labeling on self-report and examine its neural correlates during immediate and short-term reexposure. Here, we compared affect labeling with both affect matching and content labeling. We hypothesized that affect labeling would again result in a sustained regulatory effect as reflected in self-report measures, consistent with our behavioral study. To examine the neural responses, we focused on the late positive potential (LPP), a well-established marker of emotional reactivity. We predicted reduced LPP amplitudes during reexposure, reflecting decreased emotional activity, with the greatest reduction following affect labeling, followed by content labeling, and the least after affect matching. The results of this study will also be presented.

2.45 | Processing of Structural Disruptions in Dynamic Action Flow in the Developing Brain

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Action representation plays a key role in cognition and perception, relying on a basic structural organization of action elements. This study examined how young children process complex, hierarchical action structures and whether their development and underlying neural mechanisms parallel those observed in language processing. In contrast to many prior studies, we employed videos rather than static images to be able to investigate action processing under more ecologically valid conditions. To do

so, n=28 preschoolers (4-6 years) were presented with dynamic stimuli of familiar action sequences either in the control condition, where the action steps were presented in the correct temporal order or in the switch condition, where two adjacent action steps were swapped while the EEG signal was recorded. Stimuli included actions such as the preparation of an apple spritzer. In this action, it is necessary to mix water and juice, and the water bottle must first be opened before the water can be poured into the glass. Manipulating the order of the action steps allowed us to investigate whether violation of action sequences leads to similar violation responses as known from language processing. A preliminary event-related-potentials analysis shows that the observation of structurally incorrect action sequences as compared to those following a correct temporal order evokes a late negativity effect over anterior regions of the scalp at the onset of the incorrect action. Results do not confirm our hypothesis based on previous literature, where a positivity effect is usually reported in response to such a violation. However, the reported negativity might be comparable with the Error-related-negativity (ERN), a common ERP response occurring after error processing. This suggests that dynamic sequences, such as those presented in video format, might evoke neural responses that differ from those triggered by static images. Nevertheless, the present results highlight similarities between action and language processing in early childhood, pointing to domain general mechanisms.

P2.46 | Understanding Early Syntactic Processes Through the Neural Origins of the Left Anterior Negativity

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The Left Anterior Negativity (LAN) component of the Event-Related brain Potentials (ERP) is a frontal negative deflection occurring about 300-500 ms after the occurrence of a grammatical violation. This ERP component has been highly influential in psycholinguistic models, and represents evidence that syntactic processes might be affected by extralinguistic variables, such as emotional information or social factors. However, its neural origins have never been directly explored. Here, we approached this issue by analyzing data from several published ERP data sets obtained from canonical morphosyntactic violation conditions, yielding a wide sample of N=76 participants. Our analyses comprised two different distributed source algorithms: sLORETA (standardized low-resolution brain electromagnetic tomography), and CLARA (classical LORETA analysis recursively applied), plus a discrete dipole model (BESA,

brain electrical source analysis). The distributed algorithms suggested as main neural sources for the LAN a series of brain locations around the left frontal areas: BA44, BA45, BA47, Frontal Operculum (FO) and Insula, even if the FO appeared as the largest maximum. These locations were thereafter checked and compared in terms of explained variance as valued with the discrete dipole model. The main results supported that the best candidate as primary neural source of the LAN is the left FO, although the right FO might contribute too. The location, functions and connections of the FO suggest that the LAN might index the monitoring of articulatory (morphological or morphophonological) predictions based on syntactic principles outlined elsewhere, i.e., in the so-called core language system. The neural connections of the FO, particularly with TGd area in the anterior temporal pole, might in turn account for most previously reported nonlinguistic influences on the LAN.

2.47 | Exploring the Role of Orbitofrontal Oscillations in Effort-Based Decisions: Insights From Hierarchical Drift Diffusion Modeling

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Animals, including humans, must constantly decide whether to engage in physical effort to obtain rewarding outcomes. This fundamental process — known as effort-based decision-making — has been associated with a fronto-striatal network involving the orbitofrontal cortex (OFC), supplementary motor area (SMA), dorsal anterior cingulate cortex (dACC), and ventral striatum. Previous research has shown that these regions are differentially sensitive to key decision variables: the OFC to reward magnitude, the SMA to prospective effort, and the dACC and ventral striatum to both. Interestingly, reward valuation in the OFC has been linked to oscillatory activity in specific frequency bands, particularly theta (4–8 Hz) and beta (13–30 Hz). However, these findings have been correlational, and the causal role of OFC oscillations in reward valuation remains unclear. To address this, we conducted a randomized, double-blind, sham-controlled study in 20 healthy participants. Participants performed an effort-based decision-making task while receiving high-density transcranial alternating current stimulation (HD-tACS) in three conditions: sham, beta stimulation (20 Hz), and theta stimulation (6 Hz), combined with EEG recordings. Hierarchical drift diffusion modeling (HDDM) is currently being used to analyze the behavioral data and determine how OFC-targeted oscillatory stimulation influences reward valuation and, more broadly, effort-based decision-making.

P2.48 | Modulation of Auditory Cortex Activation by Language Lateralization and Musical Training

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Language lateralization refers to the asymmetric organization of linguistic functions across the cerebral hemispheres. Although most right-handed individuals exhibit lefthemisphere dominance, approximately 4-6% of them, and up to 22-27% of left-handed individuals, show atypical patterns involving right-hemisphere or bilateral organization (Mazoyer et al., 2014). Villar et al. (2022) proposed that musical training may be one factor contributing to atypical dominance, identifying musicianship as a distinct pathway toward right-lateralized language. Auditory processing also shows hemispheric specialization: the left auditory cortex is more sensitive to rapid temporal information, whereas the right is more responsive to spectral features (Robert et al., 2023). Building on this dual framework, the present study investigates how language lateralization profiles and musical experience jointly influence auditory cortical responses to non-verbal sounds. A sample of 78 left-handed adults (50 typically lateralized, 28 atypical) underwent fMRI while listening to blocks of spectral and temporal auditory stimuli, using the same materials as in Robert et al. (2023, Cerebral Cortex). Language lateralization was assessed via a verb generation task. Functional activation was extracted from Heschl's gyrus (Harvard-Oxford atlas) and from superior temporal gyrus (STG) clusters functionally defined for action-related (left STG) and object-related (right STG) sound processing. Statistical analyses revealed significant hemisphere effects across all regions ($p < .001$). In Heschl's gyrus, a condition × hemisphere interaction ($p = .008$) reflecting stronger left-hemisphere responses for spectral than temporal sounds with no differences in the right hemisphere. In STG-1, atypically lateralized participants showed greater activation than typical individuals for temporal sounds. In STG-2, a hemisphere × musical training interaction ($p = .041$) showed that musicians had stronger left-hemisphere activation than non-musicians whereas no differences existed for the right-hemisphere. These preliminary results suggest that language lateralization and musical training modulate auditory processing in distinct but complementary ways. Ongoing analyses will further clarify how these factors shape the neural encoding of non-verbal auditory information.

P2.49 | Interplay Between Cortical and Neurocardiac Interoceptive Processes and its Association With Self-reported Interoceptive Sensibility

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Interoception, the process of sensing and interpreting internal bodily signals, plays a crucial role in emotional regulation, decision-making, and overall well-being. This study aimed to investigate the relationship between self-reported interoceptive processes, assessed through the Body Perception Questionnaire (BPQ), and psychophysiological measures of interoception, including cardiac autonomic markers (HF-HRV and RMSSD), cortical processing of cardiac signals (heartbeat-evoked potentials, HEPs), and EEG microstates. We recorded EEG and ECG from 64 healthy volunteers during open-eyed resting state. A positive association was found between the Subdiaphragmatic Reactivity subscale of the BPQ and the coverage of microstate A, a spatial configuration linked to the activation of temporal brain regions, arousal, and sensory processing. No associations were observed between BPQ scores and cardiac measures or HEP amplitudes, suggesting that subjective reports may not align with psychophysiological indices of interoception. Associations were found between HEP amplitudes and microstates A and B, as well as between HRV measures and microstate D, highlighting potential links between autonomic functioning and brain activity during resting state. Although the BPQ is a widely used tool to assess interoceptive sensibility, it may not fully capture the complexity of this construct. These findings provide insight into the complex interplay between self-reported interoception and psychophysiological markers, while emphasizing the need for further research to clarify these relationships and their implications for emotional and cognitive processing.

P2.50 | Beyond Rest-and-digest: The Gastric Cycle Influences Response Times in Perceptual Tasks

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We're used to trusting our gut – but we are only beginning to understand just how extensively the gastrointestinal system communicates with the brain. Among the most striking findings is the recent discovery of the gastric network: the gastric cycle, the slow (0.05 Hz) electrical rhythm continuously generated by the stomach, is phase-synchronized with neural activity across all primary sensory and motor cortices. Yet, the functional relevance of this coupling remains unclear: does it have any effect on behaviour? Here, we addressed this question using electrogastrography (EGG) in two separate groups of participants, each performing one of two very different perceptual tasks: a speeded audio-tactile detection task, or a near-threshold visual detection task. Leveraging spline generalized linear modelling to flexibly uncover higher-order coupling patterns, we found reaction times to be coupled to the

phase of the gastric cycle across both tasks, demonstrating that the stomach shapes behaviour independently of task demands or sensory modality. In view of its link to rest-and-digest processes, the gastric rhythm could influence behaviour by coordinating a global arousal state, in which case it should co-vary with common physiological markers of arousal. We indeed found that the gastric cycle was coupled with cardiac inter-beat interval in both groups; however, it did not significantly affect respiration amplitude or frequency, nor pupil diameter. Notably, although the cardiac and respiratory cycles also modulated reaction times to a similar extent as the gastric cycle, the coupling effects of the three organs were uncorrelated to each other. Together, these findings suggest that the heart, lungs, and stomach can shape a subjects' internal state as independent contributors; and there does not appear to be only one global "bodily arousal moment" coordinated by the gastric cycle. We provide here the first direct evidence that the gastric cycle matters beyond rest-and-digest, impacting perceptual behaviour.

P2.52 | How Top-down Processes Synergistically Shape Early Visual Perception: Evidence From the C1 Erp Component

Maximilien Van Migem (Ghent University); **Daniele Marinazzo** (Ghent University); **Gilles Pourtois** (Ghent University)

Top-down processes such as spatial attention and prediction play a pivotal role in visual perception. However, the temporal dynamics of these processes, particularly of the early stages of the sensory information stream, are not fully understood. Previous EEG studies have tried to understand these dynamics by investigating the influence of top-down processes on the C1 component, which arises from the primary visual cortex (V1) and is retinotopic. Despite the fact that research on these top-down effects has been ongoing for more than two decades, findings have remained inconclusive. This might be due to the majority of studies being solely focussed on attention and in many cases these studies have confounded attention with predictive processes. Another reason could come from the C1's specific sensitivities to stimulus features and individual differences. To address these issues we developed a new paradigm that maximally utilizes the visual and spatial properties of the C1 and which allows for the factorial manipulation of spatial attention and prediction. Additionally, to account for the individual differences in the C1 response the experiment was tailored to each participant using an online localiser. Initial results (n=23), using linear mixed effect-modelling, show a significant effect of attention on the C1 in the upper visual field. However, after overlap correction through linear deconvolution this effect disappears while later components remain affected by attention (P1) or by an interaction effect between attention and prediction (P3). These novel ERP results indicate that effects of attention on the C1 could be caused or masked by overlapping ERP effects (from the preceding stimulus or other pre-stimulus interactions), and moreover that attention and prediction can each influence sensory processing at a later stage than V1, yet likely through different mechanisms.

P2.53 | Affective and Cognitive Components of Empathy Toward Individuals With Disabilities

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When people empathize with others who have different physical characteristics from their own, two systems underlying empathy seem to be mutually activated, affective empathy (intuitive empathic system) and cognitive empathy (reflective empathic system). This study explored how individuals without disabilities empathize with individuals with disabilities from the perspective of these two systems. Experiment I examined the effect of affective empathy. Ninety-nine participants without disabilities watched the video stimuli featuring either individuals with disabilities (stroke patients; Patients) or individuals without disabilities (Control) walking and stepping over high (High) or low (Low) obstacles. After watching the videos, participants were asked to rate how strongly they experienced each of seven emotions — Empathy, Sad, Happy, Nervous, Pity, Fear, and Angry — using a 7-point scale. They then completed a bodily map evaluation in which they were presented with a blank human silhouette and asked to color the area of body where they felt something while watching the video. Experiment II explored the effect of cognitive empathy. A different group of 99 participants followed the same procedure, except they were asked to rate how strongly the person in the video experienced the listed emotions and for the bodily map evaluation, to color the regions of body where the person in the video might have felt something. For ratings, we conducted a Wilcoxon signed rank test. For the bodily map evaluations, we performed a t-test for each pixel, applying FDR correction for multiple comparisons. Across both experiments, ratings for all emotional items were significantly higher in the Patients-High condition than other conditions, except Happy. Ratings for Angry, Fear, Nervous, and Happy were significantly higher in Experiment I than in Experiment II. The bodily map evaluations showed greater overall bodily sensations in the Patient condition than the Control condition. Moreover, the Patient condition induced greater chest sensations in Experiment I, and greater arm and leg sensations in Experiment II. Our findings suggest that when individuals without disabilities empathize with individuals with disabilities, affective empathy system is more strongly engaged than cognitive empathy system. This affective empathy appears to be associated with sensations in core regions of the body.

P2.55 | Neural Dynamics of Cross-modal Binding in Working Memory: Evidence From EEG and Behavioral Measures

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Working memory (WM) has been primarily studied through the senses in isolation, leaving significant gaps in our understanding of how multisensory information is encoded and maintained. Our previous results indicated that task-irrelevant features from the unattended modality of a multisensory object interfered with recall, suggesting that audio-visual features are encoded into WM through bottom-up processes. However, the neural findings did not provide sufficient evidence to support the active maintenance of these unattended features. Here, to explore this further, we ran two follow-up EEG experiments using different versions of an audio-visual delayed-match-to-sample task. Participants were presented with audio-visual objects while being instructed to focus on either the pure tones (attend-auditory), visual orientations (attend-visual), or both (conjunction). As baseline conditions, participants were also presented only with tones (auditory-only) and orientations (visual-only). Furthermore, we varied whether the auditory and visual features appeared in the same location (spatially aligned) or in different locations (spatially segregated). Condition-level representational similarity analysis (RSA) showed that the neural activity from attend-auditory and attend-visual trials was more similar to the conjunction condition than their corresponding unimodal baseline trials, even when the cross-modal features were spatially segregated. Feature-based RSA analyses corroborated these findings by demonstrating that both tones and orientations were actively stored under conditions of selective attention. In the last follow-up experiment, an audio-visual memory item was followed by either an audio-visual probe, a unimodal visual probe, or a unimodal auditory probe, with a neutral audio-visual impulse stimulus presented during the maintenance period. Participants were asked to compare the probe with their WM contents, with probe type randomized across trials. Preliminary behavioral data showed impaired performance when participants were tested on only one feature of the audiovisual item, suggesting a cost to "unbinding" the bound audio-visual object. Overall, these results suggest that audio-visual features are automatically integrated during encoding, even under selective attention. Once established, these cross-modal links remain intact and can be accessed either incidentally or in line with task demands. That is, selective attention dynamically interacts with multisensory object representations, allowing for modality-specific prioritization.

P2.56 | Moderate Evidence for Large Language Models Reflecting Human Neurocognition During Abstract Reasoning

Christopher Pinier (University of Amsterdam); **Michael Nunez** (University of Amsterdam); **Claire Stevenson** (University of Amsterdam)

Large language models (LLMs) have shown alignment with human brain activity during language tasks, but it remains unclear whether this correspondence extends to higher-order cognition such as abstract reasoning. In this study, we compared human EEG responses— specifically fixation-related potentials (FRPs) timelocked to gaze fixations onset — to the internal activations of eight open-source LLMs performing

a visual abstract rea- soning task. Intermediate LLM layers showed clear differentiation across reasoning pattern types, suggesting potential specialization. While the best-performing models reached human-level accuracy, they did not consistently align with human behavioral patterns. Representational similarity analysis revealed only moderate correlations between model activations and FRP data. This may reflect a lack of neural alignment in LLMs and/or that there is only some relevant cognitive signal in the FRPs. These findings highlight both the promise and limitations of using LLMs as models of human abstract reasoning.

P2.57 | The Influence of Emotion on the Perception and Awareness of Words

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The ability to extract meaning from words is fundamental to human cognition. However, it remains unclear whether this semantic processing requires conscious awareness or whether it can also occur unconsciously. Emotional valence is thought to grant words privileged access to awareness, yet it is unknown whether this advantage arises from enhanced perceptual processing or from post-perceptual influences, such as shifts in decision criteria or metacognitive bias. The neural dynamics underlying this preferential access also remain poorly understood. In this study, we combine psychophysical and electroencephalographic (EEG) methods to investigate whether emotional words — positive, negative, and neutral — exhibit higher perceptual sensitivity as they enter awareness, while controlling for post-perceptual factors. We employed continuous flash suppression (CFS), a technique in which dynamic Mondrian-like masks are presented to one eye to temporarily suppress from awareness a target stimulus presented to the other eye. On each trial, participants were exposed to CFS-suppressed emotional or neutral words paired with their scrambled/inverted counterparts for a fixed duration. After stimulus offset, participants reported the location of the intact word (above or below fixation), its valence (emotional or neutral), and the clarity of their subjective experience. Preliminary results indicate that perceptual sensitivity is significantly higher for negative words compared to positive and neutral words under CFS, suggesting that emotional valence facilitates access to visual awareness. To further assess the nature of this advantage, we analyse metacognitive sensitivity (the alignment between confidence and accuracy) and metacognitive efficiency (the proportion of consciously accessed information across

valence conditions as exposure duration increases). We also recorded EEG signal to examine whether event-related potentials (ERPs) associated with emotion (early posterior negativity, late positive potential), awareness (visual awareness negativity), and language processing (N400, P600) reveal the specific temporal stages at which emotional content influences access to consciousness. Together, these results will show whether semantic processing is affected by emotional valence, and whether this effect can arise in absence of awareness.

P2.58 | Multimodal Signatures of Cognitive Impairment in Multiple Sclerosis Using Eye-tracking and 7T fMRI

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Multiple Sclerosis (MS) is increasingly recognized not only as a disease of inflammatory relapses, but also as a condition marked by cognitive impairment (CI) and altered brain network dynamics. Although inflammation can be managed, progressive decline and CI often persist. We use MS as a clinical model to study how disruptions in cognition manifest in both behavior and brain function. To this end, we combine ultra-high-field 7T fMRI with an individualized behavioral battery paired with eye tracking to examine how neural activity and gaze behavior relate to cognitive performance, yielding insights that extend beyond MS. A key finding from our initial results is a convergence seen across task domains: even behavioral measures not explicitly targeting eye movements show robust associations with oculomotor-sensitive metrics. This pattern suggests shared underlying mechanisms linking sensory input, motor control, and cognitive processing. For example, gaze patterns during movie viewing – typically consistent across individuals – are more variable in our MS as opposed to our HC cohort, and correlate with broader cognitive performance. Individuals whose gaze diverges more from group viewing patterns tend to show greater impairment in standard MS clinical benchmarks, suggesting that naturalistic gaze behavior may reflect higher-order disruptions in cognitive organization. Our approach generates individualized cognitive-eye profiles that integrate performance across diverse tasks. These findings highlight the potential of gaze-based markers as ecologically valid, sensitive indicators of cognitive function, particularly in clinical populations with heterogeneous symptoms. We will present initial 7T fMRI linking naturalistic gaze behavior – inside and outside the scanner – to brain network organization in this heterogeneous clinical population.

P2.59 | Shared Retrieval Mechanisms in Semantic and Episodic Verbal Memory? An Meg Study of Healthy Individuals and Post-surgical Left Temporal Lobe Epilepsy Patients

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What is the relationship between episodic verbal and semantic memory systems? Evidence suggests that, despite being closely intertwined, the two memory systems remain distinct. To gain a more nuanced understanding of their interrelation, it is crucial to identify relevant similarities and differences between them. To this end, our exploratory study investigates the spectro-spatial characteristics of information retrieval from semantic and episodic memory in neurologically healthy participants and epilepsy patients who underwent a standard temporal lobe resection in which the basal temporal lobe area (crucial for language) and the hippocampus (episodic memory) were removed. During magnetoencephalography, participants name pictures following semantically constraining and unconstraining sentences, the former eliciting word planning in the pre-picture interval. Furthermore, the task serves as the encoding stage of the memory task, where participants read a word and press a button to indicate whether they encountered the word in the naming task (old) or not (new). To characterise the retrieval signatures of the semantic and episodic memory tasks, we conduct within-task time-frequency and source reconstruction analyses. Next, we compare these spectro-spatial signatures using mutual information. Finally, using diffusion-weighted imaging data, we probabilistically reconstruct white matter (WM) tracts to elucidate the structural connectivity supporting the observed function, with a special focus on deviations in the patient group. In line with the literature, the healthy group is expected to demonstrate power decreases in the alpha-beta frequency bands (8-25Hz) in both tasks, associated with information retrieval. Spatially, we expect the activity from both tasks to overlap in left temporo-parietal brain areas. In the patient group, we anticipate intra- or inter-hemispheric spectro-spatial changes in retrieval from semantic and episodic memory, depending on the structural integrity of WM. We hypothesise similar functional language and memory

signatures as measured with MEG that are however different in our control population. We expect these MEG signatures to be spatially associated with microstructural properties of the ventral WM tracts (ILF, IFOF, UF, MdLF) in both hemispheres. Overall, this study explores the (dys)similarities in retrieval of information from semantic and episodic memory in the frequency and spatial domains, highlighting the relationship between functional and structural neural organisation.

P2.60 | Musical Competency and Appetency in Individuals With Parkinson's Disease

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Parkinson's disease (PD) is a neurodegenerative disorder that affects movement. Musical competency refers to the ability to perceive, remember, and differentiate melodies and rhythms, independent of musical aptitude or talent. Musical appetency describes a person's desire or appetite for music. Music can provide cognitive, psychosocial, behavioral, and motor benefits for individuals with neurological disorders, enhancing overall health and well-being. However, neurological disorders can also affect musical competency and appetency, which may lessen the therapeutical effects of music in clinical populations. Understanding these aspects is critical for developing effective music-based rehabilitation approaches and optimize clinical resources. The aim of the study is to assess musical competency and appetency in individuals with PD and compare them with the norm of a neurotypical population. We also want to observe whether there is a variation in musical appetency before and after the diagnosis of PD. We tested musical competency through production (singing "Happy Birthday") and perception (using the Brief Assessment of Music Perception (BAMP)) in 30 participants with PD. Musical appetency was evaluated using the Barcelona Music Reward Questionnaire (BMRQ) completed by the participant, and the Music Anhedonia Questionnaire-Collateral (MAQ-C) completed by a caregiver to provide their insights into changes in musical appetency since the diagnosis. The scores of the BAMP and the BMRQ were compared to the normative data set from the general population. For the MAQ-C, we compared the scores before and after the diagnosis of PD for each participant. Our results show a significant difference when compared to the general population for one test of the BAMP that requires access to a tonal knowledge (Off-key test). The proportion of musical anhedonia (the inability to experience joy or pleasure with music) in our sample was significantly higher than in the general population. Finally, there was no significant difference between the musical appetency before and after the diagnosis of PD. These findings suggest a tonal deficit in musical competency of individuals with PD and higher risk of musical anhedonia. Knowing these deficits, future studies would be necessary to adapt music-based rehabilitations for individuals with PD.

P2.62 | Is Left Inferior Frontal Cortex Recruitment During Infants' Audiovisual Processing Language-Specific?

Nicole Altvater-Mackensen (University of Mannheim); **Tobias Grossmann** (University of Virginia)

Six-month-old infants have been found to recruit left inferior frontal cortex (IFC) during audiovisual speech processing (Altvater-Mackensen & Grossmann, 2016) with more pronounced IFC activation when auditory and visual speech cues match in segmental content (e.g., /a/ in both visual and auditory stream) compared to when they mismatch (e.g., /a/ in visual and /o/ in auditory stream). Furthermore, infants' left IFC responses correlate with their attention to a speaker's mouth, indexing their reliance on visual speech information. While results suggest that IFC plays an important role during audiovisual processing in infancy, it is unclear whether the reported IFC activation is specifically related to speech processing (e.g., Kuhl et al., 2014) or serves to integrate multimodal information more generally (e.g., Dehaene-Lambertz et al., 2006). To shed more light on the role of IFC during infant audiovisual processing, we assessed recruitment of IFC during processing of multimodal human speech syllables and monkey vocalisations using functional near-infrared spectroscopy (fNIRS). Eighteen six-month-olds were presented with videos of a female speaker producing /cu/- and /ba/-syllables and a monkey producing cooing and grunting sounds. Videos either matched or mismatched across modalities and were contrasted to an audiovisual baseline presenting bubbles and ringing noises. Changes in oxy- and deoxyhaemoglobin concentration in response to the stimuli were measured from multiple frontal regions in both hemispheres. In addition, we co-registered eye tracking data to assess infants' attention to the speaker's mouth. Preliminary results replicate findings of increased IFC activation for matching compared to mismatching speech. In addition, we find more pronounced activation of IFC in response to audiovisual human speech compared to monkey vocalisations, suggesting a domain-specific role for IFC in language learning and processing. Furthermore, eye tracking results show increased (visual) attention to the face for human compared to monkey vocalisations aligning with previous findings of perceptual narrowing to human speech (Grossmann et al., 2012). Further analysis will reveal how differences in attention relate to brain activation. Taken together, results of this study will shed new light on the neural basis of audio-visual speech processing in infants and critically inform existing accounts of left inferior frontal cortex function.

P2.63 | Pavlovian Conditioning of Perceptual Neural Responses

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Statistical learning refers to the process by which individuals detect and internalize sensory regularities in the environment. Statistical learning has been shown to induce specific predictive neural representations of sensory patterns. This phenomenon has been extensively demonstrated when sensory regularities are task-relevant on the other hand, preliminary evidence indicates that learning can occur independently of task relevance and when sensory regularities are purely incidental. However, the temporal and representational aspects of sensory predictions and prediction error signals induced by statistical learning of statistical learning, either task-relevant or incidental, remain unclear. Recently, adopting an implicit Pavlovian conditioning paradigm we showed that anticipatory perceptual priors are generated in relation to incidental audio-visual associations. Specifically, learning of probabilistic non-salient audio-visual associations resulted in early neural responses to predictive auditory stimuli conveying informative signals anticipating consecutive visual stimuli presentation, as well as in specific cortical response modulation to the expected visual stimulus (Greco et al. 24). Extending this previous evidence, we here aimed to clearly demonstrate that learned non-salient perceptual regularities induce rapid generation of neural priors conveying sensory-specific representational information. This is expected to result in conditioned neural responses to predictive auditory stimuli recalling the unconditioned neural responses to predicted visual stimulus. To this aim, we combined fMRI, retinotopic mapping and representational similarity analysis during a novel sensory conditioning paradigm inducing incidental crossmodal associations between conditioned neutral auditory stimuli and unconditioned visual stimuli. Four healthy participants completed a 5 days' experimental protocol consisting of habituation, 4 days acquisition where participants were exposed to incidental associations (V1 | A1, V2 | A2, V0 | A3, with a 80% schedule), and extinction. Additionally, we tested whether after sensory conditioning auditory-induced visual priors bias discrimination of visual stimuli under noisy conditions. Preliminary multivariate pattern analysis of neuroimaging data testing the similarity of neural activity elicited by conditioned auditory stimuli and unconditioned visual stimuli showed increased classification accuracy of auditory-induced neural patterns being classified into the specific visual target orientation corresponding to associations learned during conditioning. Furthermore, at behavioral level, auditory-induced visual priors appear to specifically bias perceptual discrimination of noisy visual stimuli in accordance with learned audiovisual contingencies.

P2.64 | Systematic Time-on-Task Effects in EEG Metrics: Implications for Brain-Behaviour Analyses

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It has long been known that the EEG is not a stationary signal. Alpha oscillations, for example, vary in power and frequency according to task demands, but importantly, also with time-on-task. As discussed in the symposium "Towards Robust and Reliable Cognitive Neuroscience: Meta-Scientific Perspectives", the co-occurring systematic trends of both behavioural and EEG measures with time-on-task can lead to spurious brain-behaviour relationships. Here we assess the time-on-task effects for several EEG measures such as alpha power and frequency, as well as aperiodic slope and sample entropy in a varied selection of datasets. Among the datasets are an audiovisual temporal-order judgement task, resting-state data, and a working-memory task. We show that each of the EEG measures can show significant effects of time-on-task, and hopefully motivate researchers to control for these effects in their studies.

P2.65 | Brain Signal Variability is Reduced During Self-face Recognition: Evidence From Multiscale Entropy Analysis

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Current research suggests that the sense of self is key to cognitive functioning, including memory, attention, and decision-making. This study uses a novel approach to investigate the neural signatures underlying self-identity processing, utilizing multiscale entropy (MSE) analysis, which is an index quantifying the variability and complexity of neural patterns. Thirty-two participants were presented with different facial identities (self, friend, and unknown) displaying a variety of facial expressions (happy, neutral, and angry). This design aimed to provide a more naturalistic and ecologically salient presentation of the stimuli. Participants were instructed to complete an identity recognition task (self, friend, or unknown) following the presentation of each visual stimulus. The data were analyzed using non-parametric statistics and cluster-based permutation tests. The results indicate that self-referential visual processing is characterized by lower brain signal complexity, thus reflecting more regular neural patterns compared to other identities. Furthermore, selfreferential visual processing was not modulated by emotional facial expressions. The possible neural

mechanisms underlying these neural patterns are discussed within the framework of the default mode network (DMN) activity. In this regard, it is argued that the neural signal characterization for self-referential processing most likely reflects a larger engagement of the DMN relative to non-self-referential information. This study provides evidence of the moment-to-moment brain signal variability involved in identifying self versus others.

P2.66 | Investigating Sensorimotor Deficits in Paediatric Post-stroke Dystonia: An MEG Study

Sima Buchnak (The Hospital For Sick Children Research Institute and the Institute of Biomedical Engineering at the University of Toronto); **Prisca Hsu** (The Hospital For Sick Children Research Institute); **Gloria Lai** (The Hospital For Sick Children Research Institute); **Cecilia Jobst** (The Hospital For Sick Children Research Institute); **Trish Domi** (The Hospital For Sick Children Research Institute); **Nomazulu Dlamini** (The Hospital For Sick Children Research Institute); **Douglas Cheyne** (The Hospital For Sick Children Research Institute)

Arterial Ischemic Stroke (AIS) occurs in 1.2 to 8 per 100,000 children annually, often imposing lifelong motor impairments such as dystonia, characterized by involuntary contractions and abnormal postures. This condition arises in 21% of children with basal ganglia strokes. Disrupted inhibitory processing in the motor cortex likely plays a key role in dystonia's development. These inhibitory functions are believed to be reflected in sensorimotor beta rhythms (15-30Hz), which typically show changes in power ("beta reactivity") during movement. Beta reactivity is known to be altered in adult stroke patients during a passive movement task [1], which help avoid confounding effects of motor impairments. Similarly, children with post-stroke dystonia exhibit differences in inhibitory brain activity measured with MEG in comparison to non-dystonia patients [2]. We hypothesized that these children would also show differences in sensorimotor beta reactivity. MEG data were collected from 15 paediatric AIS patients: Seven with dystonia (mean age = 13.99 SD = 2.75, 6 females), 8 without dystonia (mean age = 14.25 SD = 3.79, 4 females), and 10 healthy controls (mean age = 13.63 SD = 2.65, 5 females). Data were segmented into epochs time-locked to passive finger lifts, then co-registered to individual MRIs. Source images of beta power were computed using a beamformer algorithm. Results have shown that during movement of their affected hand, non-dystonia patients exhibit significantly stronger beta suppression compared to the affected hand of patients with dystonia ($p = .016$) and healthy controls ($p = .003$). In contrast, patients with dystonia exhibit significantly weaker beta suppression in their affected hand compared to their own unaffected hand ($p = .022$) but not to healthy controls. Thus, during movement of their affected hand, patients with dystonia experienced similar levels of inhibitory brain activity to healthy controls. Conversely, stronger beta suppression was observed during movement of their unaffected hand, suggesting impaired

disinhibition. Stronger beta suppression was also observed in both hands of non-dystonia patients, suggesting compensatory mechanisms compared to patients with dystonia.

P2.67 | Expect Nothing: Is There a Sensory Representation for the Prediction of Silence?

Valeria Baragona (Wilhelm Wundt Institute for Psychology, Leipzig University, Leipzig, Germany; Max Planck School of Cognition, Leipzig, Germany); **Erich Schröger** (Wilhelm Wundt Institute for Psychology, Leipzig University, Leipzig, Germany; Max Planck School of Cognition, Leipzig, Germany); **Andreas Widmann** (Wilhelm Wundt Institute for Psychology, Leipzig University, Leipzig, Germany)

Silence may constitute a perceptual event analogous to a sound, as recent evidence suggests. Physiologically, both the onset and the offset of a sound produce a N1 event-related potential (ERP) response modulated by the inter-stimulus interval (ISI). Moreover, when in contrast with predictions, unexpected omissions of sounds, that is silences, elicit omission N1, N2 and P3 (oN1, oN2, oP3) ERP components comparable to those elicited by the unforeseen occurrence of a sound. Recent research showed that rare absences of a silent gap in noise were followed by N2b and P3a ERP components. Following up, the present study aims to investigate whether the rare and unexpected absence of a silence, that is the continuation of a sound, may also cause an oN1, ascribing this component to the sensory processing of omissions of predictable auditory events in general (including silence), rather than only omissions of sounds. Participants repeatedly pressed a button at the regular interval of 1-2 s. In the meantime, they were exposed to a sustained brown noise stimulus lasting for the whole duration of each block. In most blocks, in 88% of cases their button press was immediately followed by a silent interruption of the noise lasting 300 ms, while in 12% of cases the noise stimulus continued (88%/12% blocks). In two blocks, button presses caused an interruption in the noise in 50% of cases (50%/50% blocks). Lastly, in two motor-control blocks, the noise was never interrupted upon button press (100% blocks). EEG and pupillometry data were recorded throughout the experiment. We hypothesize that the rare continuation of the noise stimulus, that is the absence of silence in the noise, will elicit later processing components such as the mismatch negativity (MMN) and an oP3, and importantly an early sensory „omission" component (oN1) if it is unexpected (in the 88%/12% condition). In pupillometry, we expect a larger pupil dilation response (PDR) corresponding with the rare omissions of a silence in the noise. The ERP components will be identified through exploratory factor analysis and all amplitudes will be compared with Bayesian statistics.

P2.68 | Prosody Meets Context: fMRI Evidence of Intention Comprehension in Second Language Learners

Victoria-Anne Flood (Tohoku University); **Motoaki Sugiura** (Tohoku University); **Hyeonjeong Jeong** (Tohoku University)

Prosody plays a key role in understanding a speaker's intention, a crucial component of effective social communication. Previous studies have shown that interlocutors can identify intentions through prosodic contours (Hellbernd & Sammler, 2016), engaging brain networks for auditory prosodic categorization and sociocognitive processing (Hellbernd & Sammler, 2018). However, second language (L2) learners face cross-linguistic differences, potentially increasing cognitive demands, reflected in greater activation of the left inferior frontal gyrus (Flood et al., in prep). While previous research has focused on prosody in isolation, real-life communication involves integrating multiple cues, including contextual information. Recent findings suggest that intention inference is context-dependent, allowing listeners to predict likely replies and evaluate the response coherence (Boux et al., 2023). This study investigates the brain mechanisms by which L2 learners integrate prosodic and contextual information to interpret speaker intention. We manipulated two factors: (1) the congruency between prosody and utterance meaning (congruent/incongruent), and (2) the specificity of the prior context (specific/non-specific). We hypothesize that congruent prosody preceded by specific, predictive context facilitates intention comprehension. In contrast, the same context with incongruent prosody may amplify the mismatch with the utterance, increasing cognitive demand during interpretation. Data were collected from 34 right-handed Japanese native speakers with intermediate L2 English proficiency (16 female, mean age 21.1). Stimuli consisted of English sentences with prosodic contours that were either congruent (C) or incongruent (I) with their literal meaning. Each sentence was preceded by a short scenario providing either specific (S) or non-specific (N) context, creating four conditions: CS, CN, IS, IN. Inside the MRI scanner, participants read each scenario, listened to the response, and answered true/false questions about the speaker's intention. Statistical analyses were performed using a random effects model in SPM12. The contrast [IS > CS], targeting incongruent prosody in specific contexts, revealed greater activation in regions associated with mentalizing (mPFC), memory (hippocampus), and reasoning (temporal poles), suggesting that when incongruent prosody follows a predictive context, the mismatch becomes more salient, prompting L2 learners to engage higher-level inferential processes to interpret speaker intention. Our study highlights that pragmatic interpretation in L2 relies on coordinating both prosodic and contextual cues.

P2.69 | Neural Representations of Natural Auditory Distractors

Patrik Wikman (University of Helsinki, Aalto University); **Miro Ilomäki** (University of Helsinki); **Annamária Dávid** (University of Helsinki); **Eve Kataikko** (University of Helsinki); **Sakari Säisä** (University of Helsinki); **Vilja Särelä** (University of Helsinki); **Suvi Vilppula** (University of Helsinki); **Ilkka Muukkonen** (KU Leuven)

Auditory sound scenes often comprise several overlapping sound objects. Such sound objects may either be task-relevant or act as distractors for the task at hand. Distractor low-level features, such as loudness, are well known to trigger bottom-up attentional capture. Yet, how distractor high-level features, such as the novelty of the sound in a particular sound environement, affect attentional entrainment remains elusive. Here we explore using fMRI how subjectively rated rated bothersomeness and surprisal of distracting sounds affect their neural representation. Additionally, we explore how participants' misophonia-like characteristics (assesed using the Duke misophonia questionnary) influence such representations. Participants (n = 20, 10 females) listened to sound scenes comprising six objects from three categories of sounds (speech, animal, and instrument) with occasional natural distractor sounds playing in the background. Thereafter participants performed a match-to-sample task for each of the attended sounds. Performance data was analysed using generalised linear mixed models. We observed no significant effects of distractor surprisal or bothersomeness on performance. However, there was a significant interaction between participant misophonia scores and distractor bothersomeness. That is, the performance of participants with higher misophonia scores was negatively affected by distractor bothersommeness. For the fMRI data, we performed a representational similarity analysis (RSA). This RSA revealed that distractor neural representations were affected by their rated bothersomeness and surprisal, as well as misophonia-like features, in neural networks associated with bottom-up attentional control and executive functions (right hemisphere superior frontal gyrus and temporoparietal junction). Together our results show that higher-level sound features affect both behavioural distraction and neural representations of distractors, especially in people with sound related aversion (i.e., misophonkia-like characteristics).

WEDNESDAY 17/09
10:45 POSTER SESSION 3 P 3.1 – 3.69

P3.01 | Functional Connectivity Estimation Improves When Using Multivariate Approaches

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Electroencephalography (EEG) and Magnetoencephalography (MEG) are powerful tools to study brain functional connectivity (FC) due to their excellent temporal resolution, which allows tracking fast neural dynamics. However, they have relatively low spatial resolution, resulting from the limited number of sensors in relation to the number of reconstructed cortical sources. To solve this problem, we evaluated different methods that extend the inter-area FC estimation to a multivariate scenario, aiming to improve the robustness and spatial specificity of FC analyses. We recorded simultaneous EEG/MEG data from 11 cognitively healthy participants during a 5-minutes eyes-closed resting-state session. Source reconstruction was performed using linearly constrained minimum variance beamformer, using both a scalar and a vector (3D) beamformer solution, the latter preserving 99% of the source variance. To assess FC, we used two metrics: phase-locking value (PLV), and its corrected version (ciPLV) to mitigate source leakage effect. We extracted inter-area FC information using five different approaches. Three of them were conventional methods that define one representative time series per brain area. The other two were purely multivariate approaches: one based on the average of all pairwise synchronization values between regions, and another using a clustering-based multivariate extension of the synchronization matrix. Reliability of each method was evaluated by comparing FC patterns derived from EEG and MEG using the Pearson correlation-coefficient. Results showed that both purely multivariate approaches outperformed those based on a representative time series of the areas. When using ciPLV instead of PLV the correlations improved, as removing source leakage effect makes EEG results more similar to MEG. In addition, these multivariate approaches improved when using the

3D beamformers, including in the analysis all the orientations of the source space activity instead of using only one projection per source position. In conclusion, using a multivariate extension of phase synchronization which considered all the possible interactions between the sources of two connected areas showed more reliable results than using a unique representative time series per region. Our findings highlight that multivariate approaches and 3D beamformers enhance the reliability of source-level connectivity, offering a more accurate framework to improve functional connectivity analyses in EEG and MEG.

P3.02 | Respiratory Phase Modulates Aperiodic Neural Dynamics Across Wakefulness and Sleep States

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Respiration significantly modulates brain activity, influencing neural oscillations during wakefulness and sleep. Although research in cognitive neuroscience has traditionally focused on oscillatory activity, recent findings emphasize that brain dynamics also prominently feature aperiodic activity — reflected in the 1/f slope — which is thought to index neural excitability and the brain's capacity for information processing. Recent work examining the impact of respiration on aperiodic brain activity during wakeful rest have revealed a clear association between respiratory phase and cortical excitability. However, it remains unknown whether the modulatory effect of respiration on aperiodic activity varies across different vigilance states, such as wakefulness and sleep. In the present study, we directly addressed this question by analyzing simultaneous EEG and respiratory recordings collected from healthy participants (N = 23) during their stay in the sleep laboratory. Specifically, we examined how respiratory phases modulate the 1/f slope across distinct vigilance states. Time-resolved estimates of the 1/f slope (1–40 Hz) were obtained from neural time series using a 250 ms moving window with 1 Hz frequency resolution. The respiratory phase at each window center was extracted and divided into 60 overlapping bins spanning the full cycle ($-\pi$ to π). Slope values were sorted by phase bin, and differences across vigilance states were evaluated using Watson U^2 tests. Our findings

reveal a clear state-dependent shift in how respiration modulates aperiodic activity. Specifically, during wakefulness, we observed a significant reduction in the 1/f slope at the peak of inhalation (0°), indicative of enhanced cortical excitability, and highest 1/f slope at the exhalation peak (−π and π), indicative of inhibition dominance. In contrast, during sleep (both NREM and REM), this relationship is shifted: the 1/f slope was lowest (meaning excitation dominance) during exhalation (peak in π/2), and highest (meaning inhibition dominance) during inhalation (peak in -π/2). This phase-dependent modulation during sleep suggests differential mechanisms governing neural excitability compared to wakefulness. These results provide novel insights into the intricate relationship between respiratory rhythms and brain function, highlighting that respiratory modulation of aperiodic neural activity is strongly influenced by the brain's vigilance state.

P3.03 | Error-Related Negativity (ERN) and Brain Oscillations Are Highly Heritable Trait in Young Adults: Evidence From a Twin Study

Andrey Anokhin (Washington University School of Medicine, USA); **Semyon Golosheykin** (Washington University School of Medicine, USA)

Error monitoring (EM) is essential for adaptive self-regulation of behavior. EM deficits have been implicated as a core dysfunction in a range of neuropsychiatric disorders such as ADHD, schizophrenia, addiction, whereas excessive EM has been implicated in the etiology of obsessive-compulsive disorder. Identification of genetically transmitted variation in the neural underpinnings of EM can help to elucidate etiological pathways to these disorders and establish the links between genes, brain, and behavior. Previously, we reported significant heritability of ERP indicators of EM in early adolescence (PubMed ID: 18503487), however, little is known about genetic influences on the neural mechanisms of EM in adulthood. Here we investigated heritability of ERPs elicited in a flanker task in young adult twins (age 1820, n=536, including 131 monozygotic (MZ) and 137 dizygotic (DZ) pairs. Genetic analysis using structural equation modeling revealed substantial heritability of error related negativity (ERN) ERP component, with genetic factors accounting for 63% of inter-individual variability. Time-frequency decomposition of event-related brain oscillations revealed EM-related mid-frontal theta activity, consistent with previous studies. Genetic factors accounted for 50% of variability in theta power and 40% in inter-trial phase coherence, a measure of neural synchrony. We conclude individual differences in brain activation supporting error monitoring are strongly influenced by genetic factors in young adults and can serve as intermediate neurophysiological phenotypes (endophenotypes) for investigation of genetic and neurobiological etiology of psychopathology characterized by abnormal EM.

P3.04 | Tracking Neural Dynamics of the Relational Eye-movement Effect During Memory Retrieval

Andrey R. Nikolaev (Lund University, Sweden); **Roger Johansson** (Lund University, Sweden); **Inês Bramão** (Lund University, Sweden); **Mikael Johansson** (Lund University, Sweden)

Eye movements do more than gather visual input – they actively contribute to the formation and retrieval of relational memories by linking information across space and time. During retrieval, gaze patterns often reflect memory reactivation well before an explicit response is made, a phenomenon known as the relational eyemovement effect. While this effect appears closely associated with hippocampal function (cf. Hannula & Ranganath, 2009, Neuron), the temporal dynamics linking eye movements and memory reactivation are still poorly understood. Specifically, how these processes unfold and interact over time remains an open question. To address this gap, we simultaneously recorded eye movements and EEG while participants performed a two-alternative forced-choice relational memory task. On each trial, participants viewed a cue and selected which of two equally familiar elements had been encoded with it, ensuring an equal baseline likelihood of initially fixating the target or the distractor. We analyzed fixation-related neural activity to track the temporal unfolding of the relational eye-movement effect on a fixation-by-fixation basis. Eye-tracking data revealed a robust relational eye-movement effect, characterized by disproportionate viewing of the target during correctly recalled trials. Time frequency EEG analysis across the entire test interval showed that successful retrieval was associated with distinct oscillatory patterns: a theta power increase peaking 500–1000 ms after test onset, and a sustained alpha power decrease beginning around 500 ms and persisting throughout the interval. Fixation-related EEG analyses further distinguished recalled from forgotten trials across sequential fixations. The first fixation on the target following cue presentation elicited significantly greater theta power in recalled trials, consistent with early hippocampal pattern completion. In contrast, alpha suppression persisted across later target fixations, suggesting ongoing cortical reactivation of mnemonic content. These findings reveal a temporally structured neural signature of relational memory retrieval across eye movements, marked by an early theta increase followed by sustained alpha suppression. They underscore the active role of gaze behavior in guiding memory retrieval and provide new insights into the neural dynamics underlying the relational eye-movement effect.

P3.05 | Bi Manual Dual Task Interference Reduces Beta Desynchronization During Motor Execution

Armin Hakkak Moghadam Torbati (Universite libre de Bruxelles (ULB); **Chrisitian Georgiev** (Universite libre de Bruxelles (ULB); **Daria Digileva** (Universite libre de Bruxelles (ULB); **Nicolas Yanguma Muñoz** (Universite libre de Bruxelles (ULB); **Gilles**

Naeije (Universite libre de Bruxelles (ULB); **Pierre Cabaraux** (Universite libre de Bruxelles (ULB); **Mathieu Bourguignon** (Universite libre de Bruxelles (ULB)

Background and objective: Cortical beta oscillations are the direct reflection of the state of sensorimotor brain areas: their power decreases (i.e., event-related desynchronization, ERD) during motor planning and execution and increases afterwards. However, it is not clear how simultaneous motor demands including multiple tasks can influence the modulation of beta ERD and whether such effects differ across hemispheres. We hypothesize that bi manual dual task involving contralateral muscle contraction would weaken beta ERD because bi manual dual task increases cognitive load and needs inter-hemispheric inhibition. Methods: 26 right-handed healthy participants (14 males, 12 females aged 23±5 years) opened and closed their right-hand fingers in response to beep sounds played with 3–4 seconds interstimulus interval (random jitter). This task was done in two conditions: on its own (movement-only) and while maintaining a steady isometric pinch grip at 10 percent of their maximum voluntary contraction with the left hand (bi manual dual-task). Each condition was performed for 5 minutes and repeated twice. EEG was recorded with a 64-channel system at 1 kHz. A time-frequency analysis assessed the evolution of EEG power in the 5–40 Hz range, relative to movement onset. ERD was estimated for each condition and hemisphere as the minimal relative power within 13–30 Hz, from −0.5 s to 1, among a left-hemisphere electrode selection (C1, C3, C5, CP1, ‘CP3, CP5, FC1, FC3, FC5) and its right-hemisphere counterpart. Paired t-test were used to compare ERD amplitude between hemispheres in the two conditions, and between conditions in the left hemisphere. Results: ERD was significantly greater in the left compared to right electrode selection (contralateral to the moving hand) for both the movement-only condition ($t(25) = 2.1$, $p = 0.04$) and the bi manual dual-task condition ($t(25) = 2.2$, $p = 0.03$), and ERD in the left hemisphere was significantly stronger in the movement-only condition compared with the dual-task condition ($t(25) = 6.4$, $p < 0.001$). Finally, a significant positive correlation between the two task conditions across participants ($r = 0.29 \pm 0.18$, $t(25) = 7.18$, $p < 0.001$) indicated that individuals showed consistent patterns of beta ERD modulation across two conditions. Conclusion: These results demonstrate that bi manual dual task demand reduces beta ERD, suggesting cortical resource competition or altered motor planning under increased load.

P3.06 | Beat Perception: A Window on the Neural Mechanisms Underlying the Detection of Non-adjacent Dependencies

Bianca Franzoia (University of Barcelona); **Nicola Molinaro** (Basque Center on Cognition, Brain and Language); **Ruth de Diego Balaguer** (University of Barcelona)

Research in cognitive neuroscience increasingly depicts language and music as deeply interconnected, with musical exposure and training yielding positive transfer to various aspects of language processing, including grammar. In humans, exposure to musical rhythm induces beat perception – the automatic extraction of a periodic structure in non-isochronous stimuli. Beat perception arises from neural entrainment, whereby neural populations resonate at periodicities in stimuli while allocating attentional resources to corresponding time points. Accordingly, beat perception improves perceptual processing, memory, and, motor coordination. The increased perceptual predictability induced by musical rhythm is hypothesized to initiate cascade effects that ultimately benefit syntactic processing by sharpening temporal attention and predictive mechanisms essential for tracking grammatical structures. In an EEG experiment, we explored the positive transfer effects of musical rhythmic structuring over the detection and learning of syntax-like structures, focusing on neural entrainment as the neural correlate of this mechanism. We designed three artificial languages (ALs) based on rhythmic sequences inducing beat perception. Each AL presented 15 syllables that could form AxC dependencies (A predicts C with 11 possible intermediate x-syllables) convergent to the beat (RB+); positioned in a beat-hindering structure (R) or not creating regular dependencies but within a beat-inducing rhythm (B). Participants (N=47) were passively exposed to each AL for 2min50s before completing a 6min40s syllable detection task measuring implicit learning via reaction times (RTs). Next, explicit learning was assessed through a discrimination task between rule and rule-violation sequences. Finally, participants were further exposed to the AL for 2min50s. Participants showed implicit and explicit learning of AxC structures in R and RB+ conditions, with inferior recognition performance in R compared to RB+ ($T=-2.64$, $p=0.02$). Neural entrainment, indexed by Steady-State Evoked Potentials (SSEPs) from EEG recordings, was assessed by contrasting beat-related and beat-unrelated frequencies within each condition and participant. SSEPs at beat-related frequencies were significantly lower in R ($T= -11.7$; $p>0.001$) and B ($T= -2$; $p= 0.05$) conditions as compared to RB+. These findings indicate that music-like rhythmic structuring enhances the detection of AxC dependencies and suggest that neural entrainment may sustain this effect by sharpening temporal attention towards timepoints corresponding to grammatical rules.

P3.07 | Lavi: A New Tool for Parameterizing the Electrophysiological Spectrum and Identifying Rhythmicity Bands

Golan Karvat (MRC Cognition and Brain Sciences Unit, University of Cambridge, United Kingdom); **Maité Crespo-García** (MRC Cognition and Brain Sciences Unit, University of Cambridge, United Kingdom); **Gal Vishne** (Edmond and Lily Safra Center for brain sciences, The Hebrew University of Jerusalem, Israel); **Michael C Anderson** (MRC Cognition and Brain Sciences Unit, University of Cambridge, United Kingdom (co-senior author)); **Ayelet N. Landau** (The Department of Experimental Psychology, University College London (UCL), United Kingdom; The Department of Psychology and the Department of Cognitive and Brain Sciences, The Hebrew University of Jerusalem, Israel (co-senior author)

Neural oscillations are associated with many physiological, cognitive, behavioural, and pathological states. These brain-waves span a wide range of frequencies, and therefore segmenting them into categories (bands) is a vital step to uncover their functions. This categorization is commonly done according to spectral profiles based on power. However, increasing evidence suggests that brain oscillations may sometimes appear as transient, high-power bursts rather than continuous rhythms. To account for the transient nature of oscillations, we developed a tool to segment the spectrum according to rhythmicity, defined as consistency of the phase relations between time-points. We term this tool LAVI (Lagged-Angle Vector Index), and use it to identify a universal spectral architecture comprising two categories: high rhythmicity bands linked to sustained oscillations, and new low-rhythmicity bands, dominated by transient bursts. LAVI is computationally efficient and allows automated and statistically inferred annotation of bands at the single-subject level. We demonstrate the utility of the publicly available LAVI Matlab package in adding the rhythmicity dimension to various existing datasets.

P3.09 | Pupil Size Reflects the Attenuation of Motor Fatigability by Reward

Jenny Imhof (Neural Control of Movement Lab, Dept. of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland); **Caroline Heimhofer** (Neural Control of Movement Lab, Dept. of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland); **Marc Bächinger** (Neural Control of Movement Lab, Dept. of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland); **Richard Ramsey** (Neural Control of Movement Lab, Dept. of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland); **Nicole Wenderoth** (Neural Control of Movement Lab, Dept. of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland)

Reward has been shown to enhance motor performance even in fatigued states, yet the underlying mechanisms remain unclear. Previous research suggests that reward increases the effort invested in movement. Fast, repetitive movements induce motor fatigability, here quantified as a decrease in movement speed and referred to as motor slowing. In monkeys, greater movement effort in response to reward has been linked to heightened activity in the locus coeruleus (LC). However, the LC's role in reducing motor fatigability through reward remains unexplored. Under constant lighting pupil size can be used as an approximate marker for changes in LC activity. This study investigates whether the LC might contribute to reward-related reductions in motor fatigability. Specifically, we hypothesized that reward-driven changes in pupil size would reflect the reward's impact on motor slowing. 25 healthy participants (age: 27±4y; 13 females) performed a wrist tapping task (flexion and extension) at maximal voluntary speed for 40s per trial. After 20s, a cue indicated whether the trial was rewarded or not. In reward trials, participants could earn 1 CHF by outperforming their previous reward trial. The experiment included 10 trials per condition (pseudorandomized). Linear mixed-effects models (LMEM) tested

the effect of time (0-10s, 10-20s, 20-30s, 30-40s), condition (neutral vs. reward) and their interaction on tapping frequency and pupil size. Cue-evoked changes (difference between mean 5s post-cue and mean 5s pre-cue) in pupil size were correlated with cue-evoked changes in tapping speed. Motor slowing was observed (LMEM: Time p<.001), confirming that participants entered a fatigued state. The reward cue significantly increased tapping frequency (Time x Condition interaction: p<.001) and elicited significant pupil dilation (Time x Condition interaction: p<.001). Additionally, reward-cue evoked pupil changes positively correlated with changes in tapping frequency (r=.46, 95%-CI: [.011, .721]). Our findings demonstrate that reward can attenuate motor fatigability. The correlation between reward-induced changes in pupil size and tapping speed suggests that pupil size, as a proxy for LC activity, may reflect the effort invested in the task. To further explore how different levels of effort affect pupil size, data from an ongoing pacing experiment inducing different effort levels will also be presented.

P3.10 | Four-dimensional Neural Space for Moral Inference

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Moral inference is an intuitive process guided by abstract moral principles and personal life experiences that individuals use to evaluate moral dilemmas and make judgments regarding right and wrong. Moral Foundations Theory proposes a framework for understanding intuitive moral inference across populations; however, the neural basis underlying the processing of different moral dimensions remains poorly understood. In this study, we mapped the brain networks involved in moral inference during naturalistic movie viewing. A total of 104 participants watched the Finnish film Käsky — which portrays an emotionally charged and morally complex narrative set during the Finnish Civil War — while undergoing functional MRI scanning. Dynamic ratings of 20 emotions and moral dimensions, derived from moral foundations theory, were collected from 43 viewers. This data-driven approach allowed us to investigate the dimensionality of moral inference and examine how many distinct dimensions are involved. To analyze the data, we employed dimensionality

reduction techniques to identify dependencies among the moral dimensions. MRI data were preprocessed using fMRIPrep, and associations between higher-order moral dimensions and brain activity were identified using general linear modeling and cumulative analysis. Our findings revealed four main moral dimensions: virtue (positive morality), hierarchy (collective respect), rebellion (self-interest), and vice (moral transgressions). While these dimensions shared some common neural activations, each also exhibited distinct activation patterns. Notably, the temporoparietal junction — crucial for understanding others' mental states — and the inferior parietal lobe — a hub for cognitive processes — were consistently engaged across all four dimensions. The vice dimension elicited the most extensive positive brain activation, whereas the hierarchy dimension was associated with significant negative activation. Both the anterior cingulate cortex and the middle cingulate cortex showed positive activation exclusively in response to vice-related moral inference, suggesting a potential neural signature for processing moral transgressions. Cumulative mapping further highlighted widespread brain activation during moral scenes, encompassing extensive cortical regions, the cingulate cortex, and the striatum. In summary, our results support a four-dimensional neural and psychological model of moral inference, which engages broad and distinct brain networks corresponding to different moral foundations.

P3.12 | Expatt: Temporal Signatures of Expectation and Attention Effects on Visual Information Processing in the Human Brain

Antoniya Boyanova (University Medical Center Hamburg-Eppendorf); **Arjen Alink** (University Medical Center Hamburg-Eppendorf)

Attention and expectation are thought to enhance the efficiency of sensory processing, but the neural dynamics behind their individual and combined effects on visual perception remain unclear. To address this, we used EEG to examine how these factors shape the temporal evolution of image identity decoding. In a within-subject design, participants (N=30) viewed images while instructed to attend either to the images (Att+) or to the central fixation cross (Att-). Images were presented in a deterministic and predictable sequence (Exp+) or in a random order (Exp), resulting in four experimental conditions crossing attention and expectation, presented in independent blocks: Att-Exp+, Att-Exp-, Att+Exp+, Att+Exp-. Image sequences included four distinct inanimate images, each shown for 250ms, followed by a variable ISI of 700–900ms. EEG was recorded from 64 channels, and multivariate decoding (SVM) was used to assess the emergence and generalization of image identity information encoding over time. Our time-resolved decoding results showed distinct effects of attention and expectation on the time course of EEG-based image identity decoding. While attention increased image identity decodability starting from ~100ms post image onset, expectation (i.e., deterministic stimulus order) led to a sustained reduction in decodability from 400ms onward. We did not find a significant attention

and expectation interaction in overall decoding strength at all time points, however, above-chance decodability dropped earlier in the Exp+ conditions across both attention states. Temporal generalization analyses revealed that attention gave rise to image representations that generalized more across time. Expectation, on the other hand, gave rise to a reduced temporal generalization of image representation decoding, especially in the Att-Exp+ condition. The Att+Exp- condition exhibited the most generalizable decoding, surpassing that of the Att+Exp+ condition. The latter findings suggest that expectation appears to counteract or dampen the generalizing effect of attention on image identity representations. In summary, our findings reveal that attention and expectation have temporally distinct effects on image information processing, as attention enhances early image representation while expectation suppresses late image representations. Taken together, our findings suggest that attention and expectation exert distinct effects on visual information processing in the human brain.

P3.13 | Lyapunov Exponent of Eeg Signal as a Marker of Brain Development and Emotion Perception

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The neural circuitry of emotion recognition undergoes significant development from childhood to adulthood. Children become progressively better at recognizing facial emotions, starting with basic emotions and continuing to improve with more complex ones. By focusing on nonlinear dynamics, specifically the Largest Lyapunov Exponent (LLE), this study aims to contribute to a deeper understanding of the development of emotional brain processes in terms of dynamic complexity. Methods: Participants were 161 children and young adults, divided into five age groups balanced by sex. EEG was recorded from 64 electrodes using eegoTMmylab (ANT Neuro, Germany) during the performance of an emotion conflict task. The task consisted of four blocks, each containing 60 stimuli, presented under congruent/incongruent, visual (from https://nyu.databrary.org) and auditory conditions. LLE was computed using an algorithm (Rosenstein et al., 1993, TISEAN) for epochs ranging from -200 ms to +800 ms around the stimulus onset, using data filtered in the alpha, theta, and full frequency bands. Data were grouped into networks: Anterior, Posterior, Executive, and Right/Left Hemispheres. Results: Statistical analysis using repeated-measures ANOVA revealed significant main effects for networks in the alpha ($F = 29.183$, $p < 0.001$) and theta bands ($F = 8.304$, $p < 0.001$), but not for emotion, sex, or age groups. However, significant interactions were observed in the alpha and full frequency bands EEG data: network × age ($F = 2.805$, $p = 0.002$; $F = 4.084$, $p < 0.001$), network × sex ($F = 3.071$, $p = 0.009$; $F = 3.575$, $p = 0.003$), and emotion × network × sex × age ($F = 1.650$,

p = 0.015). LLE remained lower in the youngest group, displaying minimal variability. Conclusion: These results suggest that nonlinear dynamics during rapid emotion recognition are a stable brain feature. Signal complexity varies across brain networks. In the youngest group, EEG complexity does not reflect distinct network dynamics, while effects in older participants suggest that network specialization of nonlinear activity develops later. These findings help trace the maturation of brain networks. This research was funded by the Committee of Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. BR27198099).

P3.14 | Strategic Blinking in Cognitive Tasks Improves Performance and Varies Across the Lifespan

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Humans spontaneously blink their eyes 16-20 times each minute to spread tear film on the cornea, representing a substantial amount of time awake when one's eyes are closed. Consequently, blinks are strategically timed to prioritize only the most important visual input, balancing both stimulus characteristics and personal goals. However, the process through which optimal timing is learned in a visual task has not yet been investigated in detail. Here we present video-based eye-tracking data from 750 healthy participants (aged 5-95 years) performing a structured interleaved pro-/anti-saccade task (IPAST), in which we previously found that blinks are suppressed in anticipation of the appearance of visual stimuli (Pitigoi et al., eNeuro, 2024). Briefly, pro-saccade trials require the participant to look at a peripheral stimulus once it appears, while anti-saccade trials require them to instead look to its opposite location on the screen. Anti-saccades are therefore cognitively demanding, requiring inhibitory control for successful performance, and these trials being randomly interleaved with pro-saccade trials demands heightened attention and goal shifting. Here we demonstrate that blink timing is optimized during the first 40 trials of the IPAST such that blinks decrease in periods that would compromise anti-saccade performance and increase in others. We also found significant differences in blink distribution between participants with high vs. low anti-saccade error rates. Together, these findings suggest that learning appropriate blink timing is functionally meaningful to performance in the IPAST. Furthermore, our data shows that blink timing efficiency improves gradually from childhood to early adulthood, after which it declines. This supports a possible link between the ability to regulate blink behaviour and age-related changes in learning capacity and inhibitory control taking place across the lifespan.

P3.15 | Neural Geometry Dynamics of Working Memory-guided Actions

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Previous literature has shown that control brain regions contain relevant information about upcoming novel instructed actions. In parallel, a growing body of evidence reveals that different states of priority are represented dynamically in visual working memory. Some of these studies have reported that visual memories that are currently vs. prospectively relevant can be represented within the same brain region but in orthogonal and even inverted patterns of activity. However, whether the state of priority of WM-guided novel actions similarly modulates their representational format remains unknown. Similarly, the temporal dynamics of such representational changes are unclear. We used electroencephalography (EEG) to explore these questions while participants performed two consecutive choice reaction tasks. Participants encoded two novel stimulus-response (S-R) mappings at the beginning of each trial. Subsequently, a cue indicated whether one of the encoded mappings would be relevant in the first probe ("current" condition), in the second probe after having to answer to an irrelevant stimulus ("prospective" condition), or in the second probe after a free delay ("delayed" condition). We expected that the functional relevance would influence the subjects' accuracy and response times as well as the neural geometry and temporal dynamics of the S-R mapping. Behavioural results show slower reaction times and higher error rates for the prospective condition, suggesting that task demands modulate the state of representations to guide behaviour. We then used Representational Similarity Analysis to explore how patterns from different conditions related to each other and whether the functional priority influences the neural code for S-R associations. Using three measures computed on the dissimilarity matrices, the EEG analyses reveal shared neural codes for SR categories during testing in the three WM conditions. In the prospective condition, however, the stimulus category may be maintained in a way that protects it from interference: we observe an increase in the distance between S-R categories relative to the functional relevance. These results, along with some significant preparatory activity, provide initial evidence for different coding schemes in WM modulated by task demands.

P3.16 | Modality-dependent Shifts in Source Memory Retrieval: Electrophysiological Insights Obtained From Two Virtual Reality Studies

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Virtual Reality (VR)-based encoding has been proposed to enhance memory retrieval through a shift towards recollection. However, empirical findings regarding VR's effect on retrieval performance and underlying processes are inconclusive, often relying on subjective awareness of familiarity and recollection. Moreover, a key question remains whether potential benefits of VR-based encoding are overshadowed when retrieval takes place on a conventional desktop. To tackle these limitations, we explored how retrieval performance and processes differ depending on the encoding modality across two studies by implementing a source memory paradigm. This approach objectively differentiates familiarity and recollection, and allows for examining whether the encoding modality itself, i.e., VR vs. conventional desktop-presentation, serves as a criterial source facilitating recollection. We hypothesized that in case the encoding modality functions as a criterial source, the late posterior negativity (LPN), reflecting the retrieval of source-specifying attributes, would be most pronounced for VR-engrams recalled including its correct source. Consequently, both studies employed desktop- and VR-based incidental encoding of everyday items in a within-design. In an unannounced recognition task conducted on a desktop (study 1) or in VR (study 2), participants had to differentiate between old, previously encoded and new, unknown items. If participants rated an object as being old, they had to indicate whether they encoded it in VR or on the desktop. When retrieval was performed on a desktop (study 1), memory performance did not differ between VR-encoded and desktop-encoded items. Yet remarkably, the LPN revealed that retrieval of VR-encoded items was associated with reduced familiarity compared to desktop-encoded items, suggesting a shift towards recollection for VR-based engrams. In contrast, retrieval in VR (study 2) was accompanied by better recognition of VR-encoded items, yet we observed no differences in the LPN. Consequently, our results demonstrate that memory performance and processes may vary independently. Whereas differences in memory performance were only observed under VR-based retrieval, the LPN indicated differences in retrieval processes only during desktop-based retrieval, providing initial insights into how mnemonic processing shifts with different modalities.

P3.17 | Sensorimotor Delays do Not Speak Against Pure Speech Feedback Control

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Speech feedback is a controlled variable in speech motor control. Yet, given its delay of about 120ms, it is classically assumed to influence primarily future utterances or late components of longer vowels. This aspect is usually taken as an argument against the possibility that fluent speech production is purely feedback-controlled. Typically, speech production is thought to rely on predictive forward models that allow for fast feedforward control of speech and that have been acquired during

language acquisition. Here we set out to investigate the phenomenon of coarticulation, which describes the effect that a realization of a phoneme is influenced by its preceding and forthcoming neighbours. While influences from past actions (carryover coarticulation) can be explained by a combination of physical causalities and motor planning, influences from future action goals can only be fully explained by active anticipatory processes in speech motor control. Current modeling accounts view coarticulation as a side effect of efficiency objectives of control or properties of the planning algorithm. Because anticipatory coarticulation could provide prospective sensory cues usable for feedback-dependent speech control, we characterized the dynamics of carryover and anticipatory coarticulation in a French speaker in both acoustic and articulator data as measured by Electromagnetic Articulography using General Additive Models. Our data show that anticipatory coarticulation effects dominate over carryover coarticulation effects and that prospective information on future speech is available in the somatosensory stream as early as 200ms before articulatory gesture/phoneme onset. This asymmetry is compatible with an anticipatory feedback dependent control strategy, as sensory information about future actions is available early enough to influence ongoing actions in spite of sensorimotor delays. This weakens the necessity for internal predictive forward models for the control of fast actions.

P3.18 | Action-guided Reactivation of Sequential Memory Traces in Humans

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Spatio-temporal sequences are a hallmark of episodic memory. In animals, the reactivation of previously encoded spatial sequences has been shown to guide behaviour. In humans, investigating the reactivation of sequential spatial memories on a neural level has mostly been done in virtual-reality neuroimaging experiments, lacking real-world movement. Here, we investigated the feasibility of decoding sequential memory representations from EEG data acquired in a memory paradigm that incorporated real-world head motion. 36 participants learned 24 unique sequences of four images from four categories that were sequentially presented on monitors positioned at different angles around them. Participants associated each image with a specific head orientation by turning their head to the presented image. In this way, the participant's real-world actions were explicitly part of the memory. Each sequence was followed by an immediate memory task, where the participant had to re-enact the correct head orientation sequence. To assess episodic memory, the same retrieval task was performed for all previously learned sequences, but now after a distractor task. We employed representational similarity analysis (RSA) to detect the reactivation of sequential memories, time-locked to participants' head movements in both the free recall memory tasks. As training data, we used neural response patterns from an initial visual image presentation task and from the encoding phase

of the memory task. RSA was applied at two levels. At the first level, we contrasted neural similarity between the correct and incorrect image categories for each head turn segment in the memory tasks. While this approach can reveal category specific reactivation to some extent, it is sensitive to imbalances in correlation patterns across image categories, potentially limiting its interpretability. To address this, we implemented a second-order RSA, using the full correlation matrix from the first-order RSA as input. This method captures the relational structure among all image categories, offering a more robust and informative decoding framework. Using this multi-level RSA approach, we successfully decoded memory reactivation during both the immediate and episodic recall tasks, aligned to the onset of each head turn. These findings demonstrate that action-guided reactivation of sequential memories can be identified in humans.

P3.20 | Assessing Preschoolers' Complex Action Processing in a Stacking Game Using Fnirs

Lea Haerms (Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany; University of Mannheim, Germany); **Laura Maffongelli** (University of Lübeck, Germany); **Charlotte Grosse Wiesmann** (Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany; University of Technology Nuremberg, Germany); **Markus Paulus** (Ludwig-Maximilians-University Munich, Germany); **Angela D. Friederici** (Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany); **Nicole Altvater-Mackensen** (University of Mannheim, Germany)

The ability to plan and understand complex actions considerably develops around the preschool years. Previous research suggests that the processing of hierarchically structured actions recruit the inferior frontal cortex (IFC), which is critically involved in hierarchical processing in language (Fadiga, et al., 2009). Recent meta-analyses on action and language processing in adults suggest that different subregions of the left IFC underlie structural processing of language and action (Zaccarella, et al., 2021). However, to this date, the underlying neural mechanisms of children's action processing are largely unknown. Here, we compare structural action processing and its neural correlates in children and adults using a stacking game while measuring fNIRS. We instructed N=78 children and N=47 adults to place six blocks varying in shape and size on to a small board to build a pathway for two toy figures. Task levels included two condition structures: sequential action sequences, in which the placing order of the blocks was flexible, and dependent action sequences, in which the blocks needed to be placed in a specific order. Participants were presented with twelve levels of increasing difficulty, six in each condition. We measured participant's neural response using fNIRS in a 30 second planning phase, where the setup was revealed but out of reach, followed by a 60 second building phase, in which the task was solved. Participant's behavioral performance was coded based on their success. We hypothesize that structural complexity of action sequences modulates the

activation of regions in IFC, with stronger activation for hierarchically dependent than sequential sequences. If such activation indexes structural processing, we further expect correlations between task performance and neural response. Our preliminary results in children of block-averaged fNIRS data show increases in HbO in two regions of interest in inferior (BA45) and posterior (BA44/ BA6) parts of the frontal cortex. Contrasting with previous findings on language processing and action, our preliminary results show right lateralized modulation in IFC activation depending on the action's structural complexity and children's capacity to solve structurally complex action tasks. The full adult and child datasets are currently being analyzed and will be presented at the conference.

P3.21 | Effector-specific Decision-making in a Speeded Task Using Myoelectric Interface: Parallel vs Serial Processing in Proximal vs Distal Muscles

Liang Tong (University College Dublin); **Simon Kelly** (University College Dublin); **Elaine Corbett** (University College Dublin)

Title: Effector-Specific Decision-Making in a Speeded Task Using Myoelectric Interface: Parallel vs Serial Processing in Proximal vs Distal Muscles Topic: Cognitive Modelling Authors list and affiliation: Liang Tong (presenter); Simon Kelly; Elaine Corbett; School of Electrical and Electronic Engineering and Centre for Biomedical Engineering, University College Dublin, Ireland Decisionmaking is increasingly recognized as an embodied process, where sensory-evidence, action-planning, and execution unfold interactively. However, most perceptual-decision-making research has been limited to button-press decision reports involving distal-finger-muscles, leaving unclear the influence of the motor effector on the decision process itself. This study tested decision – action coupling differs between a proximal (biceps brachii, BCP) and a distal (first dorsal interosseous, FDI) effector. Given their distinct neural control – BCP relying more on subcortical/spinal circuits, FDI on fine cortical control – this contrast provides insight into how motor pathways shape decision implementation. Participants performed a moderately time-pressured visualcontrast-discrimination task with two discriminability levels. Responses were executed by contracting either the proximal-BCP or distal-FDI muscle using an electromyography(EMG) interface, while EEG was recorded. Using EMG, we identified partial bursts – subthreshold, transient muscle activations that occurred without overt movement – as a key marker of covert motor dynamics during decision execution. Behaviorally, non-parametric tests showed no significant effector difference in accuracy or EMG-onset latency; all were significantly modulated by contrast. However, FDI showed a significantly higher rate of partial-bursts ($p < .01$), especially under low contrast. In FDI, the timing of initial partial bursts was modulated by contrast ($p < .01$), but not in BCP. This suggests that even after an initial commitment, the FDI continued to receive continuous flow from decision circuits, allowing for late revisions. In contrast, BCP appeared to fully commit once an initial decision was made, implying a reduced post-decisional

information flow. Lateralized mu – beta motor preparation signals showed similar levels of suppression at movement onset for both effectors, suggesting a common threshold at response, but FDI had a higher baseline level prior to evidence onset. This elevated inhibition could potentially reflect strategic differences in the decision mechanisms for the different effectors. These findings are consistent with the idea that distal muscles(FDI) support parallel decision – action integration with online adjustments, whereas proximal muscles(BCP) rely on a more serial, preplanned strategy. This effector-dependent distinction in decision architectures highlights the need to model the motor system as an active participant in decision-making, especially under naturalistic motor demands. Ongoing modeling (e.g., drift diffusion/ neurally-informed) and EEG-analyses will further evaluate the computational and neural underpinnings of these effector-specific dynamics. This work was funded by Research Ireland (21/PATH-S/9643).

P3.22 | Tracking the Reinstatement of Semantic and Emotional Information During Episodic Memory Retrieval

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Retrieving episodic memories often involves reconstructing both their semantic content and the emotional context in which they occurred. However, the neural mechanisms that differentiate these forms of reinstatement remain poorly understood. This event-related potential (ERP) study examines how semantic category and emotional valence are reinstated during memory retrieval. Seventy participants encoded word-image pairs, with neutral words paired with images of faces or scenes that varied in emotional valence (positive, negative, neutral). During retrieval, participants were presented with word cues and asked to recall the semantic category and emotional valence of the associated image. Brain activity from fully recollected trials, in which both category and valence were recalled, was compared to partially or completely forgotten trials. Analyses were conducted separately based on semantic and emotional content. Recollection of faces elicited a canonical left-parietal memory effect (600-900 ms), followed by two later, anteriorly distributed positive-going effects, suggesting sustained mnemonic processing. In contrast, scene recollection was characterized by a pronounced late posterior negativity (LPN; 1100–1500 ms), potentially reflecting increased reconstructive demands for contextually rich stimuli. Emotional content influenced retrieval-related brain activity, with distinct effects observed for positive and negative valence. Memory for negative associates elicited a sustained late memory effect (1200-1600 ms) across frontal and parietal sites, overlapping with the LPN observed for scenes. In contrast, memory for positive associates elicited an earlier leftparietal effect (600–800 ms), similar to the face-related effect,

followed by a later fronto-central/parietal positivity (1600-1800 ms). Neutral stimuli failed to elicit robust memory effects, suggesting that emotional arousal may enhance mnemonic reinstatement. Additionally, an early emotion-specific ERP modulation between 200–300 ms was observed for both negative and positive associates relative to neutral. This effect was independent of retrieval success, suggesting a rapid and implicit reactivation of the emotional tone of the associated image. These findings reveal both distinct and overlapping temporal and topographic neural dynamics supporting the retrieval of semantic and emotional aspects of episodic memories. They further indicate that emotional arousal can modulate memory processes at early stages, independent of conscious recollection, offering new insights into how emotionally salient experiences are reconstructed in the brain. Keywords: Episodic memory, ERPs, semantic content, emotional valence, mnemonic reinstatement.

P3.23 | High Temporally Modulated Emotional Sounds Suggest the Existence of Magnocellular Auditory Pathways for Threat Detection in Humans

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Rapid threat detection is crucial for survival. Neural models for emotional processing in vision suggest the existence of ultrafast magnocellular routes from the pulvinar of thalamus to the amygdala, allowing efficient threat detection and subsequent adaptive behavior in humans. These routes are known to mediate coarse visual processing, eliciting differential responses to threat than other more fine-grained pathways. In the auditory domain, animal evidence suggests the existence of similar routes for threat detection, but they remain unknown in humans. Using fear conditioning, a procedure that depends on amygdala response, we investigated across two complementary experiments whether magnocellular pathways to the amygdala, particularly sensitive to high temporal modulations, mediate auditory, pupillary (Experiment I) and hemodynamic responses (Experiment II) to threat in humans that may differ from parvocellular pathways, sensitive to low temporal modulations. Electroencephalography (EEG), pupillometry (Experiment I; N = 28) and functional magnetic resonance imaging (fMRI; Experiment II; N = 31) data were recorded in healthy participants while they detected voices. Voices were either paired (conditioned) or unpaired (not

conditioned) with an unpleasant white noise, which determined their threatening significance. Results suggest that fear conditioning was effective, and threatening stimuli at high temporal modulations elicited earlier auditory and pupillary responses (Experiment I) as well as stronger hemodynamic responses in the pulvinar of the thalamus (Experiment II) than those presented at low temporal modulations. Additionally, early pupillary threat responses to high amplitude modulated threatening sounds predicted individual stimulus detection (d-prime) in individuals with high anxiety (Experiment I). Together, these results are compatible with faster cortical responses to threat when encoded through magnocellular inputs to the amygdala, and suggest the existence of auditory subcortical routes for threat detection in humans, similar to those in vision.

3.25 | Facing Reality: A Joint Mobile EEG and Virtual Reality Study of Dynamic Face Processing and Recognition Using Virtual Avatars

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Human faces play a crucial role as social cues, making face processing a fundamental cognitive function with high everyday relevance. A key aspect of processing these cues is the dynamic nature of human expressions. However, research on face processing has predominantly been conducted with static 2D representations of faces on monitors. Recent advances in the development of realistic virtual avatars for use in virtual reality (VR) allow for investigation of dynamic face processing in authentic social contexts. In a joint mobile EEG and VR experiment, the initial perception and subsequent encoding of dynamic compared to static faces is investigated regarding attentional and cognitive demands. In addition, behavioral performance and engagement of recognition mechanisms during recall of perceived faces and their discrimination from novel faces is compared between encoding modalities. Participants explored several rooms within a 3D-360° virtual environment where they alternately encountered dynamic 3D avatars and static 2D images of avatars. Within each room, participants first viewed and memorized the faces of the persons, followed by an immediate recognition task that included previously seen faces alongside unfamiliar ones. During perceptual processing, stimulus-related electrophysiological responses are compared between 3D avatars and 2D images of avatars. Additionally, recognition performance and event-related potentials associated with old/new effects are examined for possible differences in the retrieval mechanisms of faces encoded in 3D or 2D. Preliminary findings reveal modalitydependent perceptual processing of dynamic compared to static faces, possibly due to additional cognitive demand but also enhanced encoding for dynamic faces. These differences extend to the behavioral performance and the cognitive processes underlying the detection of known faces, showing superior recognition of dynamic faces, and distinct engagement of

familiarity- and recollection-based recognition mechanisms depending on the encoding modality. These findings extend the understanding of real-life relevant face processing highlighting the potential of using virtual avatars to create more ecologically valid and dynamic social contexts.

P3.26 | Neural Correlates of Out-of-the-loop: The Role of Trust and Vigilance in Supervising Automation

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Neural Correlates of Out-of-the-Loop: The Role of Trust and Vigilance in Supervising Automation Mike Salomone1, Anne Guerin-Dugué2, Bruno Berberian3, Anton Andreev2, Bertille Somon3, Martial Mermillod1, Aurélie Campagne1 1 Université Grenoble Alpes, Université Savoie Mont Blanc, CNRS, LPNC, Grenoble, France 2 GIPSA-Lab, Université Grenoble Alpes, CNRS, Grenoble INP, Grenoble, France 3 Office National d'Etudes et de Recherches Aérospatiales, Salon-de-Provence, France Automation has shifted operator roles from active controllers to supervisors, increasing susceptibility to the out-of-the-loop (OOTL) phenomenon, which impairs supervisory performance. Identifying the neural correlates of the OOTL could improve its understanding and detection. In this EEG study, we examined brain activity during supervision of an obstacle-avoiding automated system, depending on participants' trust (manipulated via system reliability) and vigilance - two major OOTL factors. Fifty-five participants monitored a drone avoiding obstacles during three 1-hour sessions. Half supervised a highly reliable drone (0% errors), the others a less reliable one (25% errors). In each trial, the drone decided whether to turn right or left to avoid the obstacles gradually approaching it. Participants could request an avoidance if they judged this decision would lead to a collision. In the first session (actor), participants also had to indicate their own direction before the system's decision. In the next two sessions (supervisor), they were only required to supervise. We analyzed the event-related spectral perturbations time-locked to either the appearance of obstacles or the system's decision. Participants' vigilance level was assessed on a trial-by-trial basis by analyzing parietal global field power relative to their individual alpha frequency. Significant effects were identified using cluster-based permutation testing. The results are preliminary and based on 38 participants evenly distributed between conditions. During the obstacle monitoring period, participants monitoring a reliable system (vs. those

monitoring an unreliable system) showed higher central beta activity in the early-phase of the second supervision session, suggesting a greater decrease in response selection. This was associated with a deterioration in vigilance through a decrease in occipital beta. When participants were drowsy, these results were widespread across both supervision sessions. They also showed an increase in parietal theta in early phase, suggesting compensatory visuomotor attention related to fatigue. Participants supervising an unreliable system specifically spent more time supervising than during the actor session, reflected in a reduced occipital alpha at the end of the phase, especially when they were alert. During the system decision, a decrease in parieto-occipital alpha was observed during the unreliable system monitoring sessions when participants were drowsy, suggesting increased compensatory attention.

P3.27 | Emotional Modulation of the Acoustic Startle Response in Healthy Young Adults

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A long line of research suggests that evoking an arousing appetitive motivational state can attenuate a defensive startle reflex while an equally arousing but aversive state can strengthen it, compared to a neutral, low-arousal state. That is, the emotional valence, rather than arousal, is thought to modify the startle reflex amplitude. We sought to replicate this finding and, as there is some evidence that transcranial direct current stimulation (tDCS) targeted at the prefrontal cortex (PFC) might affect processing of emotional information, we subjected our participants to either real or sham stimulation prior to the experiment. The participants were forty-four healthy volunteers aged 20 to 35 years. The stimulation procedure with a left-PFC (F3) anode and a right-PFC (F4) cathode lasted 10 min. Next, a 50-ms burst of white noise (105 dB) was repeatedly presented via in-ear headphones either on its own or while the participant was viewing pictures drawn from the OASIS database. The pictures were, in a prior on-line questionnaire with a matching sample, evaluated either positive (high arousal), neutral (low arousal) or negative (high arousal). The acoustic startle stimulus took place after at least 3.5 s from picture onset to allow for a change in motivational state prior to eliciting the defensive eyeblink reflex. Electromyogram from the right eye, electrocardiogram and respiratory movement were recorded during the experiment. Offline, the startle reflex amplitude during picture viewing was determined and proportioned to that elicited during startle-alone trials. Statistical analyses revealed that a larger acoustic startle response was elicited during viewing of highly arousing (positive/negative) compared to low-arousing (neutral) pictures. There was no difference between the sham and the tDCS groups. In sum, our results challenge the view that the valence of the motivational state affects reflexive behavior, and we found no evidence that a single brief bout of tDCS on the PFC could modify the emotional modulation of the startle response.

P3.29 | Break Unfold: Limitations, Caveats, and Best-practices for Overlap Corrected Regression ERP Analyses

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The regression ERP framework is gaining more attention in cognitive research, facilitated via toolboxes like Unfold and LIMO. This framework allows researchers to gather new insights into brain activity by moving away from traditional, controlled lab settings and towards more complex, naturalistic experimental environments. However, much like classical ERP studies, using the regression ERP framework requires careful consideration of its suitability for a given experiment. When using linear models for more advanced modelling, like non-linear effects or to correct for overlap between adjacent events, key questions arise: How many covariates can be included? How much variability needs to exist in the event sequence? Or is it sufficient if events are presented in a random order? In fact, "How much jitter between events (i.e. inter event distance variability) is needed for overlap correction?" is the most asked question we as maintainers of the Unfold toolbox get from collaborators. This is an issue as neither the "allowed" parameter space is known, nor a practical measure exists to evaluate this appropriateness. Through systematic simulations (using the UnfolSim.jl toolbox), we investigated these challenges in modeling overlap (and covariates) of EEG data in three stereotypical experimental designs: controlled lab, free viewing, and naturalistic environment. We examined factors such as the impact of jitter, sequence randomness, and others by systematically varying parameters within each of the three experimental design structures. Subsequently, we evaluated model fit by calculating the mean squared error (MSE) between results and their ground truth, directly assessing the impact of the different parameters on estimateability. We observed an asymptotically falling curve of MSE values, with lower MSE values for "better" conditions, such as high jitter, less noise or fewer covariates. The overall asymptotic best performance depended on an interaction of all included parameters. Notably, however, this asymptotic behavior means that beyond a certain point increasing or decreasing parameters such as jitter or noise has virtually no effect on the results. Given these new insights into model behavior, we can now more directly advise researchers on how to best set-up their experiments for successful overlap correction, while still retaining the most economical design.

P3.30 | The Minimal Exposure Durations Required for Perceiving and Embodying Emotion

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Human faces convey a range of attributes – including structural configuration, emotional expression, and gaze direction – which provide crucial cues about others' mental states and intentions. The more finely tuned the visual system is to a particular attribute, the less exposure it requires for effective processing. While the visual system is highly sensitive to faces, the sequence in which it extracts different facial attributes – and whether this can occur without conscious awareness – remains poorly understood. In a series of experiments, we employed a novel LCD tachistoscope capable of ultra-brief (as short as 0.002 ms), unmasked visual presentations to determine the minimal exposure durations required for extracting specific facial attributes. We combined psychophysical measures with electroencephalographic (EEG) and electromyographic (EMG) markers to assess emotional processing and conscious awareness. Critically, we combined EEG markers of perceptual emotion processing (i.e., neural responses that distinguish emotional from neutral stimuli) with EMG markers of embodied processing (i.e., facial mimicry of emotional expressions). Our results showed that EEG markers of perceptual emotion processing emerged at just 4 ms – an exposure duration also sufficient to elicit psychophysical and EEG indicators of holistic face processing and conscious awareness. Strikingly, EMG responses revealed facial mimicry of fearful expressions in the corrugator supercilii muscle at just 1.5 ms – well shorter than the threshold for conscious awareness. In contrast, mimicry of happy expressions, measured via contraction of the zygomaticus major muscle, appeared from 4 ms onwards, coinciding with the onset of conscious processing. These findings suggest that facial mimicry can occur automatically and outside of awareness, and that mimicry of threat-related expressions such as fear may benefit from prioritised unconscious processing.

P3.31 | Establishing the Age-Related Link Between the Cortical Processing of Postural Sway and Peripheral Sensory Acuity

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Only in recent years has the investigation of cortical involvement in upright standing regulation taken shape, with a promising tool called corticokinematic coherence (CKC). Directionality analyses suggest that CKC hinges on the processing of sensorimotor afferences. However, an empirical link between CKC and proprioceptive acuity is missing. Here, we examined whether CKC, estimated during upright standing, related to two forms of sensory acuity, proprioceptive and visual. We hypothesized that CKC would be specifically related to proprioceptive, not visual, acuity. We collected center of pressure (CoP) data from 27 young (22-31 years) and 31 older (65-85 years) participants, all equipped with EEG, in 4 standing conditions: eyes-open or closed and on a hard or foam surface. CKC was quantified as coherence between EEG

and CoP velocity. Knee joint position sense (JPS) was measured using a joint position reproduction test, and visual motion acuity (VMA) via a visual motion detection task. Group differences were assessed using MannWhitney U tests. Two linear mixed models tested whether CKC depended on condition, age, their interaction, and JPS (model one) or VMA (model two). Trend analysis was conducted to assess slope differences. Older adults possessed worse JPS ($z = -2.6$, $p < 0.01$), while no differences were identified for VMA ($p > 0.05$). CKC peaked between 2-8 Hz at electrodes approximating Cz. There was a significant effect of condition, age, and their interaction on CKC ($0.0001 < p < 0.03$). In the first model, addition of the JPS-age interaction improved model fit ($\chi2(2) = 7.28$, $p < 0.03$). In the eyes-closed foam condition, a significant age-related difference in slope emerged ($z = -3.64$, $p = 0.0003$), where worse proprioceptive acuity was related to greater CKC in the young, while the older showed the opposite pattern. The inclusion of VMA in the second model did not improve model fit. CKC shows functional specificity to proprioceptive acuity. Aging may be associated with distinct sensorimotor processing strategies: younger adults may upregulate cortical processing in response to proprioceptive errors, whereas increasing proprioceptive error in older adults may disrupt cortical processing, instead of enhancing it.

P3.32 | Stimulus-driven Selection of Internal Representations in Visual Working Memory: Behavioural Consequences and Oculomotor Dynamics

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Effective behaviour requires the constant selection of relevant information from both the external environment and from internal representations held in working memory. Within classical external attention research, a distinction is made often between voluntary (goal-driven) and involuntary (stimulus-driven) attention. Conversely, research into internal attention has historically focussed almost exclusively on goal-driven influences, leaving potential stimulus-driven influences vastly underexplored. To fill this gap, we adapted the classic retrocue paradigm used in working-memory research, to include only a completely uninformative exogenous retrocue. This cue consisted of a brief change in colour of the central fixation marker, that randomly matched the colour of either or neither memory item. The uninformative cue was therefore completely unpredictive of which memory item would most likely be tested in the ensuing orientation reproduction task. To ensure participants were not able to simply ignore the uninformative cue, a secondary task was added where participants had to perceptually evaluate the cue's colour. The behavioural data showed clear significant effects of the uninformative cue on both reaction times and

orientation reproduction errors. Relative to trials with a neutral cue – whose colour matched neither memory item – we found both a behavioural benefit to the colour-matching item, as well as a cost to the other item simultaneously held in memory. By also tracking spatial biases in microsaccades, we reinforced the behavioural findings by showing clear attentional allocation to the colour-matching item, as held within the spatial layout of visual working memory. This marker additionally showed that attentional deployment commences within a few hundred milliseconds after the onset of the exogenous cue. Together, we firmly establish that (1) internal selective attention can be driven strongly in an involuntary, stimulus-driven manner; (2) these influences are driven by a benefit to colour-matching items at the expense of other memory items; and (3) this can be tracked in spatial biases in microsaccades that provide a robust continuous marker of the focus of attention in visual working memory, whether driven endogenously by our goals or exogenously by external stimuli.

P3.34 | Neurophysiological Markers of Cardiac Interoceptive Processing in First-Time Expectant Mothers

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Background: Pregnancy is a complex biological phenomenon where two distinct pathways may produce changes in interoception (ability to perceive and subjectively experience inner bodily states). First, pregnancy modifies the parental caregiving brain network, which includes key regions for interoceptive processing, particularly the insula. Second, pregnancy also changes the strength, frequency, and/or nature of interoceptive signals across different modalities (e.g., cardiac, respiratory, gastric). Aim: This study investigates pregnancy-related changes in neural markers of cortical

interoceptive processing, specifically heartbeat-evoked potentials (HEP), by comparing first-time expectant mothers with non-pregnant, age-matched females. Methods: Data were collected from first-time expectant mothers (n = 13; Mage = 32.15 years) and matched controls (n = 8; mean age = 30.88 years) at 28–32 weeks of gestation. EEG recordings, time-locked to R-peaks (ECG), were obtained while participants completed the Infant Face Repetition Suppression Task. This paradigm was designed to induce an emotion (sad vs. neutral) and age-specific (infant vs. adult) modulation of HEP amplitude. A cluster mass permutation test was employed to identify the electrodes and time-windows where HEP amplitude was effectively modulated (right frontal-central; 308 - 600 ms). Results: Repetition-suppression effects on HEP amplitude were observed for adult stimuli ($p = .049$, $d = 0.499$), while no modulation was observed in the infant condition ($p = .471$, $d = 0.174$). Pregnant participants displayed significantly lower HEP amplitude in adult trials in comparison to non-pregnant controls ($p = .046$, $g = 0.997$). Despite significant differences only emerging in the adult trials, pregnant women displayed lower HEP amplitude across all conditions. Conclusion: These findings suggest that pregnancy modifies cardiac interoceptive processing, leading to an overall decrease in HEP amplitude. Contrary to our hypothesis, expectant mothers did not exhibit infant- or emotion-specific changes in neural markers of cardiac interoception. This work was supported by the Fundação para a Ciência e a Tecnologia (FCT) through R&D Units funding (grants UIDB/05380/2020 and UIDB/05210/2020) and project funding (2022.01784.PTDC).

P3.35 | Erp Study of Brain Activity During Emotional Conflict Task Performance in Depressed Adolescent

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Emotional conflict processing is a core feature of emotion dysregulation in major depressive disorder (MDD). MDD affects about one in seven individuals aged 10 to 19 around the world and makes up 15% of the overall disease burden among adolescents. We examined the psychophysiological difference between MDD and controls in emotion conflict experience. Methods: The study included 20 adolescents with MDD (14,8; SD= 2,63) and 20 healthy adolescents (13,7; SD= 2,23). The local Ethic Committee of the Medical Faculty of Kazakh National University approved the study. Electroencephalogram (EEG) was recorded from 64 electrodes during the emotional conflict task performance (stimuli were taken from https://nyu.databrary.org) by using ANT-Neuro (Germany). Participants completed the Kovacs' Child Depression Inventory, CDI (Kovacs, 1978), Positive and Negative Affect Schedule, PANAS (Watson et al., 1988), Trait Meta-Mood Scale, TMMS (Salovey et al., 1995) and Spielberger

State-Trait Anxiety Inventory (Spielberger, 1983). Preprocessing was done in EEGLAB v14.1.2. After removing artifacts, characteristics of P300 (200ms 500ms) were analyzed for central, anterior, posterior, left hemisphere, and right hemisphere networks. Results: Adolescents with MDD showed significantly higher CDI scores (F = 32,747; p < 0,001) compared to healthy controls. They also exhibited notably lower levels of emotional clarity (F = 25,844; p < 0,001), emotional repair (F = 19,096; p < 0,001), and emotional attention to emotions (F = 7,987; p = 0,009). Analysis of P300 amplitudes revealed a significant condition*group effect interaction in the anterior brain network (F= 7,300; p = 0,012), with greater P300 responses to uncongruent "Fear" stimuli observed in the MDD group. In the right hemisphere network, P300 amplitude in response to congruent "Happy" stimuli was negatively correlated with negative affect (r = -0,541; p = 0,037). Moreover, in the central network, state anxiety was positively associated with increased P300 amplitude in response to uncongruent "Sad" stimuli (r = 0,595; p = 0,019). Conclusion: MDD participants had higher brain activation in response to negative emotional stimuli. Research support: Research has been funded by the Committee of Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant # BR27198099).

P3.36 | The Impact of Auditory Rhythmic Stimulation and Spontaneous Motor Tempo (smt) on Performance in a Dynamic Search Task

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The Impact of Auditory Rhythmic Stimulation and Spontaneous Motor Tempo (SMT) on Performance in a Dynamic Search Task Authors: Flor Kusnir*[1], Talya Shlesinger-Arad*[1], Leah Snapiri[1], Nir Shalev[3], & Ayelet N. Landau[1,2] Departments of Psychology and Cognitive Sciences, Hebrew University of Jerusalem Department of Experimental Psychology, University College London, UK Department of Gerontology & The Institute of Information Processing and Decision Making, University of Haifa, Israel Rhythms are an ever-present feature of our daily lives, shaping how we process information and respond to the environment. While previous studies have shown that rhythmic cues can guide attention and perception, little is known about the effect of external rhythms unrelated to the task at hand. However, their increased use in motor rehabilitation in various neurological conditions points to their potential use in cognitive contexts. Here, we explore whether auditory rhythmic beats orthogonal to one's goals can enhance performance in a dynamic visual search task (Boettcher

et al., 2021). Participants (n=71) were tasked with identifying targets amidst distractors, all of which faded in and out of a display over several seconds. During the task, they listened to auditory beats (1, 2, 5 Hz; or nobeat) embedded in naturalistic background sounds. Our findings reveal that rhythmic stimulation enhances detection accuracy, with the 2-Hz rhythm providing the largest benefit to performance. We then examined the link between this finding and spontaneous rhythmic preferences. To this end, we measured participants' Spontaneous Motor Tempo (SMT; Snapiri et al., 2021) using a spontaneous tapping task and assessed its impact on the effects of rhythmic stimulation on performance. Specifically, we found that participants with slower SMTs showed the most significant performance improvements: in the absence of a beat, these individuals performed worse, but listening to an auditory beat improved their performance to match that of participants with faster SMTs. These results suggest that individual rhythmic preferences influence sensitivity to external rhythms and that the presence of a beat effectively neutralizes differences in SMT. These results contribute to our understanding of the interaction between internal and external rhythms and its potential application in cognitive contexts.

P3.37 | Mu Rhythm Desynchronization During Action Execution, Observation, and Imagery: Genuine Sensorimotor Activation or Attentional Effect?

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Mu rhythm desynchronization – i.e., a reduction of EEG alpha power – is associated with motor cortex activation during action execution. Similar desynchronization has been shown during action observation and imagery as well. The involvement of the motor cortex in non executive tasks, remains, however, debated due to possible occipital alpha contamination related to visual attention. For the first time, in the same experiment we investigate Mu rhythm desynchronization across three conditions: Action execution (AE), Action Observation (AO), and Motor Imagery (MI). Each condition was structured in three successive time frames: Object observation (affordance, covert interaction with the object), task preparation (verbal instruction), and execution (participant or actor) or kinaesthetic imagination. Our goal was to disentangle whether Mu desynchronization during observation and imagery reflects genuine motor involvement or it is due to attentional processes— indicated by stronger occipital desynchronization. Accelerometer (either on participant's or actor's wrist) and EEG signals were recorded from 20 participants. Data were pre-processed and analysed

with EEGLAB /MATLAB. Time-frequency and statistical analyses focused on the alpha band. Task execution elicited Mu desynchronization in all the three conditions. Central and parietal channels showed stronger desynchronization in the AE compared to AO and MI, which did not differ one from the other. AO and MI, indeed, showed Mu rhythm desynchronization mainly on parietal channels. Importantly, no significant differences between conditions were found in occipital electrodes. By analysing the different time frames of each trial, we found that the mere observation of an object elicited an initial Mu desynchronization, which decreased afterwards before rising again during preparation and execution. From preparation to execution, Mu desynchronization increased across most channels, except in the occipital region, where lower desynchronization was observed for all conditions. The stronger involvement of parietal regions associated to limited occipital contribution suggest that Mu rhythm modulation reflects frontoparietal activation present both during AE and AO/MI conditions. Additionally, these results underline differences between regions (mainly parietal – more involved in AO and MI), which support "motor resonant" processes, compared to those centroparietal related to action execution, motor planning and control.

P3.40 | Acute and Chronic Assessment of a Novel Psilocin and Psilocybin Formulation in Mice Reveals Multiple Sex Differences

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Anxiety and depressive disorders burden millions of people globally, with currently available therapeutic options often ineffective. Novel psychoactive substances have been increasingly investigated for their use in the treatment of these disorders due to their ability to modulate neural plasticity and inflammation through cytokines. Given this, our objective was to assess the ability of a novel formulation of psilocin and psilocybin to modulate physiology, behaviour, and cytokine and chemokine levels in the brain and blood of C57BL/6 mice. We hypothesized that novel formulations of psilocin and psilocybin may have an anti-inflammatory effect peripherally and centrally in both acutely and chronically treated mice, evidenced by the reduction of cytokine and chemokine levels compared to mice treated with vehicle. Male and female C57BL/6 mice were treated with a novel formulation of psilocin and psilocybin. Acutely treated mice received 0.03 - 3 mg/kg of this formulation via i.p. injection or p.o. gavage followed by a battery of physiological and behavioural tests, or collection of brain and blood. Chronically treated mice were dosed with 0.03 mg/kg or 0.3 mg/kg of the novel formulation for 21 consecutive days followed by collection of brain and blood. Tissue samples were analyzed for levels of 32 different cytokines and chemokines using a Cytokine Multiplex Discovery Assay. We found that this novel formulation of psilocin and psilocybin produced a robust head-twitch response with greater potency than psilocybin and modest anti-nociceptive and anxiolytic

effects. It also had modest effects on spatial memory in the Y-maze. Mice treated with this formulation did not demonstrate a strong peripheral anti-inflammatory effect. Throughout our results we observed consistent sex differences that occurred following treatment of mice. This novel formulation of psilocin and psilocybin exhibited unique and promising effects on behaviour that differed from psilocybin administration and warrant further study. It is conceivable that novel formulations combining psilocin and psilocybin may have the ability to modulate the inflammatory response through alterations in central and peripheral cytokine/chemokine levels, possibly in a sex-dependent manner. Sex differences in both behaviour and cytokine/chemokine levels require further investigations into the consistency of this effect and potential mechanism(s) of action. Keywords: Psilocybin, psilocin, cytokine, chemokine, anxiety
Funding: This work was supported by funding from Zylorion Health Sciences Inc.

P3.41 | Neuronal Oscillations Predict Un-cued Task Switching in the Wisconsin Card Sorting Test

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Cognitive flexibility is the fundamental ability to rapidly adapt behavior to the environment, even when the contextual rules are implicit and change suddenly. This uncued task switching is commonly measured with the Wisconsin Card Sorting Test (WCST), in which cards need to be sorted by a changing rule that is not explicit to participants and thus needs to be deducted from feedback. Preparative un-cued task switching has previously been connected to amplitude modulations in prefrontal theta and inter-areal alpha band phase synchronization. However, it has remained unknown whether these oscillation dynamics specifically underlie interindividual performance differences enabling cognitive flexibility. Here, we collected MEG data (N=26) during the WCST to discover whether the local and inter-areal oscillation dynamics could coordinate un-cued task switching and to understand how those would relate to individual differences in task performance. We then implemented a sequential learning model to identify the impact of feedback sensitivity on oscillation dynamics and performance. Better performance was predicted by gamma (52 to 96 Hz) band amplitude increases, together with parietal alpha (7 to 13 Hz) and beta (13 to 32 Hz) band suppression following feedback. Additionally, early theta (3 to 6 Hz) synchronization and subsequent alpha (9 to 15 Hz) desynchronization correlated with fewer late trial errors. Higher sensitivity to positive feedback explained

modulations in the alpha- and beta-band amplitudes as well as theta and alpha phase synchronization, whereas sensitivity to negative feedback was mainly associated with larger gamma amplitudes. Lastly, we found increased theta-gamma phase amplitude coupling during switch trials to be associated with better performance. Our results demonstrate that next to prefrontal and inter-areal theta band modulations, un-cued task switching is also characterized by local changes in the parietal cortex in the other frequency bands, fronto-parietal alpha desynchronization, and theta-gamma phase amplitude coupling, depending on the individual's reactivity to feedback.

P3.42 | Role of the Lateral Prefrontal Cortex on Distracting Sound Processing: A Huma Lesion Study

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Previous studies have shown, with different paradigms, the involvement of the lateral prefrontal cortex in both voluntary and involuntary attention processes. The main purpose of the present work is to study the role of the lPFC in the balance between voluntary and involuntary auditory attention. We used the Competitive Attention Task (CAT), an adaptation of the Posner paradigm detection task using central visual cues and monaural auditory targets. Visual cues trigger the deployment of voluntary attention in anticipation of auditory targets. In 25% of the trials, an unexpected task-irrelevant distracting sound (phone ring, bell ring…), played between the cue and the target, triggers involuntary attentional capture. We recorded EEG in 11 patients with lesion of the lPFC and 11 matched controls. We investigated the event-related-potentials (ERPs) elicited by the distracting sounds in each group: N100, P3 complex, Reorienting Negativity (RON). The patients present a larger P3 complex and a reduced RON than the control participants. These results suggest enhanced involuntary capture of attention and difficulties in orienting back attention towards the task at hand after lesion of lPFC. Therefore, the lPFC would play a crucial role in controlling both involuntary attention towards unexpected task-irrelevant distracting sounds and voluntary attention reorientation back to the task.

P3.44 | Testing Feedback and Feedforward Mechanisms Through a TMS-EEG Experiment

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Neural synchronization plays a key role in regulating feedback control over feedforward information flow. Specifically, slower alpha/beta oscillations are associated with feedback signaling, while gamma rhythms support feedforward propagation. Recent studies combining EEG and online TMS have confirmed the causal involvement of neural synchrony in these processes. This study further investigates feedback and feedforward dynamics within the attentional network using TMSEEG. Key nodes stimulated with active TMS include the Frontal Eye Field (FEF, attentional control), extrastriate cortex (V5, motion processing), and a control region (M1 foot area). Thirty-two participants completed a near-threshold visuospatial cueing task. In half of the trials, concentric motion sine gratings were presented to enhance feedforward propagation. Participants covertly shifted attention according to a spatial cue (left or right, 80% validity) or maintained a neutral state in no-target trials (no attentional cue). Following cue onset, a single-pulse TMS was applied over FEF, V5, or foot-M1 (right hemisphere), in a block design. Each cueing interval concluded with a target (10% catch trials) and participants had to report both detection and location. EEG analysis involved time-frequency decomposition within a 1.5-second window around TMS (-1 s before TMS pulse) from 2–100 Hz. To initially isolate TMS effect on the neural fingerprints of attention, left and right cue conditions were compared to the no-attention cue condition using Wilcoxon Signed Rank tests ($\alpha = 0.05$), separately for trials with and without gratings, and for FEF and foot stimulation. The fraction of sensors showing significant power increases or decreases was calculated. Preliminary findings reveal attention effects emerging primarily in the alpha and beta bands when gratings were present, and were restricted to the alpha band in their absence. These results replicate well known neural correlate of feedback processes linked to

attentional modulation. Ongoing analyses – including effects of FEF- and V5-TMS and interactions between TMS and attention – aim to clarify the state-dependency of TMS effects and the roles of specific frequency bands in feedback and feedforward information flow through TMS-probed brain oscillations.

P3.45 | Eyes on Memory: How Attention Shapes Forgetting Across Age and Time

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Forgetting is a fundamental memory process, yet critical aspects remain unclear: what drives the degradation of complex episodic representations, how cognitive mechanisms like overt attention are involved, and how aging mediates this process. This study tests the hypothesis that overt visual attention during encoding and retrieval predicts the rate of episodic memory forgetting, and examines whether cognitive aging modulates this relationship. A preliminary sample of twenty-five younger and fifteen older adults studied 132 indoor and outdoor naturalistic scenes. Their eye movements were recorded during encoding and across three subsequent recognition sessions (30 minutes, 4 hours, and 8 hours later). The spatial spread of attention at encoding was quantified using the Root Mean Square Distance (RMSD) of fixations. Scan path similarity between encoding and retrieval (i.e., gaze reinstatement) was measured using the Longest Common Subsequence (LCS) metric. Generalized and Linear Mixed-Effects models (G/LMER) revealed comparable forgetting rates between age groups. Crucially, wider attentional spread during encoding predicted greater maintenance of episodic memories over time in both groups, although older adults exhibited a greater attentional spread overall. Furthermore, gaze reinstatement significantly predicted greater memory maintenance over time in both groups. This effect was particularly prominent at later retention intervals and for scenes widely explored at encoding, especially in older adults. These findings underscore that reinstating original viewing patterns is key to stabilizing memory traces over time. To the best of our knowledge, this study is the first to demonstrate a direct involvement of overt visual attention in the mechanisms underlying forgetting. While substantial similarities in these attentional dynamics were observed between age groups, older adults appeared to require a more extensive deployment of attentional resources. This likely reflects a compensatory strategy to maintain memory performance, highlighting adaptive cognitive processes in healthy aging.

P3.46 | Now You See Me: The Implicit Effects of Invisible Flickers

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When visual stimuli flicker above a certain temporal frequency they appear perceptually stable. However, despite this subjective invisibility, such stimuli evoke a steady-state response in the visual cortex. The apparent invisibility of the flicker makes this manipulation appealing to the study of visual processing in the brain, since the steady-state response is detectable using non-invasive physiology (M/EEG). Recent work has confirmed that rapid flicker is indeed subjectively undetectable when using explicit measures (Spaak et al., 2024) yet it remains unclear whether such stimulation influences performance implicitly. We investigated how rapid flicker influences time perception and spatial attention. First, we used a temporal bisection task to evaluate the impact of rapid flicker on temporal estimation. 40 Participants categorized stimuli of different durations as "short" or "long" after being familiarized with "short" and "long" reference durations. We found that the presence of rapid flicker resulted in underestimation of stimulus duration compared to stable stimuli. Second, we used a visual search task to investigate how rapid flicker guides attention allocation. 40 Participants were presented an 8-item search array spanning 5.76° visual degrees around central fixation. A rapid flicker appeared congruently or incongruently with the search target. We found that rapidly flickering targets were detected faster than non-flickering targets. In addition, eye movement recordings showed accelerated gaze shift bias towards flickering targets in comparison to non-flickering targets, as well as a tendency to shift gaze toward a flickering stimulus in the absence of a target. Crucially, participants could not report the location of rapid flickers, replicating previous findings. These findings suggest that different aspects of cognition are affected by rapid flicker, namely the sense of elapsed time, the movement of the eyes and the allocation of spatial attention. In addition to the implications of these findings to neuroscience, this may also have real-world implications due to the prevalence of high frequency flickers in our everyday life.

P3.47 | Bilateral Intermittent Theta Burst Stimulation Modulates Thalamo-cortical Functional Connectivity and Improves Motor and Non-motor Symptoms in Parkinson's Disease

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This study aimed to investigate functional connectivity (FC) patterns associated with intermittent theta burst stimulation (iTBS) over the primary motor cortex (M1) in addressing motor and non-motor symptoms in Parkinson's disease (PD). We hypothesized that both real and sham iTBS will induce treatment-related effects, with significantly greater changes following real iTBS. Moreover, we anticipated that real iTBS responders will exhibit superior improvement compared to non-responders, particularly in motor and mood symptoms, alongside FC changes across cortico-subcortical regions implicated in PD symptomatology. To explore this, we conducted a randomized, double-blind, sham-controlled, crossover trial, involving sixteen PD patients. Each participant received one daily neuronavigated bilateral M1-iTBS session for five consecutive days (80% of resting motor threshold). Treatment conditions were crossed over following a 3-month washout. Motor and neuropsychiatric assessments along with open-eyes resting-state functional magnetic resonance imaging (fMRI), were conducted before and post treatment. Vowelwise FC analysis was performed using aal3 atlas (cluster level: FDRc $p < 0.05$, voxel level: $p < 0.001$ uncorrected and $k \geqslant 15$). Data analysis first examined overall treatment effectiveness (real vs. sham), followed by stratification based on motor ($\geqslant$ 20% motor improvement) and mood response in real iTBS responders (minimal clinically important differences – MCID – in depression and anxiety symptoms). Compared to sham, real iTBS resulted in a higher proportion of motor, depressive, and anxious responders, each demonstrating clinically meaningful symptom reduction relative to non-responders. Real iTBS yield greater motor improvement (7 vs. 2.5 points vs. sham), reaching 9 points in motor responders. While mood symptoms significantly improved from baseline after real iTBS, differences vs. sham did not reach significance. Notably, iTBS-induced FC reorganization within thalamocortical networks was evident in real responders but absent in non-responders. Clinically motor improvement after real iTBS was characterized by increased connectivity among thalamic nuclei, temporo-cerebellar, and parietal-associative regions, while improvements in depressive and anxiety symptomatology after real iTBS were marked by increased connectivity between the thalamus and prefrontal-limbic circuits, and enhanced thalamo-frontal connectivity, respectively. Together, these findings suggest that dynamic functional reorganization of thalamocortical networks may underlie motor and mood improvements associated with bilateral M1-iTBS treatment response in PD patients.

P3.48 | The Influence of Scene Context on Perceptual Reality Monitoring

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Perceptual reality monitoring is our ability to distinguish between external perceptions and internal mental imagery. Behavioral studies with simple visual stimuli show that imagining a stimulus during perceptual detection increase presence responses, indicating that imagery is sometimes confused for perception. However, in everyday situations, stimuli appear within rich environments that might provide additional cues for reality discrimination. Specifically, whether a stimulus is congruent with the environment might influence how real it feels. This study examines how scene congruency influences perceptual reality monitoring and tests whether previous findings generalize to more naturalistic stimuli. To this end, we conduct an online experiment (N=100) in which participants detect naturalistic stimuli gradually appearing within naturalistic scenes. The scenes are either congruent or incongruent with the stimuli. Using a block design, the experiment alternates between conditions where participants simultaneously imagine the stimulus while detecting it, and conditions where they focus solely on detection. We have two competing hypotheses about how scene congruency might affect perceptual reality monitoring. On the one hand, when the content of imagery matches what we expect to appear in a specific scene, we might be more likely to confuse it for reality. In our experiment, this would be reflected as a stronger increase in false alarms during imagery in congruent compared to incongruent scenes. On the other hand, stimuli that are incongruent with the current scene may appear more salient, even if they are only imagined. In our experiment, this would be reflected in a stronger effect of imagery in incongruent compared to congruent scenes. This study extends laboratory findings to more ecologically valid settings and enhances our understanding of how humans navigate the boundary between perception and imagination in the real world. The results have potential implications for reality monitoring disorders such as schizophrenia, derealization, and post-traumatic stress disorder.

P3.49 | Exploring the Link Between Maternal Sensitivity and Touch Behaviors and Brain Response to Joint Attention Contexts in 10-month-old Infants

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Maternal sensitivity and touch have been consistently associated with improved social and cognitive developmental outcomes during infancy and are thought to play a key role in the development of joint attention. This ability typically emerges at 9 months of age and refers to an infant's capacity to coordinate attention with a social partner toward an object (e.g., a toy). Research examining the role of maternal interactive behaviors in fostering the neural processing of joint attention is still scarce. Thus, the present work aims to explore the association between mothers' sensitivity and touch behaviors with infants' patterns of cortical activation during joint attention contexts compared to non-joint attention contexts. Participants are typically developing 10-month-old infants and their mothers. A 10-minute mother – infant interaction is used to assess maternal sensitivity using the Sensitivity vs. Insensitivity scale from the Maternal Sensitivity Scales. The mother's touch behaviors during this interaction are coded into the following categories: affectionate touch, static touch, playful/stimulatory touch, instrumental touch, regulatory touch, attentional touch, and intrusive/negative touch. High-density functional near-infrared spectroscopy (HD-fNIRS) is used to measure infant brain activation in the bilateral prefrontal cortex, temporoparietal junction, and superior temporal sulcus, while infants interact with a researcher under two experimental conditions – Joint Attention and Interaction – and a baseline condition. In the Joint Attention condition, the researcher establishes eye contact, smiles, points to and talks about pictures in a book. In the Interaction condition, the researcher maintains eye contact and smiles, but instead sings a nursery song and uses hand movements. In the baseline condition, the researcher holds a toy in front of the infant without smiling, speaking, or making eye contact. Data collection and coding are ongoing, and we expect to obtain valid data from 20 infants by the time of the conference. We hypothesize that higher maternal sensitivity and more affectionate and attention-directing touch behaviors will be associated with increased cortical activation in response to joint attention (versus non-joint attention) contexts. Findings will contribute to the literature linking early positive and sensitive parent-infant interactions to social development and may provide insight into how these interactions shape early brain function involved in social cognition.

P3.51 | The Human Jukebox: Revealing the Neural Dynamics of Music Recognition With Intracranial Eeg

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Recognising a song as its melody unfolds is a universal human experience. However, the neural dynamics of this process remain largely unknown. Music is encoded in a broad network of brain regions, particularly in the superior temporal gyrus, frontal cortex, and sensorimotor cortex. These networks show frequency-specific modulations, particularly in the low-frequency (<12 Hz) and high-frequency (HFA, 80-150 Hz) ranges. Nevertheless, studies specifically focusing on the neurophysiology underlying recognition of familiar melodies are lacking. We aimed at investigating the neural dynamics supporting the recognition of familiar melodies using the spatial and temporal specificity of intracranial electroencephalography (iEEG). We hypothesized that involved brain networks would show sustained frequency-specific power modulations up to the recognition moment. In the present study, 11 patients with drug-refractory epilepsy listened to 100 western music melodies played at the piano for 20 seconds and needed to indicate when and whether they recognised them through a button press. We identified 296 taskactive channels across all recorded regions, with the majority being in Laterotemporal (33%), Basotemporal (17%), Mesiotemporal (15%), and Dorsofrontal (13%) regions. Temporal regions primarily exhibited activity in delta/theta frequencies, while Dorsofrontal regions showed more prominent responses in alpha/beta bands. We clustered task-active channels based on their time-frequency dynamics from music onset to recognition (button press), identifying five distinct clusters. Cluster 1 exhibited a sustained increase in delta/theta from onset to press, mainly in temporal channels. Cluster 2 exhibited a sustained increase in theta/alpha from onset to press, mainly in temporal and dorsofrontal channels. Cluster 3 exhibited a sustained increase in delta from onset to press, alongside HFA increase throughout the trial, mainly in temporal and insular channels. Cluster 4 responded across frequencies to both music onset and button press, mainly in frontal, parietal, and insular channels. Cluster 5 exhibited a sustained increase in theta/alpha throughout the trial, with a decrease around button press, mainly in temporal channels. By parsing spectro-temporal dynamics entrained by music throughout the brain, this work enhances our understanding of how the brain processes complex naturalistic auditory stimuli and recognizes familiar musical content.

P3.52 | Temporal Dynamics of Brain Activity in Relation to Pain and Stress Measures in Patients With Chronic Primary Pain

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Chronic primary pain (CPP), including conditions such as chronic widespread pain, arises without an identifiable underlying disease and is characterized by persistent pain in one or more body regions, leading to significant emotional distress and functional disability. This study aims to elucidate how altered brain-state dynamics may reflect dysregulated predictive processing in CPP and provide insight into the stress-pain interaction at the neural level. We hypothesized that CPP patients will show distinct temporal dynamics of brain activity compared to healthy controls (HCs), and that these dynamics will be associated with pain- and stress-related measures. The study integrates resting-state functional MRI, stress biomarkers (i.e, cortisol), subjective stress metrics, and psychosocial factors to comprehensively describe CPP. Participants include patients with CPP (n = 25) and healthy controls (HCs, n = 30). A co-activation pattern (CAP)-based dynamic functional connectivity (dFC) approach was used to compare the temporal characteristics of brain states between groups to investigate dynamic changes in brain networks. Correlation analyses were conducted to examine the relationship between the specific temporal dynamics of CAPs in CPP patients compared to those of HCs and measures of pain and stress. Three CAPs were identified using HCs as a reference: CAP1 (anterior insula co-activated with the default mode network (DMN)), CAP2 (anterior insula with the salience-somatomotor network), and CAP3 (anterior insula with the visual network). Group comparisons revealed significant differences in the temporal characteristics - specifically, the relative occurrence and number of entries - of CAP1 and CAP2 between CPP patients and HCs. In CPP patients, both perceived stress scale (PSS) scores and cortisol levels were negatively correlated with temporal characteristics of CAP1, while cortisol levels also showed a positive correlation with the temporal characteristics of CAP2. These findings suggest that CPP patients exhibit reduced coupling between the anterior insula and the DMN (CAP1), associated with both subjective and objective stress measures. In contrast, increased coupling with the salience-somatomotor network (CAP2) was associated with elevated cortisol levels. Taken together, these results support the hypothesis that altered brain-state dynamics in CPP are tightly linked to stress-related mechanisms.

P3.53 | Pupil Dilation and Eye Movements Track Emotion Content in Natural Speech

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Speech varies in its rhythmic structure. This variability is reflected in the speech envelope, which consists of slow amplitude fluctuations that provide essential temporal cues. Neural activity aligns with speech rhythm in a process known as speech tracking, which aids temporal prediction and supports continuous speech comprehension. While speech tracking has been widely studied at the neural and behavioral levels, emerging evidence suggests that it may also occur at the physiological level, particularly in ocular responses. In this study, we investigated whether (1) eye movements and pupil dilation track the speech envelope and (2) tracking strength varies with perceived emotional content. Forty-one participants listened to TED Talks while we recorded eye-tracking data and electrooculography (EOG). Participants intermittently rated the continuous speech segments on valence (negative–positive) and arousal (low-high) scales. Speech tracking was quantified using a mutual information framework. Results showed significant envelope tracking across pupil dilation, vertical EOG, and horizontal EOG. All measures exhibited the strongest tracking below approximately 4 Hz, while horizontal EOG additionally tracked higher frequencies (approximately 4-8 Hz). Linear mixed-effects models revealed enhanced ocular tracking during lower-valence (i.e., more negative) speech. Furthermore, arousal enhanced speech tracking, but only for pupil dilation and horizontal EOG. Taken together, these findings suggest that ocular activity dynamically tracks rhythmic speech structure and is sensitive to the emotional content of speech. This supports ocular tracking as a potential physiological marker in auditory and affective neuroscience and demonstrates that top-down factors impact speech rhythm processing.

P3.55 | Increased Subjective Feeling of Ownership in Microgravity and Stable Sense of Agency Are Associated With Task Load: A Virtual Tool-use Training in Simulated Gravitational Physics

Amir Jahanian Najafabadi (Bielefeld University)

Prior research (Jahanian Najafabadi et al., 2025) showed that higher cognitive load, especially under hyper-gravity was strongly associated with reduced subjective agency over the VR controller, with frustration having the most pronounced effect. Overall, increased cognitive effort tended to diminish the sense of control. In this research, a virtual mechanical grabber like tool was used to extend prior findings and explore whether emergence of ownership and agency is associated with perceived tactile distance (TD) and reaching distance estimation (RDE). Eleven participants learned to use virtual tools for 120 trials in each of the three counterbalanced gravitational

conditions (microgravity, Earth gravity and hyper-gravity) where they grasped distant spheres and moved toward to their virtual personal space matched with their physical space. Subjective feeling of ownership was negatively correlated with RDE Error, indicating that those who reported greater ownership over the virtual tools tended to be more accurate in RDE. While Participants rated their perceived ownership over the tool higher in microgravity (lowest in Earth gravity), agency over the tool highly perceived and remained unchanged across all gravitational conditions. Compared to other gravitational conditions, in microgravity, higher ratings of ownership were associated with reduced TD judgment administered on their forearm wielding the tool, while higher sense of agency ratings in micro- and hyper-gravity were associated with reduced TD judgment error leading to the incorporation of tools into their internal hand model, and irrelevant to the perception of reaching distance. Additionally, reduced mental load in microgravity and increased physical load conditions led to higher ratings of agency, and better performance load (vs lower performance load) was linked to a stronger sense of ownership under high gravity, which people feel more ownership when they perform well. performance load was negatively predicted agency ratings, as performance increases, the feeling of agency decreases. Hypergravity increases agency compared to Earth gravity, while microgravity has no significant effect. In microgravity condition, higher reported effort was associated with lower perceived agency, suggesting that participants may have felt less in control when the task demanded more effort in an altered environment. Overall, findings suggest that tool embodiment is partially dependent on gravitational context and is modulated by task load.

Keywords: Ownership, Microgravity, Sense of Agency, Task Load, Virtual Tool-use, Gravitational Physics.

P3.56 | Around the Clock: Physiological Markers of Lapses in Attention During Sustained Task Performance

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Too often still, people lose their lives or livelihoods in tragic accidents that are the result of lapses in attention. With today's technology, it should be possible to develop assistance systems which used changes in physiological signals to indicate an imminent lapse. Our study aims at identifying physiological markers that are maximally diagnostic and reliable, first in the lab and then in a more ecologically valid setting. In the lab, we monitored arousal and attentional fluctuations by recording changes in pupil diameter and electroencephalographic (EEG) activity as participants completed modified versions of two sustained attention paradigms, the Mackworth Clock Task (MCT; Mackworth, 1948) and the Sustained Attention to Response Task (SART; Robertson et al., 1997). Both tasks required participants to remain focussed for a long period of time and respond appropriately to infrequent target events. We

hypothesised that changes in pupil diameter and EEG alpha power would predict attention-related errors and reaction times. To test our hypotheses, we first conducted a two-factor repeated measures ANOVA on the pupil data comparing pre-stimulus pupil diameter for correct (attentive) versus incorrect (inattentive) responses in each task. The EEG data were analysed for each task separately using paired samples t-tests to compare pre-stimulus EEG for correct and incorrect responses. We also examined whether pupil diameter and EEG alpha power would predict reaction times in each task using linear regressions. For the EEG data, both analyses were conducted using a non-parametric cluster-based permutation approach. Preliminary pupil results mostly support our pre-registered hypotheses: in both tasks, missed targets were preceded by a smaller pupil diameter, indicating reduced arousal levels. Pupil diameter also negatively predicted reaction times in the MCT, that is, slower reactions to the target events were also preceded by a smaller pupil diameter. In contrast, our analyses did not substantiate effects in EEG alpha power. Exploratory spectral analysis however showed performance-dependant theta-and beta power effects that dissociated the two task types. Ultimately, the results thus far imply that neurophysiological measures do predict attention-related errors and behavioural performance, but findings may depend on the task being used.

P3.57 | Cardio-audio Regularity Encoding Modulates Pupillary Responses Over Time

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Neural encoding of auditory regularities enhances stimulus predictability, reducing both processing demands and arousal. Previous studies, which recorded pupillometry data during the presentation of auditory regularities, showed that predictable stimuli were associated with smaller pupil diameters compared to stimuli following irregular patterns. This study builds on these findings by investigating how auditory stimuli with varying degrees of embedded regularity may impact ongoing ocular dynamics. We aimed at exploring the effect of cardiac stimuli on auditory regularity processing and at assessing whether the brain can leverage the ongoing cardiac rhythm to improve the predictability of auditory stimuli. Trains of auditory stimuli were presented in a pseudorandomized order with the following regularities: synchronous (Synch, fixed R peak to sound interval), isochronous (Isoch, fixed sound-to-sound interval), asynchronous (Asynch, no regularity), and a baseline (Baseline, no

auditory stimulation). Using high-precision pupillometry acquired in 29 participants, we analyzed pupillary dynamics both locally (stimulus-locked) and globally (across the stimulus sequence). Auditory stimuli elicited significantly higher pupil dilation responses in all conditions compared to the baseline, exhibiting a biphasic response: an initial constriction (~200 ms post stimulus onset), followed by dilation (~500 ms). Globally, repeated sound exposure induced cumulative changes in pupillary dynamics. The Synch and Isoch sequences resulted in sustained constriction below baseline, with Synch values significantly different from zero. Significant differences were also observed across auditory conditions, specifically between Synch vs. Asynch and Isoch vs. Asynch. Furthermore, a negative correlation was observed between heart rate and pupil size in the Sync condition alone. These findings suggest that cardiac-synchronized sounds are perceived as more predictable, reducing cognitive load and arousal, observed as sustained pupillary constriction. The pupil's sensitivity to temporal regularities underscores its utility as a non-invasive marker for the study of sensory predictability and neural-autonomic coupling.

P3.58 | Functional and Structural Brain Correlates Associated With Proactive Interference and Healthy Aging

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Previously relevant but currently irrelevant information in working memory (WM) has a detrimental effect on performance -proactive interference (PI)-. The ability to inhibit such disruption has been found to decline with age. This study aimed to increase our understanding on how this age-related change in PI sensitivity relates to functional brain activity and brain structure in regions of interest (ROIs) previously related to PI resolution. Cognitively healthy young (n = 18, age range: 20-35) and older adults (n = 17, age range: 55-76) underwent a structural MRI recording and completed a Recent Probes PI task while functional MRI data was collected. Participants must memorize either faces or scenes presented in a mixed array and, after a brief delay, indicate whether a probe stimulus was in the array or not. PI was assessed contrasting behavioural performance and brain activity in trials requiring a negative response for probe stimuli that appeared in the previous trial (high PI) and those that had not been shown for at least six trials (low PI). Behavioural results showed that older adults were generally less accurate and slower to respond than

young adults, although both age groups showed lower accuracy on high than low PI trials. Young adults also showed PI effects on reaction times during trials in which scenes were memorized, while older adults were equally slow in both PI conditions. Greater activity in the left inferior frontal gyrus (IFG) in high than low PI trials was observed in the fMRI data analysis, even when controlling for age or cognitive status (assessed with the MOntreal Cognitive Assessment -MOCA-). Young adults also showed PI effects in the left insula, superior frontal gyrus (SFG) and supplementary motor area (SMA), although these effects did not persist when controlling for age or cognitive status. Additionally, left insula and SFG as well as bilateral IFG showed reduced cortical volume (adjusted for intracortical volume) in the older group. Results are discussed in relation to scaffolding theories of cognitive aging and how the pattern of results in older adults' functional data may shed light onto the compensatory neural mechanisms observed in aging.

P3.60 | Exploring Auditory-motor Neural Processing of Self-produced Overt Speech

Iida Aakko (University of Helsinki); **Petri Pulli** (University of Eastern Finland); Jaakko Kauramäki (University of Helsinki); **Riikka Möttönen** (University of Helsinki); **Satu Saalasti** (University of Eastern Finland)

Exploring auditory-motor neural processing of self-produced overt speech Iida Aakko, University of Helsinki, Department of Speech-Language Pathology, Finland Petri Pulli, University of Eastern Finland, Department of Humanities, Finland Jaakko Kauramäki, University of Helsinki, Department of Speech-Language Pathology and Psychology, Finland Riikka Möttönen, University of Helsinki, Department of Digital Humanities, Finland Satu Saalasti, University of Eastern Finland, Department of Humanities, Finland ICON 2025 ABSTRACT Speech production is a highly complex motor action requiring precise coordination of several anatomical structures as well as several auditory-motor neural processes. Speech production involves continuous integration of sensorimotor information for planning and executing the articulation, while simultaneously relying on auditory feedback to monitor and adjust speech output. During speaking, the neural processing of the acoustic speech signal is affected by self-generated motor speech. This effect may be strongest for pseudowords compared to meaningful words. To date, only a limited number of studies have determined the neural dynamics of overt pseudoword production. Furthermore, the functioning of the bilateral auditory-motor network during speaking is still underdetermined. The objective of the current research is to determine the relationship between the auditory and motor speech processing areas with selfproduced pseudowords. This was accomplished by comparing hemodynamic activation (functional near-infrared spectroscopy, fNIRS) to the same speech stimulus used in overt speech production and auditory perception. Participants were 27 (24 females; 3 males) right-handed neurotypical adults (mean age 23 years) with normal or corrected-to-normal vision and no history of hearing impairments. Data were collected in a larger

experiment investigating the effect of real-time ultrasound visual feedback of tongue movements (UVF) during speaking with three, counterbalanced conditions (speaking, speaking with UVF and listening). A block-design methodology was used with varying time intervals (15–26 s) between trials (25 s), resulting in 6 minutes duration for each block. Participant's task was to produce pseudowords, and their hemodynamic responses were recorded with fNIRS (NirX NIRSport 2), with 16 channels bilaterally, optoids placed on fronto-temporal speech areas identified from the previous literature. Preprocessing and first-level analyses were conducted with manufacturer-proved acquisition software after which statistical analyses were performed with RStudio. Data quality varied between the participants. At the group level, we found both increase in oxygenated haemoglobin and decrease in deoxygenated haemoglobin in the classical fronto-temporal speech areas, and different patterns of activation were identified during overt speaking and listening. The results of this study show that speech production and listening are closely processed in the brain, and auditory and speech motor areas are involved in both neural processes.

P3.62 | Reviss: Towards the Development of Relaxing Visual Stimuli Set for Emotion Induction

Martyna Olszewska (Nicolaus Copernicus University in Toruń); **Ewa Ratajczak** (Nicolaus Copernicus University in Toruń)

Movie scenes are commonly used in scientific research as a method of emotion induction. A number of stimulus databases have been developed to induce both positive and negative affect, as well as discrete emotions. Available collections offer a variety of film clips aimed at inducing sadness, fear, anger, joy, amusement or desire. However, databases covering relaxing visual stimuli are difficult to access. Therefore, the purpose of the presented study was to develop a database of movie scenes designed to induce relaxation. We selected 26 scenes depicting natural scenery from documentary and feature films and series (e.g., "Our Planet"). Our choice was guided by numerous studies showing that photographs or paintings of natural landscapes have a positive effect when inducing feelings of relaxation. Each scene was evaluated by 10 judges, and based on the averaged ratings and their comments, 10 clips were selected. These were presented to 151 subjects. After viewing each scene, participants reported their emotional state during the screening by rating the intensity of sadness, anger, disgust, fear, anxiety, desire, joy and relaxation. In addition, they also determined the intensity of perceived arousal and boredom. Four out of ten scenes scored very high in terms of evoking the emotion of relaxation, with the average intensity of the relaxation felt while watching these clips being significantly higher than the average intensity of any other emotion. Five additional scenes were rated as adequately relaxing, though they also evoked mixed emotions, with relaxation frequently accompanied by joy. One clip received relatively low ratings and was predominantly described as boring. The study provided interesting observations on

the reception of film scenes depicting nature, and the resulting database provides a foundation for further research. Studied scenes can be used to both induce a state of relaxation, as well as to induce positive affect.

P3.63 | Walking Modulates Visual and Auditory Perception According to Stride-cycle Phase

Matt Davidson (University of Technology Sydney); **Gabriel Clouston** (University of Sydney); **Frans Verstraten** (University of Sydney); **David Alais** (University of Sydney)

Although we are inherently active beings, most of our knowledge regarding perception stems from a tradition of seated laboratory experiments that restrict natural movement. This approach precludes a holistic understanding of how perception may operate in more ecologically valid contexts, such as during dynamic activity or everyday behaviour. Here, we leveraged advances in wireless virtual-reality (VR) to present tightly-controlled stimuli during steady-state walking. Participants performed various perceptual tasks while walking on a smooth-level path at a constant walking speed, and by combining psychophysics with motion tracking and body-kinematics, we finely sampled task performance according to an individual's stride-cycle phase. In a first series of visual detection experiments, we observed sinusoidal oscillations in accuracy, reaction-time, and response likelihood, with best performance at the group-level during the swing-phase of each step. At the participant level, Bayesian inference of population prevalence revealed highly prevalent oscillations in performance that clustered in two idiosyncratic frequency ranges (2 or 4 cycles-per-stride), with a strong phase alignment across participants. In a second series of experiments, we extend this result to auditory and multi-sensory tasks, revealing distinct phases for optimal performance that are modalityspecific during each step. This generalised effect, showing that walking rhythmically modulates perception, demonstrates the importance of studying conscious experience during more naturally and ecologically valid forms of behaviour, and could lead to new conceptual understanding of the links between mind and body.

P3.64 | Effects of Social Interaction on Foreign Word Learning in Virtual Reality (VR)

Najla Azaiez (Department of Psychology, University of Jyväskylä, Finland); **Xueqiao Li** (Department of Psychology, University of Jyväskylä, Finland); **Shun Liu** (Department of Psychology, University of Jyväskylä, Finland; Department of Education, Hunan First Normal University, China); **Piia Astikainen** (Department of Psychology, University of Jyväskylä, Finland)

Previous research has shown that social contexts can facilitate foreign language learning. Virtual reality (VR) environments are also effective tools for enhancing learning across age groups. This study combines these two approaches to develop a powerful method for supporting language acquisition. To investigate the impact of social interaction in VR-based learning, we examine brain responses to foreign words following a learning session conducted either with or without social exposure. In both the social and non-social conditions, participants learn 48 foreign (Arabic) words. The conditions are otherwise identical, except that in the social condition, an AI-powered virtual agent (avatar) is present to interact with the learner. In the non-social condition, participants learn the words in the same virtual environment, but receive only audio instructions, without any social interaction. Twenty native Finnish-speaking adults with no prior exposure to Arabic complete both conditions in a counterbalanced order. Learning outcomes are assessed during the VR session using behavioral memory tests, and afterward through an Event-Related Potential (ERP) recording based on the N400 paradigm. We expect word learning to be more effective in the social condition. Enhanced learning in the social condition is expected to result in a larger N400 congruency effect – greater amplitude differences between correct and incorrect word-picture pairs – along with improved behavioral performance (higher accuracy and faster reaction times). The results will be discussed in relation to potential mechanisms by which social interaction facilitates foreign language acquisition.

P3.65 | Spontaneous Alpha-band Lateralization Boosts Initial Stimulus Availability in Iconic Memory by Modulating Occipital Cortical Excitability

Paul Smith (University of Münster); **Prof. Dr. Niko Busch** (University of Münster)

Spontaneous occipital pre-stimulus oscillations in the alpha band have been associated with visual task performance. Alpha power is thought to reflect neuronal excitability, with low alpha power indicating increased excitability and vice versa. However, the research on the effects of this excitability has been focused on detection/discrimination tasks. We investigated the link between excitability and visual memory, specifically iconic memory, which has strong contributions from V1. Do spontaneous fluctuations in excitability affect the persistence of visual information in IM in addition to effects on detection/discrimination? To answer this question and to distinguish this from typical visual tasks, we utilized a partial-report paradigm (n=51). Six concentric stimuli were briefly flashed, and the to-be-reported target was indicated by a cue that appeared after a variable stimulus-cue onset asynchrony. High pre-stimulus alpha power was associated with better accuracy and stronger confidence, specifically at electrodes ipsilateral to the subsequently cued target item. Our results show that moment-to-moment fluctuations in cortical excitability of the two hemispheres affect visual processing beyond mere detection and discrimination. Specifically, relative suppression at the moment of stimulus onset of the hemisphere processing subsequently irrelevant items boosts the initial stimulus availability of relevant stimulus information in iconic memory.

P3.66 | Mapping Control Over the Attention Allocation in Working Memory Using Modified Sternberg Paradigm With Meg

Semyon Mening (Higher School of Economics); **Nikita Otstavnov** (Higher School of Economics); **Tommaso Fedele** (Children's Hospital University of Zurich)

Cognitive control and attention are involved in the processes of maintaining and deleting information from working memory (Courtney, 2004). Patterns of goal-directed updating and inhibition of information might be used in adjusting cognitive tasks' performance. That is why Oberauer (2019) proposes that attention allocation mechanisms might be held inside a separate system of working memory – procedural working memory. Mapping function of attention allocation could provide insights into the organization of working memory and the role of executive control in it. To study these processes in the context of cognitive tasks, we developed and approbated a modified Sternberg paradigm (Otstavnov et al., 2024). In this paradigm manipulation and storage with the similar structured information applied in different tasks. It allows us to compare activity associated with storage and manipulation with the information. Subtracting storage from manipulation would demonstrate activity associated with specific attention allocation pattern representations. We applied frequency analysis in data obtained with magnetoencephalography to find if there any increased or decreased activities in specific oscillatory bands. Alpha induction above the central area was demonstrated in the mental rotation task in contrast with the spatial information storage (visual task). The alphabetization task demonstrated alpha reduction above the occipital area and beta reduction above the frontal in contrast with storage of the sequence of letters (verbal task). We suppose that different connectivity networks should be selectively activated in this task and be modulated by the prefrontal cortex. That is why we aim to conduct source and connectivity analysis. We aim to detect central networks and regulate switching between tasks by constraining more precise time-frequency analysis and focusing on network dynamics in early and later periods. Granger causality analysis would be used to reveal if frontal networks would modulate task representations as supposed by the distributive executive hypothesis (Zink, Lenartowicz & Markett, 2021). However, up until now we proposed and approbated an experimental paradigm for precise mapping tasks' representations in different modalities (visual and verbal). It demonstrated oscillatory activity specific for manipulation of information in different modalities.

P3.67 | Saccade-pursuit Coordination With Simulated Central Vision Loss

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In fully-sighted individuals, pursuit and saccadic eye movements work together to foveate moving objects, with pursuit maintaining target fixation and catch-up saccades occurring when targets move off of the fovea during pursuit. While mechanisms of saccade-pursuit interactions are well understood in healthy individuals, less is understood in cases of central vision loss, such as with age-related macular degeneration (AMD). Some AMD patients develop preferred retinal loci (PRL), replacing the fovea as the oculomotor reference during fixation. To examine plasticity in saccade-pursuit mechanisms and rehabilitation feasibility, we simulated central vision loss in healthy young adults and investigated whether and how participants adapted to using a PRL as their new oculomotor reference over 5 days of visual tracking tasks. 25 fully-sighted participants performed a pursuit task, involving a moving target that jumped randomly (designed to evoke catch-up saccades) while viewing with a gaze contingent artificial central scotoma. The scotoma, shaped like a bitten cookie, was designed to encourage participants to use a specific PRL (peripheral location with the highest acuity). 20 of the same participants also completed a saccade task to examine the development of the PRL as an oculomotor reference. For both tasks, most participants displayed saccade endpoint shifts towards the PRL location. On average, there was a 0.5° endpoint shift towards the PRL (Range=-0.3°-1.5°) between day 1 and 5 for the pursuit task, and a 1° shift for the saccade task (Range=-0.5°-2.2°). Paired t-tests show significant endpoint shifts from day 1 to 5 in 13/25 participants for the pursuit task and 17/20 for the saccade task. Overall, we found some level adaptation of saccade-pursuit interactive mechanisms and shifts in the oculomotor reference for most participants. These results provide a promising route for central vision loss rehabilitation, aimed at improving eye movements and encouraging PRL use, that could improve residual visual function and quality of life.

P3.68 | The Effect of Sensory Modalities of Naturalistic Stimuli on Emotion Recognition

Yongseong Lee (Cognitive Science Research Group, Korea Brain Research Institute, Daegu, Republic of Korea); **Youngju Lee** (Cognitive Science Research Group, Korea Brain Research Institute, Daegu, Republic of Korea); **Dongha Lee** (Cognitive Science Research Group, Korea Brain Research Institute, Daegu, Republic of Korea)

Emotion recognition is a critical skill for individuals to interpret others' emotions and adapt to social contexts. Although emotions are conveyed through multiple sensory modalities in real life, prior studies have largely relied on limited sensory modalities for emotional stimuli. It is unclear how sensory modalities play roles in recognizing emotions or whether there is any dominance across modalities. We hypothesized that visual modality would be more dominant in emotion recognition over audio modality, particularly in positive emotions. In the current study, participants were randomly presented with seven naturalistic emotional stimuli ('angry,' calm,' 'disgusted,' 'fearful,' 'happy,' 'sad,' and 'surprised') in three modalities (audio-only, visual-only, and

audio-visual) and rated each stimulus on valence and arousal. Data analysis using two-way repeated-measures ANOVA revealed significant differences across modalities. We found that emotions presented in audio-only conditions showed lower valence and arousal scores compared to visual-only and audio-visual conditions. Specifically, 'angry' and 'surprised' were perceived less negatively and 'calm' more positively in audio-only conditions. Moreover, 'disgusted' and 'happy' were recognized less accurately in audio-only compared to other modalities. In visual-only conditions, 'surprised' was evaluated to be more negative. Furthermore, in visual-only conditions, 'calm' was perceived to be stronger than other conditions. However, 'fearful' and 'sad' did not significantly differ in valence and arousal ratings across modalities. These findings indicate different impacts of sensory cues on emotion recognition, highlighting the predominant role of visual cues in interpreting emotions.

P3.69 | Neural Adaptation in Response to Vocal and Emotional Sounds Throughout Development

Zoé Ranty (Université de Tours, INSERM, Imaging Brain and Neuropsychiatry iBraiN U1253, 37032, Tours, France); **Annabelle Merchie** (Université de Tours, INSERM, Imaging Brain and Neuropsychiatry iBraiN U1253, 37032, Tours, France); **Marie Gomot** (Université de Tours, INSERM, Imaging Brain and Neuropsychiatry iBraiN U1253, 37032, Tours, France)

Adaptation to the sensory environment is essential for detecting and responding quickly to changes, anticipating future events, and ultimately, communicating and recognizing others' emotions. The neural mechanisms driving these behaviors and how they develop throughout life are still not well understood. In electrophysiology, neural adaptation can be measured through Repetition Positivity (RP) which corresponds to an increase in positive potentials with the increasing number of repetitions of the same stimulus. The aim of the current study was to explore the effects of nature (vocal/non-vocal) and valence (emotional/neutral) on the establishment of auditory regularities throughout development. Thirty-three children (8-13 years) and 29 adults participated in an EEG study. Auditory evoked potentials (AEPs) were measured during a roving paradigm while trains of 4,8 and 14 repetitions of vocal and non-vocal sounds were presented. The vocal stimuli consisted of /a/ phonemes pronounced with neutral or sad prosody, and non-vocal counterparts were synthetized using similar acoustic characteristics. P1 and N1 amplitudes were measured to study regularity encoding dynamics according to repetitions. RP was calculated as the difference between many (12-14) and (2-4) few repetitions. Obligatory AEPs do not display same morphology in both groups: only a large P1 is measured in children while the classical P1-N1-P2 complex is shown in adults. As depicted in the literature on AEPs maturation, P1 amplitude and latency decreased with age. RP was observed for each sound nature and valence in both groups with a larger amplitude in children than in adults, while no effect of age among children was reported.

Responses dynamics showed a progressive diminution of N1 amplitude in adults with the increasing number of repetitions for vocal and non-vocal sounds regardless of valence. In children, neural adaptation dynamics was characterized by a regular augmentation of P1 amplitude with the increasing number of repetitions, regardless of sound nature and valence, while no interaction between age and repetitions was reported. Although obligatory responses are not mature in school-aged children, findings confirm that neural adaptation is an essential process already established for non-vocal, vocal, and emotional sounds early in development.

WEDNESDAY 17/09

15:30 POSTER SESSION 4 P 4.1 – 4.69

P4.01 | Neural Event Segmentation in Narrative Film: Constructing and Remembering Events Across Sensory Modalities

Roger Johansson (Department of Psychology, Lund University); **Karin Isberg** (Department of Clinical Sciences, Lund University); **Maja Rudling** (Department of Clinical Sciences, Lund University); **Johan Mårtensson** (Department of Clinical Sciences, Lund University); **Jana Holsanova** (Lund University Cognitive Science, Lund University)

A central function of human cognition is the ability to perceive, understand, and remember life experiences as meaningful sequences of discrete events. This process, known as event segmentation, allows individuals to spontaneously construct and update event models and has been shown to engage a distributed network of brain regions that transiently increase in activity at event boundaries (e.g., Zacks et al., 2010, Front. Hum. Neurosci.), supporting narrative comprehension across sensory modalities (Zadbood et al., 2017, Cereb. Cortex). However, it remains unclear how these neural dynamics are shaped by the sensory modality through which a narrative is experienced. In this study, we investigated how the presence or absence of visual input shapes neural event segmentation and its relationship to comprehension and memory. We used 7-Tesla functional magnetic resonance imaging (fMRI) to measure brain activity while thirty participants experienced the short film The Red Balloon (cf. Zacks et al., 2010), either as a full audiovisual movie or as an audiodescribed version without visual input tailored for visually impaired audiences. After scanning, participants rated their comprehension and completed a verbal free recall of the film. Transient brain responses were modeled time-locked to key event boundaries identified independently by human raters. This analysis revealed activity in a network of regions consistently implicated in the construction and updating of event models, including the hippocampus, angular gyrus, precuneus, and posterior cingulate cortex. While both presentation formats engaged elements of this network, contrasts

revealed modality-sensitive differences: audiovisual viewing more strongly recruited occipital and parietal regions involved in perceptual and spatial processing, whereas audio-described narration more prominently engaged temporal and frontal areas associated with semantic and linguistic processing. In two case studies of blind participants who experienced the audio-described format, prominent activity emerged primarily in the posterior cingulate cortex, possibly reflecting a greater reliance on internally driven event models in the absence of visual input. By relating neural segmentation responses to participants' comprehension and verbal free recall, we further elucidate how the dynamic interplay between sensory modality, brain activity, and memory shapes the way narrative events are constructed in the brain.

P4.02 | Temporal Autocorrelation is Predictive of Age – An Extensive MEG Time-series Analysis

Christina Stier (Institute for Biomagnetism and Biosignalanalysis, University of Münster, Germany); **Elio Balestrieri** (Institute for Biomagnetism and Biosignalanalysis, University of Münster, Germany); **Jana Fehring** (Institute for Biomagnetism and Biosignalanalysis, University of Münster, Germany); **Niels K. Focke** (Clinic of Neurology, University Medical Center Göttingen, Göttingen, Germany); **Andreas Wollbrink** (Institute for Biomagnetism and Biosignalanalysis, University of Münster, Germany); **Udo Dannlowski** (Institute for Translational Psychiatry, University of Münster, Münster, Germany); **Joachim Gross** (Institute for Biomagnetism and Biosignalanalysis, University of Münster, Germany)

Understanding the brain's evolving dynamics throughout life is pivotal for anticipating and evaluating individual health. While previous research has described age effects on the spectral properties of neural signals, it remains unclear which ones are most indicative of age-related processes. This study addresses this gap by analyzing resting-state data obtained from magnetoencephalography (MEG) in 350 adults at the Cambridge Center for Ageing and Neuroscience (CamCAN) using 5988 features and whole-brain anatomical parcellation. We extracted features from the highly comparative time-series analysis toolbox (Fulcher et al., 2017) and conventional features encompassing frequency-specific power, amplitude- and phase-based connectivity, the 1/f exponent (slope), and alpha peak frequency (instantaneous alpha peak frequency, center of gravity). Each feature was used to predict the individual age of participants (18-88 years) using partial least squares regression (PLSR) and 10-fold cross-validation. The model performance was evaluated by correlating the true and predicted age (Pearson's r) and the mean absolute error (MAE).Traditional spectral features showed a prediction accuracy between r = 0.17 (MAE = 17.1) and r= 0.65 (MAE = 11.99), with the lowest performances of amplitude- and phase-coupling measures and best performances of measures depicting alpha peak frequencies. Over a hundred time-series features proved superior (r > 0.7), with the highest accuracies for the autocorrelation (AC) function at a time delay of 36 ms (r = 0.75,

MAE = 10.38). The prediction analyses for each feature were not confounded by sex or eTIV (pFDR > 0.05). We provide an overview of the predictive value of neurophysiological metrics commonly studied to describe the healthy or diseased brain and a comprehensive set of time-series features in the context of development and aging. The profiling of regional MEG signals revealed lifespan patterns that can be captured by simple linear time-series measures, which were more accurate than the conventional spectral features. Notably, distinct patterns of AC within the visual and temporal cortex were most informative.

P4.03 | Mapping the Subcortical Fear Pathways in Humans: Thalamo-amygdalar Connections Identified With Diffusion-weighted Tractography

Emmanouela Kosteletou Kassotaki (Brainlab – Cognitive Neuroscience Research Group, Department of Clinical Psychology and Psychobiology, University of Barcelona; Institute of Neurosciences, University of Barcelona, Spain); **Liu Mengxing** (Department of Neuroscience, Tufts University School of Medicine, Boston, MA, USA); **Martina Trisia Cinca-Tomás** (Brainlab – Cognitive Neuroscience Research Group, Department of Clinical Psychology and Psychobiology, University of Barcelona; Institute of Neurosciences, University of Barcelona, Spain); **Pedro M. Paz-Alonso** (BCBL. Basque Center on Cognition, Brain and Language, Donostia-San Sebastián, Spain; Ikerbasque, Basque Foundation for Science, Bilbao, Spain); **Judith Domínguez-Borràs** (Brainlab – Cognitive Neuroscience Research Group, Department of Clinical Psychology and Psychobiology, University of Barcelona; Institute of Neurosciences, University of Barcelona, Spain)

Rapid and efficient fear processing is key for survival. To serve this purpose, influential models of emotion have postulated the existence of several subcortical pathways, or “low roads”, that may send fast sensory inputs from the thalamus to the amygdala (a critical structure for emotion detection) before cortical processing takes place. Relatedly, research in rodents and non-human primates has described distinct thalamo-amygdalar connections for fear processing across multiple sensory modalities. These connections mainly originate in three thalamic nuclear groups (posterior, intralaminar, and medial), and project to the basolateral amygdala (BLA). However, the existence of similarly diverse thalamo-amygdalar projections remains unknown in humans. Here, we mapped these subcortical connections in a sample of 113 human participants, aiming to reproduce those previously described in the non-human animal literature. We reconstructed white matter tracts connecting thalamic subnuclei to BLA using an advanced tractography protocol designed to ensure computational reproducibility (Lerma-Usabiaga et al., 2023; Liu et al., 2022). Moreover, to assess the reliability of these tracts, a prerequisite for assessing their anatomical plausibility, we examined their white matter micro- and macrostructural properties across test-retest sessions in a subset of 24 participants. Microstructural reproducibility was assessed via pairwise correlations of fractional anisotropy, while

macrostructural reproducibility was estimated using the Dice index to evaluate volume-based overlap. Among the posterior thalamic nuclei, projections from the medial geniculate nucleus and the medial and inferior pulvinar to the BLA emerged as the most strong and reliable thalamo-amygdala pathways, whereas the lateral and anterior pulvinar segments exhibited weaker and less consistent connectivity. In turn, intralaminar thalamic nuclei (parafascicular, central medial, and centromedian) showed only modest connection to the BLA, with high intrasubject variability and moderate-to-low reproducibility. Finally, among the medial nuclei, the mediodorsal nucleus exhibited a robust bilateral connection to the BLA, with a high number of streamlines and moderate-to-high reliability across sessions. These findings provide the first anatomical overview of multiple direct thalamo-amygdalar connections in humans, particularly involving the posterior and midline thalamic subdivisions, and may thus provide valuable insights into the neural mechanisms underlying human subcortical affective processing.

P4.04 | Synchronized Brain Rhythms at Pitch Rates: A Mechanism for Sensorimotor Coupling in Sound Perception and Production

Enrico Sozza (Brainlab, Cognitive Neuoscience Research Group, Department of Clinical Psychology and Psychobiology, University of Barcelona (UB), Spain; Institute of Neuroscience (UBneuro), University of Barcelona, Spain); **Jordi Costa-Faidella** (Brainlab, Cognitive Neuoscience Research Group, Department of Clinical Psychology and Psychobiology, University of Barcelona (UB), Spain; Institute of Neuroscience (UBneuro), University of Barcelona, Spain; Institut de Recerca Sant Joan de Déu (IRSJD), Esplugues de Llobregat (Barcelona), Spain)

Successful pitch perception and production are crucial in everyday human life, particularly for speech and music. Pitch refers to the perceptual attribute of the repetition rate of a sound waveform and, albeit still under debate, is assumed to be represented in the brain by both a place code (tonotopy; periodotopy) and a temporal code (phase-locked neural firing to sound periodicity). Temporal coding of pitch can be measured non-invasively through the Frequency Following Response (FFR), a sustained auditory event-related potential recorded with M/EEG to periodic sound stimulation, with presumed neural generators in cortical and subcortical regions of the auditory system. The FFR is modulated by linguistic and musical experience and appears disrupted in several developmental disorders. However, the functional role of the responses measured by the FFR remains unknown. Recent functional imaging studies (fMRI) have identified a network of brain areas involved in pitch control beyond auditory regions, including the cerebellum, well-known for sensorimotor learning. In line with the communication-through-coherence hypothesis, we propose that temporal coding might serve as a communication mechanism between brain areas within the pitch control network to fine-tune pitch perception and production, complementing classical place coding in the auditory system. To test this, we collected

EEG data from young participants during a non-vocal pitch-matching task. We manipulated the audio-motor map between the position of the finger on a pad and the pitch of the delivered sound to create conditions of high versus low predictability. Using state-of-the-art source localization methods, we reconstructed the sources of oscillatory activity at the exact pitch rate of the delivered sound (between 120 and 240 Hz). Our results showed localized activity in brain areas consistent with the pitch control network, suggesting that sound pitch may serve as a synchronization signal between these regions. Furthermore, behavioral results showed better performance in the high predictability condition, with increased cerebellar activation. These findings suggest that cerebellar activity at pitch rates may be critical for effective pitch production following sensorimotor learning. Overall, our study contributes to understanding the communication dynamics within a widespread network of regions oscillating at sound pitch rates to foster successful pitch production.

P4.05 | Effects of Deep Brain Stimulation of the Entorhinal Cortex on Memory Function in the D-galactose Induced Rat Model of Aging

Gela Beselia (Ivane Beritashvili Center of Experimental Biomedicine); **Maia Burjanadze** (Ivane Beritashvili Center of Experimental Biomedicine); **Temur Nanishvili** (Ivane Beritashvili Center of Experimental Biomedicine); **Barbare Nozadze** (Ivane Beritashvili Center of Experimental Biomedicine); **Manana Dashniani** (Ivane Beritashvili Center of Experimental Biomedicine)

Aging is a complex biological process which is characterized by structural and functional changes in cells and tissues, which can lead to reduced cognitive functions. One of the most exciting emerging frontiers is the possibility of using deep brain stimulation (DBS) in the context of memory and cognitive disorders. However, it remains uncertain which of DBS targets is most effective or how chronic stimulation impacts neurocellular and circuit function. Some animal models of aging are used as tools for this purpose; amongst the main models in current use can be cited the animal models induced by D-galactose (D-gal). In the present study D-gal-induced animal model of aging was used to assess the effects of chronic entorhinal cortex (EC) stimulation on memory function, as well as hippocampal neurogenesis in behaviorally characterized rats; the EC provides the major cortical input to the hippocampus. The hippocampus, a structure underlying cognitive function, is highly vulnerable to aging. Male outbred albino rats – aged 3 months served as subjects at the start of experimentation. Rats were randomly assigned to prepare four experimental groups: control, D-gal - with s.c. administration of D-gal, (3) D-gal/I - with electrode implantation and D-gal/S - with electrical stimulation. Short-term and long-term object recognition memory were assessed using the novel object recognition task in an open field, spatial working memory using spatial alternation task in the plus-maze and learning process and long-term spatial memory were evaluated using the Morris water maze task. To determine the effect of D-gal and EC-DBS on adult neurogenesis

the number of Doublecortin-immunopositive neurons in the dentate gyrus (DG) subfield of the hippocampus was counted in all groups of rats. The present study demonstrate: (a) D-gal-induced reduction in the number of Doublecortin-positive cells in DG in rats that exhibited impaired spatial, working, and recognition memory, (b) EC-DBS increases the number of Doublecortin-positive cells in the DG to levels comparable with the control group and improves cognitive impairment. Overall, these results suggest that chronic EC-DBS may serve as an effective therapeutic target for aging-related memory disorders. Supported by the funding from the SRNSFG: Grant #-FR-23-18847

P4.06 | Looking for Memory: Tracking Neural Representations at Moments of Gaze Reinstatement

Hannah Herschel (Department of Psychology, Lund University); **Andrey R. Nikolaev** (Department of Psychology, Lund University); **Bardur Hofgaard Joensen** (Department of Psychology, Lund University); **Inês Bramão** (Department of Psychology, Lund University); **Roger Johansson** (Department of Psychology, Lund University); **Mikael Johansson** (Department of Psychology, Lund University)

Eye movements originally made during memory formation are often spontaneously reproduced during retrieval, even in the absence of visual input, directing gaze back to the locations where goal-relevant episodic information was previously encountered. This behavior, known as gaze reinstatement, is thought to support the reactivation of episodic content associated with those locations (e.g., Johansson et al., 2022, Proc. R. Soc. B). However, no previous study has directly demonstrated content-specific neural reactivation during gaze reinstatement. To address this gap, we combined simultaneous EEG and eye-tracking with multivariate pattern analysis (MVPA) to decode content-specific neural activity during a free-viewing memory task in which participants reinstated multi-element events while "looking at nothing". Thirty-eight participants encoded a series of events, each comprising six visual elements from three categories (faces, places, objects), presented at distinct screen locations. Each encoding phase was followed by a 10-second looking-atnothing period, during which the visual elements were removed and only empty placeholders remained, requiring participants to mentally reinstate the event using spatial cues alone. To examine category-specific neural activation during this looking-at-nothing phase, we first computed fixation-related potentials (FRPs), applying deconvolution modeling to correct for overlapping effects from unrestricted eye movements. We then compared FRP amplitudes for fixations directed to locations where category-specific elements had been presented during encoding. This analysis revealed significant differences between face- and place-associated locations over occipital areas, emerging around 150-400 ms after fixation onset. Next, we applied MVPA with a bivariate linear classifier to decode fixation-related EEG during the looking-at-nothing phase. Neural responses were classified based on fixations to locations previously

occupied by category-specific event elements. Classification accuracy peaked around 200-300 ms after fixation onset, reliably distinguishing between element categories. Finally, the neural decoding results were related to vividness ratings and subsequent memory performance, offering further insight into how gazeguided neural reactivation supports memory. These findings extend prior work by providing the first direct neural evidence of content-specific memory reactivation at moments of gaze reinstatement, supporting the view that eye movements play an active role in reconstructing episodic memories.

P4.07 | Functional Dynamics of Transient Semantic and Episodic Retrieval Failures: A Tip-of-the-tongue Study

James C. Barry (BCBL. Basque Center on Cognition, Brain and Language); **Garikoitz Lerma-Usabiaga** (CBL. Basque Center on Cognition, BrCBL. Basque Center on Cognition, Brain and Language; IKERBASQUE, Basque Foundation for Science and Language; IKERBASQUE, Basque Science Foundation); **Pedro Manuel Paz-Alonso** (CBL. Basque Center on Cognition, Brain and Language; IKERBASQUE, Basque Foundation for Science)

A tip-of-the-tongue (ToT) is a universal experience that can affect almost everyone and can provide a naturally occurring window into the processes behind successful and unsuccessful memory retrieval. While ToTs have only previously been studied within semantic memory (general knowledge and facts), here, we advance previous literature by also examining them within episodic memory (remembering prior events). Combining a famous face paradigm with event-related fMRI, we examined the neural correlates of successful and unsuccessful semantic and episodic retrieval. In the scanner, 30 subjects were presented with 220 non-famous recently learned face-name pairings (episodic memory), as well as 220 famous faces (semantic memory). Participants were instructed to respond to whether they successfully recalled the name ("known"), experienced a ToT ("ToT"), recognised the face but could not recall the name ("familiar") or did not know the face ("unknown"). Conjunction maps across all conditions uncovered a predominantly left-lateralised face recognition network, including the fusiform gyrus, pulvinar, superior colliculus, insula, and IFG. Furthermore, contrasts of interest identified a ventral and medial network associated with successful semantic retrieval and a frontoparietal network associated with successful episodic retrieval. ROI and functional connectivity analyses in individual-subject space revealed that, I) for semantic memory, semantic (left pars triangularis) and cognitive control regions (left dlPFC) showed significantly increased activation, as well as stronger functional connectivity between left and right anterior hippocampus for semantic ToTs compared to semantic successful responses; and, II) for episodic memory, while no region showed stronger engagement for episodic ToTs compared to successful episodic retrieval, stronger functional connectivity was observed between left and right pars triangularis for episodic ToTs versus successful episodic

retrieval. Our findings highlight the regional involvement of left lateral PFC and the functional coupling between left and right lateral PFC in trying to resolve semantic and episodic ToTs.

P4.08 | Beyond Frequency Bands: Mapping Task-specific Changes in the Brain's Natural Frequencies With Continuous Spectral Resolution

Juan José Herrera-Morueco (Universidad Autónoma de Madrid); **Enrique Stern** (Universidad Autónoma de Madrid); **Lydia Arana** (Universidad Autónoma de Madrid); **Almudena Capilla** (Universidad Autónoma de Madrid)

Brain oscillations exhibit region-specific characteristic frequencies, often termed "natural frequencies," which are thought to reflect intrinsic functional properties of neural circuits. A recent magnetoencephalography (MEG) study provided an atlas of the brain's natural frequencies using a data-driven method based on spectral decomposition and kmeans clustering. Their approach revealed fine-grained, region-specific oscillatory preferences beyond the canonical frequency bands. While previous work has focused on resting-state data, the impact of active cognitive engagement on natural frequencies remains largely unexplored. Building upon this framework, in this study, we investigated task-dependent changes of natural frequencies using magnetoencephalography (MEG) data from the Human Connectome Project (HCP). Participants engaged in four conditions: Resting State, Motor, Working Memory, and Language/Math Processing. For each subject, brain activity was source-reconstructed using 1 cm3 voxels and power spectra computed via Fourier decomposition. Natural frequencies were then estimated through k-means clustering of power spectra. Critically, we sampled frequency over a continuous scale of logarithmically spaced frequency bins, ranging from ~1.65 to 82 Hz. This fine-grained, continuous-frequency approach allows for higher spectral precision than traditional band-based analyses. To incorporate spatial structure, for each voxel, we derived a vector reflecting the proportion of neighboring voxels (within a 1.5 cm radius) that exhibited each frequency, resulting in normalized frequency distributions per voxel, subject, and condition. To assess changes across tasks, we compared voxel-wise frequency distributions using effect size metrics and permutation testing. Our analyses revealed that cognitive engagement leads to systematic shifts in natural frequencies. Specifically, during the Motor task, we observed increased frequencies in sensorimotor regions, suggesting enhanced high-beta and gamma activity associated with movement execution. The Working Memory condition elicited higher frequency within the alpha range in parietal regions, indicative of heightened cognitive processing demands. Similarly, the Language/Math Processing tasks showed frequency changes in parietal, temporal and prefrontal areas, reflecting the complex linguistic and numerical processing involved. These findings demonstrate that natural frequencies are not static attributes but dynamically adapt to the functional requirements of specific cognitive tasks. This taskdependent modulation underscores the flexibility of neural

systems and highlights the importance of considering continuous frequency spectra in understanding brain function.

P4.09 | Self-other Distinction and Mu Rhythm Suppression Across Development: Neural and Behavioral Correlates

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The ability to distinguish between self and others is fundamental to the sense of self and social interaction. While the mirror neuron system (MNS) is known to activate during both action execution and observation, prior neuroimaging studies have indicated that MNS-related regions, particularly in the right hemisphere, respond selectively to selfrelated stimuli. This implies that the MNS may serve not only to simulate others' actions but also to distinguish self from others. Mu rhythm suppression (8-13 Hz), a putative EEG correlate of MNS activity, has been studied as an indicator of motor resonance; however, it remains unclear to what extent this suppression reflects self–other distinction, and how it relates to explicit behavioral discrimination. This study examined how mu suppression reflects self – other distinction across different developmental stages, and whether its directional preference (i.e., toward self or other) is associated with behavioral discrimination accuracy. Twenty-one adults and fifteen children performed a self – other discrimination task while viewing short videos of hand movements recorded from first- or third-person perspectives, depicting either their own or another person's hand. EEG was recorded from 64 channels during observation. Event-related spectral perturbations (ERSPs) in the mu band were analyzed from a central electrode cluster and submitted to repeated-measures ANOVA with agency, perspective, and hemisphere as within-subject factors. Behavioral discrimination sensitivity (d') was calculated from task performance, and correlations with mu suppression indices were assessed within each group. In adults, self – other differences in mu suppression emerged in the right hemisphere but not in the left. In children, overall suppression was weaker and showed a perspective-dependent reactivity: stronger suppression to others hand in first-person view and to own hand in third-person view. While adults showed higher d' scores overall, children also performed with high discrimination sensitivity. In both groups, first-person perspective enhanced discrimination. Notably, only in children did individual differences in mu suppression correlate with behavioral d'. These findings suggest that even when self–other discrimination is behaviorally successful, the underlying neural representations and processing mechanisms may differ across development.

P4.10 | Phase-amplitude Coupling in Executive Control: Evidence from iEEG During Awake Brain Surgery

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A distributed frontoparietal network (FPN) is known to support executive control processes across a wide range of domains such as working memory and attention. While fMRI has provided robust evidence for the role of this network in control processes, direct insights into its neural dynamics at the meso-scale level remain limited. Using intracranial EEG (iEEG) during awake brain tumor surgery, we previously demonstrated that high-gamma (70–250 Hz) activity in individual electrodes can serve as a functional signature for frontal control regions. Here, we extend this work by investigating functional connectivity between iEEG electrodes to characterize interactions between control regions and adjacent networks. We analyzed task and rest iEEG data from the frontal cortex of 13 patients undergoing awake tumor resection surgery. Functional connectivity was assessed using phase-amplitude coupling (PAC), a measure previously linked to executive control. Specifically, we focused on coupling between beta-band phase (12–30 Hz) and highgamma amplitude. During an executive control task with high cognitive demand, overall connectivity was significantly larger within the FPN compared to cross-network pairs. 32% (29/92) of electrode pairs within the FPN showed significant phase-amplitude coupling. In contrast, only 14% (15/106) of cross-network pairs (FPN to non-FPN) exhibited significant coupling, and was primarily driven by beta phase within the FPN and high-gamma amplitude in adjacent regions. Similar patterns were observed during rest and a low-demand task. These findings suggest that beta–high-gamma phase-amplitude coupling may play an important role in the neural mechanisms underlying executive control and highlight that resting-state and task-related meso-scale connectivity share key

organizational features within the frontal cortex. Our findings further demonstrate the importance of incorporating connectivity-based intraoperative mapping to preserve cognitive function during neurosurgical procedures.

P4.11 | Effects Of Stress And Exercise On Trust Behaviour

Shiyao Zhang (Queen Mary University of London, School of Biological and Behavioural Sciences)

Trust is a fundamental component of social interaction. This study investigated physical exercise's effect on acute stress and how it further influences trust behaviour, with a particular focus on the interplay between physiological responses, self-perceived stress, and trust behaviour changes. 144 participants (67 females, 77 males) were randomly assigned to one of four conditions in a 2×2 factorial design (Exercise × Stress). Participants completed a baseline trust game, their assigned intervention (exercise, stress, both, or neither), and a post-intervention trust game. Throughout the procedure, physiological data, including heart rate (HR), heart rate variability (HRV), blood pressure (BP), selfperceived stress ratings, Big Five personality traits, and risk propensity, were collected. Trust scores were normalized using min-max scaling, and trust change was defined as the difference between post- and pre-intervention scores. Our results indicate that exercise significantly attenuated physiological stress responses, notably suppressing increases in systolic BP (SYS) and diastolic BP (DIA) (both $p < .01$). However, exercise had a limited impact on self-perceived stress increases. Mixed-effects model on self-reported stress and physiological stress response revealed that physiological changes in DIA ($\beta = 5.76$, $p = .002$) and HR ($\beta = 1.66$, $p = .006$) significantly predicted self-reported stress changes. Chronic perceived stress did not predict acute subjective stress reactivity. Moreover, physiological markers (SYS, HR) can significantly predict trust changes (SYS: $\beta = 0.96$, $p = .036$; HR: $\beta = 0.30$, $p = .001$), while self-perceived stress changes did not ($p > .4$). Mixed-effects model on interventions and trust changes revealed that both physical exercise ($\beta = 0.21$, $p = .028$) and acute stress ($\beta = 0.27$, $p = .046$) independently enhanced trust behaviour. Gender influenced trust behaviour as well ($\beta = 0.22$, $p = .013$). The interaction between stress and baseline trust level was significant ($\beta = -0.49$, $p = .009$). To conclude, physiological responses, rather than subjective stress, better predict trust changes under acute interventions. Exercise effectively attenuates physiological stress and enhances trust. These findings highlight the importance of using objective physiological indicators and controlling for gender and baseline trust in future social decision-making research.

P4.12 | Changes in Brain Activation in Response to Joint Attention Contexts from 10 to 13 Months af Age Using High-density Fnirs

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Joint attention refers to the infant's ability to coordinate attention with a social partner towards an event/object (e.g., a toy). This ability typically emerges around 9 months of age, but during the second year of life, infants become more competent in joint engagement. Neuroimaging studies with adults suggest the involvement of several brain networks, such as the dorsal and medial frontal cortex and the temporoparietal junction, to process joint attention interactions. Infant studies remain scarce, often focusing on a single brain region and using cross-sectional designs. The present study uses functional near-infrared spectroscopy (fNIRS) to longitudinally examine the brain regions activated in response to joint attention stimuli during the emergence of the ability (10 months of age) and at an intermediate stage of its development (13 months of age). Participants are typically developing infants assessed at 10 and 13 months of age. A high-density fNIRS device (HD-fNIRS) is used to measure bilateral brain activation in the prefrontal cortex, superior temporal sulcus, and temporoparietal junction while the infant interacts with a female researcher. The infant-researcher interaction includes three conditions: Joint Attention (the researcher shows a picture book to the infant while making eye contact, using gestures, smiling, and labelling the pictures); Dyadic Interaction (the researcher sings nursery songs and performs hand actions/games while making eye contact and smiling to the infant); and No Interaction (the researcher stays in silence while holding a toy in front of the infant (no eye contact with the infant). Data collection is ongoing, and we expect a sample size of 15 infants with valid trials assessed at both time points by the time of the presentation. We hypothesise a stronger brain activation in the targeted areas at 13 than 10 months in response to joint attention stimuli versus the dyadic interaction and no interaction conditions. This study can help to identify typical neural signatures of joint attention that might assist early screening for neurodevelopmental disorders. Our findings may also inform future studies and

early intervention programs to adequately promote infants' joint attention abilities and foster optimal developmental trajectories from an early age.

P4.13 | Temporal Eigenvectors Encode Perceptual Switches During Bistable Motion Perception

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Bistable perception, where an ambiguous stimulus leads to alternating perceptual interpretations, offers a valuable phenomenon for studying the brain's dynamic processing of ambiguity. However, the underlying neural dynamics of these alternating percepts remain poorly understood. This study investigates the attractor dynamics of bistable perception. Attractor dynamics refers to the behavior of a system in which the system's state evolves over time toward certain preferred configurations, known as attractors. Natural systems, like the brain, are often non-linear, meaning their output doesn't change in a straight and proportional way with their input, which makes them difficult to understand. Their behavior can be simplified for interpretable analysis by linearizing their dynamics. The Hankel Alternative View of Koopman (HAVOK) method achieves this by identifying intrinsic coordinates – variables derived from the system's own dynamics. EEG data offers high temporal resolution but does not directly reveal the structure of the brain's internal dynamics. HAVOK transforms EEG into a lower-dimensional space capturing the system's governing states. The analysis used EEG data from 22 participants viewing a Structure-from-Motion stimulus, where white and black dots on a gray background created the illusion of a 3D sphere rotating clockwise or counterclockwise, leading to two competing percepts. The analysis focused on alpha band (7–13 Hz) activity in parieto-occipital regions, based on prior findings linking alpha oscillations to bistable perception and visual perception in general. HAVOK produced a simple system resembling the Frenet-Serret frame, a geometric framework describing the smooth trajectory of curves in space. To examine how this trajectory evolved just before a perceptual switch, we integrated the temporal eigenvectors over a 500 ms window preceding each switch. This revealed pronounced lateralized effects: changes over left hemisphere electrodes predicted rightward perceived motion, and vice versa. These effects were specific to the alpha band and were statistically validated using the Wilcoxon signed-rank test, due to non-normality indicated by the Shapiro-Wilk test. Our results show that bistable perception follows smooth, low-dimensional dynamics uncovered by HAVOK. Transforming EEG into intrinsic coordinates revealed lateralized alpha-band patterns predictive of perceptual switches, highlighting HAVOK's value in exposing hidden brain dynamics during ambiguity.

P4.15 | Neural Encoding of Continuous Word Meaning Likelihood During Semantic Disambiguation

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When we encounter a semantically ambiguous word, we can easily tell which of its meanings is most likely given the context. But does our brain also encode the less likely meanings? We contrasted two hypotheses: continuous encoding (the brain activates the less likely meaning proportionally to its contextual likelihood) versus categorical encoding (the brain does not activate the less likely meaning). In an online behavioral experiment, participants read German sentences that contained an ambiguous target word with balanced meaning frequency, Blatt (paper / leaf) or Tor (gate / goal; 150 sentences per target and 45-52 participants per sentence). Participants then rated which target meaning was more likely on a continuous scale. Average ratings confirmed that the likelihood of alternative meanings varied continuously across sentences, with some biased strongly to one meaning and others only weakly biased. However, single-trial ratings were insensitive to continuous differences in meaning likelihood but were instead categorically biased towards one meaning. To examine whether neural representations of the target words are nonetheless sensitive to continuous meaning likelihood, we recorded MEG in 19 participants who listened to the same sentences. We decoded the target word (Blatt vs. Tor) from MEG signals, training the decoder on sentences that supported one meaning of each target word (e.g., paper and gate) and testing it on sentences that supported the other meaning (e.g., leaf and goal). Under the continuous encoding hypothesis, weakly biased sentences would cause stronger activation of the less likely target meaning. This would make target representations more similar between the training and test sets and thereby increase decoding accuracy. Alternatively, if the less likely meaning is not activated, decoding accuracy would remain at chance regardless of bias strength. Supporting the continuous encoding hypothesis, we found that decoding accuracy increased linearly from strongly to weakly biased sentences around 800 ms before target onset. Anatomically resolved decoding localized this effect to the right superior parietal and the bilateral superior temporal regions. Thus, all word meanings are co-activated proportionally to their contextual likelihood even before we hear that word, which renders its overall neural representation uniquely context-specific.

P4.17 | Frequency-dependent Relationships Between Age and Bold Signal Variability Across the Adult Lifespan

Audrey Zhu (School of Psychology, University of Auckland); **Dr. Reece Roberts** (School of Psychology, University of Auckland); **Prof. Lynette Tippett** (School of Psychology, University of Auckland)

The relationship between age and intraindividual variability of the blood oxygen level-dependent (BOLD) signal during functional magnetic resonance imaging (fMRI), referred to as BOLD variability (BOLD-var), remains debated. Using resting-state fMRI data from 874 participants aged 18 to 89 years from the Human Connectome Project (HCP) Aging, Development, and Young Adult datasets, we examined how different frequency bands influence the association between age and BOLD-var. Standard deviation (SD) and percentage amplitude fluctuation (PerAF) were calculated from the full-band resting-state time-series. Age-related effects were assessed using multivariate partial least squares analysis. This process was repeated after applying four consecutive bandpass filters spanning low- to high-frequency ranges (0.007–0.052 Hz, 0.052–0.106 Hz, 0.106–0.206 Hz, and 0.206–0.438 Hz). In the full-band data, BOLD-var showed significant positive correlations with age ($p < .001$). Following bandpass filtering, the slowest frequency band (0.007–0.052 Hz) exhibited negative associations with age ($p < .001$), whereas the faster bands continued to show positive effects (all p's < .001). Notably, such shifts in results induced by bandpass filtering were only observed in cortical areas; the spatial patterns and direction of age effects in subcortical areas remained consistent across the four frequency bands. These findings suggest that BOLD-var is a strong and frequency-dependent predictor of age. Moreover, the removal of high-frequency components alters both the directionality and spatial distribution of age effects, indicating opposing contributions from neural (low-frequency) and non-neural (high-frequency) signal sources in cortical areas. Understanding these distinct components may clarify inconsistencies in the literature regarding age-related changes in BOLD signal variability. Future work should explore how frequency-specific BOLD-var patterns relate to cognitive function and risk for neurodegenerative diseases across the adult lifespan.

P4.18 | Early Dietary Exposure to Fat and Sugar Impairs Neurogenesis and Spatial Memory Without Astrocytic Response

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The increasing consumption of high-caloric diets (HCDs), especially those rich in saturated fats and refined sugars, is becoming more prevalent among younger

populations. This trend raises particular concern because the brain during adolescence and early adulthood continues to undergo critical developmental processes, including neurogenesis and glial cell maturation. Metabolic disturbances during this period may compromise brain plasticity and heighten vulnerability to cognitive and emotional disorders later in life. While the harmful effects of HCDs in adults are well-documented, their impact during early life stages remains less understood. This study aimed to evaluate the effects of two different HCDs – a high-fat (HF) diet and a high-fat high-sugar (HFHS) diet – on memory and related hippocampal function in young rats. Two-month-old male Wistar Hannover rats were randomly assigned to one of three groups: control (CT), HF, and HFHS. After 8 weeks on their respective diets, the animals were tested in the Morris Water Maze (MWM) for spatial reference and working memory, and were subsequently euthanized for brain tissue analysis. Hippocampal neurogenesis was assessed through immunohistochemistry for doublecortin (DCX), while astrocytic morphology was evaluated using glial fibrillary acidic protein (GFAP) staining. Behavioral results revealed that both HCDs appear to have a slight impact on spatial learning, memory, and working memory, but this impact was only statistically significant for reference memory, as indicated by the reduced platform crossings in the HFHS group. Interestingly, despite the mild behavioral effects, both HF and HFHS diets resulted in a significant reduction in DCXimmunoreactive cells in the subgranular layer of the dentate gyrus, suggesting impaired hippocampal neurogenesis. Conversely, the number and morphology of GFAP-positive astrocytes in the dentate hilus remained unchanged. This study demonstrated that early-life exposure to HCDs, particularly the HFHS diet, can negatively affect hippocampal neurogenesis even in the absence of marked behavioral deficits. While only the HFHS group exhibited significant impairment in reference memory, both HF and HFHS groups showed a significant reduction in DCX-positive cells in the subgranular layer of the dentate gyrus, indicating compromised neurogenesis. In contrast, no changes were observed in the number or morphology of GFAP-positive astrocytes, suggesting that these diets do not induce detectable astrogliosis in the short term. These findings indicate that cellular alterations may precede more evident cognitive dysfunction, highlighting the importance of nutritional intervention during critical developmental periods.

P4.20 | Active Vision Modulates Cortical Stages of Visual Processing

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It has been hypothesized that, under naturalistic viewing conditions, the visual system anticipates upcoming visual input temporally contingent on the execution of saccadic eye movements. In line with this idea, it has been shown that changes in visual input across saccades elicit stronger post-saccadic/fixation-locked neural

responses than corresponding no-change conditions; an effect known as the preview effect. In the present study, we demonstrate that this preview effect cannot be explained by neural adaptation alone. We recorded concurrent magnetoencephalography (MEG) and eye-tracking data in a gaze-contingent preview experiment in which participants made cued saccades to object stimuli. We contrasted this saccade condition to a passive replay and a post-saccadic blank condition to rule out adaptation of neurons with large receptive fields and spatiotopic adaptation, respectively. Source-localized MEG activity was temporally deconvolved from stimulus onset and eye movement events in order to deal with condition differences in gaze behavior. We found a preview effect in the primary visual cortex and in ventral-occipital areas. This preview effect was larger in the saccade than in the replay condition and comparable to the blank condition. This pattern of results shows that the preview effect hinges on oculomotor activity. Active vision apparently modulates cortical stages of visual processing in a way that goes beyond retinotopic and spatiotopic adaptation. This modulation of active vision is probably mediated through a corollary discharge and saccadic remapping. The preview effect might, thus, be considered the result of predictive or anticipatory processing that is specific to eye movements.

P4.21 | Teaching an Old Dog New Tricks: Older and Younger Adults Show Differences in Learning Slopes But Comparable Overall Gains Following Three Weeks of Skill Training

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Abstract. Aging negatively impacts manual motor performance, but older adults still retain significant motor learning capacity. While initial learning may be slower, studies show that normalized performance gains during short training periods (<1 week) are similar between younger and older adults. However, it remains unclear whether

extended training enables older adults to close the performance gap. To investigate age- dependent differences in performance, learning slopes and changes in task-dependent neural activity after long-term training, we tested 27 younger (22-27 y.o.) and 27 older (65-70 y.o.) healthy adults on a visually guided bimanual pinch force task over five weeks. Participants completed four fMRI sessions: D1 and D2 (initial training), D3 (after three weeks of home-based training), and D4 (two-week retention). Performance was assessed using Time on Target, and linear mixed models were used to evaluate learning trajectories. Task-related brain activity was measured using BOLD fMRI and is currently analyzed with Statistical Parametric Mapping (SPM). Behavioral results showed that age-related performance advantage persisted across sessions (main effect of group, $F(1, 53) = 49.75$, $p < 0.001$). However, relative learning gains, demonstrated that older adult's performance benefit significantly more from extended training (Time × Group interaction $p < 0.001$) as confirmed by post-hoc tests ($p < 0.001$). Skill retention was similar across groups, with no significant performance decline between D3 and D4. Both groups plateaued in performance during home training, however the young group plateaued significantly sooner than the older (on average; young on day 9. Older on day 12, t-test $p = 0.01$) indicating a difference in the learning slopes between groups. The ongoing fMRI analysis will allow us to connect performance changes with changes in task-dependent brain activity. In summary, our results suggest that increasing training time does not allow older adults to catch up to the performance levels of younger adults with similar training exposure. However, older adults do benefit from training to at least the same extent as their younger counterparts and do not show signs of declining retention of manual motor skills after a two-week break.

P4.22 | Use of Working Memory During Reinforcement Learning as Reflected in Frontal Theta-band Oscillations

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Updating ones behavior based on the results of previous actions, or reinforcement learning (RL), has traditionally been attributed to prediction-error-based learning in the striatum. However, more recent evidence indicates that working memory (WM) also supports such learning when delays between learning experiences are short. In a first study, we investigated how WM use during RL is reflected in lateral prefrontal and medial frontal theta-band oscillations, which are known to be involved in WM and feedback processing, respectively. To this end, we measured EEG while young adults (19-25y) performed a deterministic RL task in which they learned stimulus-response associations by trial-and-error. Stimulus repetitions were separated by either short or long delays. We replicated the behavioral results that we previously found in older adults: learning was faster with short than long delays, while consolidation was better in the long-delay condition. Similarly, theta power during the choice period was larger in the short-delay than the long-delay condition at

bilateral lateral prefrontal electrodes. However, post-feedback theta power did not differ between delay conditions at either lateral or medial frontal electrodes. Thus, although choice-related theta power may reflect WM usage, so far we did not find evidence of post-feedback WM updating. In a second, follow-up study, we investigated whether WM use and theta-power differences during learning depended on feedback consistency, and whether age-related changes in learning were related to changes in theta power. Here, we measured EEG while young (18-30y) and older (65y and older) adults performed a RL task that included both deterministic and probabilistic feedback. The results of this study will also be presented.

P4.23 | Modelling the Adaptive Transformation of Representations in Brains and Artificial Networks

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In cognitive neuroscience, observed phenomena are often explained through models. Using various frameworks to organise our understanding, we construct mechanistic explanations of cognitive processes to capture the trajectory of information from stimuli to behaviour. The advent of high-performing Artificial Neural Networks (ANNs) provides a useful tool for hypothesising about human vision, enabling a novel framework centred around aligning the internal representations of biological and artificial systems. Both AI and Cognitive Neuroscience researchers aim to develop valid methods for the mechanistic explainability of systems and use them to build models of various cognitive processes. In the current proposal, we build on recent efforts on representational alignment, which focuses on finding similarities between the activations representing stimuli in specific brain areas and layers of ANNs. We extend this by exploring the trajectories of ANN's representations for different input features depending on their function in solving a task. This will provide a tool for tracking the development of representations. The characterisation of these trajectories in ANNs can then be used to describe similar representational trajectories measured in humans via time-resolved recordings (e.g., EEG). In our first study, we aim to characterise input-to-output representational trajectories by feeding a set of images through ResNet-50 and assessing the similarity patterns of its internal representations. We hypothesise that stimulus features like image prototypicality will impact category boundaries and convergence speed. The subsequent goal is to test how different input properties modulate internal representations, thus enabling outcome flexibility. In addition, this approach would allow us to identify which computational principles are similar in humans and ANNs, while promoting a bi-directional frame-

work between AI and cognitive neuroscience that is open to iterative updating of mechanistic explanations.

P4.24 | Affective State-dependent Itbs Effects on the N-back Task

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The neural and behavioral effects of transcranial magnetic stimulation (TMS) are the result of a nonlinear interaction between the brain's ongoing state and the stimulation, a phenomenon known as state-dependency. Differences in the underlying brain state at the time of stimulation might be a key factor contributing to the large variability in the clinical efficacy of TMS treatments for neuropsychiatric disease. Affective brain states engage the same neural networks that are disrupted in neuropsychiatric conditions and targeted by TMS, making them an ideal candidate for the research of state-dependent TMS effects. In this sham-controlled, withinbetween subjects study, we manipulated affective state (neutral vs negative) using a mood induction procedure, while delivering intermittent theta-burst stimulation (iTBS) to the left dorsolateral prefrontal cortex (lDLPFC). We measured behavioural, ERP and oscillatory changes on an n-back task in a pre-post design in healthy female volunteers, where memory load was adapted to each individual to maintain a high level of difficulty. Additionally, we collected depressive symptom (BDI-II) and reproductive state data (RSQ), to explore trait state-dependent TMS effects on EEG and behaviour. Changes in RTs, accuracy and sensitivity scores will be analyzed using linear mixed models. Changes in the amplitude and latency of the N200 and P300, as well as in oscillatory power within the theta and alpha bands will be further analyzed. Finally, the effects of depressive and reproductive trait state on these outcome measures will also be explored. We expect that a negative mood induction will result in stronger TMS-induced task improvement, compared to neutral mood induction. Further, a negative mood induction will result in stronger ERP and oscillatory changes on task EEG compared to neutral mood induction. The rationale behind these hypotheses lies in the affective state-dependent pre-activation of relevant prefrontal circuits disrupted in Major Depressive Disorder and involved in the treatment effects of iTBS. These findings will advance our understanding of brainstimulation interactions and inform novel strategies to improve TMS treatments for neuropsychiatric disorders.

P4.25 | Strengthening Cognitive Networks With Multi-node Brain Stimulation

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Non-invasive brain stimulation (NIBS), such as Transcranial Magnetic Stimulation (TMS), has traditionally targeted isolated brain regions to confirm functional roles or alleviate symptoms. However, cognitive functions rely on complex, distributed networks, rendering current approaches misaligned with the brain's intrinsic organization. A promising alternative, Paired Associative Stimulation (PAS), leverages Hebbian learning principles – "neurons that fire together, wire together" – to strengthen functional connectivity across networks. While PAS has proven effective in the motor domain, its application to higher-order networks, such as the frontoparietal network (FPN) associated with cognition, has yielded limited success. This may be due to inter-individual variability and the dynamic nature of network activation across different brain states. This study aimed to develop an individualized PAS protocol to enhance FPN connectivity and improve spatial attention performance. Participants (N=20) first underwent (f)MRI to identify target FPN nodes – the right Frontal Eye Field and Intraparietal Sulcus – and their connectivity patterns. In a second session, EEG was recorded to establish baseline connectivity, and attentional performance was measured using a spatial attention task involving peri-threshold visual stimuli presented in a cued hemispace. PAS was then applied to sequentially stimulate the identified frontal and parietal nodes, mimicking their natural directional flow of connectivity. Post-stimulation EEG and task performance were used to assess changes in both neural activity and behavior. A third session replicated the protocol with control stimulation that disrupted the natural sequence of activation. Preliminary results suggest that state-dependent PAS can enhance FPN connectivity, as evidenced by increased right-hemisphere EEG coherence post-stimulation, accompanied by improved attentional performance. As expected, the control condition did not yield significant changes. This study advances connectivity-based brain stimulation by tailoring PAS protocols to individual functional architecture. These findings support the development of targeted, network-informed NIBS interventions with potential for broader cognitive applications and personalized treatments for neurological and psychiatric conditions.

P4.26 | What Are the EEG Network Dynamics Supporting Executive Functioning During Learning?

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The efficiency of novel learning is heavily dependent on cognitive control and executive function (EF). Consequently, increased ability to cope with cognitive demands is a consistent predictor of learning across various tasks and populations. However, the roles of particular brain networks in this interplay remain to be understood. As differences in cognitive control and learning performance have been linked to differential network composition and dynamic network reconfigurations, our preliminary hypotheses focus on establishing networks present during a novel learning task over time, differences between attentional demands on a group level, and linking this to individual performance. Here, we use an artificial symbol learning paradigm and behavioural data collection with concurrent 32-channel EEG recording in 25 adult participants: first, teaching them an ordinal sequence of symbols, followed by a magnitude comparison task to test successful learning. The analytical pipeline features novel modelling methods to identify network dynamics of oscillatory activity involved with the tasks. Specifically, we apply the Hidden Markov Model (HMM): a model describing M/EEG time series through an underlying sequence of 'hidden' transient states, which closely correspond to canonical resting state networks found in fMRI, enabling prediction of networks that are most likely to be activated during specific tasks or periods. In addition to yielding unique power & coherence spectra and an array of summary statistics, the identified networks are used for evoked potential analyses. Preliminary findings suggest differences in frontal networks between more and less attentionally-demanding conditions, and a relationship with individual task performance. Furthermore, we hypothesise that there will be an increase in frontoparietal activity following deployment of learned knowledge compared to the pre-task resting state. Further work will investigate similar hypotheses applied to an EF task dataset collected with 64-channel EEG, and to a third study focusing on the interplay between network characteristics and performance between learning and EF. Besides uncovering cognitive mechanisms, such findings can be beneficial for individuals affected by neurodevelopmental or learning disorders. Additionally, this project is crucial for validating the efficacy of novel machine learning methods for lower-density EEG analysis, enabling more cost-effective and simpler experimental procedures to investigate brain network dynamics.

P4.27 | Social Dynamics in Language Comprehension: Behavioural and ERP Evidence

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It has been proved that social information affects language comprehension, including syntax. To further understand this cognitive process, it is essential to explore how social dynamics – specifically competition vs collaboration – influence both the performance and neural response of individuals engaged in language comprehension tasks. This study investigates whether and how social dynamics between two friends affect language comprehension. To this aim, pairs of friends were asked to discriminate between grammatically correct sentences and those containing morphosyntactic anomalies under three conditions: individually, jointly, or competitively. Behavioral results revealed that error rates were less in joint condition as compared to the individual condition, mainly due to judgements of grammatically correct sentences, with the competitive condition yielding intermediate results. Reaction times were longer in the joint condition than in the competitive condition. In addition, the onset of the left anterior negativity (LAN) of the Event-Related brain Potentials (ERP) to morphosyntactic violations was delayed in the joint condition relative to both the competitive and the individual conditions. Further, a larger P600 component was observed for the competitive condition compared to the individual condition, with the joint condition again exhibiting intermediate values. These results are interpreted in the context of social facilitation theory and participants' strategies as a function of whether they are working jointly or in competition.

P4.28 | Asct: A Pipeline for Standardized Analysis of Meg/eeg Directional Connectivity

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Connectivity analysis enables us to reveal a dynamic information exchange in cortical areas as a key to understanding the working brain. Estimation of directed connectivity from EEG/MEG signals typically requires advanced processing of the signal with a large number of computational steps to obtain reliable outcomes. Here, we propose a complete processing pipeline for effective connectivity analysis based on prior source localization implemented as the Atlantis Source Connectivity Toolbox (ASCT). This open-source toolbox, available at https://atlantis.psychologia.uj.edu.pl, covers the complete signal processing from raw data import to connectivity

estimation using the Directed Transfer Function. It also implements leakage correction, statistical testing, and visualization of results. Importantly, the software comes with recommendations for the analysis of one's own data to support general research replicability. Here we provide sample results with simulated MEG resting state data, where prepared signals were 'injected' into selected regions of interest, and the real Eriksen flanker task EEG recording with the analysis of cognitive control effects in the frontoparietal and saliency functional brainnetworks. Our results highlight the importance of routine use of the leakage correction that prevents the detection of spurious links. We also discuss potential benefits of source separation prior to their reconstruction for more accurate estimates of connectivity performed with the Directed Transfer Function.

P4.29 | How Prior Motor States Can Shape Perceptual Choice Bias: Insights From Sensorimotor Beta Oscillations

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Emerging evidence suggests that decision making is not a purely cognitive process preceding motor output but rather an embodied phenomenon in which the sensorimotor system actively shapes choice selection. Beta oscillations (13–30 Hz) over the sensorimotor cortex have been shown to encode motor action and bias subsequent decisions toward alternation via left-right hemispheric asymmetries in beta power rebound dynamics. This study investigated whether sensorimotor beta oscillations elicited by an isolated, voluntary motor action could influence a subsequent, unrelated perceptual decision. Twenty-three healthy adults (22 right-handed) completed a two-stage task while 64-channel EEG was recorded. On each trial, participants pressed a button with either the left or right thumb to a letter cue ("L" or "R"; initial response). Following a variable delay (0.5, 1.2 or 3s), they judged the orientation of a briefly presented visual grating (anticlockwise vs. clockwise) and responded by a second button press (left or right thumb; decision response). We hypothesized that the beta rebound triggered by the initial response would bias perceptual decisions toward alternation, particularly when the decision stimulus is presented around the time when the beta rebound peaks. Choice bias was quantified as the threshold difference between psychometric curves fitted for left versus right initial-response

trials. We found that participants with higher post-initial response contra-ipsi beta rebound were more likely to alternate in decision responses. This relationship was not modulated by delay. When considering within-participant variability in beta rebound lateralization across delays, we found that trial-by-trial increases in beta rebound significantly increased decision speed. These findings suggest that prior motor states may shape subsequent decision bias and reaction time by promoting response alternation and accelerating decision speed, supporting an embodied decision-making framework in which the sensorimotor system contributes towards the perceptual decision making process.

P4.30 | Brainagemap: A Lightweight Deep Learning Model to Delineate Local Brain Aging Patterns Using Structural Magnetic Resonance Images

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Estimating age based on neuroimaging data using machine learning methods provides a straightforward measure for the quantification of how far an individual person is from the healthy brain aging trajectory. Recent studies demonstrated that besides predicting a single (global) brain age, a better picture of the aging process could be obtained by estimating the biological age of individual brain areas separately. Based on previous work regarding interpretable disease classification, we developed a novel lightweight deep learning model called BrainAgeMap for estimating global and local brain age simultaneously based on structural magnetic resonance imaging (MRI) data. Our results suggest that BrainAgeMap can be used to delineate fine-grained spatial patterns of age-related structural changes associated with specific neurodegenerative and neuropsychiatric disease states, namely Alzheimer's disease, frontotemporal dementia, and schizophrenia. These findings underline the promise of regional brain age estimation in the better understanding and monitoring of disease processes underlying common brain disorders.

P4.31 | Contextual Familiarity Preserves Episodic Memories: Evidence From a Novel Virtual-reality Paradigm

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Episodic memory is often conceptualised as a faithful replaying of events in our minds; however, evidence suggests it is a reconstructive process that relies heavily on existing contextual relationships between semantic, spatial, and temporal details. To examine how contextual familiarity affects the resilience of episodic memories, we developed an ecologically focused virtual reality (VR) platform. One hundred participants, stratified across the adult lifespan (20-70 years), explored four immersive household environments, observing and interacting with stimuli that systematically varied in their semantic and spatial contextual congruence within each room. Participants completed four memory tests across multiple recall paradigms immediately, and at 1, 3, and 6 days post-encoding. Results revealed that objects with high contextual congruence were recalled with greater accuracy and confidence across all delays, while more unusual semantic and spatial relationships exhibited steeper rates of episodic forgetting. Recall confidence declined over time in parallel with recall accuracy, suggesting that relational congruence at encoding confers both objective and subjective resilience. These findings held consistently across 'what', 'where', and 'when' memory domains. Bayesian modelling accounting for item interdependencies further indicated that episodic forgetting between domains is not linear or uniform but is influenced by proximity to existing relational schemas. Overall, our findings suggest that episodic memory is scaffolded by existing relational knowledge structures, where events that mirror expectations can be recalled more accurately and for longer periods, whereas unfamiliar relationships are more vulnerable to errors. Our novel VR approach provides a powerful new tool for investigating episodic memory, where prioritising ecological validity invites a reframing of how real-world episodic memories are constructed and change over time.

P4.32 | Eye Movements and Alpha/Beta Power During Memory Retrieval Are Linked to Encoding and Memory Performance

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Humans predominantly rely on vision to gather information about the world around them. Successful memory of a visual stimulus can thus be predicted based on the amount of eye movements made when exploring it. Another well-established predictor of successful memory formation is EEG alpha/beta power (~8-30Hz). However, recent research indicates that this so-called alpha/beta subsequent memory effect may be largely accounted for by the amount of eye movements during encoding, suggesting a task independent relationship between alpha/beta power and eye movements. Here, we further investigate the links between eye movements, electrophysiology, and memory performance, specifically focusing on memory retrieval and its comparison to encoding. In the study phase of this free-viewing memory task, participants were asked to encode naturalistic scenes. After a delay, a recognition test assessed their memory performance. EEG and eye-tracking were simultaneously

recorded throughout the experiment. We hypothesized that, similar to their relationship during encoding, saccade frequency at retrieval would be negatively associated with alpha/beta power. In turn, alpha/beta power was expected to be negatively associated with behavioral memory performance. Our results supported the expected relationship between alpha/beta power and eye movements: greater sustained posterior power decreases in the alpha/beta range during scene-viewing with more, as opposed to less, visual exploration. When contrasting retrieval EEG data according to memory performance, we found early posterior alpha/beta power decreases for correctly remembered, compared to forgotten scenes. However, participants made fewer saccades at retrieval for remembered scenes than for forgotten and new ones. To further investigate the complex relationship between eye movements, alpha/beta power, and memory performance, we compared gaze patterns during retrieval with those during encoding. Based on previous studies that showed gaze-pattern reinstatement during memory retrieval, we expected high scene-specific and memory-related gaze similarities. Results confirmed this prediction and suggested that retrieval gaze during successful remembering might be particularly related to gaze patterns during an early encoding time window. These findings support the idea that gaze patterns reveal memory reactivation. Overall, the negative correlation between eye movements and alpha/beta power during retrieval supports the notion that low frequency electrophysiology and visual exploration are tightly linked, regardless of the specific task.

P4.33 | Body Language: The Stomach Modulates Brain Activity at Rest and During Speech Processing

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In recent years, neuroscience has moved away from its isolationist perception of the brain as a closed system, increasingly recognizing the influence of bodily signals on neural activity. Various visceral organs create slow frequency rhythms which directly contribute to the temporal organisation of brain dynamics. Beside the more prominent cardiac and respiratory rhythm, specialised cells in the stomach wall also generate slow electrical waves. This gastric rhythm modulates spontaneous fluctuations in resting-state neural activity in a large cortical network including unimodal

sensory-motor regions and the insula. Recording electrogastrography (EGG) and MEG data from N = 30 healthy participants at rest, we replicated the spatial structure of the novel gastric network, while also characterizing the nodes of the network in the spectral domain using phaseamplitude coupling analyses.Cross-frequency coupling of gastric rhythm phase to neural oscillations modulated brain activity on a large spatial and spectral scale, encompassing all gastric network areas as well as delta to beta frequency bands supporting cognitive brain function. Modulation patterns differed across brain areas and frequencies. Additionally, based on the involvement of unimodal sensory areas at rest, we extended the spotlight on gastric modulation of brain activity to a task context, namely rhythmic auditory perception. Participants listened to a natural speech sequence and an auditory sequence derived from the speech signal, consisting of a series of sine tones temporally aligned with the syllable onsets of the speech signal. During these perceptive tasks, the gastric rhythm modulated temporal fluctuations in brain activity in frequencies between 0.5 and 30 Hz, with comparatively stronger beta-range coupling in the right ventromedial prefrontal cortex (vmPFC) during the rhythmic auditory sequence that conveyed semantic information. Our results suggest a link of gastric-brain coupling not only to sensory and motor processing, but possibly also to large-scale brain organisation.

P4.34 | Time Perception is (only) Mildly Affected by Spatial Distance and Tool-use Training in Young and Older Adults

Amir Jahanian Najafabadi (Bielefeld University); **Christoph Kayser** (Bielefeld University)

Recent studies suggest that our perception of time is tied to the embodiment of space. To corroborate this, we tested 282 younger and elderly participants in a time reproduction task and in either physical and virtual setups. Stimuli were presented at three distances (60, 120 & 240 cm) from the body and both before and after tool-use training manipulating objects at distances between 120 and 200 cm. For young but not elderly participants, reproduced intervals were significantly longer for stimuli at 120cm compared to 60cm prior training. For young participants, tool-use significantly shortened reproduced intervals around the distance at which tool-use training was operated (120 cm). This effect was again absent in the elderly. In both groups, participants' sensitivity to the presented intervals did not differ between distances prior training, but was significantly reduced by tool-use at all distances. We observed qualitatively similar results for experiments in physical and virtual setups but the effect sizes were generally small, pointing to systematic but weak effects. Overall, this supports previous claims that time perception is tied to space and our interaction with this when we are young, though further work is required to understand the robustness and specificity of these effects. Keywords: Time perception, Peripersonal Space, Space Representation, Active Tool-use, Aging

P4.36 | Effect of Cerebellar tDCS on Cortical Processing of Proprioception in Friedreich's Ataxia and Healthy Controls

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Friedreich's ataxia (FRDA) is the most common autosomal recessive ataxia, characterised by atrophy of the spinal and cerebellar gray matter. A characteristic symptom of FRDA is a loss of proprioception. Cerebellar transcranial Direct Current Stimulation (ctDCS) is a non-invasive neuromodulation technique which has some therapeutic potential for FRDA, however, the extent to which it alleviates proprioceptive impairments remains unknown. In 18 FRDA patients and 16 healthy controls we investigated the effect of ctDCS on the cortical processing of proprioception assessed with Corticokinematic coherence (CKC) – the coupling between electrical activity of the sensorimotor cortex (SM1) and finger movement kinematics. Provided that CKC is a biomarker of clinical severity, a therapeutic effect of ctDCS on proprioceptive processing should manifest as increased CKC post stimulation. All participants underwent a pre-ctDCS CKC assessment followed by 20-minute daily ctDCS for 10 days and a post-ctDCS CKC assessment. CKC was computed as the coherence between left SM1 Magnetoencephalography signals and accelerometry data from the right index finger, recorded while the finger was passively moved at 3 Hz by a pneumatic stimulator. CKC magnitude was assessed at movement frequency and its five successive harmonic frequencies, for the FRDA patients and controls, and pre- and postctDCS. CKC was characterised by large peaks at movement frequency and harmonics, more markedly so in the control group. Accordingly, across harmonics, there was a significant difference in CKC magnitude between FRDA patients and controls ($p < 0.001$), with FRDA patients possessing lower global CKC. There was, however, no difference between CKC magnitude pre- and post-ctDCS for either group ($p = 0.802$). Lastly, in the FRDA group, we found a significant correlation between baseline pre-ctDCS CKC magnitude averaged across the five harmonics and the Scale for the Assessment and Rating of Ataxia scores ($r = -0.62$; $p = 0.014$). Our results confirm that decreased cortical processing of proprioception is a biomarker of the proprioceptive impairments of FRDA, however, this biomarker was not improved by ctDCS.

P4.37 | E-sports as a Window Into Cognitive Assessment: Insights From Performance, Eye-tracking, and Neuropsychology in First-person Shooter (fps) Video Games

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Excelling in traditional sports depends on the critical coordination of cognitive processes (e.g., overt attention) with downstream sensorimotor actions. In recent years, electronic sports (e-sports) have gained traction across different age groups. Expert

players in e-sports, like those in traditional sports, have confirmed superior search strategies, anticipatory abilities, and task-switching efficiency compared to non-expert gamers. However, little is known about the neuropsychological characteristics underpinning successful performance in gameplay and their potential for application outside gaming contexts. To address this gap, we recruited 20 non-professional participants (10 males: M = 28.2, SD = 2.57; 10 females: M = 26.1, SD = 3.22), who played eight different first-person shooter (FPS) video games selected from the "Aimlab" platform (e.g., shooting fixed/moving targets, memory, audio-spatial tasks) while their eye movements and hand responses were collected using an EyeLink 1000 and the Weblink software, respectively. Each game was played four times, totaling 32 game plays, over approximately one hour of gameplay. Before and after the gaming session, participants completed a standardized battery of neuropsychological tests (DiaNe System) tapping into selective attention and working memory skills. We examined the correlations between response accuracy, time, and gaze metrics (fixation number and duration) with the neuropsychological results of each individual before and after the gaming session. Better performance on selective and sustained attention from the neuropsychological tests was associated with superior performance in video game tasks on target detection ($r = .498$, $p < .01$), decision shot ($r = .496$, $p < .01$), and grid shot ($r = .593$, $p < .01$). Moreover, the number of fixations during the gaming tasks involving memory positively correlated with neuropsychological performance in visuospatial and working memory tasks ($r = .535$, $p = .01$). However, we did not find any improvement in the neuropsychological tests after the gaming session. Our findings highlight that performance in e-sports tasks is associated with cognitive functions measured by traditional neuropsychological tools. This result points to the importance of gaming as a potential frontier for cognitive assessment, one that better aligns with our current highly digitalized world.

P4.38 | How Task Dissimilarity Shapes Adaptive Control: A Meta-analysis

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Humans flexibly adapt their behavior in response to conflicting situations. This is often studied by measuring the congruency sequence effect, which reflects the reduced impact of congruency after an incongruent trial. A long-standing debate has been whether these adaptations reflect a domain-general or domain-specific process, to which many studies have contributed by studying the congruency sequence effect

across trials from different tasks. However, different studies used different tasks, and the various ways of manipulating task dissimilarity can offer different insights on the scope and nature of the underlying adaptive control processes. Therefore, we conducted a systematic, preregistered meta-analysis (from 1992 to 2023, 169 experiments, 229 effect sizes for cross-task CSEs). Our findings show that while task dissimilarity generally shows a negative effect on cross-task congruency sequence effects (e.g., when there are differences in conflict type, relevant and irrelevant stimulus dimension, or response modality), using different stimuli or response buttons actually increased cross-task congruency sequence effects. For example, when tasks shared the same conflict type, larger congruency sequence effects were observed when the exact stimuli and response options of both tasks did not overlap. These results call for a more refined understanding of what drives adaptive control, with a central role for shared versus separate task representations, moving beyond simple domain-general or domain-specific accounts.

P4.39 | The Orienting of Spatial Attention in Touch and Pain: Evidence for Modality-specific Modulations of the Cue-locked Lateralized Erp Components

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The present study investigated whether lateralized event-related brain potential (ERP) components triggered during covert shifts of spatial attention are selectively modulated by the cued modality of a forthcoming somatosensory target (pain vs. touch). Typically, in cuing studies of spatial attention, the anterior directing attention negativity (ADAN) is elicited over frontal electrodes upon cue presentation and is followed by the late directing attention positivity (LDAP) over posterior electrodes and by the late somatosensory negativity (LSN) over central electrodes. In the present study, lateralized ERPs were recorded during a cueing paradigm in which centrally presented visual cues provided information about the location (left vs right hand) and the modality (pain vs. touch) of the task-relevant target. Upon cue presentation, participants were instructed to covertly select the cued location and modality to respond to infrequent cued targets, while ignoring uncued targets and all non-targets. Results showed the expected sequence of markers of anticipatory spatial attention reflecting preparatory activity within the anterior and posterior parts of the fronto-parietal attentional network. ADAN, LDAP and LSN were elicited regardless of the cued target modality, confirming the supramodal nature of the orienting mechanisms responsible for these lateralized components. Intriguingly, the LDAP was modulated by the cued modality with larger amplitudes when participants expected pain compared to touch. These findings are in line with recent evidence suggesting that

the LDAP component is modulated by alerting mechanisms. We speculate that the enhanced LDAP amplitudes observed in the present study reflect stronger preparatory activity in anticipation of nociceptive events.

P4.40 | Learning in Neurofeedback Does not Guarantee Adhd Symptom Improvement

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Neurofeedback (NFB) is a promising, non-invasive intervention for ADHD that aims to train self-regulation of brain activity. Despite decades of clinical use, the mechanisms underlying its efficacy remain unclear – particularly the role of NFB learning in ADHD symptom reduction. This study advances the NFB field by introducing both theoretically grounded and data-driven frameworks that conceptualize learning as a dynamic, individualized process. Data were drawn from a 25-month longitudinal randomized controlled trial of theta/beta ratio (TBR) NFB treatment in children with ADHD (N = 100; ages 7–10). Moving beyond prior work that characterized learning through binary classifications and group-level averages, we captured within- and between-session training dynamics and applied clustering methods to define distinct learner profiles, highlighting the heterogeneous nature of NFB responses. Our results demonstrate that while most participants learned to regulate TBR effectively, individual learning did not reliably predict symptom improvement. Instead, linear mixed-effects model results indicated that non-specific factors such as participant engagement and training context were more predictive of clinical outcomes. Moreover, variability in learning curve shapes – typically overlooked in standard NFB studies – suggests that NFB learning does not follow a uniform pattern, with individuals engaging through distinct mechanisms aligned with either operant-conditioning or skill-acquisition models. These insights advance theoretical understanding of NFB mechanisms and call for individualized, mechanism-informed approaches to optimize treatment outcomes and deepen clinical interpretation.

P4.41 | Social Cognition in Anxiety: Investigating Atl Involvement in the Emotional-semantic Integration

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In everyday life we are constantly comparing ourselves to others in terms of achievements, appearance and wealth. Upward social comparisons, comparing ourselves with those better off, may provoke anxiety, especially in high-trait individuals. Neural substrates of social comparison include the anterior cingulate cortex (ACC), anterior insula (AI), and orbitofrontal cortex, regions likewise implicated in anxiety, suggesting an overlap between socio-emotional systems. However, research on this interaction is lacking. The anterior temporal lobe (ATL), linked to social concept processing and affective disorders, may play a key integrative role by accessing conceptual knowledge about others. Clarifying ATL involvement could deepen our understanding of anxiety-related mechanisms. In this study we investigate the social neural network and its differences across subclinical trait-anxiety, paying special attention to the implication of the ATL. We developed a gamified fMRI task prompting participants to compare themselves with superior or inferior competitors based on social background and performance, designed to elicit upward and downward social comparisons respectively. 78 healthy participants with varying levels of anxiety underwent the task. fMRI data were acquired, optimised to obtain signal from the inferior ventral and frontal regions. Trait anxiety and positive affect were assessed using the STAI-T, BIS, Sensitivity to Punishment (SP), BAS, and Sensitivity to Reward (SR) scales. fMRI data were preprocessed with fMRIPrep. Whole-brain analyses were performed with SPM12, NiLearn and NiBabel. Psychometric scores were synthesized via principal component analysis (PCA) into composite anxiety and positive-affect factors. Whole-brain results comparing superior competitor against inferior (upward > downward) showed increased BOLD signal in the bilateral AI, inferior frontal gyrus (IFG), bilateral but more right-lateralised MTG, and the supplementary motor area. Emotional and semantic processing areas show activations in social comparison, indicating promising interactions between both systems. As next steps, we will conduct multiple regression analyses using the PCA anxiety and positive affect factors at whole-brain and ROIs levels, alongside functional connectivity analyses, specifically psychophysiological interaction (PPI) models. The current project may clarify the interaction between social and emotional mechanisms, advancing our understanding of anxiety processes.

P4.42 | Task-related Theta and Alpha Cortical Activities Induced by Static Balance Tasks in Older Adults

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Abstract Balance control is a basis for motor development and underpins essential behaviors such as reaching and locomotion throughout the lifespan. Postural control has a profound impact on a wide range of daily activities, from voluntary movement to responding to external disturbances and sustaining a particular posture.

While maintaining postural stability and balance is crucial for healthy aging, the neural mechanisms underlying balance performance remain poorly understood. In this study, we investigated the effect of balance static tasks on task-related EEG activity across different experimental conditions. 18 old-aged adults participated in each task condition. Resting-state EEG measurements were conducted over two minutes, during which participants remained still, keeping their eyes fixed on a cross displayed on a computer screen. We further used the Wii balance board (Nintendo) to measure balance performance. The following EEG recording was continued while 14 trials of static balance tests were done (with 10-second rest between trials): balancing on both feet with eyes open (EO), balancing on both feet with eyes closed (EC), balancing in a one-leg stand (OLs). The primary focus was to assess changes in brain activity, measured by EEG frequency bands (beta, alpha, theta), and regional brain activation (ROI) across various conditions and groups. Results revealed that participants exhibited significant changes in relative power in occipitalcentral and posterior-central, with pronounced effects in the alpha and theta bands under both EO and OLs conditions. Compared to the EC condition, stronger modulation in relative power was observed in occipital-central and posterior-central, with increased theta-alpha power during EO and OLs conditions, and notable reductions during EC. Additionally, results demonstrated increased posterior-central and occipital-central relative power, particularly under the EO condition, where theta and alpha bands were most pronounced. The data indicate that changes in EEG relative power, particularly in theta and alpha bands, are dependent on the specific conditions of static balance tasks, with EO leading to higher activation in some regions (posterior-central) compared to EC and OL conditions. With these results, we contribute to the understanding of neural changes induced by a balance static task and the role of sensory conditions in modulating task-related brain activity.
Keywords: Static balance task, task-related EEG, relative power, old adults

P4.44 | Studying Human Consciousness in Real-world Settings: Advances in Cognitive Neuroscience

Juan Carlos Osorio-Aravena (Universidad de Granada)

Studying Human Consciousness in Real-World Settings: Advances in Cognitive Neuroscience Juan Carlos Osorio-Aravena1 1Universidad de Granada, Spain Abstract Detecting conscious states and understanding how brain activity gives rise to subjective experience remain major challenges for science in general and for cognitive neuroscience in particular. These challenges are even greater when studying consciousness in real-world settings – ironically, precisely where subjective experience naturally emerges and unfolds. Although the literature on human consciousness outside controlled laboratory environments is still limited, there is growing recognition of the need for more naturalistic studies. This work provides a state-of-the-art review of cognitive neuroscience research on human consciousness conducted in

real-world or naturalistic contexts. The review is organised around four dimensions: 1. Cognitive processes examined: attention; awareness; naturalistic behaviours (e.g., navigation, social interaction, spontaneous decision-making); and phenomenal aspects (e.g., intentionality, temporality). 2. Experimental approaches: behavioural and neurophysiological measures, and neurophenomenological methods. 3. Technologies and tools: wearable neurotechnologies and mobile neuroimaging (EEG, fNIRS, mobile fMRI). 4. Limitations, challenges, and opportunities: robust data-collection in uncontrolled environments; integration of laboratory and real-world findings; and future directions for extending lab-based paradigms into naturalistic settings. Real-world neuroscience approaches are heterogeneous in aims and methods but converge on the goal of understanding cognitive functions as they occur naturally. Studies in real-life contexts can reveal mechanisms and influences (e.g., stress, social context) that are difficult or impossible to replicate in the lab. Recent advances in portable neurotechnologies, mobile neuroimaging, and innovative experimental designs now enable researchers to investigate brain activity and conscious processes during dynamic, everyday behaviours. New methodological and theoretical frameworks are needed to bridge lab-based and real-world cognitive neuroscience studies, providing complementary insights into how conscious experience emerges. Disclosure: ChatGPT was used to identify and correct typos and to suggest organizational and phrasing improvements for clarity and readability.

P4.45 | Investigating the Contribution of Alpha and Theta Oscillations to Predictive Coding in Visual Perception With tACS

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Perception relies on predictions to efficiently manage the constant input of sensory input. These predictions may be shaped by the rate at which information is sampled from the environment, a process supported by alpha-band (7-13Hz) oscillations, and by statistical learning (detecting and exploiting regularities), associated with theta-band oscillations (4-7Hz). To investigate this potentially dissociated role of neural oscillations in predictive coding using transcranial alternating current stimulation (tACS), 120 healthy participants performed a twoflash fusion task, judging whether one or two rapid flashes appeared on-screen, while implicitly learning the probability of 2-flash trials through contextual cues (low/equal/high probability) preceding the target stimulus. In two experiments, participants were assigned to different tACS protocols (each group, n=30). In the first one, alpha- tACS was applied bilaterally over parieto-occipital areas, at either 2Hz above (IAF+2) or below (IAF-2) the participant's individual alpha frequency. In the second experiment, theta-tACS (6Hz) was applied to the frontal midline. A common sham group (alternating the protocol placement) was collected for both experiments. Behavioral analyses of signal detection

measures did not support our initial hypotheses. Alpha-tACS was expected to produce protocol-dependent effects, with the IAF+2 protocol facilitating a faster sampling speed and thus higher sensitivity in detecting these targets, and IAF-2 reducing sampling speed and thus, lower sensitivity. However, sensitivity was reduced in both active alpha-tACS protocols as compared to the sham group. Theta-tACS, on the other hand, was expected to aid in the learning process, thus producing more sustained or quicker differences in response criterion to the different cue possibilities. While thetatACS did not accelerate learning, it sustained a more stabilized learning pattern as compared to the sham condition. Interestingly, accuracy data showed a hemifield-dependent detrimental effect of stimulation across both experiments: 2-flash accuracy was consistently lower in all active protocols (IAF+2, IAF-2, theta-tACS) compared to the sham group, exclusively for stimuli presented in the right hemifield. These unexpected results may be due to the increased cognitive load induced by simultaneously performing perceptual and learning tasks. Ongoing analysis of EEG data collected throughout both experiments may offer further insights into these findings.

P4.46 | The Effect of Learning and Distractors on Working Memory Performance in N-back Task

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Working memory (WM) – the ability to temporarily store and manipulate information – is influenced by various factors, including learning and background stimuli. Prior research shows that training on WM tasks can improve task performance (Studer-Luethi & Meier, 2021), while background distractors, particularly visual stimuli, can impair it (Turoman & Vergauwe, 2024) This study investigated how learning and background stimuli affect WM performance using the n-back task (Kane et al., 2007). Volunteer participants (n=149; mean age 28.28±7.79, 106 female) visited the lab twice. During each visit, they reported whether the current letter on the screen matched the one shown two positions earlier (2-back task) under three background types: no background (2-back0), auditory (2-backA), and visual (2-backV), with 2-back0 always first. Sensitivity (d') was calculated for each trial (Kane et al., 2007). It was hypothesised that performance would be poorest during the first 2-back0 due to initial learning effects, and poorest in 2-backV during the second, reflecting distractor effects emerging after learning. Results showed higher overall d' during the second visit, $F(1,92)=108.969$, $p<0.001$, $\eta 2=0.194$, indicating learning. A small effect of background type emerged, $F(2,184)=3.648$, $p=0.028$, $\eta 2=0.009$, along with a significant interaction between testing time and background stimuli, $F(2,184)=22.978$, $p<0.001$, $\eta 2=0.079$. Post-hoc tests showed that d' was lowest during the first 2-back0 but highest in the second, suggesting learning happening during the rest period. No significant difference between auditory and visual distractors was found during first ($p=0.069$) or second visit ($p=0.191$), indicating no domain-specific background effects.

When gender and age were added as covariates, the background effect (p=0.827) and interaction (p=0.184) lost significance, while age had a small but significant effect, $F(1,90)=4.464$, $p=0.037$, $\eta^2=0.034$. The findings suggest that learning occurs across sessions during the 2-back task, while modulates the impact of background stimuli on WM. This suggests that learning happens during high cognitive load WM tasks but background stimuli may be ignored. This abstract was edited and shortened with the assistance of ChatGPT, a language model developed by OpenAI (2025). References: Kane, M. J., Conway, A. R. A., Miura, T. K., & Colflesh, G. J. H. (2007). Working memory, attention control, and the n-back task: A question of construct validity. Journal of Experimental Psychology: Learning, Memory, and Cognition, 33(3), 615-622. https://doi.org/10.1037/0278-7393.33.3.615 OpenAI. (2025). ChatGPT (May 12 version) [Large language model]. https://chat.openai.com/ Studer-Luethi, B., & Meier, B. (2021). Is Training with the N-Back Task More Effective Than with Other Tasks? N-Back vs. Dichotic Listening vs. Simple Listening. Journal of Cognitive Enhancement, 5(4), 434—-448. https://doi.org/10.1007/s41465-020-00202-3 Turoman, N., & Vergauwe, E. (2024). The effect of multisensory distraction on working memory: A role for task relevance? Journal of Experimental Psychology: Learning, Memory, and Cognition, 50(8), 1220-1248. https://doi.org/10.1037/xlm0001323

P4.47 | A Two-stage Machine Learning Approach for Estimating Individual Alpha Frequency From Eeg Data

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Electroencephalography (EEG) is one of the primary tools used in neurophysiological research, offering valuable insights through frequency-based analyses of brain activity. EEG frequency bands – such as the alpha band – traditionally are interpreted using standard ranges derived from population-level data (e.g., alpha is typically defined as 8–12 Hz). However, individual brain function can significantly deviate from such standard ranges. For example, the individual alpha frequency (IAF), which marks a person's unique peak of alpha activity in the power spectrum, can vary substantially across individuals. Accurate identification of IAF is particularly crucial in such contexts as transcranial electrical stimulation (tES), where stimulation parameters must be tailored to individual neural characteristics in order to maximize efficacy and safety. Current methods for determining IAF include several automated algorithms. One of the most widely used approaches is the Philistine algorithm (Corcoran et al., 2018), which, despite its popularity, achieves accuracy of about 69% (Ociepka et al., 2022), which is relatively low. This level of performance limits its applicability in high-stakes or clinical settings. Motivated by the need for improved precision in EEG-based frequency analysis, we have initiated the development of a novel method for IAF detection. Our approach leverages machine learning tools, aiming to enhance both the robustness and the interpretability of IAF estimation. More specifically, our

novel method divides the IAF identification process into two phases: (1) approximate localization of the peak, (2) decision if the initial guess is indeed the alpha peak. The first phase is based on the derivative approximation combined with regression models. The second phase is based on the application of several classification tools, including difference operators and support vector machines. We evaluated our method on a dataset comprising 3-7 EEG recordings from each of 206 individuals. The algorithm achieved an IAF detection accuracy of 89%, significantly outperforming the Philistine algorithm, which reached 69% on the same dataset. Preliminary evaluations suggest that our method outperforms the Philistine algorithm in both accuracy and consistency across varied EEG datasets. This work contributes to the growing body of research advocating for individualized analysis in cognitive neuroscience and neuromodulation and has the potential to improve the effectiveness of brain stimulation protocols and other EEG-based interventions. This is the first iteration of our algorithm, and ongoing work aims to further refine its accuracy and reliability.

P4.48 | Neuroelectric Signatures of Social Evaluative Conditioning: Learning Socioaffective Preferences Toward Unfamiliar Individuals

Minah Chang (University of Trento); **Luciana Ciringione** (University of Trento); **Luca Ronconi** (University of Trento); **Andrea Caria** (University of Trento)

Human social behavior is fundamentally influenced by subjective interpersonal preferences. Social evaluative conditioning – an associative learning process – plays a central role in shaping these preferences by altering the affective value assigned to others[1]. Despite its significance, the neurobiological mechanisms underlying this process remain underexplored[2]. To address this gap, we conducted an EEG study examining how unfamiliar individuals acquire socioaffective value through verbal evaluative conditioning. We hypothesized that pairing neutral faces with rewarding verbal stimuli would increase their perceived attractiveness, valence, and arousal. Additionally, we expected such conditioning to modulate neurophysiological responses – specifically enhancing late positive potential (LPP) amplitudes and increasing left frontal asymmetry.In our two-day protocol, 42 participants underwent habituation and acquisition (Day 1) followed by a second acquisition and extinction phase (Day 2). Neutral facial images were paired with either rewarding (CS+) or neutral (CS−) video-recorded visual and verbal stimuli. EEG was recorded using a 27-channel Ag/AgCl cap based on the 10-20 system. Participants also completed psychometric assessments (BDI-II, STAI-Y, PANAS) to account for mood and affective traits.Repeated-measures ANOVA of behavioral ratings revealed significant main effects of CS type and time, as well as CS type and time interactions. Faces paired with rewards were rated as more attractive and emotionally positive post-conditioning. EEG analyses supported our hypotheses: LPP amplitudes were significantly larger, and left frontal asymmetry was more pronounced for CS+ compared to CS− faces. These findings prove that social evaluative conditioning modulates neural responses

associated with affective appraisal and approach motivation[3,4,5]. Our study contributes to understanding how verbal cues can shape interpersonal preferences and their neural underpinnings.

References:

[1] Levey, A. B., & Martin, I. (1975). Classical conditioning of human 'evaluative' responses. *Behaviour Research and Therapy, 13*(4), 221-226.

[2] Caria, A., & Dall'Ò, G. M. (2022). Functional neuroimaging of human hypothalamus in socioemotional behavior: A systematic review. *Brain Sciences, 12*(6), 707.

[3] Baeyens, F., Eelen, P., Crombez, G., & Van den Bergh, O. (1992). Human evaluative conditioning: Acquisition trials, presentation schedule, evaluative style and contingency awareness. *Behaviour Research and Therapy, 30*(2), 133-142.

[4] Hütter, M., Sweldens, S., Stahl, C., Unkelbach, C., & Klauer, K. C. (2012). Dissociating contingency awareness and conditioned attitudes: Evidence of contingency-unaware evaluative conditioning. *Journal of Experimental Psychology, 141*(3), 539-557.

[5] Kocsor, F., & Bereczkei, T. (2017). Evaluative conditioning leads to differences in the social evaluation of prototypical faces. *Personality and Individual Differences*, 104, 215-219.

P4.49 | Electrophysiological Underpinnings of Structure-based Interactions Across Memory Systems

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Lesion studies of the brain have made a strong case that the brain is organised in a modular fashion. For instance, hippocampal and entorhinal damage often leads to selective impairments, supporting a distinction between segregated sub-systems such as 'procedural' and 'declarative' memory. However, recent research suggests that these systems are more interconnected than initially thought. Implicitly learned motor sequences can facilitate word-list learning if the two tasks share a common/congruent abstract structure, while incongruent structures lead to impaired task performance. This suggests that abstract sequence representations may support a mapping mechanism that enables crossdomain generalization. Further evidence implicates the motor network in applying this mapping and in actively contributing to information transfer from procedural to declarative memory systems. To investigate the neural basis of this structure-based interaction, we recorded magnetoencephalography (MEG) data while human participants performed a serial reaction time (SRT) task followed by a wordlist-learning task. Participants were assigned to either a 'congruent' group, in which both tasks shared an abstract structure, or an 'incongruent' group, where the structures differed. We analysed neural activity during task performance, as well as across recurring rest-periods. This allowed us to characterize both the online and off-line neural dynamics throughout learning and transfer. Our work contributes to a more integrated understanding of memory systems, suggesting

that rather than operating in isolation, these traditionally segregated networks can share complex serial information through mappings that facilitate generalization across different cognitive domains.

P4.50 | Sensorimotor Predictions Dynamically Modulate Somatosensory Perception During Movements to Self-touch

Noa Cemeljic (Karolinska Institutet); **Xavier Job** (Karolinska Institutet); **Konstantina Kilteni** (Karolinska Institutet)

Self-touch feels less intense than an identical touch delivered by another person or a robot. This distinction between self- and external touch is thought to arise because the brain predicts the somatosensory consequences of voluntary movements using the copy of the motor command. Currently, it remains unclear how these sensorimotor predictions impact somatosensory perception before or after self-touch occurs. We addressed this in a series of behavioural experiments across two studies. The participants performed a force-discrimination task while moving their right hand to touch their left hand – in every trial, they received two forces on their left index finger and had to respond which one was stronger. Depending on the trial group, the first force was delivered at different times during the movement, while the second force was delivered after the movement had ended. We fitted the participants' responses with the psychometric curves for each trial group, extracted the points of subjective equality, and compared them between different trial groups. First, we showed that somatosensory perception on the left hand was attenuated proportionally to the predicted time of self-touch. During the movement, tactile stimuli were perceived gradually weaker as the movement progressed, reaching their lowest perceived intensity at the time of self-touch. After the movement ended, the perceived intensity returned close to baseline levels. Second, we demonstrated that sensorimotor context plays a crucial role in forming predictions that attenuate self-touch. When the reaching movements did not generate expectations of self-touch, no gradual attenuation of somatosensory perception was observed, underscoring the predictive nature of somatosensory modulation during movements leading to self-touch. Third, our new results indicate that visual input significantly contributes to the formation and updating of sensorimotor predictions about the timing of self-touch. When participants could use their vision while moving to touch their own hand, the somatosensory perception was again gradually attenuated during the movement, reaching the peak attenuation at the time of self-touch. However, this temporal tuning was diminished when movements were performed without vision, with somatosensory perception being uniformly attenuated throughout the movement and at the moment of selftouch. Our findings thus suggest that multiple sensory modalities contribute to the predictive mechanisms responsible for self-touch attenuation.

P4.51 | Remote Gamified Assessment of the Impact of Parkinson's Disease on Attention

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Parkinson's disease (PD) may affect both motor and cognitive functions, including attention. While prior research has examined PD's impact on spatial attention, it often focused on isolated attentional functions or specific cueing formats. Our study aims to address this gap by providing a comprehensive examination of the key functions of attentional orienting, executive function, and alerting. We assessed how exogenous and endogenous orienting cue modes influence PD patients' visuo-spatial attention, including dorsal attention network orienting benefits, ventral attention network re-orienting costs, response switching (RS), alerting abilities, and inhibition of return (IOR). 111 PD patients and 82 healthy controls (HC) performed a remotely conducted, computerized ecological task, a modified version of the Attention Network Test. This paradigm simultaneously assessed alerting, orienting benefits, re-orienting costs, and RS in endogenous and exogenous cueing modes, and IOR in the exogenous conditions only. PD patients exhibited a significant deficit in orienting benefits under endogenous cueing, while re-orienting costs did not differ between groups. They also showed significantly greater RS costs than HCs under exogenous cueing, whereas endogenous-driven RS processes remained intact. No group differences were observed in IOR or alerting efficiency. To conclude, our findings indicate that PD does indeed impact the attention system, but the effects are selective and complex. Although PD patients did not experience a heightened cost of re-orienting, nor did PD impair their alerting network or IOR, our results reveal the selective and complex nature of PD's impact on the attention network, highlighting specific vulnerabilities. On one hand, PD patients showed a low benefit in orienting their attention in response to endogenous cues, where there is an additional internal cognitive processing requirement. This suggests that fundamental abilities for selective attention are not necessarily impaired in PD, but the disease becomes more evident only when additional processing demands are present in the task. On the other hand, under exogenous, more reflexive conditions, PD patients exhibited a heightened response-switching cost, suggesting a reduced capacity to effectively utilize external cues. This reflects challenges to rapidly adapt to changing task demands in more automatic and reflexive scenarios.

P4.52 | Age-related Differences in Neural Mechanisms of Credit Assignment During Decision Making

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Previous research indicates that younger adults (YAs) flexibly use Model-Free (MF) and Model-Based (MB) strategies to solve the credit assignment (CA) problem, which involves linking outcomes to specific actions. Older adults (OAs), however, tend to rely more on the less resource-intensive MF learning strategy. The changes in CA abilities with age and the neural mechanisms behind these changes remain unclear. In this study, 11 younger (20-35 years) and 12 older adults (65-74 years) participated in a dual-bandit decision-making task (Moran et al., 2019) while their electroencephalography (EEG)signals were recorded. After learning a deterministic transition structure with 100% accuracy, participants completed 504 trials where uncertainty was introduced to examine the interplay between model-based (MBCA) and model-free credit assignment (MFCA) with partially observed outcomes. Specifically, in one-third of the trials (uncertainty trials), participants observed ambiguous outcomes and inferred the secretly chosen bandit based on the learned structure, while in the remaining (standard) trials, complete outcome information was provided for value updating. Results revealed that both age groups performed above chance and demonstrated significant learning over time. A generalized linear mixed effect model (GLMM) examining choice preference in the standard trials for the previously chosen or rejected bandit in the uncertainty trials revealed that only YAs' choices were strongly influenced by previous rewards from the informative outcome, suggesting involvement of retrospective model-based (MB) guidance in MFCA for younger but not older adults. Computational modeling confirmed contributions from MFCA and MBCA in both groups, with YAs relying more heavily on MBCA compared to OAs. ERP and time frequency analyses of the outcomes phase suggest that both groups had similar neural responses, yet Yas exhibited greater differentiation between rewarded and unrewarded outcomes than older adults, which echoes the behavioral findings. Overall, our results provide preliminary evidence for CA ability change during healthy aging.Future analyses will explore the relationship between behavior, modeling parameters, and neural activity to further clarify these age-related changes in credit assignment.

P4.53 | The Influence of Temporal Context on Vision Over Multiple Time Scales

Reuben Rideaux (The University of Sydney); **Kacie Lee** (The University of Sydney)

Past sensory experiences influence perception of the present. Multiple research subfields have emerged to study this phenomenon at different temporal scales. These phenomena fall into three categories: the influence of immediately preceding sensory events (micro), expectations established by short sequences of events (meso), and regularities over long sequences of events (macro). In a single paradigm, we examined the influence of temporal context on perception at each scale. By integrating behavioural, electroencephalographical, and pupillometry recordings, we identify two distinct mechanisms that operate across all scales. The first is moderated by attention and supports rapid motor responses to expected events. The second operates independently of task-demands and dampens the feedforward neural responses produced by expected events, leading to unexpected events eliciting earlier and more precise neural representations. We further show that perceptual recall of sensory events exclusively reflects neural representations during this initial feedforward stage and that recall biases towards previous events (serial dependence) is explained by expectation of sensory stability over time.

P4.54 | The Physiological Impact of the Whole-body Kinesthetic Illusion During Observation of Avatar Walking on Spinal Reflex Excitability

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We demonstrated that the body segmental kinesthetic illusion exerts its effects not only on the brain but also on the spinal level motoneuron excitability. The purpose of the present study was to examine the hypothesis that full-body avatar walking can induce a whole-body walking illusion and influence spinal reflex excitability. The

study's participants were comprised of 17 individuals who met the following criteria: no history of neurological or muscular disorders, a mean age of 24.06 years, and a standard deviation of 3.97 years. The protocol was explained to the participants, who then provided written informed consent. The avatar walking was displayed on the HMD. In the control condition, participants' spinal reflexes were recorded while observing a full-body avatar walking using virtual reality alone. In the experimental condition, a motion capture device was utilized to synchronize the participants' motions with a full-body avatar in real time. Subsequently, the spinal reflex was repeatedly recorded while observing a full-body avatar walking. In both conditions, the participants observed the avatar walking for a duration of five minutes in each walking phase, with a total observation period of 20 minutes across the four phases. The electrical stimulation was set randomly for each avatar walking phase as follows: midstance, toe-off, mid-swing, and heel contact. It was directly applied immediately before the movement of the phase. The subjective perception of the avatar was measured using a 7-point Likert scale. The H-reflex amplitude indicated a significant interaction between phase and condition ($p = 0.031$). A post-hoc Bonferroni correction revealed a significant difference between the heel contact and toe-off phases, but only in the experimental condition. Specifically, an increase in H-reflex amplitude was observed during the toe-off phase ($p = 0.014$). Positive correlations were identified between the intensity of the walking illusion and the H-reflex amplitude in the toe-off phase within the experimental conditions ($p=0.025$; $r=0.542$). The present study demonstrated that the spinal reflex excitability undergoes changes depending on the walking phase in the presence of a walking illusion. Furthermore, the results revealed that full-body avatar walking has the capacity to induce a whole-body walking illusion and affect spinal reflex excitability.

P4.55 | Neural Correlates of Experience in Rhythm Interaction

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Synchrony to music arises naturally within and between individuals, offering benefits for affect, perception, and health. Understanding its underlying mechanisms and subjective experience can enhance medical and entertainment applications. While neuroscience has advanced our understanding of rhythm interaction through internal brain representation and computational perception models, these commonly rely on passive listening paradigms. Given the central role of active participation and experience in rhythm and music interaction, this reduces ecological validity. To address this, the present study investigates markers of neural entrainment during an active synchronisation paradigm, assessing their ability to predict subjective experience. Participants performed rhythms of varying complexity (waltz, march, and

polyrhythms), synchronising with a human partner or metronome, and rated their experience across dimensions such as flow, arousal, and pleasure. Neural features, including spectral magnitudes, autocorrelation, and band-based power modulations, were analysed as entrainment markers and correlated with subjective experience. Results indicated partner realism significantly impacted experience, with human-based interactions eliciting higher flow than metronome-based ones. Neural entrainment reflected heard and performed rhythms and effectively distinguished between simple and complex beat patterns. Spectral features (FFT and autocorrelations) showed promise in predicting flow, surpassing behaviour-based models. However, models leveraging statistical properties of band activity (e.g., relative power and differential entropy) still outperformed entrainment-based predictors. These findings underscore the value of neural entrainment in characterising active rhythmic interactions and predicting subjective ratings, warranting further investigation in larger, ecologically valid paradigms.

P4.56 | Exploring the Influence of Motor Effort on Perceptual Decision-making

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Motor actions play a fundamental role in decision-making, with recent evidence suggesting that motor demands can shape both the dynamics of decision formation and the final choice. However, the consequences of motor demands on perceptual decision processes remain largely unknown. This study aims to investigate how motor effort influences perceptual decision-making, examining whether its effects emerge early in the process or evolve over time, and whether they introduce biases, such as a preference for lower-effort responses. We hypothesize that changing the motor effort required in reporting a decision might lead to strategic adjustments to decision process parameters, and that these adaptations may depend on the speed and pressure involved. For example, decision making may be more cautious in conditions where very low effort is required and there is a risk of executing unintentional responses. Moreover, we predict that when participants are introduced to conditions requiring differing levels of force, they may develop a bias toward lower-effort options, which, in line with previous research, could persist even when force demands are equalized in a post-testing phase. To test these hypotheses, we employ a two-session experimental design using a 2AFC perceptual task. In the first session, participants make perceptual judgments (i.e., identify tilt direction) while exerting high or low force under varying contrast and urgency conditions. In the second session, we investigate motor effort biases by requiring different force levels for each hand. We collect electrophysiological data (EEG and EMG) along with the force applied. We will examine EEG decision formation signals aligned with both stimulus onset and the initiation

of decision commitment, as measured by EMG onset latency. Combined with behavioural data, these EEG signatures will provide insight into the nuanced interactions between motor effort and perceptual decision-making. This work was funded by the European Research Council Starting Grant MYODECISION (101077772).

P4.57 | Neuropsychophysiological Correlates of Compassion Towards Others: A tDCS Study

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Background and objectives: Compassion involves sensitivity to the suffering of others and oneself, along with the motivation to alleviate it. Neurophysiological studies show activation in areas such as the left inferior frontal gyrus (lIFG), anterior insula (AI), and left supplementary motor area (lSMA), accompanied by physiological changes like reduced heart rate variability (HRV). Transcranial direct current stimulation (tDCS) has been used to modulate AI activity during compassion processing, although its effects on subcortical regions are indirect. Despite growing interest, important gaps remain in understanding the neurophysiological correlates of compassion. To address this, we aim to investigate and modulate the neuropsychophysiological and behavioural correlates of compassion toward others, focusing on its two dimensions: sensitivity to suffering and motivation to alleviate it. Methods:

A randomized, double-blind, controlled study is being conducted with 93 participants assigned to one of four groups receiving anodal or sham tDCS over the lIFG or lSMA while watching a compassion-inducing video. Data on subjective experience, psychophysiology (HRV, SCR, SCL), and neural activity are collected at baseline and post-stimulation via high-density functional near-infrared spectroscopy (HD-fNIRS). We hypothesize that anodal tDCS over the lIFG during compassion induction will enhance sensitivity to suffering, as reflected in neural activity, HRV, skin conductance response (SCR), skin conductance level (SCL), and self-report, compared to stimulation over the lSMA and sham. Conversely, we expect anodal tDCS over the lSMA to enhance motivation to help, indicated by the same measures. For statistical analysis, SCL/SCR, HRV, and HD-fNIRS data will be preprocessed using Ledalab, Kubios HRV, and the DOTHUB toolbox, respectively. Generalized linear mixed models (GLMM) will assess primary outcomes, with stimulus type as the within-subject factor and tDCS group as the between-subject factor. Moderation analyses will explore secondary hypotheses involving baseline measures and outcomes. Expected results: Exploring targeted neuromodulation approaches may lead to therapeutic strategies in disorders where compassion is limited, such as personality disorders. These results will help to develop new compassion-based interventions in clinical contexts and promote well-being in non-clinical populations.

P4.58 | Neural Signature of Chronic Pain in Temporal Summation of Second Pain: Modulation by Cognitive Processes

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The functional status of pain perception and modulation pathways has been explored using quantitative sensory testing paradigms (QST; Arendt-Nielsen, 2015), such as temporal summation of second pain (TSSP; Price et al., 1977). Chronic pain patients show deficient pain modulation, such as hyperalgesic reactions or longer persistence of pain, that can be observed with TSSP paradigms (O'Brien et al., 2018). In addition, previous studies have shown that engaging in cognitive tasks decreases the TSSP phenomenon in healthy participants, with changes in the power spectral density of the EEG (PSD, Rubal-Otero et al., 2024). However, it is not clear how the

TSSP effect might be modulated by cognitive processing in chronic pain. In this work, we recorded EEG activity of a sample of 28 chronic pain patients and 28 healthy controls (age 25-65 years) during a TSSP paradigm consisting of trains of 12 heat stimuli applied over the hand. The TSSP paradigm could be presented alone ("attention to hand" condition) and in combination with a 2-back working memory task ("2-back" condition). We will compare the EEG power spectral density in the theta, alpha and beta frequency bands to heat painful stimuli in both groups for both conditions. Given that chronic pain patients show alterations in modulatory nociceptive mechanisms, we hypothesize that TSSP in chronic pain patients will show a distinct PSD signature and different cognitive modulation of EEG during painful stimuli than healthy controls. Exploring the neural signature of pain perception in a TSSP paradigm in chronic pain, and how cognitive processes modulate it, may contribute to the understanding of supraspinal influences on nociceptive modulatory mechanisms in chronic pain populations, with application to the design of intervention strategies for these patients.

P4.59 | Investigating the Impact of Cognitive Stress on Heartbeat-evoked Potentials and Respiratory Modulations

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Stress is a multifaceted phenomenon that disrupts bidirectional communication between the brain and body. Its interaction with interoception – our ability to sense internal bodily signals – also relies on this dynamic exchange, yet the mechanisms underlying their interplay remain unclear. A well-established method to assess cardiac interoception at the cortical level is the Heartbeat-Evoked Potential (HEP), whose amplitude increases when attention is focused on interoceptive signals compared to exteroceptive controls. Recent evidence shows that HEPs are modulated by respiratory phase during interoceptive tasks, with higher amplitudes during exhalation than inhalation. This modulation (ΔHEP) is proposed to reflect enhanced interoceptive attention during exhalation and may serve as a physiological marker of optimized cardiac interoceptive processing. This study investigates whether acute mental stress alters HEP amplitude and whether respiratory-phase-related enhancement of interoceptive attention is preserved following stress. Thirty healthy adults completed two counterbalanced sessions (stress and control). Each session included a pre- and post-stress-induction interoceptive task, requiring participants to silently count their heartbeats. The stress session involved a cognitively demanding arithmetic task; the control task had minimal cognitive load. Continuous EEG, ECG, respiration, and

salivary cortisol were recorded during both sessions. Heart rate variability (HRV) was extracted from ECG signal to verify stress induction, confirmed by significant HRV reductions. In a further anaysis HEPs will be computed by averaging the EEG epochs around 300-600 ms after the ECG R-peaks over a cluster of fronto-central electrodes. Respiratory phases will be identified from the respiration signal to compute HEPs specific to inhalation and exhalation. ΔHEP will be calculated for each participant by subtracting mean HEP amplitude during inhalation from that during exhalation. To our knowledge, this is the first study to examine respiratory-phase-dependent modulation of HEPs in the context of acute stress. We hypothesize that stress will reduce HEP amplitude during the post-stress interoceptive task, indicating disrupted cortical processing of cardiac signals. We further aim to assess whether the exhalation-related optimization of cardiac interoceptive attention (ΔHEP) remains intact following stress.

P4.60 | How and When do Expectations Shape Sensory Processing?

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Predictive processing theories propose that the brain continuously generates expectations about incoming sensory information and compares these predictions to actual inputs, resulting in sensory prediction errors. However, the level of abstraction at which the visual system predicts stimulus features, and the time at which those predictions shape perceptual processing, remain unclear. Here, we recorded EEG while participants viewed object images that were either expected or unexpected based on probabilistic cues. Using a deep neural network, we quantified low-level and high-level visual surprise elicited by the images. Single-trial ERPs were then regressed onto these surprise scores, allowing us to test when and which kind of visual surprise drives sensory prediction errors. Results showed a significant modulation of evoked activity over occipital electrodes approximately 200ms after stimulus onset by high-level, but not low-level, visual surprise. High-level visual predictions are thus rapidly integrated into visual processing, suggesting that the brain tends to abstract away from low-level details and instead leverages high-level priors to optimize sensory processing.

P4.61 | Differences in Sensorimotor and Respiratory Synchronization between Individuals with High and Low Schizotypy: Effects of Social Bias and Stimulus Predictability

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Social interactions rely on alignment of actions, emotions, and mental states between individuals, a process supported by physiological synchronization. This capacity to synchronize is shaped by contextual factors and is enhanced when external signals follow predictable temporal patterns. This study investigates how schizotypal personality traits are linked to sensorimotor and respiratory synchronization abilities and the role of social bias and stimulus predictability on these abilities. Forty-six healthy adults, stratified into high and low schizotypal groups via Schizotypal Personality Questionnaire scores, performed two tasks: a sensorimotor synchronization task (finger taps to a flashing visual cue) and a respiratory synchronization task (breathing to an expanding – contracting visual signal). Although participants believed they were interacting with another subject, all stimuli were pre-generated to control inter-stimulus intervals and respiratory cycle variability across subjects. Each task comprised two within-subject manipulations: predictability, in which stimulus sequences were either highly or poorly temporally predictable, and social bias, in which participants were led to think they were paired with an ingroup versus an outgroup partner. Physiological signals (EEG, ECG, respiration) were recorded during baseline and throughout each task. Synchronization performance is quantified via inter-tap interval variability, asynchronies for sensorimotor synchronization and phase-locking value, relative phase, and percentage of in-phase occurrences for respiratory synchronization. Brain – body interactions will be assessed by computing the mutual information rate between frontal EEG band-specific power and autonomic signals (ECG and respiration). We will use Linear mixed-effects models to evaluate the effects of Group, Condition, and their interactions on synchronization performance. Moreover, we will assess the role of brain-body interactions on synchronization performance across tasks and conditions. We hypothesize that high schizotypal individuals will exhibit reduced synchronization performance compared with low schizotypal individuals, with this disparity increasing in low-predictability condition. We expect that outgroup social bias will diminish synchronization performance, with a more evident impact in low schizotypal participants. Finally, we predict that stronger brain – body coupling will correlate with better synchronization. This study aims to extend our understanding of how synchronization abilities vary across the schizotypal spectrum and how both temporal predictability of the stimuli and social context influence these abilities.

P4.62 | Specification of Attentional Deficit in Attention Deficit/hyperactivity Disorder (adhd)

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Attention deficit/hyperactivity disorder (ADHD) is considered as one of the most common developmental disorders diagnosed in childhood. As the name implies, children and adolescents with ADHD are known to have attentional deficits, but what is less clear is the type of attentional processes that are particularly affected. Indeed, attention is not a unitary phenomenon, but it is a multifaceted construct supported by multiple brain processes such as voluntary and involuntary attention. However, the different facets of attention have been rarely simultaneously investigated in ADHD. The Competitive Attention Test allows to study the balance between voluntary and involuntary attentional processes, and to simultaneously measure different facets of attention, such as voluntary attention orienting, distraction, sustained attention, and impulsivity, as well as phasic arousal. This study aimed to specify the attentional deficits in children and adolescents with ADHD using the Competitive Attention Test. The performance of 25 children and adolescents with ADHD were compared with those of typically developing (TD) peers previously tested and included in a normative database. The data show that children and adolescents with ADHD present a slower processing speed, a reduced correct responses rate and a larger reaction time variability, compared to TD peers. However, they managed to maintain the balance between voluntary and involuntary attentional processes, speaking for no difference in distractibility. Moreover, ADHD patients commit more random responses and responses to the cue, as well as a larger increase in phasic arousal to the distracting sounds. Based on the norepinephrine's dual role in both boosting arousal and selectively amplifying high-priority stimuli, these behaviors could be explained by an impaired norepinephrine regulation in patients with ADHD. This work shows that patients with ADHD suffer rather from sustained attention deficit and enhanced impulsivity than from increased distractibility, which could be associated to a dysregulation of arousal.

P4.63 | Validation of the Korean Moss Attention Rating Scale in Traumatic Brain Injury: Reliability and Validity

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Objective: Attention deficits are common and disabling across all severities of traumatic brain injury (TBI), yet standard neuropsychological tests often fail to capture their real-world manifestations. The Moss Attention Rating Scale (MARS) was developed to address this gap as an ecologically valid, observer-rated tool. This study aimed to translate and validate the Korean version of the MARS (K-MARS), establishing its reliability and validity for clinical and research use in Korean TBI populations. Methods: A prospective single-center study was conducted in a Korean inpatient rehabilitation setting. Fifty-one TBI patients completed the K-MARS, along with standardized cognitive and psychological assessments including the KMMSE, K-MoCA, Trail Making Test, Digit Span Test, Auditory CPT, BDI, BAI, PSQI, and CNT. Forty participants completed a second K-MARS assessment 1-2 weeks later for test–retest analysis. The K-MARS was translated following international guidelines for cross-cultural adaptation. Psychometric properties were evaluated through Spearman's correlations (for convergent/discriminant validity), Cronbach's alpha (for internal consistency), and intraclass correlation coefficients (for test–retest reliability). Results: The K-MARS demonstrated high internal consistency (Cronbach's $\alpha = 0.870$) and excellent test–retest reliability (ICC = 0.976 for total score; >0.93 for subscales). Convergent validity was supported by significant positive correlations with cognitive measures (e.g., K-MMSE, Digit Span, Auditory CPT) and negative correlations with indices of cognitive dysfunction (e.g., GDS, TMT times). Discriminant validity was confirmed by weak or non-significant associations with mood and sleep measures (e.g., BDI, BAI, PSQI). Among its subscales – Restlessness/Distractibility, Initiation, and Sustained/Consistent Attention – the Initiation and Sustained Attention domains showed minimally acceptable internal consistency. Conclusion: The Korean version of the MARS (KMARS) is a psychometrically sound tool for evaluating attention-related behaviors in TBI patients. Its strong reliability and validity support its use in both acute and subacute rehabilitation settings, providing a standardized, ecologically valid alternative to traditional cognitive testing. The K-MARS enhances clinical decision-making, interdisciplinary communication, and patient-centered care by capturing subtle behavioral

indicators of attentional functioning. Future studies should expand validation efforts across multiple centers and rater types to confirm broader applicability.

P4.64 | Do EEG Alpha-band Traveling Waves Encode Sensory Evidence and Prior Expectations in a Motion Judgement Task?

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Recent studies have demonstrated that alpha-band oscillations in the EEG are spatially organized as traveling waves. The propagation direction of these waves is typically bimodal and oriented along the occipital-frontal axis, with forward waves more prominent during visual processing and backward waves dominating at rest and during active inhibition of visual input. Previous modeling and simulation efforts suggest that the waves represent long-range cortical communication along the visual hierarchy. More specifically, it has been proposed that the two directions are functionally distinct, with forward and backward waves representing network states in which bottom-up and top-down communication are dominant, respectively. However, this link is supported by largely correlational evidence and remains to be established experimentally. Here, we test this hypothesis in a visual decision-making task. Observers were asked to indicate the direction (left/right) of a moving random-dot pattern simulating downward motion tilted to either direction. Before each trial, a cue indicated the probability of the correct response. In a 3 x 3 design, we independently varied the reliability of sensory evidence (motion coherence) and prior expectation (cue's probability) across trials. Our behavioral results show that observers combine the two information sources as expected, as demonstrated by the modulation of response accuracy and reaction times. Preliminary EEG results reveal that alpha traveling waves are more forward-directed during the coherent motion and suggest that oscillatory amplitude in this state encodes the amount of sensory evidence between conditions. In contrast, backward waves do not show the hypothesized modulation by the cued probability. Based on the final results, we will fit a dynamical evidence accumulation model to the behavioral data for each observer to correlate forward and backward waves with individual decision parameters. We expect that our findings will provide significant evidence of how scalp-level traveling waves should be interpreted. A possible functional dissociation of forward and backward waves could also inform future dynamical models explaining their cortical generation.

P4.65 | Exploring Pre-attentive Neural Markers of a Natural Tempo Preference in Auditory Rhythmic Processing

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Humans can efficiently adjust their temporal attention with the beat of incoming auditory sequences across a range of various tempi. When this incoming auditory information is presented at a rate of ~1.5Hz, recent studies have shown that human participants achieve a higher task accuracy than when presented at slower or faster tempi. This holds for a large variety of auditory discrimination and detection tasks (beat discrimination, higher-pitch tone or syllables, longer tones, …, see Gupta et al 2024 , Zalta et al 2020). To better understand the neural basis of these behavioral findings, we propose to investigate whether this natural tempo preference arises independently of task demands and may originate in early stages of auditory processing. Specifically, we aim to systematically assess the influence of tempo on pre-attentive neural markers of auditory processing: the N1 and the mismatch negativity (MMN). Although prior research on event-related potentials (ERPs) has examined the effect of stimulus-onset asynchrony (SOA) on ERP amplitudes, most studies have used only a limited number of SOA conditions (typically 2 or 3), preventing a fine-grained analysis of the relationship between tempo and ERP amplitude or latency. In the present study, we designed a classical passive auditory oddball task (deviant probability p = 0.10) varying the presentation tempo across 5 conditions (tempo: 0.84Hz, 1.05Hz, 1.40Hz, 2.10Hz or 4.20Hz). Neural activity of 25 healthy human participants was recorded using 64-channel EEG while participants were asked not to pay attention to the sounds and watched a silent movie. Preliminary results show that the amplitude of the N1 in response to standard (and deviant) sounds follows a linear relationship with tempo – longer SOAs yield larger N1 amplitudes, while shorter SOAs result in reduced amplitudes – consistent with physiological recovery cycles in auditory neurons. We hypothesize that the MMN amplitude will exhibit a non-linear relationship with tempo, providing a first indication of why periodic temporal attention operates most efficiently around 1.5 Hz.

P4.67 | Interplay of Predisposition and Plasticity in Musical Skill Acquisition

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Our ability to acquire new skills depends on the brain's initial state and its capacity to adapt during learning. Predisposition refers to the innate characteristics or pre-existing neural states that shape readiness to learn, while neuroplasticity reflects the brain's ability to reorganize in response to learning and experience1-3. The interplay of these two factors may explain individual variability in learning abilities and outcomes and generalization to related domains of expertise. This study identifies neural patterns associated with predisposition and neuroplasticity, examining their shared and unique contributions to skill acquisition. Eighty musically naïve adults learned to play Beethoven's Für Elise over four piano training sessions, using an in-house software designed for a gradual learning process with objective performance measurements. Participants underwent functional magnetic resonance imaging (fMRI) scans before and after completing the training routine, in which they listened to learned and unlearned melodies and musical instruments. A voxel-wise GLM was conducted to detect changes in neural responses following training. Significant learning-induced increases in activation were found in the premotor cortex, supplementary motor areas, middle temporal gyrus, and intraparietal sulcus ($p<0.05$, FDR corrected), primarily when participants listened to the learned stimulus - Für Elise on piano. However, a significant increase was also evident in response to Für Elise on other instruments, suggesting that the expertise acquired generalized beyond the original instrumental context while remaining tied to the melodic context. Moreover, we trained Brain-based set (BBS) models4 to predict participants' behavioral performance scores from pre-training neural activity during passive listening, demonstrating the ability of neural predispositions to predict learning outcomes. Pre-training scans predicted performance scores during training (correlation of predicted and actual accuracy scores: $r=0.32$, $p<0.01$). Next, we trained BBS classification models to distinguish between neural responses pre- and post-learning across various auditory conditions. Classification accuracy was highest for activation maps in response to the learned context ($AUC=0.82$, $p<0.05$). Finally, we measured the overlap between each model's top contributing brain regions to examine the dynamics between predisposition and plasticity processes. We found a relatively low overlap (Dice index=0.22), suggesting distinct roles for predisposition and neuroplasticity in shaping skill acquisition and learning outcomes.

P4.68 | Salience, Similarity & Search Modes: Deconstructing the Distractor Positivity Component and the Encephalographic Signatures of Distraction

Dock H. Duncan (Vrije Universiteit Amsterdam); **Dirk van Moorselaar** (Vrije Universiteit Amsterdam); **Jan Theeuwes** (Vrije Universiteit Amsterdam)

Since its first reporting in 2009, the distractor positivity component has become a paradigm measure of distraction in visual search. Measured in the contralateral electrodes using electroencephalography, this component has come to represent the initial capture, and subsequent suppression, of distracting input in a visual array; with

its modulations often used to make grand claims about the human mechanisms of distractor handling. However, several fundamental questions remain open about this component and its interpretation. Most critically, it has never been comprehensively demonstrated how this component changes in response to more- or less-distracting stimuli, nor how the nature of the search task itself changes the shape and behavior of the positivity. In a series of experiments, we show that the distractor positivity displays markedly different behaviors depending on the salience of the distractor, as well as the participants current task set. Aside from supporting a dissociation of the early and late variants of this component indexing salience detection and suppression respectively, we also note the interaction of the distractor-evoked N2pc significantly influences the positive components signature during singleton search mode. Further multivariate decoding demonstrates that distractor processing effectively mirrors speeded target processing in salience detection mode, but not in feature search. Together, these results elucidate the ERP signatures of suppression under various conditions, as well as inform the fundamental differences in encephalographic signatures of feature- versus singleton guided search.

P4.69 | Developing a Predictive Coding Task for Social Cognition: A Tool for Investigating Individual Differences in Prior-sensory Integration

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Existing predictive processing paradigms primarily focus on visual or sensorimotor tasks. While some attempts have extended predictive models to the social domain, they often rely on low-level visual predictions that do not sufficiently engage higher-order mentalizing processes. As a result, these tasks may fall short in capturing predictive processes relevant to social cognition, such as those involved in the mentalizing system and affective inference. An imbalance in these mechanisms is proposed to underlie social deficits observed in disorders such as autism and schizophrenia – both marked by impairments in social functioning. To address this, we propose a task that targets the mentalizing network to investigate predictive coding in social cognition. Predictive processing accounts suggest that humans integrate prior expectations and sensory input to make perceptual inferences, with individual differences – ranging from "prior-prone" to "sensory-prone" – shaping social functioning. Our task assesses predictive flexibility, defined as the ability to shift reliance between priors and sensory input depending on their relative precision. Participants first see a prior

image that conveys the nature of the relationship between two characters – either certain (positive or negative) or uncertain (neutral). This is followed by a scenario panel depicting a cartoon-based social situation involving those characters. Based on this context, participants answer a yes/no question targeting the mentalizing network (e.g., "Will she help him?") and rate their confidence. The outcome is then revealed through a target image, presented either clearly or with visual masking to reduce sensory precision. Participants respond to the same question again, providing a second confidence rating. By systematically manipulating the precision of both priors and sensory input, the task allows us to track how individuals integrate these sources to make social predictions. We expect group and individual differences in the extent to which priors or sensory evidence dominate under uncertainty. Future studies will examine whether the task can distinguish between neurotypical individuals and populations with atypical social functioning – such as those with autism or schizophrenia – by revealing group differences in reliance on priors versus sensory input. Rather than relying on symptom-based categorizations, this paradigm supports a trait-based approach to assessing predictive styles in social cognition and can be adapted for EEG, fMRI, or behavioral methods.

THURSDAY 18/09

10:45 POSTER SESSION 5 P 5.1 – 5.69

P5.01 | Externally Imposing Temporal Coding Dynamics: A Closed-Loop EEG Phase--Stimulation Study

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The theta-gamma code hypothesis suggests that the brain encodes different neuronal representations by assigning each neuronal group a preferred firing phase within a theta cycle. This phase carries item-specific information and influences perception. However, it is unclear what determines a group's preferred firing phase. The aim of this study was to present target items in a paired associate learning task at one of two theta phases, such that participants would implicitly learn that target presentation is coupled to specific theta phases. We here validate the reliability of presenting visual targets at specific theta phases. Further, we hypothesized that targets learned at a particular phase would be recognized better if they were presented at that phase during memory testing. To this end, we utilize a closed-loop EEG system with a paired associate learning task. We read out participants instantaneous mid-frontal

theta oscillations and predicted theta phase in real-time by using an autoregressive model, which allowed us to present a visual target on a specific phase during a learning period, establishing implicit phase-target associations. We validate our methodological approach of phase-dependent visual stimulus presentation and show that forward prediction of an ongoing EEG signal using an autoregressive model allows for reliable visual stimulus presentation at a desired target phase of ongoing midfrontal theta oscillations. Our methodological approach was being successfully implemented. Our behavioral analysis did not yield the expected effect of oscillatory phase serving as neuronal mnemonic marker.

P5.02 | Disentangling Neural Networks for Statistical Learning and Rule Generalization

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An essential aspect of language acquisition involves identifying rules embedded within words and phrases. Such rules often rely on sequential co-occurrences between elements (e.g., "These cupcakes are unbelievable"), making the tracking of statistical relationships between non-adjacent dependencies crucial. Prior research has shown that this process is supported by a ventral fronto-parietal network. As learning progresses, rules can be consolidated, abstracted, and transferred to new contexts; however, generalization fails when the left parietal lobe (LPL) is impaired. This study aimed to: (1) replicate previous behavioral and neural findings implicating the left frontoparietal network in both rule learning and generalization, with a specific role of the LPL in supporting generalization; and (2) dissociate neural circuits involved in abstract rule generalization from those supporting statistical learning during early rule acquisition. The experiment spanned three sessions combining functional magnetic resonance imaging (fMRI) and transcranial magnetic stimulation (TMS). Participants were exposed to three artificial languages (L1, L2, L3), each with distinct auditory word sets. Rule based sequences followed an A–X–C structure (e.g., leja male kudo), where "A" predicted "C"; no-rule sequences followed an X–X–C pattern. Implicit learning was assessed through a target detection task focused on identifying the "C" element, predictable only in Rule conditions. In the first session (L1), participants learned the A–X–C rule. In subsequent sessions (L2 and L3), conducted one week later, generalization was tested with new languages maintaining the same structure. During these sessions, Theta Burst Stimulation (TBS) was applied to either the LPL (peak activation from L1) or the vertex (control site) during fMRI. Results confirmed LPL involvement in rule learning. TBS to the LPL impaired generalization, whereas vertex stimulation preserved it. When generalization was intact, a bilateral frontoparietal network was recruited. In contrast, when the LPL was disrupted and re-learning was required, increased involvement of subcortical regions – particularly

the hippocampus and cerebellum – was observed. These findings reinforce the critical role of the LPL in rule generalization and highlight the compensatory contribution of subcortical structures when cortical areas are compromised.

P5.03 | Motion Processing is Improved Following Perceptual Learning in Maculopathy Patients

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Macular diseases, such as age-related macular degeneration and Stargardt's disease, result in progressive and irreversible central vision loss, significantly impacting patients' quality of life. A promising approach to mitigate these impairments is training patients' functional peripheral vision. This study explores whether perceptual learning can improve patients' ability to discriminate motion direction, a visual function that relies on both central and peripheral vision, and whether it induces cortical plasticity. Nine patients with macular diseases, along with their age- and gender-matched controls (n = 18 in total), underwent 12 training sessions over four weeks during which they had to report the motion direction (either upward or downward) of a translating pattern defined from dynamic random-dot kinematograms. Most of them (n=14) also underwent fMRI measurements before and after perceptual learning to assess motion-selective responses at the cortical level. To ensure both groups processed equivalent visual information, each control participant's visual field was masked using an artificial scotoma derived from their paired patient's clinical measurements. All participants, regardless of group, improved their performance with training, showing a mean improvement rate of 41.7% ± 5.1% ($p = 0.0002$, Wilcoxon test). This suggests that perceptual learning is effective in this context. At the cortical level, motion stimuli activated the human V5/MT+ complex (hMT+), areas V3A and V6, and parts of primary visual areas (V1, V2, and V3) connected to peripheral vision in both patients and controls. These activations did not significantly differ between the two groups before and after learning. However, both groups showed significant increases in hMT+ responses after training. Overall, our results indicate that perceptual learning based on motion direction discrimination enhances neural responses in area hMT+ and improves motion perception in both maculopathy patients and

aged individuals with normal vision. This opens promising avenues for developing rehabilitation strategies.

P5.04 | Brain Anatomy and Molecular Signaling Predict Neurophysiological Dynamics

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Brain activity is shaped and constrained by the underlying anatomy and organization, which form the foundation for human cognition and behavior. However, the precise nature of this relationship remains unclear. Here, we present a nuanced approach to investigate the extent to which resting-state activity can be explained by structural and neurochemical features. What are the most important predictive features, and which aspects of brain signals do they change? Using openly available data from the Cambridge Center for Ageing and Neuroscience, we computed power spectra (1-60 Hz) for 350 individuals (18-88 years) measured using magnetoencephalography (MEG). Five minutes of data were used after regressing out the effects of age, sex, and intracranial volume. We applied partial least squares regression (PLSR) and 10-fold cross-validation to predict the averaged power spectrum in 200 brain areas from 55 brain maps (neuromaps: Markello et al., 2022, Nat Meth; enigma toolbox: Larivière et al., 2021, Nat Meth). Spherical rotations of these maps (spin-test with 1,000 permutations) were used to generate a null distribution and assess statistical significance. We then applied stepwise PLSR starting from the most predictive map and iteratively added indicative maps to test at how many features model accuracy peaks. Our model predicted regional differences in power spectra with high accuracy ($R2 = 0.83$, $pspin < 0.05$). Key predictors included mean neuronal density, opioid, dopaminergic, acetylcholinergic, serotonergic, and GABAergic receptor distributions, along with the principal component of gene expression. Stepwise regression revealed that the spatial and biological information from around 20 maps sufficed to accurately explain functional variability in the power spectrum. These results suggest that a substantial portion of cortical variation in brain activity during rest is governed by specific microstructural and neurochemical distributions. Critically, uncovering this link will deepen our understanding of neuronal dynamics and lay the groundwork for exploring how these key features may underlie cognition or clinical disorders.

P5.05 | Dopamine, Deep Brain Stimulation, and Fronto-basal Ganglia Intracranial Recordings During Goal-directed Decision Making in Parkinson's Disease

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Adaptive behavior requires goal-directed decision making to overcome impulses and habits, and deficits in goal-directed decision making predict severity of neuropsychiatric symptoms, such as apathy and impulsivity issues common in Parkinson's disease (PD). Goal-directed control relies on top-down frontal cortex signals, and the basal ganglia (BG) integrates goal-directed and habitual systems under dopaminergic influence. Theta and beta oscillations help coordinate these functions, and dopaminergic medications and BG deep brain stimulation (DBS) treatments for PD motor symptoms are known to modulate theta, beta, and the degree of goal-directed decision making. Therefore, identifying fronto-basal ganglia signals underlying these decision-making strategies could yield biomarkers to tailor precision therapies for neuropsychiatric symptoms. Here, we use novel sensing-enabled deep brain stimulation devices and chronic electrocorticography to record intracranially from human premotor cortex (PMC), anterior prefrontal cortex (PFC), and BG while people with PD perform a modified two-step reward learning paradigm that separates goal-directed and habitual decisions (n=14 PD patients, 3-18 runs each, ON/OFF dopamine and BG DBS; convergent results from n=17 runs in 1 dystonia patient). Behaviorally, reinforcement learning modeling showed that dopamine and DBS worsened learning (DA: $p=0.001$; DBS: $p=0.001$), revealing cognitive side effects. Dopamine also increased habitual decision making ($p=0.022$), which was mediated by impaired cognitive flexibility (higher state switching costs, $p=0.042$). Neural recordings showed single-trial low frequency power in PMC, PFC, and BG tracked key learning and decision-making variables, including choice values and reward prediction errors (RPEs). PMC beta power was reduced after difficult choices between similarly valued options, when the habitual system was surprised at the second task stage, and after surprising outcomes at feedback (all $p<0.05$, cluster-corrected), which collectively suggest a role in internal model updating. Theta power increased for negative RPEs in PMC and BG but for unsigned RPEs (i.e., non-valence surprise) in aPFC, potentially reflecting cognitive control adaptations. In contrast, BG delta power increased for positive RPEs (all $p<0.05$, cluster-corrected), similar to EEG reward positivities liked to mood disorders. These findings demonstrate how dopaminergic and DBS treatments for motor symptoms can cause learning and decision-making deficits linked to apathy and impulsivity and reveal the neural underpinnings of these computations in human reward circuits, thereby informing future therapies for neuropsychiatric conditions.

P5.06 | Spatiotemporal Decoupling of Reward Components in the Human Midbrain: An Eeg-fmri 7t Study

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To generate adaptive behaviour, the brain must detect and evaluate rewards amidst competing stimuli. Physically salient stimuli tend to capture greater attention and may be prioritised for valuation. An influential framework suggests that rewards are processed via a two-component dopaminergic response, evolving over time from an initial salience signal to a subsequent value signal (Schultz, 2016). These signals are thought to arise from the same midbrain neuronal population, making them challenging to disentangle – even at the single-neuron level. Here, we directly test this framework in humans by exploiting high-temporal-resolution EEG recorded simultaneously with 7T fMRI, enabled by an in-house-built MRI coil. Participants (N = 24) performed a reward-anticipation task in which physical salience (large vs. small stimuli) and value (reward vs. no reward) were orthogonally manipulated. Multivariate discriminant analysis of EEG data revealed an early physical salience signal (150–300 ms), followed by a later, partially overlapping value signal (250–600 ms), aligning with the hypothesised temporal cascade. We leveraged trial-by-trial variability in these EEG signatures to build EEG-informed fMRI regressors, allowing us to temporally and spatially dissociate the two signals in the midbrain. Critically, the EEG-informed fMRI analysis revealed distinct spatio-temporal profiles: an early physical salience signal emerged in the posterior substantia nigra (160–220 ms), followed by a lagged value signal in the anterior substantia nigra and ventral tegmental area (400–460 ms). Our findings reveal a spatial gradient from physical salience to value signals in the midbrain, following a posterior-lateral to anterior-medial organisation—consistent with non-human electrophysiology studies on motivational salience and value. Connectivity analyses further showed that the early physical salience signal potentiated subsequent value processing in the ventral tegmental area, suggesting an attention-guided mechanism in dopaminergic reward processing. In sum, by fusing EEG and 7T fMRI, we temporally and spatially dissociate salience and value signals in the human midbrain during reward anticipation, providing direct evidence for a two component reward response in humans.

P5.08 | Is the Prefrontal Cortex Necessary for Conscious Perception?

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The necessity of the prefrontal cortex (PFC) in generating consciousness remains a mystery. Frontal theories argue that the PFC is necessary for consciousness, while sensory theories propose that consciousness arises from posterior activity in sensory cortices. To adjudicate between these theories, inattentional blindness (IB) is a particularly useful paradigm, where a stimulus presented in plain sight fails to reach conscious awareness for some individuals. Because the stimuli are kept constant across participants, any differences in neural activity between these participants can be attributed to conscious awareness. As previous studies on the role of the PFC have been mixed, we reanalysed EEG data from a no-report IB paradigm (N=30) conducted by Shafto and Pitts (2015). This task systematically manipulated awareness and task-relevance of face stimuli. To test the role of the PFC in consciousness, we used dynamic causal modelling (DCM), a technique which enables estimating the directed influence that a brain region has on another. We then conducted a second-level parametric empirical Bayes model on the modulatory connection parameters of the DCMs. This allowed us to estimate how connectivity was modulated at the group-level across the variables of awareness and task-relevance. While an initial data-driven search corroborated neither sensory nor frontal theories of consciousness, we conducted a more directed hypothesis-driven analysis where we limited our model space to relevant a priori models. This analysis revealed that both theories could explain the data, with a very slight preference for frontal theories. Specifically, a model with backward connections switched off within the posterior cortex explained awareness better (posterior probability = 0.53) than a model without backward connections from the PFC to sensory regions. Our findings could be interpreted as support for theories which propose a subtle yet crucial contribution of the PFC in consciousness and underscore the pressing need for impartial empirical comparisons of theories of consciousness.

P5.09 | Precision of Predictions is Encoded in Excitatory Top-down Connectivity from the Insula to V1 and Inhibitory Connectivity via the Pulvinar

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The brain's ability to weight predictions by their precision (i.e., the inverse of variance) is a central mechanism in predictive processing, enabling optimal integration of prior expectations with incoming sensory input. Dysregulation in precision modulation has been proposed as a key mechanism in neuropsychiatric disorders such as autism and schizophrenia. Despite its theoretical significance, the neural circuitry that implements precision-weighted prediction remains unclear. Using 7-Tesla fMRI and Dynamic Causal Modelling (DCM), this study investigated how the brain encodes the precision of predictions during a visual cueing task with high- and low-precision conditions. We focused on the modulatory connections between the key regions implicated in predictive processing: the insula, pulvinar, and primary visual cortex (V1).

We tested a DCM model that encompassed the following hypotheses motivated by the literature: (1) the insula exerts inhibitory modulation on V1 during high-precision predictions; (2) the pulvinar exerts inhibitory modulation on V1 during high-precision predictions; and (3) the strength of these modulations predicts inter-individual variability in behavioural performance. Thirty-one healthy individuals (16 female, 1 prefer not to say, age 27.8±6.9 years) participated. The data were acquired using a Siemens 7T MRI Scanner equipped with a 32channel head coil. The functional sequence (T2*-weighted) consisted of a multiband Generalised Autocalibrating Partially Parallel Acquisitions accelerated Gradient-echo Echo-planar imaging sequence in the steady state (84 interleaved slices parallel to the anterior-posterior commissure line, slice thickness = 1.6mm, repetition time = 0.8s, echo time = 22.2ms, flip angle = 45°, field of view = 20.8cm, matrix size = 130×130, volume = 1084). High-resolution structural images (T1-weighted) was acquired using Magnetization-Prepared Rapid Gradient Echo sequence to assist with functional image co-registration and normalisation. The data were preprocessed and analysed in Statistical Parametric Mapping 12. The preprocessing steps included realignment, motion correction, coregistration, segmentation, normalisation, physiological noise correction. Partially supporting our hypotheses, the DCM analyses revealed that high-precision predictions elicited excitatory modulation from the insula to V1 (Pp = .95), alongside inhibitory influences from the insula to the pulvinar (posterior probability: Pp = .99) and from the pulvinar to V1 (Pp = .89). These findings suggest a two-route mechanism whereby the insula directly enhances top-down predictions in V1 while indirectly dampening bottom-up sensory input via the pulvinar. Furthermore, individual differences in behavioural sensitivity to precision were positively predicted by pulvinar-to-insula connectivity and negatively predicted by the connectivity between pulvinar and V1, highlighting the behavioural relevance of these pathways. Together, these results provide empirical evidence for precision modulation in predictive processing through coordinated insula-pulvinar-V1 connectivity. This mechanism may facilitate Bayesian integration under uncertainty and offers new hypotheses into how precision weighting may be disrupted in neuropsychiatric conditions.

P5.10 | Graded Aversive Stimuli Modulate Fear Network Activity: A 7t Fmri Study

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Pavlovian fear conditioning provides a robust experimental paradigm for investigating neural mechanisms underlying threat processing and has contributed to our understanding of anxiety disorder pathophysiology. This study aimed to investigate whether the intensity of unconditioned stimuli modulates neural activation patterns in fear-related brain networks. We hypothesized that conditioned stimuli predicting electric shock would be associated with increased activation in the fear network, with higher shock intensity eliciting stronger responses. Forty-seven healthy adults

underwent a fear conditioning task during concurrent skin conductance response (SCR) measurement and ultra high field functional magnetic resonance imaging (7T fMRI). During acquisition, participants were presented with geometric shapes as conditioned stimuli followed by either a single electric shock (CS+), three successive electric shocks (CS+++), or no outcome (CS-). Statistical analyses using repeated measures ANOVA revealed significantly increased SCR in both CS+ and CS+++ trials compared to CS- trials, confirming successful fear conditioning. Additionally, SCR was significantly higher in CS+++ trials than in CS+ trials, demonstrating successful manipulation of aversive intensity. Whole-brain fMRI analysis with family-wise error correction showed significant activation for CS+++ versus CS contrasts in key components of the fear network, including amygdala, periaqueductal gray, insular cortex, anterior cingulate cortex, precuneus, and supplementary motor area. Similar significant activation patterns emerged when comparing CS+ versus CS- trials. Direct comparison between CS+++ versus CS+ conditions revealed greater activation in these same structures, supporting our hypothesis that more aversive expected outcomes lead to stronger engagement of threat-responsive neural circuits. These findings extend our understanding of how the brain processes threats of varying intensity and may have implications for anxiety disorders characterized by heightened fear responses or threat sensitivity where such dose-response effects might be particularly prominent. Future research should examine whether individual differences in neural responses to graded threat stimuli correlate with anxiety vulnerability or symptom severity in clinical populations.

P5.11 | Learning Foreign Speech Sounds in Pairs or Alone: Behavioral and Erp Evidence in Adults

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Social interaction has been shown to enhance language learning, yet its effectiveness and underlying neural mechanisms in adult learners remain underexplored. This study investigated whether learning foreign phonetic features – specifically Mandarin tones – is more effective when conducted in pairs compared to individual learning. Forty-two native Finnish speakers were randomly assigned to a pair-learning group (LPair, n = 22) or an individual-learning group (LIndi, n = 20). Participants completed a one-hour training session per day over four consecutive days, either in pairs or individually according to group assignment. Each session included exposure to continuous speech and isolated speech sounds with visual tone cues, change detection and identification tasks with feedback, and a listen-and-repeat task. Behavioral performance in tone discrimination and categorization tasks, along with event-related potentials (ERPs) recorded during passive and active listening to tone changes, were assessed before and after the four-day training period. Comparisons between pre- and post-test performance revealed improvements in response times in the tone categorization task, as well as in both accuracy and response times in the tone discrimination task across both groups. ERP analyses showed an increase in

P3a amplitude in response to tone changes following training, suggesting enhanced automatic attentional orienting to tonal variations. While no significant group differences emerged in the overall pre- to post-training comparisons, participants in the pairlearning group demonstrated significantly higher sensitivity (d′) to tonal changes on the first day of training, indicating more effective early-stage perceptual learning. These findings suggest that a short-term (4-hour) phonetic training program can improve both behavioral performance and neural responsiveness to non-native speech sound contrasts. Moreover, pair-based learning may facilitate enhanced perceptual sensitivity during the initial phases of acquiring foreign phonetic features.

P5.12 | The Impact of Right Cerebellar tDCS on Semantic Word Retrieval

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Semantic memory retrieval is a fundamental cognitive function essential for adaptive behavior. Research suggests that cerebellum is involved in semantic processing, but its contribution remains unclear and underexplored. To clarify the functional role of the cerebellum in semantic memory retrieval, we conducted a double-blind, randomized controlled trial in which healthy adult right-handed participants completed free-associative (automatic) and dissociative (controlled) word retrieval tasks before and during either anodal (n = 50) or sham (n = 50) transcranial direct current stimulation (tDCS) targeting the right posterior cerebellum. We found that anodal cerebellar tDCS selectively impaired freeassociative retrieval, while exerting no significant effect on controlled-dissociative retrieval. Crucially, further analyses revealed that the disruption of free-associative performance was most pronounced in trials with cue words eliciting strong, dominant associations, compared to cues evoking a broader set of weaker associations. These findings provide evidence that the cerebellum contributes to automatic semantic retrieval, specifically by facilitating the activation of habitual, well-established conceptual associations. This role is consistent with the views of the cerebellum as a structure involved in the formation of associative patterns and predictions across multiple domains, including language and higher cognition. (Grant support: APVV-23-0145, VEGA 2/0052/23, VEGA 2/0067/25)

P5.13 | Moving Towards Confidence: Higher Motor Precision Reduces Information Seeking in Perceptual Decisions, Independently From Accuracy

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Perceptual confidence is defined as the subjective evaluation of how accurate a perceptual decision will be (prospective) or was (retrospective). Recent models of perceptual metacognition suggest that retrospective confidence is shaped not only by sensory evidence, but also by motor information. A recent study showed that high motor precision required for implementing a perceptual decision increases observers' retrospective confidence in their choice, without affecting accuracy. The current study aimed to investigate whether the retrospective confidence change induced by motor information plays a functional role in guiding subsequent behaviour, specifically, whether it affects the decision to seek additional information before making a final choice. Previous research has shown that retrospective confidence influences information-seeking behaviour, with lower confidence prompting a more frequent resampling. Accordingly, we tested whether costly motor responses, which are known to boost confidence, reduce observers' tendency to seek further information compared to non-costly responses. Twenty-four subjects judged the orientation of a Gabor patch. The precision required to implement the perceptual decision was manipulated: participants provided a response by reaching toward large or small circles (corresponding to low and high motor precision, respectively), using a computer mouse, and clicking inside them. Subsequently, they were given the opportunity to see again the stimulus in order to maximize their perceptual accuracy. If they chose to view it again, they were asked to evaluate whether their initial decision was more likely correct or incorrect. Hierarchical Bayesian mixed models showed that information seeking correlated with both accuracy and response times: obeservers were more likely to view the stimulus again after inaccurate decisions and slower responses proving that information seeking is a reliable correlate of confidence. We also observed that higher requirement for a precise motor decision (i.e., reaching small circles) was associated with a lower tendency to view the stimulus again without impacting accuracy or decision commitment time. In sum, motor costs seem to modulate perceptual confidence, and this modulation plays a functional role in shaping subsequent behaviour. Future studies should investigate whether this effect is specific to motor costs or can be attributed to other types of costs.

P5.14 | Basal Forebrain Grey Matter Reflects Nicotinic and Muscarinic Receptor Topographies

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While the role of the neurotransmitter acetylcholine in arousal, attention and memory functions is well-established, how the molecular and cellular architecture of this system relates to variation in macroscale grey matter morphology remains poorly understood. The current study combined cytoarchitectonic maps of the basal forebrain - the primary source of cortical acetylcholine - with normative PET radioligand binding maps for the vesicular acetylcholine transporter (VAChT), M1-muscarinic and α4β2-nicotinic receptors, to assess the correspondence in grey matter variation between cholinergic seed and target regions. T1-weighted MRI data of three independent cohorts were preprocessed using the Computational Anatomy Toolbox to derive normalized grey matter probability maps. Basal forebrain grey matter was extracted based on cytoarchitectonic masks for medial septum/diagonal band of Broca (Ch1-3) and basal nucleus of Meynert (Ch4) subregions. Structural covariance was examined using general linear models, while controlling for effects of age, sex and total intracranial volume. The strongest voxel-wise effects for basal forebrain structural covariance were in basal ganglia, thalamus, hippocampus and amygdala. Correspondence between subregional (Ch1-3/Ch4) grey matter covariance and (M1-muscarinic/α4β2-nicotinic) receptor subtype topographies showed both, between- and within-region effects, which validates seed and target region markers for cholinergic system integrity. Normative residuals related to VAChT binding were linked to regional grey matter volume in the basal forebrain between participants. Overall, our results show that readily indexed grey matter covariance patterns reflect underlying molecular architecture, suggesting that grey matter metrics may serve as a valuable and accessible proxy for assessing cholinergic integrity in studies of health and disease.

P5.15 | Does Enfacing Your Older Self Modulate How You Think You Can Change in the Future?

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Individuals often underestimate how much their personality traits will change in the future, while reporting greater changes when reflecting on their past relative to the present – a cognitive bias known as the End of History Illusion (EoHI). Research in

embodied cognition suggests that bodily representation plays a key role in shaping selfconcept, implying that identity is grounded in physical experience. Building on this, we tested whether modulating facial self-representation through a bodily illusion involving one's aged face can influence the EoHI. Participants completed a validated questionnaire to assess perceived personality change across three time points: 10 years in the past, the present, and 10 years in the future. The EoHI was measured before and after the enfacement illusion, a perceptual illusion used to modulate one's face representation. In our setup, participants received tactile stimulation on their cheek while watching a video of their digitally aged face being touched in a corresponding position. We compared the illusion condition – synchronous touches between participants and their aged face – to an asynchronous control condition. To assess the illusion, participants completed a questionnaire and a psychophysical task in which they judged whether morphed images blending their present and aged face resembled their current appearance. Preliminary results showed the enfacement illusion modulated participants face representation, as reflected by the questionnaire and the psychophysical task. The end of history was present both after synchronous and asynchronous conditions. However, the synchronous illusory conditions significantly reduced the perceived changes in the future, while the asynchronous conditions significantly reduced the perceived changes in the past. Overall, these results showed that the illusion of having an older face, as assessed by questionnaires and psychophysical tasks, modulates the perceived changes over time. This might be because updating one's face representation toward an older version may shift the perception of the current self, making it feel closer to the potential future self. In contrast, the asynchronous condition modulated the perceived changes in the past. This effect is likely due to that seeing an aged version of oneself might minimize the perceived significance of changes that have already occurred.

P5.16 | Associations Between the Perception of Photographic and Schematic Faces and Symptoms of Depression and Anxiety

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The present study aimed to investigate pre-attentive and attentive perception of facial emotions, and the influence of depression and anxiety symptoms on face processing. In addition, it was examined whether the processing of photographic images differs from the processing of schematic faces. To achieve this aim, participants' ERPs (P1, N170, P3b) were measured using EEG, and levels of depression and anxiety were assessed using the EEK-2 (Emotional State Questionnaire, EST-Q2, Aluoja et al., 1999) and DASS (Lovibond & Lovibond, 1995) questionnaires. Six different identities of Ekman faces (Karolinska Directed Emotional Faces, KDEF, Goeleven jt, 2008) were chosen as real human images and there were six different schematic faces identities

to match Ekman faces. Stimuli were presented in three tasks: ignored task using equiprobable paradigm, ignored task using oddball paradigm and attended task using oddball paradigm. Data from 70 participants were analyzed: 57 F, 13 M, aged 18 to 40 years (mean = 23.29, SD = 5.58). Emotional faces were processed with greater neural resources than neutral ones. However, the results showed no association between higher levels of depression and better perception of sad faces, nor between higher levels of anxiety and better perception of angry faces – this held true in both pre-attentive and attentive conditions, and for both schematic and photographic face series. The results did reveal differences in processing between schematic and photographic faces, with schematic faces eliciting lower positivity (P1, P3b) and greater negativity (N170). Differences in amplitude and latency between equiprobable and ignored oddball conditions was presented.

P5.18 | Eeg Microstates as a Neurocorrelate of Cognitive Reserve in Older Adults

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Cognitive Reserve (CR) is a term that helps explain differences in cognitive functioning between people of similar or the same age and refers to the knowledge and skills acquired by a person through education, professional work, social contacts, and intellectual and physical activity undertaken from an early age. A higher level of CR is associated with greater efficiency, neural capacity, and the ability to compensate by engaging additional brain regions during information processing. The presented project aimed to investigate the relationship between the CR and brain neurodynamics at rest. The study involved 35 healthy individuals aged 63–79. Cognitive Reserve Scale (CRS) was used to measure the level of CR, and brain resting state activity was recorded using electroencephalography (EEG). The signal analysis revealed seven microstate classes. For each class, the following were calculated: occurrence (number of times a given class was dominant per second), duration (average time a given class was dominant), and coverage (percentage of total recording time during which a given class was dominant). Participants were divided into two groups by the median of the CRI score, and the Mann-Whitney U test was performed. The results were interpreted by assigning specific functions to particular classes of microstates and comparing them with microstates described in the literature. The results show that individuals with lower CR have a longer duration of microstates #1 and #2. In the literature, microstate #1) is associated with mind-wandering, personal meaning processing, and self-referential thinking and occurs more frequently in resting conditions. Longer duration may indicate lower cognitive flexibility and a greater tendency to linger in a state of internal rest, which may be a form of compensation for reduced CR. Microstate #2 is associated with processing visual and auditory stimuli and general arousal levels. Its prolonged duration may indicate the rigidity of the sensory

information processing system. Higher CR was associated with more frequent and dominant microstate #7. Literature connects it with the somatosensory network - high CR could support the maintenance of alertness and balance between internal and external processes, which facilitates the flexible management of attentional resources under changing environmental conditions.

P5.19 | Targeted Prefrontal tDCS Enhances Cognitive Reappraisal of Negative Film Clips: Psychophysiological Correlates

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Cognitive reappraisal (CR) is a well-established emotion regulation (ER) strategy that involves reinterpretation or psychological distancing from emotionally salient stimuli. This strategy reliably recruits regions of the prefrontal cortex (PFC), particularly the dorsolateral (dlPFC) and ventromedial (vmPFC) areas, which are implicated in cognitive control and implicit regulation, respectively. Transcranial direct current stimulation (tDCS), a non-invasive neuromodulation technique, has been shown to modulate cortical excitability in these regions and may potentiate the regulatory effects of CR on emotional responses. This single-blind, sham-controlled study investigated the combined effects of CR and targeted prefrontal tDCS on psychophysiological markers of emotion regulation during exposure to negative affective stimuli. A total of 85 healthy participants were randomly assigned to receive stimulation over the dlPFC (n = 46, 34 females) or vmPFC (n = 39, 35 females). All participants underwent a standardized CR training session followed by two experimental sessions (active and sham tDCS, counterbalanced across participants). During stimulation, participants were instructed to apply CR while viewing emotionally negative and neutral film clips selected from the Emotional Movie Database (EMDB). Heart rate (HR), skin conductance (SC), and respiratory rate (RR) were recorded continuously throughout stimulus presentation. Results revealed that active tDCS over the dlPFC, in combination with CR, significantly reduced HR compared to sham stimulation, indicating enhanced autonomic regulation. In contrast, no significant difference in HR was observed between active and sham conditions in the vmPFC group. Timecourse analysis further demonstrated that active tDCS over both dlPFC and vmPFC led to significant reductions in HR at the final segments of the emotional clips compared to

baseline (first five seconds), suggesting a delayed but meaningful regulatory effect. No significant effects of tDCS were found on SC or RR across either stimulation site. These findings provide novel evidence that combining CR with targeted prefrontal tDCS, particularly over the dlPFC, can enhance physiological regulation during emotional challenges. This has important implications for developing neuromodulation-augmented interventions for affective disorders, where deficits in emotion regulation and autonomic reactivity are prevalent. The study underscores the relevance of integrating brain stimulation with cognitive strategies to optimize emotion regulation outcomes.

P5.20 | The Effect of Social Pressure Framing on Facial Emotion Recognition in Lonely People and its Neural Mechanism Underlying the Process

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Lonely people perceive the social world as threatening and avoid social interactions due to their biased cognitive process. Many studies suggested a relationship between loneliness and facial emotion recognition, the first stage of social information processing. However, others argued that lonely people possess the proper recognition ability but fail under social pressure – "choke under pressure" socially. "Choke under pressure" suggests that pressure may increase excessive attention over the task execution. Based on that, we proposed hypotheses on the recognition failure in higher loneliness: attention overload (overactivation of the dorsolateral prefrontal cortex (dlPFC)) and enhanced emotion processing (overactivation of emotion processing-related areas). As the neural mechanism underlying the failure is still unresolved, our objective is to elucidate the neural mechanism of facial emotion recognition failure due to social pressure in lonely people. To achieve our objective, we are recruiting 100 Japanese young adults; currently, 52 participants' data have been collected. Participants were assigned to the social pressure or control group and performed a facial emotion labeling task (angry, happy, and sad face) during fMRI scanning. The behavioral results from a linear model analysis of sad faces recognition accuracy showed a significant interaction effect of social pressure and loneliness; higher loneliness score is associated with worse accuracy only in the social pressure group. Additionally, the neuroimaging result from whole-brain analysis (sad > happy faces) showed greater activation in the insula, dlPFC, and subcortical area, including thalamus and putamen, in the social pressure group compared to the control group. This finding indicates the social pressure group displayed enhanced attention control through dlPFC activation and sad emotion processing through the insula and subcortical area

activation supporting attentional control overload and enhanced sad emotion processing simultaneously. Unfortunately, no correlation between loneliness score and those neural findings was observed. In conclusion, preliminary results partially support our hypothesis, that enhanced sad emotion processing and attentional control overload potentially lead to sad faces recognition failure. However, it is still unclear whether these hypotheses explain the "choking" in lonely people. Due to the nature of incomplete data, further data collection is necessary to confirm the current findings.

P5.21 | Fixation-related Potentials Reveal Preserved Extrafoveal Semantic Processing in Healthy Older Adults

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Objects violating contextual expectations (e.g., finding a fork in a bathroom) are known to capture early attention and trigger a fronto-central N400 response, reflecting the cognitive effort to solve their semantic mismatch within the scene. Yet, the extent to which high-level semantic information is accessed from extrafoveal vision and whether this processing is spared by ageing remains unclear. This question was addressed by co-registering eye-tracking (1000 Hz) and EEG (64 electrodes, 512 Hz) in younger (N = 22) and healthy older adults (N = 20) as they freely viewed real-world indoor scenes in preparation for a change detection task. Each scene included a target object that was either semantically consistent (e.g., toilet paper) or inconsistent (e.g., tennis ball) with the embedding context (e.g., bathroom). We applied a regression-based linear deconvolution to model how semantic consistency modulates fixation-related potentials (FRPs). This analysis specifically examined semantic processing during the preceding fixation (t−1, i.e., parafoveal), the target fixation (t, i.e., foveal), and all non-target fixations, as well as scene-onset ERPs, while controlling for overlapping EEG activity across consecutive fixations. Both age groups displayed earlier and longer first fixations on semantically inconsistent objects, replicating prior findings that contextual violations are attentionally prioritized and require greater cognitive effort to be integrated within the scene. Crucially, EEG data revealed that both younger and older adults exhibited a larger frontocentral N400 response to inconsistent versus consistent objects, beginning during the preceding fixation and extending through the target fixation. This suggests that semantic information is detected extrafoveally, and its inconsistency is resolved once the object is foveated. The only age-related difference, independent of object semantics, was a significantly reduced neural response, widely distributed along the scalp, at scene onset in older compared to younger adults, which may point at a reduced efficiency in extracting the scene gist due to ageing. Together, these findings provide robust behavioural and neural evidence that healthy older adults retain the ability to access high-level semantic information from extrafoveal vision, countering the hypothesis that extrafoveal semantic processing deteriorates with age.

P5.22 | A Direct Auditory Subcortical Route to the Amygdala That Supports Fear in Humans

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Quick and efficient processing of fear is critical for survival. To support this ability, a subcortical pathway from the pulvinar of the thalamus is thought to act as a shortcut to the amygdala for visual fear in humans. In turn, evidence from non-human animals suggests the existence of a homologous subcortical pathway in the auditory system, although its presence and function in humans remain unclear. To test this possibility, we used probabilistic streamline tractography and fixel-based analysis on diffusion-weighted images from 200 participants in the Human Connectome Project. We reconstructed different candidate auditory subcortical pathways and examined their behavioral relevance. Our findings revealed a particularly relevant white matter tract connecting the inferior colliculus to the basolateral amygdala via the medial geniculate body (MGB) of the thalamus, with greater fiber density in this tract being associated with heightened fearfulness and better hearing ability in noise. These correlations support the role of this pathway in affective and auditory functions, respectively. In contrast, a control analysis of the core thalamocortical pathway, connecting ventral MGB to primary auditory cortex and thus bypassing the amygdala, was associated with hearing ability in noise but not with fearfulness, supporting its selective role in auditory processing. These findings provide new insights into the neural systems for fear in humans, highlighting the functional significance of auditory subcortical pathways and their role in integrating sensory and emotional information.

P5.23 | Neural Speech Tracking in Young Cochlear Implanted Adults

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Language acquisition relies on critical periods in early development when the brain is especially receptive to linguistic input. For typically hearing children, auditory exposure during this time is crucial for the maturation of neural systems that support speech perception and comprehension. In the case of congenital deafness, hearing may be restored through cochlear implantation, yet this intervention typically

occurs no earlier than one year of age, following a period of auditory deprivation. This study explores whether young adults who were congenitally deaf but received early cochlear implants (CIs) process naturalistic speech similarly to their typically hearing peers at the neural level.To investigate this, EEG data were recorded from two demographically matched groups of young adults: 12 early-implanted CI users (mean implantation age: 22 months) and 12 typically hearing controls. Participants listened to short narratives presented in two formats – audio-only (A) and audiovisual (AV) – and subsequently answered comprehension questions. Neural synchronization with the speech envelope was assessed at the individual level by measuring Temporal Response Functions (TRFs).Both groups exhibited clear TRFs in response to speech in both A and AV contexts. Notably, neural tracking was enhanced in the AV condition relative to the A condition for both groups, indicating that visual cues facilitate speech processing across populations. However, CI users demonstrated significantly higher TRF amplitudes, potentially reflecting greater neural effort during speech tracking (all $p<0.05$, cluster-corrected). Consistent with this interpretation, CI users achieved lower comprehension scores compared to their hearing peers ($p<0.05$). These findings suggest that early cochlear implantation enables the development of neural mechanisms for speech tracking that resemble those of typically hearing individuals. However, subtle differences in neural effort and comprehension outcomes point to lingering effects of early auditory deprivation, even when intervention occurs relatively early. This emphasizes the importance of early auditory input during critical periods of language development and highlights the need for ongoing support in CI users to optimize language outcomes.

P5.24 | Sensorimotor and Social Experiences of Architectural Space Influence Human Multisensory Integration Processes

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Built environments are typically shared with others. For this reason, it is crucial to understand how spatial and social cognition may be linked functionally. Recent studies

show that parietal motor rhythms code architectural transitions, and that experiencing built interiors can modulate the dorsal premotor areas during the processing of social cues (Presti et al., 2023). Based on these findings, we hypothesize that architecture and social presence may have a mutual effect on parietofrontal networks, impacting the multisensory representations of space. We conducted three experiments using an Audio-Tactile Interaction Task (Canzoneri et al., 2012). Participants responded to tactile stimulation delivered during the presentation of a looming sound, such that delivery times corresponded to six distances from the body (D1:5 cm to D6:300 cm). Experiment 1 examined whether sensorimotor experience (static vs dynamic), and architectural setting (indoor vs outdoor) affect mulitsensory space. Experiments 2 and 3 tested for an effect of the social component (virtual avatar), depending on spatial locations (L1: 0.90m, L2: 2.50m), and architecture on the multisensory integration processes. Reaction times (RTs) were analyzed to test for benefits or costs. Across all experiments, RTs suggested a gradient of integration resources distributed across near, middle, and far spaces. In Experiment 1, architecture showed a significant effect, with indoors yielding faster RTs. Moreover, static architectural experience led to faster RTs at D3 (123cm), whereas dynamic experience sped up responses at D6 (300cm). In Experiment 2, the avatar at L1 caused RTs to increase, whereas at L2 it caused them to decrease. Notably, the increase in RTs caused by the avatar at L1 was stronger indoors for near distances, and outdoor for far ones. In Experiment 3 non-social objects did not modulate RTs. These findings suggest that sensorimotor, architectural and social cues contribute to build a functional representation of space. The presence and location of others shape how we map space, while the architecure can facilitate or hinder interactions. These findings have implications for designs promoting human activities and interpersonal dynamics. References Canzoneri, E., Magosso, E., Serino, A. (2012). Dynamic Sounds Capture the Boundaries of Peripersonal Space Representation in Humans. *PLOS ONE 7*(9):e44306. https://doi.org/10.1371/journal.pone.0044306 Presti, P., Galasso, G. M., Ruzzon, D., Avanzini, P., Caruana, F., Rizzolatti, G. & Vecchiato, G. (2023). Architectural experience influences the processing of others' body expressions. *Proceedings of the National Academy of Sciences of the United States of America, 120*(41), e2302215120. https://doi.org/10.1073/pnas.2302215120

P5.25 | Distinct Neural Signatures of Search Strategies

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Visual search reflects the interaction between bottom-up sensory inputs and top-down attentional control. When a target is highly salient, it tends to "pop out" amongst competing stimuli, enabling effortless, rapid detection utilizing parallel search. In contrast, when distractors are highly similar to the target, each stimulus needs to be compared to an attentional template, leading to effortful serial

search. These search processes are associated with distinct neural signatures: serial search is linked to increased involvement of frontal brain regions in response to top-down guidance, whereas parallel search evokes early EEG components like the N2pc reflecting stimulus-driven selection. In this study, we used multivariate pattern analysis (MVPA) of EEG recordings to distinguish between parallel and serial search strategies to examine the impact of search mode on sensory target processing. Participants searched for a tilted "T" among five "L" distractors positioned equidistantly on an invisible circle surrounding a central fixation cross. Distractor similarity and orientation uniformity were manipulated across blocks to induce either parallel or serial search. Each block consisted of 12 "inducer" trials intended to bias participants towards a specific search mode, followed by 3 "test" trials featuring medium similarity and heterogeneous distractor orientations – stimuli that could support either parallel or serial search. Although the test trials were visually identical across blocks, we hypothesized that neural activity would reveal the influence of the preceding inducer trials, reflecting the search strategy induced by the block context. The results showed that MVPA of posterior EEG activity revealed successful classification of search mode shortly after display onset. Cross-generalization between inducers and test trials confirmed strategy-specific neural signatures within the 150–250 ms window relative to display onset. Further analyses, using reaction time – matched trials, found no cross-generalization of sensory responses to targets between serial and parallel conditions despite significant generalization between same-search-type inducer and test trials. These findings suggest that serial and parallel search modes are neurally dissociable and involve differences in early sensory processing, even when visual input is controlled.

P5.26 | Rethinking Biological Sensitivity to Context: High Hrv Predicts Enhanced Working Memory in Low-ses Children

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Children from low socioeconomic status (SES) environments often experience chronic stress, which can impact cognitive development. However, such adversities do not necessarily affect all children equally. Differential susceptibility (DST) and biological sensitivity to context (BSC) theories propose that some individuals are more responsive – both for better and for worse – to environmental influences, due to

heightened physiological sensitivity. A major limitation of existing research is its focus on cognitive skills deemed developmentally adaptive in high-resource settings. Consequently, high-BSC children are often characterized as optimal cognitive performers in supportive contexts, but show suboptimal functioning when raised in disadvantaged environments, reinforcing the view of heightened sensitivity as a developmental liability under adversity. This framing, however, overlooks the possibility that heightened physiological sensitivity may foster cognitive specializations attuned to adversity. Environmental uncertainty, a defining feature of high-stress contexts, may promote cognitive adaptations that enhance survival by improving the ability to monitor threats and opportunities. One such adaptation could involve working memory updating – the capacity to efficiently replace outdated information with contextrelevant inputs. Building on this idea, the present study examined whether high vagally mediated heart rate variability (HRV) – a biomarker of BSC – is associated with enhanced working memory performance in preschoolers from low-SES backgrounds. We assessed 106 children (ages 5–6) from public schools in Montevideo, Uruguay, categorized into low (n=52) and middle/high SES (n=54) groups. Resting HRV was measured via electrocardiography, and participants were classified into high or low HRV groups using a median split. Working memory was evaluated using a computerized direct Corsi Block-Tapping Task (CBTT), a measure of visuo-spatial span that may reflect underlying updating processes. Given non-normal distributions, Aligned Rank Transform ANOVA assessed the effects of SES and HRV on CBTT performance. Results revealed a significant SES × HRV interaction ($F(1,102)=7.63$, $p=0.0068$). Low-SES children with high HRV outperformed their low-HRV same-SES peers ($p=0.0221$), suggesting enhanced working memory, potentially reflecting context-calibrated updating. No significant HRV-related differences emerged within the middle/high SES group. These findings challenge the deficit-based interpretation of BSC and DST, highlighting heightened sensitivity as a plasticity factor supporting ecologically contingent adaptation in low-resource environments.

P5.27 | Neurocomputational Mechanisms Underlying Curiosity

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Curiosity is fundamental to human behaviour. Traditionally, it has been dichotomised into two subtypes: perceptual curiosity refers to the desire for information about sensory stimuli, whereas epistemic curiosity refers to the desire to obtain new knowledge. Recent frameworks suggest that both subtypes of curiosity may be driven by a shared underlying desire to reduce uncertainty about our knowledge of the world. However, this hypothesis has yet to be formally tested. Here, we asked whether the

value of perceptual and epistemic information rely on shared or separate neurocomputational mechanisms. Across separate tasks, we asked healthy young adults to decide how much effort they were willing to invest to reduce their uncertainty about the identities of blurred stimuli (perceptual curiosity task), or the outcome of predetermined lotteries (epistemic curiosity task). Each participant completed both tasks within an fMRI environment. Mixed-effects logistic regressions showed that, across both perceptual and epistemic tasks, participants became less likely to choose the informative option as effort requirements increased. In contrast, they were more likely to seek information when uncertainty was high – in particular, when lottery outcomes were more uncertain in the epistemic task, and when image identity was more ambiguous in the perceptual task. Computational models of behaviour, which estimated the subjective value of information, further showed that across both tasks, individuals were willing to exert more effort to reduce higher levels of uncertainty. These results suggest that information is more valuable when it serves to resolve greater uncertainty. Model-based fMRI showed that the value of perceptual and epistemic information correlated with activity across a network of corticostriatal areas. However, each task also engaged nodes that were unique to perceptual and epistemic curiosity. Together, these findings support a general mechanism through which reducing uncertainty motivates curiosity-based behaviours, while highlighting the complexity of curiosity as a multifaceted construct.

P5.28 | Adaptation of Cortical Tracking of Speech to Syllabic (Ir)Regularities

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In order to comprehend speech efficiently, humans have to adapt rapidly their neurocognitive model for language processing to the characteristics of the incoming speech signal (e.g., timing, pitch, noise). Relevantly, in the adaptation to speech timing, listeners make use of acoustic temporal regularities to make predictions about when will likely occur the relevant units for speech comprehension, such as syllables, words or phrases. Big proportion of these temporal regularities is embedded in the amplitude modulations of the speech envelope, which bear the syllabic and prosodic structure information. A wealth of studies in the past decade have attested the relevance of cortical tracking of speech. That is, during speech comprehension, the brain entrains to the amplitude modulations of speech mainly within the prosodic and syllabic timescales by leveraging cortical oscillatory activity within the delta (1-3 Hz) and theta (4-8 Hz) frequency bands respectively. We investigated cortical tracking via two interrelated questions. First, whether there is an adaptation of brain oscillatory activity to speech syllabic timing. To achieve this, we manipulated the syllabic rhythmicity of speech into 3 experimental conditions: natural, isochronous

(perfectly regular), and anisochronous (irregular) speech. Second, the relationship of cortical syllabic tracking with speech comprehension, to assess the behavioral relevance of this cortical mechanism. We analyzed magnetoencephalographic (MEG) activity (oscillatory phase and temporal response functions) at source level, as well as the behavioral responses of 45 adult native speakers of Spanish. Isochronous speech, although being unnatural and infrequent, offers a regular template which oscillatory activity can exploit to extract syllabic information. Accordingly, we found higher theta oscillatory phase synchronization for isochronous than natural speech, and natural than irregular speech. We also discovered a negative correlation between syllabic tracking and comprehension. Our interpretation is that, while counterintuitive, this finding informs about the flexibility of cortical syllabic tracking to adapt to speech under demanding conditions (i.e., more reliance on syllabic tracking to comprehend challenging speech segments). Our research offers an empirical proof that helps grounding recent theoretical and computational models of speech processing about the interplay of theta oscillatory activity and different contextual demands (particularly syllabic timing) for speech comprehension.

P5.29 | Forgetting Food: A Preliminary Study Exploring Memory Suppression Mechanisms in Individuals With and Without Food Addiction

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Food addiction (FA) is characterised by compulsive overconsumption and diminished control over highly palatable foods. Growing research shows that FA is associated with heightened reactivity and impaired inhibitory control in response to food cues. Recently, memory suppression has been explored as a strategy to strengthen inhibitory control abilities, potentially contributing to the reduction of food cravings and improvement of intake regulation. This preliminary study aims to assess memory suppression abilities in individuals with and without FA and explore potential between-group differences concerning the suppression of high-caloric and low-caloric food-related memories. Eighteen participants were included in the analysis and divided into a control group (n = 14) and a FA group (n = 4). An adaptation of the Think/No-Think paradigm, the Think/No-Think-Food task, was designed to examine memory suppression using food images, including high- and low-caloric categories. Participants memorised pairs of neutral and food images and were then instructed to recall (Think) or suppress (No-Think) the previously learned associations, with recall accuracy being assessed for all image pairs in a final memory test. Behavioural and electroencephalographic (EEG) data were recorded to explore memory suppression

abilities and its neural correlates. Behavioural results confirmed the validity of the Think/No-Think-Food task, with No-Think food images showing below baseline levels of recollection, indicating successful memory suppression. EEG results revealed reduced late parietal positivity amplitudes during No-Think trials, consistent with reduced conscious recollection resulting from memory suppression. Neutral images associated with high-caloric foods elicited higher P1 amplitudes, suggesting greater emotional salience than low-caloric ones. Subjective food ratings support these findings, with high-caloric items rated as more pleasant, arousing, palatable, and craving-inducing than low-caloric items. Reduced N2 amplitudes were observed for high-caloric No-Think trials, suggesting diminished retrieval suppression for calorie-rich stimuli. Contrary to expectations, no significant differences were found between FA and non-FA individuals regarding suppression or brain activity. Nonetheless, these initial findings highlight the potential of the Think/No-Think-Food task as a useful instrument to study memory suppression abilities in the context of food cues, with important implications for the study of FA and associated conditions, such as eating disorders and obesity.

P5.30 | Neither Wrong Nor Right: Medium Prediction Errors Modify Episodic Memories

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Episodic memories are not static – they shift and reshape in line with our changing environment. One powerful mechanism for change are prediction errors, which arise when predictions about what is going to happen next do not match the actual input. Previous studies have identified several different consequences of prediction errors for episodic memories, while it is unclear how they are related to each other. Therefore, based on theoretical work, this study investigated the size of prediction error as a possible key factor in determining recognition memory and neural memory representations. In an fMRI experiment, participants listened to a series of naturalistic dialogues. In a later session, a target statement in the dialogue was altered to introduce a mismatch and thus evoke a prediction error. After that, the original dialogues were played again to measure representational change as a function of prediction error size. Additionally, recognition and source memory were tested, for both original and mismatch targets. Results indicated that mnemonic and representational outcomes critically depended on the size of the prediction error. Larger prediction errors were linked to increased recognition memory for the original and mismatching targets, and better source memory for the mismatching targets. Additionally, they led to higher representational stability in the original targets, indicating less representational change after large prediction errors. Both recognition memory and original stability were reduced when prediction errors were medium-sized. These outcomes may be based on stronger original reinstatement during the mismatching input when prediction errors were large, protecting the original from interference

and leading to distinct encoding of the new and mismatching version. The results are congruent with theoretical work, which suggests that large prediction errors lead to the establishing of a separate predictive model, while medium prediction errors promote integration of new information into the existing model. As prediction is not necessarily a conscious process, the results implicate prediction errors as a powerful catalyzer of change in episodic memory – especially when predictions promote medium prediction errors.

P5.31 | The Role of the Brain's Natural Frequencies in Resting-state Network Connectivity

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According to leading theories in cognitive neuroscience, electromagnetic oscillations play a central role in the organization of neural communication. A deeper understanding of brain oscillations is therefore essential for unraveling the functional architecture of the human brain. Previous work has shown that intrinsic neural oscillations follow a regionally specific organization, with each brain area associated with a characteristic natural frequency. However, the precise contribution of the brain's natural frequencies to network connectivity has yet to be determined. While resting-state networks (RSNs) have been consistently identified using functional magnetic resonance imaging (fMRI), their electrophysiological counterpart remains elusive. Seminal studies indicated that connectivity between RSN nodes is indexed by frequency-specific power envelope correlations, particularly within the alpha and beta bands. However, a key limitation of this approach is the assumption that oscillatory activity is sustained over time. To overcome this limitation, the present study employed a burst co-occurrence analysis to explore the involvement of natural frequencies in RSN connectivity. To this end, we first identified oscillatory episodes in source space using a large MEG dataset (N = 128) from The Open MEG Archive (OMEGA). Then, we applied independent component analysis (ICA) to the time series of the previously detected oscillatory burst occurrences. Our results show that RSNs can be reconstructed with an accuracy comparable to that obtained via amplitude envelope correlations, based solely on the temporal co-occurrence of oscillatory episodes in the alpha and beta frequency bands. The peak frequencies of co-occurring bursts were approximately 10 Hz and 20 Hz for the visual and somatomotor networks. Interestingly, the left and right frontoparietal networks exhibited a frequency-specific dissociation, with bursts around ~14 Hz in parietal nodes and ~20 Hz in frontal nodes, suggesting the presence of multifrequency coupling. These findings suggest that electrophysiological resting-state functional connectivity may be driven by the co-occurrence of transient oscillatory episodes, rather than by sustained amplitude envelope correlation. Moreover, our results support the notion that the brain's natural frequencies play a pivotal role in RSN connectivity, shaping the specific oscillatory frequencies at which distinct network nodes communicate.

P5.32 | Theta-gamma Tacs and Cognitive Training in Cognitive Decline: Effects on Working Memory Performance

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The preclinical stages of Alzheimer's Disease (AD) often involve deficits beyond the hallmark impairments in episodic memory, including those related to working memory (WM), as observed in individuals with Subjective Cognitive Decline (SCD) and Mild Cognitive Impairment (MCI). Recent evidence highlights theta-gamma coupling – where gamma bursts are nested within theta oscillations – as a key neural mechanism for WM maintenance, and this coupling appears to decline in the early stages of AD. Transcranial alternating current stimulation (tACS) can modulate these dynamics by applying sinusoidal electrical currents. Previous studies have shown that left frontal theta-gamma tACS can positively affect WM performance in both young and older healthy adults. This study investigated the effects of 20-minute thetagamma tACS (6 Hz, 80 Hz) applied over the left dorsolateral prefrontal cortex (DLPFC), combined with 30 minutes of computerized cognitive training, in 29 older adults with SCD or MCIEach participant completed two blocks of eight consecutive sessions (excluding weekends): one with real tACS and the other with sham tACS, with a gap of 6 to 12 weeks between blocks. The order of stimulation conditions was counterbalanced across participants. WM performance was assessed using a visual match-to-sample task, and behavioral outcomes were analyzed using ANOVAs with two within-subject factors: session (pre-treatment vs. post-treatment) and condition (sham-tACS vs. real-tACS). The results showed improvements in response accuracy and speed in the post-treatment sessions compared to the pre-treatment ones, with more hits, more correct rejections, fewer false alarms, and shorter reaction times. These findings suggest that cognitive training was effective or that a learning effect occurred. However, no additional significant effects or interactions were found, indicating that real tACS treatment did not produce improvements beyond those observed with sham tACS. Future studies should explore other variables that may be masking potential effects, such as participants' age or their baseline performance quality.

P5.33 | Attention in Space and Time: How Adhd Affects Learning of Spatiotemporal Regularities

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Attention allows us to prioritise relevant information and ignore distractions in our sensory environment. Since natural scenes constantly change, we must adapt our attentional priorities accordingly. Predictable signals, like traffic lights, help us control attention by anticipation in time and space. Recent studies show that adults diagnosed with ADHD present difficulties with temporal expectations (Dankner et al., 2017). We used the Dynamic Visual Search task (DVS; Boettcher et al, 2022) to explore the effects of prediction-led attention in time and space. Participants with and without ADHD were instructed to detect pre-defined targets that either appeared at a predictable time and approximate location or randomly. Prediction formation can then be investigated by comparing performance to predicted versus random targets. In line with previous literature, we found that all participants benefited from target predictability, reduced distractor load, and over-time repetition. By tracking mouse movements, we discovered that these benefits enabled earlier, faster, and more pronounced hand movements toward and away from targets following their detection. In comparison to controls, participants diagnosed with ADHD presented worse performance, both in accuracy and in response times, and slower motor movements toward and away from targets. Moreover, neurotypicals exhibited progressive increases in prediction benefits across blocks, whereas participants with ADHD reached a plateau in their benefits early in the task. These findings shed light on the moment by moment impact of prediction formation as well as how ADHD constrains the sustained improvement of these predictive mechanisms, suggesting fundamental differences in the dynamic allocation of temporal attention. References Dankner, Y., Shalev, L., Carrasco, M., & Yuval-Greenberg, S. (2017). Prestimulus Inhibition of Saccades in Adults With and Without AttentionDeficit/Hyperactivity Disorder as an Index of Temporal Expectations. *Psychological Science, 28*(7), 835-850. https://doi.org/10.1177/0956797617694863 Boettcher, S. E. P., Shalev, N., Wolfe, J. M., & Nobre, A. C. (2022). Right place, right time: Spatiotemporal predictions guide attention in dynamic visual search. *Journal of Experimental Psychology: General, 151*(2), 348-362. https://doi.org/10.1037/xge0000901

P5.35 | Neural Mechanisms of Maladaptive Threat Learning and Safety Processing in Tinnitus

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Within the framework of threat and safety learning in psychopathology, our study investigates how tinnitus influences aversive and safety learning mechanisms. Classical conditioning, often used as a neurophysiological model for tinnitus-related distress, proposes that the perception of the phantom sound becomes implicitly linked to negative emotional states – a premise that informs treatments such as Tinnitus Retraining Therapy. We proposed that individuals with tinnitus would display heightened generalization of aversive responses and impaired threat inhibition – particularly in prefrontal brain regions (vmPFC, dlPFC) – relative to healthy individuals. To examine this, tinnitus sufferers and control participants engaged in an auditory conditioning task where either a low-frequency (700 Hz) or high-frequency (1000 Hz) tone (CS+) was paired with an aversive unconditioned stimulus (US), and the alternative tone (CS-) signaled safety. Moreover, seven generalization tones evenly spaced between CS- and CS+ were included to assess the gradient of threat generalization. Magnetoencephalography (MEG) recordings, along with explicit subjective ratings, revealed that although both groups showed generalization, tinnitus patients exhibited a reversal in prefrontal neural activation gradients. This pattern indicates a breakdown in typical inhibitory mechanisms that modulate attention, perception, and physiological arousal during learning, potentially accounting for the elevated emotional distress commonly experienced by individuals with tinnitus.

P5.36 | Sequence Models for by-trial Decoding of Cognitive Strategies in Perceptual Decision Making

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The hallmark behavioral pattern in perceptual decision making is the speed-accuracy trade-off (SAT). The SAT is the observation that when pressed for time, participants speed up and at the same time sacrifice accuracy. Typically, this is operationalized with a time pressured Speed condition, and an Accuracy condition where there is no

time pressure. The dominant theoretical explanation involves a response threshold that lowers under time pressure, such that participants can suffice with accumulating less evidence before committing to a choice, but with an increased chance of making an incorrect decision. To address the question whether individuals indeed execute the same cognitive operations in the speed condition as in the accuracy condition, but with a lower decision threshold, we combined Hidden Multivariate Pattern analysis with a structured state space sequence (S4) model to decode cognitive strategies from electroencephalography data at the trial level. Here, we assume that cognitive strategies are composed of sequences of cognitive operations, that should differ if a strategy is categorically different. Our results reveal an additional cognitive operation, labeled Confirmation, which seems to occur predominantly in the accuracy condition but also frequently in the speed condition. The modeled probability that this operation occurs is associated with higher probability of responding correctly as well as changes of mind, as indexed by electromyography data. By successfully modeling cognitive operations at the trial level, we provide empirical evidence for dynamic variability in decision strategies, challenging the assumption of homogeneous cognitive processes within experimental conditions. Our approach shows the potential of sequence modeling in cognitive neuroscience to capture trial-level variability that is obscured by aggregate analyses. The introduced method offers a new way to detect and understand cognitive strategies in a data driven manner, with implications for both theoretical research and practical applications in many fields.

P5.37 | Network Cofluctuation Dynamics Are Related to Personalized Neural State Transition Timing

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Our ongoing experience is segmented into a nested series of discrete events, behaviourally and neurally separated by boundaries. This segmentation is so strongly associated with shifts in brain activity patterns, that researchers can decode event transitions in movies and auditory narratives using fMRI. This work has primarily looked at how these region-specific neural event transitions are associated with human annotated behavioural event boundaries. However, given that widespread brain regions help support the event segmentation process, it is possible that large-scale coordination between regions could also be related to behaviour, as the brain coordinates with information in the environment. In the current study, we used a publicly available fMRI movie narrative dataset to explore whether changes in network coordination (as measured by cofluctuations in the BOLD signal) are associated with commonly perceived behavioural event boundaries as well as personalized neural state transition timing. Network dynamics are often measured by correlating the BOLD signal across regions using sliding window analyses. However, this temporal imprecision makes it difficult to relate these changes to neural and behavioural event transitions, which are fleeting. Therefore, we leveraged the temporal precision

of the Edge Timeseries method to measure network cofluctuation dynamics at a TR-by-TR level. This allowed us to compare the timing between these shifts in network cofluctuation and behavioural and neural event boundaries. Our preliminary results show that shifts in network cofluctuations were correlated with shared behavioural event boundaries, especially within the Dorsal Attention Network (DAN; $p < .01$). We also found that changes in within-network cofluctuation, including in the DAN, were correlated with personalized neural event boundaries ($p < .001$). The network cofluctuation dynamics surrounding personalized transitions demonstrated a profile consistent with reconfiguration of functional network structure. These results suggest that shifts in network coordination dynamics support our segmentation of experience into meaningful events, as we in turn coordinate with our environments.

P5.38 | Aperiodic Correlates of Predictive Coding in Visual Motion Perception

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Recently, the aperiodic feature of the spectrum described by a 1/f power law has received increasing interest in the study of human cognition. Its indices, the exponent and the offset, were linked to neurophysiological processes of excitation/inhibition balance and neural noise, making the aperiodic activity a fitting proxy to investigate the relationship between cognition and brain activity. With this study, we wanted to explore the role of the aperiodic activity in perceptual sampling and predictive processes. We recorded EEG activity in 60 participants performing a Representational Momentum (RM) task. RM is a perceptual phenomenon in which the remembered final position of a moving object is slightly displaced in the direction of the motion, and has been previously linked to visual predictive processes. The RM paradigm that we used involved the presentation of clockwise-rotating bars that participants had to compare to a second firm bar, i.e., the probe, which could have the same inclination as the last position of the rotating bar or be slightly tilted clockwise or counterclockwise. Our results show that higher offsets measured during the perception of the moving bar (before the probe presentation) were associated with smaller behavioural RM effects, possibly suggesting that a lower perceptual efficiency due to higher neural noise could impair prior formation, consequently decreasing the RM effect. Moreover, during the perceptual decision-making stage, i.e. in the 550 to 850 ms post-probe period, both the exponent and the offset were higher in parietal and frontal areas in the trials where the participants reported the incongruency between the two bars, compared to when they did not. This was evident in the most unexpected condition, when the probe was tilted against the direction of previous

motion, suggesting that exponent and offset increments in these trials may reflect the inhibition of the motion model in favour of a higher reliance on perceptual input. These results show the involvement of the aperiodic activity in visual perception and related predictive processes, both at the group and interindividual level, pointing out the need to deepen its role in cognition.

P5.39 | Do Normative Brain Deviations Improve the Predictability of Depressive Psychopathology Compared to Raw Brain Variables?

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Precision psychiatry aims to identify biomarkers for mental disorders using multivariate machine learning (ML) methods. However, recent evidence suggests that ML models fail to reliably distinguish patients with major depressive disorder (MDD), the mental disorder with the highest health-related burden, from healthy controls using structural neuroimaging data. Our aim was to address this challenge by using normative modelling. We examined whether deviations from normative brain models can improve the performance of ML models predicting MDD diagnosis and severity of depressive symptoms, compared to models based on raw structural brain features. We trained normative models based on T1-weighted magnetic resonance imaging data from the German National Cohort (NAKO, N = 10,692) and transferred the models to the Marburg-Münster Affective Disorders Cohort Study (MACS, N = 1,741) to quantify normative deviations in healthy controls and MDD patients. Hierarchical Bayesian regressions were applied to model voxel-based morphometry as well as region-based surface, thickness and volume (FreeSurfer), while accounting for age, sex, total intracranial volume and study site. Support vector machines and random forests were trained to predict MDD diagnosis and depressive symptom severity from both normative deviations and raw structural brain features. Using normative deviations as input for machine learning-based predictive models did not improve the classification accuracy or prediction of symptom severity compared to raw features. Across machine learning models and brain features, accuracies for the classification of healthy controls and MDD patients ranged from 52.39% to 58.49%. The explained variance for predicting depressive symptom severity remained below 2% for all models. Moreover, normative models trained on the large NAKO did not improve performance over normative models trained on a subset of healthy participants of the MACS sample. To conclude, normative deviations did not improve the prediction

of MDD diagnosis or symptom severity from structural brain data. A comprehensive evaluation of the normative models revealed that normative models did not benefit from the large normative cohort. Our findings highlight current limitations of structural imaging for individual-level prediction in depression and suggest that integrating normative and predictive modelling requires further methodological advances.

P5.40 | Endogenous Brain Rhythms Predict Individual Differences in Speech Comprehension

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Individuals differ widely in their ability to understand speech under challenging conditions, such as background noise, rapid speech, or intermittent interruptions. Endogenous brain rhythms, which are ubiquitous neural oscillations that vary across individuals may shape language processing. Our large-scale study (N = 400, age range 16 to 76, with diverse recruitment to address WEIRD [Western, Educated, Industrialised, Rich, and Democratic] population biases) investigates whether resting state EEG rhythms predict speech comprehension abilities, independent of peripheral hearing. Participants complete a 10-minute EEG recording and three behavioural speech comprehension tasks: noise-masked, time-compressed, and interrupted speech. In all comprehension tasks, difficulty level was parametrically modulated. By modelling individual peak frequencies and amplitudes, we aimed to disentangle how these rhythms might facilitate comprehension. Initial analyses confirmed broad inter-individual differences in task performance across all tasks. However, we also observed that task performance was correlated across participants. Individuals who were good at comprehending noise-masked speech tended to also perform well with time-compressed and interrupted speech, suggesting a potential role of general top-down mechanisms that influences comprehension. Electrophysiologically, brain rhythms were organised into topographically distinct patterns, with for example theta being most prominent in central auditory electrodes and alpha being most prominent in occipital electrodes. We found several rhythmic patterns that influenced speech comprehension, particularly at more difficult levels. For example, the individual auditory theta peak frequency predicted comprehension in the time-compressed speech task: faster theta rhythm was associated with better comprehension of fast speech. On the other hand, individual theta amplitude was associated with comprehension of noise-masked speech. Interestingly, the auditory alpha amplitude at rest predicted overall speech comprehension - lower alpha was associated with better performance across tasks. These associations persisted after controlling for hearing thresholds, underscoring the role of central auditory processing. Our study bridges a critical gap between basic neurophysiology and real-world listening. These findings could inform personalised interventions (e.g., hearing aids tailored to neural profiles) and refine theoretical models of speech perception across populations. Ultimately, our

findings suggest that the brain's rhythmic architecture is a foundational aspect of auditory comprehension, offering a neurophysiological framework to better understand individual variability in communication abilities.

P5.41 | Do Temporal Expectations Modulate Rhythmic Behavioral Sampling in Auditory Perception?

Thibault Marichal (Ghent University); **Durk Talsma** (Ghent University); **Tom Verguts** (Ghent University)

Perception is increasingly understood as a rhythmic (oscillatory) process rather than a continuous stream, in which sensory information is sampled in discrete temporal cycles. A separate literature has shown that perception is fundamentally predictive: by anticipating upcoming stimuli, processing becomes more efficient. Here, we integrate these literatures and propose that oscillatory sampling properties – particularly sampling frequency – are adaptively modulated to optimize processing. Specifically, sampling frequency may increase before an expected event and decrease when no event is anticipated, since sustained high-frequency sampling without expectancy yields minimal benefit and incurs metabolic cost. To test this, we measured oscillations in behavior using an auditory perception task in which stimulus onset was varied. Participants responded as quickly as possible to tones presented either within a visually cued (expected) interval or earlier, thereby violating that expectation. On 80 % of trials, sounds occurred in the expected window; on 20 %, they appeared earlier. To probe rhythmic sampling in these two conditions, we densely sampled reaction times over a 480 ms window, using 16 equally spaced (30 ms) presentation times. Each tone was delivered to either the left or right ear, and participants indicated detection via button press. The resulting time series of reaction speeds was analyzed with a linear regression model that incorporated a sinusoidal component – estimating frequency, amplitude, and phase – and separate slope and intercept parameters for expected versus unexpected stimuli. We report how temporal expectations modulate the rhythmic sampling of auditory information and situate our findings within the broader literature on oscillatory sampling and predictive processing.

P5.42 | Targeting Attentional Shifts in Parkinson's Disease: How Deep Brain Stimulation Affects Perseveration and Learned Irrelevance

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Parkinson's disease (PD) is characterized by early impairments in attentional set-shifting, reflecting deficits in cognitive flexibility. Two distinct phenomena contribute to these deficits: perseveration (PE) and learned irrelevance (LI). PE refers to the difficulty in shifting attention away from a previously relevant stimulus, whereas LI describes the difficulty in shifting attention toward a stimulus that was previously irrelevant. While PE is a well-documented deficit in PD, the mechanisms and clinical relevance of LI remain understudied. Moreover, although the effects of dopaminergic medication on PE and LI have been investigated, no studies have examined the impact of deep brain stimulation (DBS) on these phenomena. This study compared performance on PE and LI tasks among PD patients treated with DBS, PD patients in the OFF-medication state, and healthy controls. Considering that LI is less dependent on dopaminergic system and more sensitive to disruptions in attentional prioritization, it was expected to be particularly susceptible to the effects of DBS. We developed a computerized LIPE task based on a visual discrimination learning paradigm. A total of 135 participants (26 DBS patients, 51 PD patients OFF-medication, and 58 healthy controls) completed the LIPE task along with a battery of control measures, including the Montreal Cognitive Assessment (MoCA), Verbal Fluency Test (VF), and Color Trails Test (CTT). Disease severity was assessed by a board-certified neurologist using the Unified Parkinson's Disease Rating Scale (UPDRS). Linear mixed-effects models evaluated the effects of treatment group and task condition (LI/PE/control) on reaction times (RTs), controlling for cognitive, demographic, and clinical variables. DBS patients demonstrated significantly slower RTs (1.11s) compared to OFF-medication patients (0.84s; $p = 0.003$, $d = 0.67$) and controls (0.75s; $p = 0.002$, $d = 1.06$). The difference between OFF-medication patients and controls was not significant ($p = 0.91$, $d = 0.29$). Task condition significantly affected performance ($p < 0.001$), with the LI condition eliciting the slowest responses. A significant treatment × task interaction ($p = 0.005$) indicated that DBS patients were disproportionately impaired in the LI condition, suggesting greater difficulty in overcoming LI compared to PE. DBS was associated with broader deficits in cognitive flexibility than medication withdrawal. These findings underline the necessity for routine cognitive assessment following DBS and highlight the need for targeted cognitive interventions addressing cognitive flexibility impairments in PD patients.

P5.43 | Task-modulated Functional Connectivity in Decision-making Under Uncertainty: Evidence From the Balloon Analog Risk Task

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While decision-making regions in the brain are well established, how these regions interact during uncertain choices remains unclear. In this study, we analyzed

openaccess fMRI data using an updated brain atlas (AAL3) and applied advanced methods – psychophysiological interaction (PPI) and network-based statistics (NBS) – to examine task-related changes in functional connectivity. This approach not only advances our understanding of the neural architecture underlying complex decision-making but also underscores the importance of reproducibility, transparency, and scalability through the use of publicly available neuroimaging data. In this study, we used an open-source dataset acquired from OpenNeuro, containing 16 healthy individuals who performed the Balloon Analog Risk Task (BART), a well-established measure of decision-making behavior. The task included reward balloons with varying explosion probabilities and a neutral balloon as a control condition. Imaging data were acquired using a 3T Siemens scanner and preprocessed with CONN and SPM12, including realignment, normalization, smoothing, and denoising with CompCor and motion correction. Functional connectivity during the inflation of rewarded balloons – compared to the control condition – was examined using generalized psychophysiological interaction (gPPI) models across 46 regions defined by the AAL3 atlas, which includes anatomically refined subdivisions, such as reward- and arousal-related nuclei. NBS was employed to identify significant differences in functional connectivity across brain networks modeled from neuroimaging data. To further explore the neural basis of risk-taking behavior, we examined correlations between network-level metrics and behavioral performance – specifically, the adjusted pump rate, defined as the average number of balloon inflations on trials that resulted in successful monetary gains. During uncertainty, the most prominent increases in functional connectivity were observed between the anterior cingulate cortex and inferior opercular and orbital regions of the prefrontal cortex during decision-making. In contrast, fewer decreases in connectivity emerged, primarily between striatal regions and medial/orbital prefrontal areas. Additionally, adjusted pump rates were positively associated with connectivity between the left Rolandic operculum and right medial orbitofrontal cortex, as well as between the right pulvinar thalamus and right precuneus. These findings provide preliminary insight into the functional networks underlying risk-taking behavior during decision-making under uncertainty. By linking behavioral performance on the BART with task-modulated connectivity patterns, the study identifies potential neural mechanisms underlying adaptive risk-taking. Increased connectivity among valuation and control regions suggests coordinated engagement during deliberative choices. In contrast, reduced connectivity between striatal and prefrontal areas may reflect diminished engagement of habitual or automatic pathways during deliberative decision-making. However, given the limited sample size, these results should be interpreted with caution and considered exploratory. Future studies with larger, more diverse cohorts are necessary to validate and extend these findings. The combined use of psychophysiological interaction analysis and network-based statistics enabled a detailed examination of functional integration, while the use of open-access fMRI data underscores the importance of transparent and reproducible research practices in cognitive neuroscience.

P5.44 | A Novel Free-viewing Task to Investigate Attention Bias in Adolescents With Depressive Disorders

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Previous research has investigated the extent to which individuals with depression display attention biases to emotional stimuli during free-viewing (FV) tasks. However, the majority of such research is conducted in adult samples and utilizes static images (Suslow et al., Journal of Affective Disorders, 2020). This poses a problem because 1) depression typically emerges in adolescence, thus research within this age group is imperative and 2) video clips as opposed to images offer more translation to real world context. To investigate oculomotor behaviour of adolescents with depression we developed a novel FV video task, which includes 10 minutes of neutral clips (e.g., cityscapes, nature) and 10 minutes of clinically-oriented clips (e.g., happy/neutral/sad/angry faces, food/people eating, alcohol/people drinking). Clips containing people were carefully curated to include an equal number of male/female-presenting actors as well as diversity of race. The study sample included 50 adolescents with MDD (mean age [M]=15.87, 40 female, Patient Health Questionnaire [PHQ] score=14.1) recruited from a local psychiatric outpatient program and 50 age- and sex-matched healthy controls (M=15.82, 40 female, PHQ=1.92) recruited from the community. All participants completed FV and several self-report questionnaires for psychiatric symptoms. Across all clip types, preliminary data suggest that youth with MDD had increased baseline pupil size, longer fixation durations, reduced center bias, and a delay in micro-saccade rebound following clip changes. Content-specific analysis has yet to be conducted, but it is hypothesized that increased depression severity (as indicated by the PHQ) will positively correlate with fixation time on negative faces and negatively correlate with fixation time on positive faces. Future analyses will also seek to determine the effect of sex, gender, and age on these outcomes. If a distinct pattern of attention bias and low-level oculomotor responses is identified, this task may be used as a depression-screening tool in the future.

P5.45 | Global Cooperation Project: Testing Interventions to Reduce Polarization

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Humans tend to form groups based on shared characteristics, i.e., moral values. However, this tendency often results in an "us vs. them" division, which can lead to intergroup conflict. A consequence of these conflicts is polarization. While previous research has demonstrated that interventions can effectively reduce partisan animosity, their impact on cooperation and social dynamics remains underexplored. This study aims to investigate whether interventions can enhance cooperation, reduce polarization, social distance, and increase interconnectedness among individuals with polarized opinions in a cross-cultural sample spanning 50 countries. The sample will be comprised of 1,500 participants per country (75,000 participants in total). They will be assigned to one of four intervention groups or a control condition. The interventions, previously tested in a U.S. sample, will be adapted for cultural relevance in each participating country. Cooperation will be assessed through two social dilemmas: the Public Goods Game (PGG) and the Prisoner's Dilemma (PD). Additionally, social distance will be measured using the Bogardus Social Distance Scale, interconnectedness through the Inclusion of the Other in the Self Scale, and intergroup animosity via self-reported affective evaluations of the opposing group. Data analysis will be conducted using hierarchical linear modeling to account for the nested structure of individuals within countries. We hypothesize that interventions will increase cooperation, reduce social distance, and enhance interconnectedness compared to the control group. Furthermore, individual traits such as open mindedness and lower collective narcissism are expected to moderate these effects. We also anticipate cross-cultural variations, with differences in intervention effectiveness influenced by socioeconomic and cultural factors. By providing a large-scale, cross-cultural evaluation, this study aims to generate insights into how interventions can mitigate polarization and foster prosocial behavior in diverse social contexts.

P5.46 | Audiovisual Pitch Perception Training in Peripheral and Central Auditory Deficits

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Pitch perception is essential for a good comprehension of music and speech, as well as for auditory scene analysis. However, pitch processing can be impaired in peripheral or central auditory deficits. In the case of hearing loss, cochlear implants (CI) can restore a part of the auditory signal, but due to the limited number of electrodes, pitch perception remains poor. In congenital amusia, a neuro-developmental

disorder, music perception is altered due to pitch processing deficits. Our present study builds on previously reported benefits of multisensory integration of audiovisual (AV) cues on pitch processing and tested whether AV training could result in an enhancement of pitch processing in amusic (n=18), control participants (n=19) and CI users (n=11). The training consisted of three pitch-related tasks, performed twice per week over 15 weeks: a pitch change detection task (PCD), a pitch direction of change identification task (DCI), and a pitch short-term memory task (STM). Each session lasted about 15min. Half of the training trials were auditory only, and the other half audiovisual. Auditory and audiovisual trials were randomized. Before and after the training phase, participants underwent testing sessions without visual cues. During the testing sessions, participants performed the same three tasks as during the training and additional untrained tasks. In addition, we used magnetoencephalography (MEG) measures to assess the effect of the AV training on brain plasticity for amusic and control participants. We recorded brain responses during an active short-term memory task for pitch and a passive oddball paradigm with pitch deviants. All AV training gains (for both behavioral and neural measurements) were compared to those of a control training targeting visuo-spatial attention. The order of audiovisual or visuospatial training sessions was counterbalanced across participants. Our results revealed a benefit of the AV pitch training on the performance of CI users and amusic individuals, revealed by faster response times (CI users) and higher accuracy (amusics). Moreover, we observed behavioral benefits of the AV training on hearingin-noise abilities in CI users. The investigation of the training effect on auditory networks in amusics and controls revealed a decrease of N100 component after the AV training. These results suggest that pitch perception can be enhanced thanks to pitch AV training and provide new perspectives to enhance auditory cognition in other cases with hearing loss, such as presbycusis.

P5.47 | The Representational Alignment Between Humans and Language Models is Implicitly Driven by a Concreteness Effect

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The nouns of our language refer to either concrete entities (like a table) or abstract concepts (like justice or love). Cognitive psychology has established that whether words refer to concrete or abstract concepts influences their processing both at the behavioral and neural level. Accordingly, understanding how concreteness is represented in our mind and brain is a central question in psychology, neuroscience, and computational linguistics. While the advent of powerful language models has allowed for quantitative inquiries into the nature of semantic representations, it remains largely underexplored how they represent concreteness. Here, we used behavioral judgments to estimate semantic distances implicitly used by humans, for a

set of carefully selected abstract and concrete nouns. 40 participants were asked to rate the odd item out of a triplet of words (number of triplets = 9880). Using Representational Similarity Analysis, we find that the representational similarity space of participants and the semantic representations of language models are significantly aligned and that both are implicitly aligned to an explicit representation of concreteness, which was obtained from our participants using an additional concreteness rating task. Importantly, using ablation experiments, we demonstrate that the human-to-model alignment is substantially driven by concreteness – but not by other important word features established in psycholinguistics, such as word frequency. These results are critical for the use of language models in both behavioral and brain studies. Extending the present approach to functional neuroimaging data and model-to-brain alignment will be highly fruitful to improve our understanding of the organization of semantic representations in the human brain.

P5.48 | Single-neuron Representations of Fear Processing in the Human Brain

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The amygdala and hippocampus play key roles in fear learning, but the contribution of human single neurons within these regions towards fear processing remain unclear. We investigated single-neuron activity from the amygdala in nineteen epilepsy patients undergoing a context-dependent fear conditioning paradigm. Preliminary results via cluster-based permutation analysis of 24 amygdala neurons show that during acquisition, neuronal firing rate significantly differentiated aversive US (unconditioned stimulus) vs. non-aversive no-US outcomes, driven by a robust cluster identified between 475-525 ms post-event onset (cluster $p = 0.03$), indicating higher firing for US presentations. This early differentiation highlights the amygdala's rapid encoding of aversive outcomes during the acquisition of associative fear learning, providing insight into the single-neuron correlates underpinning the formation of threat associations in humans. We are currently expanding the analyses to investigate the neural representations of CS+/CS- cues in the amygdala, as well as the contribution of hippocampal neurons towards fear acquisition and extinction. Exploratory analyses will include representational similarity analysis to investigate context specificity, item stability, etc., to expand upon our group's previous fMRI and macro-EEG results utilizing the same experimental paradigm.

P5.49 | F-FEEB – Neural Correlates of Affective Self-other Distinction

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Affective self-other distinction (SOD) refers to the ability to differentiate between one's own emotional state and one's empathic response to another person's emotional state. Failures in SOD can lead either to perceiving another person's emotional state as more similar to one's own than it actually is (called emotional egocentric bias (EEB)) or to perceiving one's own emotional state as more similar to another person's than it actually is (called emotional altercentric bias (EAB)). Previous studies investigating the neural correlates of SOD observed that SOD was related to activity in the right supramarginal gyrus (rSMG). Here we present a new paradigm to assess SOD, the Food Emotional Egocentricity Bias paradigm (FEEB). In the FEEB, participants have to switch trial-by-trial between rating their own or another person's emotional response to the food stimuli. The FEEB uses visual food stimuli to elicit emotional responses and videos of facial expressions to elicit an empathic response, which taken together reliably evoke an EEB and EAB. In contrast to previous SOD paradigms, the FEEB uses videos of facial expressions as direct cues to indicate the other person's emotional state. The aim of our study was to investigate, whether activity in the rSMG is in general related to SOD across different modalities and whether EEB and EAB have common or separate neural correlates. 26 participants performed the FEEB while we used functional magnetic resonance imaging to test whether rSMG activity is specific for SOD in general. Our whole brain analysis revealed that both EEB and EAB were associated with the same differences in neural activity in rSMG, insula, right inferior frontal gyrus and ventral striatum. However, interindividual differences in the EEB were negatively related to activity in the left supramarginal gyrus and precuneus, whereas interindividual differences in the EAB were negatively related to activity in the right dorsolateral prefrontal cortex. These results suggest, that the rSMG is relevant for detecting conflicting emotional states, whereas failures in SOD, reflected in the size of the EEB and EAB, depend on separate neural networks.

P5.50 | Production-perception Link for German Lexical Stress

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Syllable stress is a central prosodic feature in German, conveying both meaning (e.g., úmfahren/umfáhren – driving around/driving over) and metrical structure. Stress is conveyed by relative changes in vowel duration and pitch, that is, stressed syllables are longer and marked by pitch increases. Effective communication relies on accurate perception and production of these stress patterns. Speech accommodation, a well-researched phenomenon, shows that speakers modify their prosodic patterns in response to the acoustic environment, illustrating the complex and dynamic relationship between speech production and perception. Here we aim to better elucidate this bidirectional link and hypothesize that individuals' sensitivity to acoustic stress markers is interdependent with their use in stress production. In an online within-subject experiment, native, monolingual German speakers (n=21) were asked to produce and discriminate stress patterns on two pseudowords ("luma" and "haku"). In the perception task, participants judged whether the first or second syllable of the target pseudowords was stressed. On each token, pitch (140–230 Hz) or duration (90– 180 ms) of the first syllable were manipulated along a continuum in 7 steps, while the second syllable was held constant. In the production task, participants were asked to produce a specified stress pattern on the same pseudowords, either in isolation or embedded within semantically coherent sentences. Preliminary results (n=21) show stronger reliance on vowel duration than on pitch for stress identification and production. This was evident in group-level effect sizes, which were larger for duration, and in effect size variability across participants, which was larger for pitch. Patterns were similar between word and sentence production. The individual use of pitch was more robust over words and conditions than the use of vowel lengthening. This suggests that vowel length is more dependent on linguistic context - such as phonetic composition and position within the sentence - and highlights the role of pitch as a stable cue in speech production. Overall, preliminary analyses show that our tasks offer robust estimates of reliance on different acoustic prosodic cues. Correlational analyses across tasks on the complete data set (target n = 50) will be reported at the conference.

P5.51 | Distinct Neural Signatures for Content and Timing Predictions in Music and Speech

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Prediction is a fundamental aspect of cognition that allows for anticipation of the content ("what" will occur) and timing ("when" it will occur) of upcoming events. However, it is unclear how the brain generates and integrates these predictions, and whether these processes operate similarly across domains. The current EEG experiment aims to investigate the interaction between content and timing predictions across music and speech domains by manipulating each type of prediction independently. Content in melodies/sentences was altered such that the ending note or word was either predictable or unpredictable based on the preceding context. Timing was manipulated globally so that the presentation rate of middle notes/words was altered in the unpredictable condition and remained unchanged in the predictable condition. Behaviourally, participants were asked to rate how well the final note/word completed the melody/sentence. To investigate the effects of training-related neuroplasticity on music prediction, as well as potential transfer effects to speech prediction, 24 musicians and 24 non-musicians were recruited. Data collection has been completed, and all analyses will be finalised before the conference. Preliminary behavioural analyses (Bayesian Mixed Effects Model) suggest an effect of content predictability in both music and speech, with lower completion ratings for unpredictable final notes/words. The influence of content predictability was supported by the neural data analyses (ERP and Decoding). Responses to the final note/word could most reliably be differentiated between conditions after 200-300ms in the melodies, and after 300-500ms in the sentences. Preliminary analyses also suggest an additive effect of timing in the melodies, with stronger responses elicited with unpredictable timing. In the preliminary neural analyses, an effect of timing was not observed in sentence processing, suggesting a domain-specific interaction between content and timing predictions. Additional analyses will incorporate measures of individual variability (musical sophistication, working memory capacity and behavioural sensitivity to the task) as regressors to predict neural responses. Results will shed light on the complex interaction between content and timing predictions, with implications for understanding how these dimensions are processed across music and speech, and how musical training might influence this.

P5.52 | Interpersonal Coordination Modulates Dynamic Functional Connectivity in a Hyperscanning EEG Mirror-game Experiment

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Previous research has shown that interpersonal synchronization emerges spontaneously when people are visually coupled, as reflected in both behavioral and neural measures. However, the neural dynamics underlying such synchronization remain poorly understood, especially in complex dynamic interactions. This study employed EEG-hyperscanning and a dynamic functional connectivity approach to explore brain dynamics during improvised movements performed under varying degrees of visual feedback and coordination instructions. Participants engaged in a "mirror-game" paradigm consisting of three conditions: Solo (improvised movements at their preference without visual feedback), Spontaneous (improvised movements at their preference with visual feedback), and Coordination (improvised movements with visual feedback with explicit synchronization instructions). We hypothesized that the differing degrees of self-other integration across conditions would modulate dynamic neural connectivity patterns, particularly within alpha and beta frequency bands. Dynamic functional connectivity was assessed using an adaptation of the Leading Eigenvector Dynamics Analysis (LEiDA) method for EEG data. After band-pass filtering the 64-channel EEG signals, dynamic phase-locking matrices were calculated across consecutive time windows. The dominant connectivity patterns at each window were represented by extracting the leading eigenvector from each phase-locking matrix. These eigenvectors were concatenated across participants, conditions, and epochs, then clustered using k-means clustering, exploring cluster solutions ranging from 4 to 20 states. The occurrence probability of each connectivity state was computed per participant for each of the 3 conditions. Preliminary findings revealed significant differences in dynamic connectivity primarily within the alpha band, localized across frontal and occipital/centro-parietal brain regions. Specifically, frontal regions demonstrated higher state occurrence probability during the Coordination condition compared to Spontaneous and Solo conditions, potentially reflecting increased cognitive load and motor planning demands associated with greater self-other integration during interpersonal synchronization. Conversely, occipital and centro-parietal regions showed higher state occurrence probability during the Solo condition compared to Spontaneous and Coordination conditions, possibly suggesting reduced withinperson action-perception coupling, and hence greater self-decoupling during conditions of interpersonal coordination, as shown in previous studies (Heggli et al., 2019; Zimmermann et al., 2022). These findings highlight distinct neural connectivity profiles underlying spontaneous and intentional synchronization during improvised interactions.

P5.53 | White Matter Network Microstructure Predicts Computational Phenotypes of Effort And Reward Valuation

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Effort-based decision-making – the process of evaluating whether a reward is worth the required effort – is central to human behavior. Disruptions in this valuation process contribute to apathy, a core symptom in numerous neuropsychiatric disorders. Even in healthy subjects, there is substantial inter-individual variability in how effort and reward are valued. Although prior research has implicated a fronto-striatal network – including the supplementary motor area (SMA), orbitofrontal cortex (OFC), dorsal anterior cingulate cortex (dACC), and ventral striatum – in effort and reward valuation, the structural underpinnings of individual differences in this network remain poorly understood. Here, we investigated whether white matter microstructure explains variability in computational phenotypes of effort and reward valuation. Forty-five healthy participants performed a validated effort-based decision-making task, allowing us to estimate individual valuation parameters using formal computational modeling. Participants also underwent diffusion-weighted MRI. We conducted whole-brain voxel-wise analyses of fractional anisotropy (FA) and mean diffusivity (MD), unconstrained by anatomical priors, to identify regions where white matter microstructure covaried with individual valuation tendencies. Our results reveal that valuation parameters significantly correlate with white matter microstructure in multiple regions, including – but not limited to – tracts within the fronto-striatal network. Notably, we identified microstructural features in tracts connecting OFC and dACC (i.e., in the anterior cingulum), in SMA-related tracts, as well as in regions outside this classical network. Finally, we show that individual valuation phenotypes can be predicted with over 80% accuracy using these microstructural features in a supervised machine learning model. These findings provide the first whole-brain evidence that inter-individual differences in effort and reward valuation are anchored in distributed white matter architecture. They open new avenues for identifying structural biomarkers of valuation dysfunction, as observed in clinical apathy.

P5.54 | Electric Magnetic Stimulation Restores Brain Glucocorticoid Receptors in Depressed Rats Treated With Oxytocin

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Electromagnetic Stimulation (EMS) is an emerging therapeutic approach that shows promise in treating various psychiatric conditions, including depression. The role of glucocorticoid receptors (GRs) and their interaction with oxytocin in the context of depression and electromagnetic stimulation involves multiple neurobiological mechanisms. The aim of this study was to investigate the effects of EMS on NR3C1 gene expression in both blood lysate and brain tissue in the context of oxytocin treatment in clomipramine-treated rats. Experiments were conducted on intact and clomipramine-induced depressed male rats (n = 15 per group). Clomipramine was administered at a dose of 25 mg/kg intraperitoneally from postnatal days (PN) 8 to 21, which resulted in depressive-like behavior. From PN70 to PN80, the rats were subjected to EMS. At PN80, rats were treated intranasally with 18 IU of oxytocin for 10 consecutive days. To assess NR3C1 gene expression in the brain tissue and blood lysate, an immunoenzymatic assay was performed using the Rat NR3C1/Glucocorticoid Receptor ELISA Kit. The reliability of the data was evaluated using ANOVA. Results indicated that NR3C1 gene expression in the brain homogenate was significantly reduced in depressed rats compared to intact rats ($P \leqslant 0.01$). In contrast, NR3C1 gene expression increased dramatically in the blood cell lysate ($P \leqslant 0.01$). In intact rats, oxytocin increased NR3C1 gene expression in the brain tissue homogenate ($P \leqslant 0.01$) while decreasing it in the blood lysate ($P \leqslant 0.05$). EMS fully restored GR expression in both brain tissue and blood lysate, which had been impaired by clomipramine treatment ($P \leqslant 0.01$). These findings suggest that oxytocin itself upregulates GR expression in the brain, counteracting the harmful effects of chronic stress on the GR system by reducing HPA axis overactivity and promoting GR sensitivity. When combined with EMS, oxytocin may further enhance the restoration of GRs by creating a more favorable environment for neuroplastic changes and receptor expression. In conclusion, the combination of EMS and oxytocin treatment may act synergistically to restore GR function in depression, leading to more substantial changes in brain regions related to stress and emotion, and potentially improving the expression and function of GRs. The research was funded by the Shota Rustaveli National Foundation FR -22-1319.

P5.56 | Pre-stimulus and Post-stimulus Alpha Amplitude: Are They Related?

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Introduction. Event-related changes in alpha rhythm amplitude observed with magneto- and electroencephalography (MEG/EEG) accompany every stimulus processing, as well as almost all motor or cognitive events. Studies that look into pre-stimulus alpha amplitude (Apre) effects suggest that high alpha amplitude corresponds to a more pronounced inhibition in the cortex, while low alpha amplitude – to disinhibition. Studies that look into post-stimulus amplitude (Apost) effects report an omnipresent decrease in alpha amplitude, known as event-related desynchronization (ERD). However, there is no agreement on whether smaller or larger ERD correlates with better performance (it seems to depend on the task). Nonetheless, for assessing post-stimulus effects, the common (and ubiquitous) method of calculation of ERD is computing the relational change, i.e., scaling the post-stimulus amplitude to pre-stimulus: Apre-ApostApre. In our study, we asked the question of whether scaling is an essential or reasonable approach to capture neurophysiologically relevant processing. On the one hand, if the relative change in amplitude (the delta between Apre and Apost) is functionally relevant, then the use of the formula is appropriate. On the other hand, if the level to which amplitude drops carries pertinent information, then the formula may conceal the true effect. Methods. We analysed EEG data from 40 healthy participants (age 20–35 yrs). Our participants received either above threshold electrical stimuli or no stimuli to their left index finger and were asked to report perceiving something with a button press. We sought to explain the detection rate with three predictors: either Apre or Apost or ERD. We performed the analysis with a two-level regression approach: first level, running the regression for each participant, and second level, testing the first-level beta coefficients for each predictor against zero and comparing beta coefficients between the predictors. Results. We observed that, in sensory areas, Apost significantly better explained individual stimulus detection performance than Apre or ERD. Discussion. Based on the analysis of one experiment, we suggest that scaling post-stimulus amplitude to pre-stimulus may not be the optimal approach to detect functionally relevant processing. In a follow-up, we will apply this analysis to other datasets to confirm the results.

P5.57 | Effect of Hm4di Activation of Camkii Neurons in the Ventral Hippocampus With Clozapine-n-oxide on the Behavior and Cognitive Alterations Induced by Chronic Restraint Stress in Rats

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Background: The survival and adaptation of species to stress depend on physiological and behavioral responses. While these responses are crucial in the short term, their repeated or prolonged activation, such as during chronic exposure to stressors, can lead to morphofunctional dysfunctions that may result in diseases. Clinical and preclinical studies have demonstrated cognitive impairments following chronic stress. Hypotheses: The hypothesis of present study is that glutamatergic neurons in the ventral hippocampus (vHip) are involved in memory impairment related to a motivated task. Experimental procedures: Using designer receptors exclusively activated by designer drugs (DREADDs), we inactivated vHip glutamatergic neurons and evaluated their role in learning and non-emotional memory under repeated restraint stress (CRS) via the novel object recognition (NOR) test. Male rats received viral vector injections delivering the inhibitory hM4Di DREADD (pAAVCaMKIIa-hM4D(Gi)-mCherry) or empty viral vector (pAAV-CaMKIIa-EGFP) into the vHip. All animals received Clozapine-N-Oxide (CNO) intraperitoneally. They were exposed to acute (RS, 2h/day, 1 day) or chronic restraint stress (CRS, 2h/day, 21 days) or were not stressed. Anxiety-like behavior was assessed in the open field test (OFT), and memory performance in NOR, 24 and 48 hours after RS or CRS or without stress. Statistical analysis and results: Significant differences were observed in the OFT for time spent ($F(2, 22) = 4.025$, $P = 0.0324$) and distance traveled ($F(2, 22) = 35.72$, $P < 0.0001$) in the center, and time spent ($F(2, 22) = 6.838$, $P = 0.0049$) and distance traveled ($F(2, 22) = 4.891$, $P = 0.0175$) in the periphery among control animals (pAAV-CaMKIIa-EGFP) non-stressed, RS and CRS groups. Additionally, CRS control animals (pAAV-CaMKIIa-EGFP) differed from CRS hM4Di DREADD vHip (pAAV-CaMKIIa-hM4D(Gi)-mCherry) animals in time spent ($t = 2.474$, $P = 0.0268$) and distance traveled ($t = 2.677$, $P = 0.018$) in the center. Long-term NOR analysis ($F(5, 43) = 2.864$, $P = 0.0256$) indicated a significant difference between acutely stressed control and RS hM4Di DREADD groups ($t = 3.396$, $P = 0.0043$). These findings highlight vHip glutamatergic neurotransmission in anxiogenic like-behavior and memory processes under stress. Funding: The São Paulo Research Foundation (FAPESP #2018/04899-1; 2021/00148-4; 2023/12262-1; 2023/00306-4).

P5.58 | Is Successful Response Inhibition Modulated by Transient Beta Bursts?

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The ability to inhibit inappropriate or irrelevant responses to achieve goals is a key component of executive functions and a common deficit in major psychiatric disorders. A frequent paradigm for studying the neural processes underlying response inhibition is to ask participants to respond to a GO stimulus and inhibit the response to noGO stimuli. The neural pathways for response inhibition have been linked to the fronto-striatal network, specifically, the inferior frontal gyrus (IFG) applies top-down regulation, suppressing an already initiated response through the subthalamic nucleus (STN), leading to the inhibition of motor responses in the primary motor cortex. However, little is still known about how prefrontal circuits executes this top-down control signals to inhibit unwanted processes. Magnetoencephalography (MEG) studies have shown that in correctly inhibited trials, there is an increase in beta band power in the right inferior frontal cortex (rIFC) and the pre-supplementary motor area (preSMA). Recent studies have shown that this augmented average power in the beta band may arise from transient power within this frequency band in non-averaged data, referred to as "events" or "bursts." To better understand how this increase in beta power might emerge from local neuronal dynamics, we analyzed the characteristics of high-power transient oscillatory events in each Go/noGO trial. A sample of N=80 healthy subjects was recorded using magnetoencephalography while performing a Go/No-Go task with a ratio of 70 Go trials to 30 no-GO trials. For each trial, the power spectrum and time-frequency representations were calculated in prefrontal and parietal sensors. A time-frequency algorithm (Shin et al., 2017) was used to detect oscillatory events in the beta band [12-30] Hz and characterize them according to their rate, duration, power, and frequency range. Preliminary analyses suggest that in correctly inhibited trials, there is a systematic increase in power in the beta band [12-30] Hz, as well as an increase in the expression of high-power transient oscillatory events in beta after the noGO stimulus in prefrontal region sensors (lPF p-value = 0.02; rPF = 0.053). These findings suggest that bursting in the β band likely reflects a rapid activation of inhibitory control after a stop signal, which could explain longer response latencies during correctly inhibited trials.

P5.59 | Impact of Natural Aging on Sensory Reweighting Dynamics During Continuous Proprioceptive Perturbations: A Temporal Response Function Analysis at the Biomechanical and Cortical Levels

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Sensory reweighting (SR), the adaptive modulation of visual, vestibular, and proprioceptive inputs for balance, is essential for postural control,particularly in older adults. While SR has been extensively explored through biomechanical measures, its neural encoding is less known. This study investigated age-related SR dynamics at both biomechanical and cortical levels. Seventeen healthy young (26.5 ± 2.8 years) and fourteen healthy older adults (66.2 ± 3.8 years) equipped with a 64channel EEG cap, stood on a force plate placed atop a custom-built mechanism imposing continuous ankle joint perturbations in the sagittal plane. Proprioceptive perturbations (random

fluctuations at 0.4°, 0.8°, 1.6°, 3.2°; 0.5–2.0 Hz) were presented in four separate conditions, each lasting 5 minutes and repeated twice in random order. Cross-validated ridge regression estimated the temporal response function (TRF) of anteroposterior center of pressure (COP) and EEG signals for each condition. TRF amplitudes were extracted from -0.5 to 1.0 s. SR was quantified as the opposite of the ratio of the 2nd to the 1st order coefficients of a polynomial fit to TRF amplitude plotted as a function of stimulus amplitude. SR indexes of COP and EEG signals were compared between age groups (independent t-tests) and between modalities within groups (paired t-tests). Across all participants, COP TRFs showed a consistent negative peak around 0 ms, followed by a positive peak within 0–500 ms, enabling robust SR estimation. COP-based SR was significantly higher in young (0.27 ± 0.10) than older adults (0.18 ± 0.05), $t(29) = 2.85$, $p = 0.008$, $r = 0.47$. EEG-based SR did not differ between age groups ($p > 0.05$). No significant difference was found between COP-based and EEG-based SR in the young group, though a trend toward significance emerged in the older group ($p = 0.057$). This study is the first application of the TRF framework to assess SR under continuous, unpredictable proprioceptive input. Findings reveal age-related decline in biomechanical SR, while cortical SR appears preserved, suggesting peripheral rather than cortical degradation. Age-related subcortical/medullary changes such as impaired spinal reflexes or cerebellar sensorimotor integration may underlie the observed decline. These results underscore the importance of investigating neural contributions to postural control and fall risk in aging.

P5.60 | Pupillary Evidence of Global and Selective Effects of Auditory Attention on Arousal

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Attention enables to prioritize and focus on relevant information, while still processing irrelevant stimuli, allowing to remain aware of unexpected events in the environment, without being distracted by them. Achieving this requires a good balance between a "global" readiness to respond (i.e., arousal) and a "selective" focusing mechanism (i.e., voluntary attention) to filter out distracting stimuli. Recent theories

suggested that arousal does more than maintain overall alertness: it would also refine selective attention mechanisms. Indeed, through norepinephrine release in the brain, arousal can amplify strong task-relevant signals while suppressing weak or random activity, thereby selectively facilitating the processing of relevant stimuli. However, to date, we lack a unified account of how top-down attention might engage both a global boost in arousal and a more targeted enhancement for high-priority events. The objective of the study was to examine how task engagement and stimulus relevance modulate arousal. The Competitive Attention Task (CAT), is an auditory detection paradigm, enabling to investigate arousal responses to both relevant and unexpected irrelevant events. The participants' level of task engagement was manipulated by comparing an active detection condition with passive exposure to the same stimuli. As pupil dilation has been shown to indirectly reflect the activity of the Locus Coeruleus – Norepinephrine system, pupil dilation was used as an indirect measure of the arousal level. The data showed that both relevant and irrelevant sounds elicit larger pupil dilation under active conditions, indicating a global arousal effect. Crucially, only relevant sounds triggered additional dilation when preceded by an informative cue, demonstrating a selective arousal mechanism associated with top-down attention. These findings illustrate the NE's dual role in boosting overall alertness while selectively enhancing high-priority stimuli. Beyond theoretical implications, this work highlights that the CAT captures measurable arousal components, reinforcing its utility for clinical assessments of attention-arousal clinical disruptions.

P5.61 | Grounding Distractor Inhibition in Action Control: Distractor-location Learning is Viewer Dependent

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Spatial selective attention is typically thought to act as a sensory filter: prioritizing the processing of relevant information at a particular location in space over that of irrelevant information. Research using interactive setups, rather than standard static laboratory setups with seated observers, however, shows that spatial selective attention does not simply facilitate sensory processing at a particular location (where), but also involves the planning of how to (covertly) sample that information from the agent's perspective. That is, spatial selective attention is constrained by sensorimotor processing and includes an action component. Here we ask whether this extends to the flipside of target selection — whether the suppression of irrelevant distractors is similarly viewer dependent. In three experiments (one preregistered), participants

performed an additional-singleton visual search task in which a salient distractor could occur more often at one of the search locations (unknown to the participant). Critically, we manipulated the standing position of participant, which enabled us to disentangle whether implicit distractor-location learning is anchored in world coordinates or incorporates information as to how one can suppress attentional sampling in space from their viewpoint to prevent distraction. In the first experiment, participants stood on one side of the table during the training phase and then moved 90 degrees to another side of the table for the testing phase. In the second experiment, the likely distractor location either moved with the participant's standing position (the viewer-centered group) or remained fixed in the world irrespective of the current standing position of the participant (the environment-centered group). In the third and last preregistered experiment, the search display was presented too briefly for eye movements so that we could confirm that the effects of distractor-location learning could not simply be explained by learning to move the eyes away to reduce distraction upon display onset. Across all three experiments, we found that implicit distractor-location learning is viewer dependent. These findings show that humans continuously incorporate information about their own position relative to to-be-ignored objects and that, like attentional facilitation, implicit learning to inhibit distractors cannot be abstracted from the agent and is fundamentally grounded in action control.

P5.62 | Hearing the Self: Disentangling Agency and Ownership in Voice Perception

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According to the internal forward model, each time we produce speech, the brain generates a prediction of the expected auditory feedback. When the actual sound aligns with this prediction, it is identified as self-generated. However, self-recognition in auditory perception is thought to be a complex process involving two usually overlapping components: agency – the feeling of being the source of a voice – and ownership – the feeling that a voice belongs to oneself. While the internal forward model explains self-recognition through motor-related prediction, it also provides a way to operationalize agency via congruence between intention and outcome and ownership via the match between heard voice and self-voice. To investigate whether these two components can be dissociated using electrophysiological measures (EEG), fifty young adults (25 female) were recruited for the experiment. Initially, a voice recording session took place to obtain self-voice stimuli. In the EEG task, two words were displayed on the screen and participants were asked to choose one of

them. Auditory feedback followed their choice. Since they believed to be doing the task with the experimenter, voice feedback could be either a congruent or incongruent word (i.e., the word chosen by the experimenter), spoken in the self-voice or in other-voice (i.e., the voice of the experimenter). N100 and P200 mean amplitude were used as outcome measures in two linear mixed models. The results revealed a main effect of ownership on the N1 latency window ($\beta = .374$, $p = .002$), indicating an enhanced response for the self-voice (vs. other-voice). A main effect of agency was found on the P2 latency window ($\beta = -1.021$, $p < .001$), showing an enhanced response to congruent (vs. incongruent) words. An interaction between agency and ownership was also found on the P2: the agency effect was larger for the self-voice ($\beta = .585$, $p = .016$). Our findings highlight the sensitivity of the N1 to ownership and suggest that the P2 is a more reliable marker of agency. The results also suggest an early dissociation between agency and ownership in the auditory domain, with ownership preceding agency and later modulating it.

P5.63 | Out of Place, Out of Mind? Examining the Impact of Contextual Congruency on Object Representation

Miriam Tortajada (University of Granada); **Javier Ortiz-Tudela** (University of Granada)

The congruence between an object and the context in which it is located can be beneficial in some situations and detrimental in others. For example, we are quicker to detect a pot on a bedside table than on the kitchen worktop (i.e. a semantically incongruent pairing), but we are more likely to identify the object as a pot when it is on the worktop compared to when it is on the bedside table (i.e. a semantically congruent pairing). One possible explanation for these opposing effects is that semantic context alters the relevance of certain features of the object representations and thus facilitates certain tasks over others. Specifically, semantically congruent scenes would prioritise high-level features that match contextual semantic expectations, whereas incongruent scenes would promote object-background segregation and emphasise low-level features. To test this hypothesis, we present a novel framework in which participants will be presented with different objects embedded in congruent and incongruent scenes during fMRI recording. In a subset of the trials, they will be asked to respond to either a low-level feature (e.g., the colour of the object) or a high-level feature (e.g., whether the object was animate or inanimate). Behaviourally, we expect that high-level features will be reported more accurately in congruent trials than low-level features, and vice versa for incongruent trials. To investigate the neural counterpart of this effect, a set of Representational Dissimilarity Matrices (RDMs) will be simulated, capturing different levels of object representation along the concrete-abstract hierarchy. These RDMs will then be correlated with the neural RDMs derived from participants' voxel patterns across the conditions. We expect that the incongruent trials will better align with the concrete end of the spectrum (e.g., lines or colours), whereas the congruent trials will be better captured by the abstract

end (e.g,. semantic embeddings). These results would provide empirical support for the idea that object representations shift dynamically along a perceptual-semantic continuum as a function of contextual congruency.

P5.65 | What Cognitive and Emotional Development Profile in Severely Intellectually Disabled Autistic Adults?

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Autism Spectrum Disorder (ASD) is considered as a lifelong neurodevelopmental disorder, the severity of which is augmented by intellectual disability and currently represents a significant public health issue. Thus, adults including those with severe intellectual disability (ID), need constant and regularly updated support in all areas of relational and social life, autonomy and health. For planning this support, it was necessary to assess cognitive and socio-emotional abilities in order to specify domains which were less or more comparatively delayed and that had to be specifically trained. This study focused on assessment of cognitive and socio-emotional development profile with an adapted tool, already validated for assessing children with ASD. Twenty-eight adults (19 men and 9 women with mean ages of 40 years 7 months and 37 years 2 months respectively) with developmental levels less than 2 years were examined. ASD is diagnosed using PDD-MRS and CARS and that of ID from DSM-5. Cognitive and socio-emotional development was assessed using the Socio-emotional and Cognitive Evaluation Battery adapted to Adults (SCEB-A). Results. The lowest levels of development concerned with vocal imitation and symbolic play abilities, and the highest levels, visuospatial construction and social communication abilities. Conclusion. This developmental pattern was similar to toddlers and children with ASD for whom Exchange and Development Therapy was benefic. So, from this assessment, personnalized cognitive and social remediation and this therapy might be planned for these adults.

P5.66 | From Sensory Signals to Self-evaluation: Internal Factors Driving Multisensory Perception and Confidence

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Multisensory integration is shaped by both internal states and external stimuli; however, the role of physiological arousal and internal awareness in perceptual and metacognitive processes remains underexplored. We examined performance and confidence across two sessions of a sound-induced flash illusion (SIFI) task in 15 participants (mean age = 24.9 years, SD = 5.6). Participants completed the SIFI task at three stimulus onset asynchronies (SOAs: 50, 150, 200 ms) in two sessions: one following cold pressor immersion (stress induction) and one control session, in randomized order. Measures included cognitive functioning (MoCA), self-reported anxiety (GAD-7), sensory sensitivity (HSP Scale), and interoceptive awareness (MAIA subscales 3 and 8). Physiological markers (galvanic skin response, heart rate) were recorded but not reported here. Despite the modest sample, the within-subject design with random intercepts enabled examination of individual differences while accounting for variability. Multicollinearity checks confirmed independence among predictors. Separate mixed-effects regression models were run for performance and confidence as dependent variables, with all other variables entered as predictors. Performance improved significantly as SOA increased, rising from 50.3% at the 50ms baseline to 80.9% at 200ms. This was reflected in significant model estimates ($\beta = 1.53$ at 150 ms, $\beta = 2.08$ at 200 ms; both $p < .001$). Confidence rose more modestly, with a significant increase only at 200 ms ($\beta = 0.09$, $p < .05$), suggesting a dissociation between accuracy and confidence. Accuracy was also higher in the second session regardless of condition ($\beta = 2.09$, $p = .038$), indicating learning effects; confidence was unaffected by session order ($\beta = 0.45$, $p = .40$). Individual traits further shaped outcomes. Interoceptive awareness was unrelated to performance but negatively associated with confidence ($\beta = -0.22$, $p = .04$), suggesting more cautious self-evaluation. Cognitive score predicted lower confidence ($\beta = -0.28$, $p = .03$) but higher performance ($\beta = 0.75$, $p = .03$). Anxiety, sensory sensitivity, and stress manipulation showed no significant effects on either confidence or performance. These findings suggest that internal traits such as interoceptive awareness and cognitive functioning may differentially influence perceptual and metacognitive processes. Understanding these dissociations has important implications for models of metacognition, as they suggest that internal signals may modulate confidence independently of perceptual accuracy, potentially via distinct neural mechanisms – an idea that warrants further investigation in larger samples.

P5.67 | Subliminal Attention Capture by Ocular Singletons: The Role of Target-distractor Distance

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Bottom-up attention is readily captured by singletons that stand out via unique features. An ocular singleton (oc-singleton) refers to an item presented exclusively to

one eye while remaining perceptually indistinguishable from surrounding items. Oc-singletons attract attention more rapidly than orientation singletons, despite operating below the level of conscious awareness. Zhaoping (2008) presented participants with search arrays of horizontal bars, with a tilted bar serving as the target. The presence of an oc-singleton was manipulated, and furthermore either overlapped with the target (congruent condition), serving as a facilitator, or was one of the surrounding bars (incongruent condition), serving as a distractor. Target detection was faster than baseline in the congruent condition and slower in the incongruent condition. However, this study included a small sample size and ambiguity in the operationalization of the oc-singleton. Specifically, it was unclear whether the effect was due to the presence of a unique item in one eye or the absence of a corresponding item in the other eye. The current study followed the paradigm but extended previous work in two ways: (1) by systematically examining the effect of oc-singleton in relation to target–distractor distance; (2) by introducing a binocular condition, where the oc-singleton was presented to both eyes while the surrounding items were monocular, in addition to the original dichoptic condition where the oc-singleton was absent in one eye. In addition to the original oc-singleton effects, we found that in the incongruent condition, reaction time increased with greater target–distractor distance. Furthermore, reaction time in the binocular condition was significantly shorter than the dichoptic condition, but only when the oc-singleton and the target were congruent. In correspondence, preliminary analysis of eye-tracking data revealed a tendency to shift gaze towards targets earlier in the binocular-congruent condition than in the dichoptic-congruent condition. Finally, although attention was guided toward the ocsingleton location, participants could not consciously distinguish it from its surroundings. These results will be reported in the context of the low level brain regions processing eye-of-origin of visual input, and their interaction with the oculo-motor system in the guidance of attention.

P5.68 | The Influence of Tonic Arousal on Phasic Arousal and Attention at the Behavioral and Physiological Levels

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Arousal and attention are crucial brain functions for optimizing performance. Several theoretical models propose a key interplay between attention and arousal, yet this

relationship remains largely untested experimentally in humans. Animal studies suggest that tonic and phasic activity of the Locus Coeruleus – Norepinephrine system are linked, with an intermediate level of tonic arousal associated with high phasic bursts and optimal performance. We investigated this interaction in 34 healthy young adults performing an auditory attention task that simultaneously assessed phasic arousal, voluntary attention and involuntary attention (the Competitive Attention Task). We modulated the tonic arousal level by presenting calm and exciting music extracts prior to the task. We recorded electroencephalography, pupil dilation, skin conductance and heart rate. Data were analyzed using ELAN, QRSTool (heart rate peak detection) and custom Matlab programs. High arousing music resulted in increased tonic arousal, as measured using pupil size and heart rate, and in enhanced reaction times to target sounds. An interaction between anticipatory attention and phasic arousal was observed on reaction times, the pupil dilation response and the P3-complex to distracting sounds: the effect of the distractor arousing content was larger under higher anticipatory attention. Moreover, this interaction was stronger after low rather than high arousing music. This study provides experimental evidence in humans that tonic arousal can influence both phasic arousal and performance.

P5.69 | A Grid-like Code of Tactile Perception

Mariana Babo-Rebelo (Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS); **Hyuk-June Moon** (Korea Institute of Science and Technology (KIST); **Nathan Attia** (Campus Biotech Foundation); **Bruno Herbelin** (Ecole Polytechnique Fédérale de Lausanne (EPFL); **Juliette Boscheron** (Ecole Polytechnique Fédérale de Lausanne (EPFL); **Olaf Blanke** (Ecole Polytechnique Fédérale de Lausanne (EPFL)

As a 2-dimensional system, the skin shows certain analogies with the external environment. Both contain boundaries and landmarks, and both can be navigated – through touch in the case of the skin. We here tested whether the brain mechanisms known to encode our trajectories in external space, i.e. grid-cells, can also encode the trajectory of a stimulus travelling across the skin. Given that tactile receptive fields are oval-shaped and that, as a result, tactile distance perception is anisotropically distorted (Longo & Haggard 2011), we further hypothesized that a grid representation of the skin might encode a distorted skin space. In each trial of this fMRI experiment, the experimenter drew 3 successive line segments on the participant's hand dorsum (n=29). The participant reported whether line segments 1 and 3 crossed or not. We then tested whether these tactile stimulations generated the signature of grid cells, i.e. a 6-fold modulation of BOLD activity (Doeller et al 2008), in the entorhinal cortex, the region typically showing grid cell activity during spatial navigation, and in the somatosensory cortex. We initially found no gridcell signature in the entorhinal cortex (p=0.37). However, after distorting the stimulation space according to each individual's level of tactile anisotropy, measured in a separate task, we found significant grid-cell signatures in this region (p=0.018). The somatosensory

cortex also showed the signature of grid cells for the anisotropic space (p=0.0020), as well as for the original non-deformed stimulation space (p=0.020) but less robustly. These effects were specific to a 6-fold modulation of BOLD activity (not 4-, 5- or 7-fold; p>0.30), confirming the underlying hexagonal pattern of grid-cells. These results demonstrate that the cognitive mechanisms used for encoding external space are also used for encoding skin space, a space that is directly experienced from the inside, here navigated by an external agent. This grid code directly relies on the sensory inputs, with their inherent constraints and distortions, suggesting that it corresponds to a low-level sensory grid code.

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10:45 POSTER SESSION 6 P 6.1 – 6.68

P6.01 | Emergent Neural Principles of Speech Encoding in Contrastive Joint-embedding Models

Alessandro Corsini (University of Ferrara); **Alice Tomassini** (University of Ferrara); **Lorenzo Pedani** (University of Ferrara); **Luciano Fadiga** (University of Ferrara); **Alessandro D'Ausilio** (University of Ferrara)

Speech perception requires transforming acoustic signals to extract relevant information, yet the computational principles guiding these transformations remain largely unknown. Recently, unsupervised deep learning models have demonstrated the ability to learn rich speech representations that correlate with neural activity. However, it remains unclear whether this correlation reflects only output similarity or extends to shared principles of sensory information extraction. To investigate potential shared principles, our study explores contrastive learning within joint-embedding architectures (JEAs). These models learn compressed, causal representations by filtering information irrelevant for predicting future speech signals. We compared speech encoding in JEAs (specifically utilizing Wav2Vec2.0 and the CEBRA framework), with neural processing measured via EEG activity from 26 Italian participants listening to English sentences (USC-Timit dataset). A rhyming task during listening engaged participants in active feature extraction. First, we validated the perceptual relevance of the JEA representations via neural encoding. We found that neural encoding strength within a key processing window (-0.25 s to +0.8 s lag) positively correlated with participants' behavioral performance in the rhyming task ($r = 0.434$, $p = 0.026$), suggesting JEA features capture behaviorally relevant aspects, without any supervision. Next, reverse-engineering the speech encoding strategies revealed both the brain and the JEA model prioritize causal information over mere signal variance. Strikingly, EEG encoded low-variance subspaces: the bottom 1% variance subspace

(0.0020 ± 0.00019 bits; MEAN±SEM) shared similar information with EEG signals as the top 99% variance subspace (0.0019 ± 0.0002 bits; MEAN±SEM), indicating a focus beyond high-energy components. Finally, evaluating the model's objective function at inference time showed the brain encodes new predictive information identified by the model (i.e., information non-redundant with the past, identified using the model's InfoNCE loss). This neurally encoded predictive information significantly explained participants' behavioral performance ($r = 0.430$, $p = 0.028$). Overall, these findings underline the potential of selfsupervised contrastive learning (SSL/CL) for studying fundamental cognitive mechanisms and suggest that the observed alignment between these models and brain activity may stem from shared computational principles of causal and predictive sensory information extraction.

P6.02 | Spatiotemporal Interactions in Perceptual Organization: Behavioral and EEG Evidence From Crowding and Uncrowding

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Perception requires the brain to construct coherent representations from a continuous stream of sensory input. This entails balancing temporal integration – binding stimuli over time to form unified percepts – with temporal segregation, which maintains sensitivity to rapid changes. Simultaneously, objects in the visual field are often embedded within cluttered environments, leading to crowding – where nearby distractors impair object recognition. Under specific configurations, however, crowding can be alleviated through uncrowding, driven by perceptual grouping principles (Gestalt principles). In a series of three behavioral experiments (total $N = 48$), we investigated the temporal dynamics of crowding and uncrowding in a Vernier discrimination task. Participants judged the offset of a Vernier stimulus flanked by either crowding-inducing vertical lines or uncrowding-promoting rectangular shapes. Across experiments, we manipulated (1) stimulus duration, (2) the Stimulus Onset Asynchrony (SOA) between Vernier and flankers, and (3) spatial attention, which was directed either toward the hemifield where the stimulus appeared or to the opposite hemifield. Our results demonstrate that both temporal parameters and attentional focus shape the time course of uncrowding effects. More specifically, the uncrowding benefit emerged around 160 ms even in absence of attention and around 30 ms when Gestalt-inducing flankers preceded the Vernier stimulus, suggesting that rapid feedback mechanisms contribute to the coordination of perceptual organization. We conducted a complementary EEG experiment ($N = 30$) to investigate neural mechanisms underlying feedback-related processes. As in the second behavioral task,

participants judged the offset of a Vernier stimulus surrounded by flankers (vertical lines or rectangles), while the SOA between Vernier and flankers was systematically manipulated. Preliminary results suggest that alpha oscillations (7–13 Hz) support bottom-up temporal processing of Vernier-flanker configurations, while top-down influences on integration of Gestalt-inducing flankers are observed in a posterior ERP component around 200 ms after Vernier onset. Together, our findings provide converging behavioral and neural evidence that perception in cluttered environments depends on dynamic interactions between spatial configuration and temporal structure, advancing our understanding of how the brain flexibly resolves crowding and achieves coherent visual experience across space and time.

P6.03 | Emotion Beyond Awareness: Erp Evidence of Unconscious Modulation in Syntax

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The independence of syntactic processing from other perceptual and cognitive domains remains a subject of debate. Recent studies have suggested that emotional information can modulate syntactic analysis, thereby supporting interactive models of language processing. In this study, we investigate whether subliminal emotional information can influence syntactic processing, aiming to elucidate the neural mechanisms underlying this potential interaction. To this end, 36 native-Spanish speakers completed a grammaticality judgment task, in which they assessed whether visually presented sentences were grammatically correct or incorrect. Ungrammatical sentences included morphosyntactic violations in the verb. Crucially, between the noun and the verb, a masked adjective with either positive, negative, or neutral emotional valence was briefly displayed (16ms). A subsequent visibility test confirmed

that participants were not aware of the masked adjective. ERP analyses revealed a tendency towards enhanced LAN and attenuated P600 components in response to syntactic violations following negative-valence adjectives. This pattern may suggest early prioritization of syntactic processing induced by negative valence, in line with the negativity bias, potentially reducing the need for subsequent reanalysis. Conversely, positive-valence adjectives elicited an increase in P600 amplitude. This aligns with broader interpretations of the P600 as reflecting integrative operations that encompass both linguistic and affective information to support prior context or discourse representations. From an integrationist perspective, the P600 extends beyond syntactic reanalysis, reflecting a more general integrative mechanism that combines linguistic and affective cues to support coherent interpretation. Taken together, these results contribute to the growing body of literature indicating that syntactic processing is not entirely encapsulated, but may, at least under certain circumstances, be flexible and content dependent.

P6.04 | The Impact of Breathing on Mind Attribution: How Respiration Shapes Social Categorization

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Growing interest is being directed toward respiration as an internal metronome that influences attention orientation and general cognitive processing. Previous research has shown that reaction times (RTs) and accuracy improve during inhalation when compared to exhalation. Given the importance of interoception and physiological rhythms in social perception, it is crucial to explore how respiration can also impact social processes. In this study, we investigated the effects of respiration on our ability to categorize a human face (as opposed to an avatar), influencing this process differently depending on whether the face belongs to our ingroup or outgroup. The task consisted in an oddball task, where participants were instructed to discriminate as quickly and as accurately as possible between human faces and doll-like avatars. The faces were labeled as ingroup (Italian) or outgroup (Romanian) and divided into four blocks, alternating between Italians and Romanians. The distinction between groups was fictional, determined solely by indications before each block. During the whole experiment, respiration was recorded using thoracic and abdominal belts. Results revealed that RTs in the human-versus-avatar categorization task were influenced by respiration phase. Participants took longer to identify human faces (regardless of the group) during inhalation. Additionally, RTs were significantly longer in the Italian blocks than in the Romanian blocks. These findings suggest that ingroup faces are subjected to a more careful inspection and that inhalation prolongs attention to human faces. This study serves as a pilot for a subsequent experiment incorporating EEG, which will provide deeper insights and greater interpretative precision. The clear effect of respiration observed here paves the way for further research on a phylogenetic mechanism that shapes perception and the attribution of mind to others.

P6.05 | A Complementary Dual Sensorimotor Mechanism Underlying Action Observation

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Observing others' actions is an everyday experience that enhances imitation, which is crucial for motor learning and skill acquisition. Action observation (AO) involves similar neurophysiological mechanisms as action execution. For example, both attenuate primary sensorimotor (SM1) cortical oscillations, mainly within alpha and beta bands. Interestingly, beta SM1 oscillations leave a trace in muscle activity and contraction force during steady muscle contraction. However, it remains unclear whether modulations in response to AO can be reliably detected from peripheral signals. In this study, nineteen healthy young participants (8 female) performed steady pinch-grip contractions against force transducers while observing videos of goal-directed actions. Videos featured kinematically natural goal-intact (Normal), unnatural goal-intact (How), and natural goal-violating (What) right-hand or bimanual actions. Electroencephalography (EEG), surface electromyography (EMG) of first dorsal interosseous (FDI) muscles, and force data were recorded bilaterally. Time-frequency analysis based on the Hilbert transform was applied to signals filtered in 5-Hz wide bands (5-40 Hz). Amplitude was averaged across trials with respect to action onset. The significance of modulation was investigated using cluster-based permutation. Throughout AO period (500-2500 ms), alpha amplitude over the left SM1 cortex (C3) decreased in all conditions with a subsequent rebound. Right FDI EMG alpha amplitude decreased concurrently despite the absence of movement. The force signals did not show consistent modulations across conditions. Cluster based statistics confirmed significant alpha suppression over C3 (all conditions $p < 0.03$), with limited beta effects (only C4 in 'Normal' condition, $p = 0.037$). No significant effect of condition was found. Our results suggest that although EEG reliably captures the cortical dynamics related to AO, peripheral signals do not reflect the same sensorimotor processes. The increase in EMG alpha amplitude may represent a localized inhibitory mechanism within SM1 cortex that stabilizes the contraction during AO, occurring in parallel with global cortical activation. These opposing yet complementary mechanisms may represent the motor cortex's ability for internal simulation to understand others while simultaneously suppressing motor output to prevent unintentional or socially inappropriate imitative behavior. This study brings novel perspectives for AO assessment, which is key to understanding the functional role of sensorimotor oscillations in motor and social cognition.

P6.06 | Predictive Action Representations in Synchronous Joint Reaching Tasks: Insights From Two Eeg Studies

Dimitrios Kourtis (University of Stirling)

We run two electroencephalography (EEG) studies to investigate whether people form joint action plans, which include the predictive representation of their own as well as a co-actor's possible reaching directions in synchronous joint reaching tasks. In Study 1 (29 participants), an EEG participant and a confederate of the experimenter were seated side by side viewing a computer monitor on which visual stimuli were displayed. Three possible reaching targets were arranged on conceivable semicircles at the side of each co-actor. In Study 2 (31 participants), we increased the social relevance of the co-actors' movement, having them seated facing and moving towards each other, and reduced the cognitive load by decreasing the number of possible targets to two. The experimental paradigm in both studies was a choicereaction task, in which an informative cue indicated the possible reaching targets for each co-actor, followed 12000ms later by an imperative signal, which specified the targets to be reached and prompted the co-actors to initiate their actions in a coordinated manner. We hypothesized that action onsets as well amplitudes of movement planning (stimulus-locked Cognitive Negative Variation (CNV) and response-locked Movement Related Potential (MRP)) and task updating (Go-P300) Event Related Potentials (ERPs) would be modulated in relation to the number as well as the spatial configuration of possible reaching targets of each co-actor. Largely confirming our predictions, behavioural analyses showed that in both studies, the participants' action onsets were inversely related to the number of their own as well their co-actors' possible reaching directions. EEG analyses showed that in both studies the amplitudes of all ERPs of interest were modulated in relation to the participants' possible reaching directions. However, similar modulation of the movement related-ERPs in relation to the co-actor's possible reaching directions was observed only in study 2. Taken together, our results suggest that people adjust their action onsets in relation to both their own and their co-actors' possible reaching directions, but the formation of joint action plan at the sensorimotor level depends on the spatial configuration and the requirements of a given task.

P6.08 | Investigating Sympathetic Arousal Through Brain-body Coupling: A Meg and Eda Study

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The autonomic nervous system – particularly its sympathetic branch – plays a central role in preparing the body for action during perceived danger. One of its key markers, phasic electrodermal activity (EDA), reflects changes in skin conductance driven by sweat gland activity and is widely used as a temporally precise index of sympathetic arousal and emotional engagement. In this study, we investigated brain – body coupling using simultaneous magnetoencephalography (MEG) and EDA recordings while participants engaged in a naturalistic paradigm modeled as an escape game (Fung et al., 2019). We hypothesized that transient oscillatory activity in cortical regions would predict fluctuations in EDA, and that such coupling would be modulated by the emotional context of the task, specifically whether the trial was perceived as threatening or safe. Fifty-five healthy adult participants completed an escape game that included 14 blocks, each comprising both threat and safe runs. Threat runs always occurred last in the block, and an electrical shock was delivered at the end of the run. To avoid habituation and enhance anxiety, the shock was administered in 9 out of 14 blocks via electrodes placed on the ring finger of the right hand. In safe runs, no stimulation occurred. Each run epoch included a 7.5-second period (−1 s to 6.5 s relative to run onset). MEG data were recorded using a 306-channel Elekta Neuromag system, while simultaneous EDA signals were acquired from the distal surface of the right foot to avoid interference with hand movements. MEG preprocessing included standard artifact rejection. Time – frequency decomposition was performed using Morlet wavelets, focusing on the theta (4–7 Hz), alpha (8–12 Hz), and beta (16–29 Hz) bands. Source localization was then performed using sLORETA, and values were log-transformed ($\log_{10}$). EDA signals were z-scored per subject and epoched relative to run onset, matching the MEG data. Multivariate pattern analysis (MVPA) was applied to source-projected MEG data in a time-resolved fashion using logistic regression to classify threat versus safe runs and to identify the timing and location of neural signals distinguishing the two conditions. Linear mixed-effects models (LMEMs) were then used to assess whether power in selected MEG time windows and ROIs predicted subsequent EDA in discrete 100 ms time bins across the run (−1 to 6.5 s), testing for both main effects of power and interactions with run type. Results revealed that EDA responses were significantly elevated during threat runs compared to safe runs, particularly within the 1.5–3.0 s post-onset interval ($p < 0.05$, FDR-corrected). This pattern indicates a phasic increase in sympathetic arousal in anticipation of potential aversive stimulation. Time-resolved MVPA achieved peak classification accuracy only in beta band power and only in the 400–800 ms window following run onset, suggesting that early cortical responses in this time range reliably distinguished between threat and safe conditions. At the source level, key contributors to this discrimination included the left and right somatosensory and premotor cortices and the left anterior insula – regions implicated in motor preparation, interoception, and affective salience, respectively. LMEM analyses revealed that in the left insula, higher beta power during the 400–800 ms window was associated with increased EDA responses in the 2.3–2.8 s post-onset interval, but only in threat trials. This finding suggests that activity in the insula during early anticipation may prime sympathetic responses later in the trial. In the right premotor cortex, higher beta power during the same window predicted increased EDA in the 2.3–3.0 s

interval, regardless of run type, indicating a more generalized motor-arousal linkage. In the left premotor cortex, an inverse relationship emerged: lower beta power in the early window predicted higher EDA responses in a delayed time bin (4.1–5.5 s), specifically during threat runs. This region-specific inversion highlights the complexity and temporal specificity of brain–body coupling, potentially reflecting different functional roles of cortical areas in threat evaluation versus action preparation. Notably, these effects were either absent or substantially diminished during safe runs, underscoring the context-dependent nature of cortical – autonomic interactions. FundingThis study was supported by Business Finland under the DIGIMIND project (Digital Indicator of Mental State).
Keywords: phasic electrodermal activity, sympathetic arousal, beta oscillations, magnetoencephalography

P6.09 | Attention States Modulate Sharp Wave Ripple Probability and Their Temporal Coupling to Low-frequency Oscillations

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Background. Sharp-wave ripples (SWRs) are millisecond-scale, high-frequency, transient oscillations generated in hippocampal CA1 that support memory consolidation and planning. Although typically studied during sleep or quiescence, SWRs also arise during active behavior in rodents, primates, and – recently – humans. However, the functional role of these “awake” SWRs remains unknown. We investigated how internally driven changes in sustained attention modulate (a) SWR probability and (b) SWR-coupling to ongoing low-frequency neural oscillations. Methods. We analyzed intracranial EEG from 105 hippocampal contacts in 17 epilepsy patients performing a Sustained Attention to Response Task (SART). Hippocampal contacts were identified anatomically and functionally by the presence of a P3 visual-evoked potential. SWRs were detected with a standard amplitude-threshold procedure; interictal discharges were excluded. Attentional state was classified as online (increased attentiveness) or offline (decreased attentiveness) using both behavioral criteria (reaction-time distributions) and subjective introspection probes. We also investigated SWR-locked phase coherence (quantifying consistency of phase angles across SWR events) and power magnitude between online and offline attention states in low frequencies (1-30Hz). Results. We found that periods of focal attention were characterized

by the increase of hippocampal SWR rate. When attentional state was defined by reaction-time distributions, SWR rate rose markedly ($z = 6.74$, $p < 0.0001$, $n = 105$); the increase showed a trend with subjective thought probes ($z = 1.72$, $p = 0.08$, $n = 105$). Removing all contacts in the pathological hemisphere (54 contacts from 15 patients) left the effect intact: ripple count ($z = 3.61$, $p = 0.0003$) and rate ($z = 4.04$, $p < 0.001$) were both higher during focal attention, and the subjective thought probe-based contrast remained significant ($z = 2.01$, $p = 0.0488$, $n = 27$ from 54 patients). SWRs during offline (i.e., mind wandering) intervals were more temporally coupled to ongoing low-frequency (theta–beta) oscillations, indicating increased rhythmic coordination during offline attention state. This difference was most prominent 70 ms before the SWR the theta – alpha extending to low beta range (6–19 Hz; all $p < 0.05$, $z > 1.96$, FDR-corrected; $n = 105$). This difference persisted after equating ripple counts across conditions, confirming it was not driven by the unequal number of events. No difference in SWR-locked power survived correction for multiple comparisons. Conclusions. Attention modulates hippocampal SWR dynamics: it increases ripple probability and alters the low-frequency phase architecture surrounding each event. Specifically, SWRs arising during mindwandering are more tightly nested within theta – alpha rhythms than those occurring during focal attention. This dissociation suggests that attention governs not only how often hippocampal ripples occur but also how they are integrated with ongoing oscillatory activity, offering new insight into the interplay between attention, memory processing, and hippocampal network states.

P6.10 | Statistical Learning Can Impair Encoding of Information in Episodic Memory

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Statistical learning is a process in which people unintentionally extract statistical regularities from the environment, which facilitates perception by enabling the brain to predict upcoming information. Recent evidence suggests that the same brain structures are responsible for predicting future experiences and encoding new information into memory, and when faced with a conflict between these processes, the brain favors prediction over encoding. This hypothesis was confirmed in a study by Sherman and Turk-Browne (2020), in which participants viewed a stream of pictures belonging to different categories and responded whether each picture contained a man-made object. Unbeknownst to participants, some of the categories were assigned to AB pairs, so that pictures in the second category (B) were predictable and always appeared after pictures in the first predictive category (A). Control pictures (X), which were not associated with any regularities, were embedded between AB pairs. Worse hit rate for predictive pictures (A) than for predictable (B) or control

(X) pictures was observed, confirming that the process of prediction impaired the encoding of information in memory. We conducted a systematic replication of this study and ran three experiments that differed in the number of AB pairs, thus imposing different demands on statistical learning. In Experiment 1 with three AB pairs, we found that the hit rate was lower for predictable pictures (B) than for predictive pictures (A). In Experiment 2 with two AB pairs, we observed a lower hit rate for predictive (A) pictures than for control pictures (X), replicating a key finding of Sherman and Turk-Browne (2020). In Experiment 3 with only one AB pair, we found no differences in hit rates between predictive (A), predictable (B) and control (X) pictures. Our results suggest that statistical learning can impair the encoding of information in episodic memory, but the exact nature of this impairment depends on the difficulty of statistical regularities. Overly complex regularities may impair the encoding of predictable items, overly simple regularities may not affect memory at all, but moderately complex regularities may impair the encoding of predictive items, showing that under certain circumstances the brain may indeed favor prediction over encoding.

P6.11 | Exploration Strategies Influence Visual-auditory Sensory Substitution in a Passive Guidance Setup

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Sensory substitution devices (SSDs) assist or replace sensory functions by engaging other modalities such as audition or touch (Auvray, 2006). They allow users, especially those with visual impairments, to perceive their environment differently (Bach-y-Rita et al., 1969). These devices also provide valuable insights into perception, highlighting the crucial role of action within the perceptual process. However, the precise role of action in perception remains debated (Froese & OrtizGarin, 2020) and the importance of exploration strategies has been emphasized (Bermejo et al., 2015). We conducted two studies on the role of action and exploration strategies in 2D shape perception using an SSD coupled with a pantograph, a mechanical system that transfers arm movements from one participant to another in real time. In the first study, active participants voluntarily controlled the sensor, while passive participants were guided by their active partners through the pantograph. Results showed that both active and passive participants improved their shape perception ($p < .001$), with no significant difference between the groups across three sessions of 10 trials (20 per condition). This suggests that self-initiated action is not essential for shape perception. Additionally, no differences were observed in a fourth session, where all participants acted independently. However, a significant positive correlation between the performances of active and passive participants ($p < .05$) suggests that the exploration strategies used by active participants in sessions 1-3 influenced the performance of passive participants once they became active in session 4 (Akar et al., in revision). In a subsequent study, we examined the effect of exploration strategies on perceptual performance in passive conditions. The experimenter assumed the

active role, using four distinct guiding strategies, with passive participants grouped by strategy (n = 12 per group). Results showed that participants guided with a micro-scanning strategy (oscillatory movements along the shape's contour) achieved significantly higher perceptual accuracy and confidence ($p < .05$). Our findings confirm the feasibility of passive guidance and highlight the critical role of exploration strategies in sensory substitution. These insights could inform the design of assistive technologies and rehabilitation programs. Topic: Sensory systems, Perception, Attention, Cognition.

P6.12 | Oscillatory Traveling Waves During Visual Spatial Attention Orienting and Reorienting

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Attention – the selection and facilitation of information processing – was correlated to neural oscillations in the alpha (8-12 Hz) and theta (4-7 Hz) frequency bands in different regions of the brain. Although it is a fundamentally spatio-temporal system, attention, and its neural correlates, are often studied in either the spatial or temporal domain alone thus limiting explanatory power. Recently, authors have shown that during the orienting of attention, alpha oscillations propagate across the cortex as traveling waves (Alamia et al., 2023; Fakche et al., 2024). Here, we systematically assessed the functional role of low-frequency oscillatory traveling waves in attentional orienting and re-orienting. We used a multimodal approach of simultaneous MEG and EEG recordings and psychophysics in healthy human participants (N = 20). They performed an orientation discrimination task in which an iconic auditory cue directed visual spatial attention either toward the target (valid –attention is sustained at that location; 66.6% of trials) or the distractor location (invalid –attention reorients from the distractor to the target location, i.e., exploration; 33.3%). Behavioral performance (measured as d-prime) and alpha lateralization (stronger alpha power in the ipsilateral MEG-EEG sensors electrodes relative to the attended location) indexed our successful attentional manipulation. We then compared traveling waves properties such as direction and speed where they occurred in single trials between the different experimental conditions. Our results suggest that distinct dynamics of low-frequency traveling waves may differentiate between attention conditions. Comparisons between MEG and EEG measurements further allows a better understanding of their propagating properties in the cortical medium. The systematic comparison of alpha and theta traveling waves dynamics

during attention orienting and reorienting provided new insights into their potential influence on inter-areal neural communication.

P6.13 | Alpha and Beta Cortico-Motor Phase Dynamics Shape Visuomotor Control on a Single-Trial Basis

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A central question in sensorimotor neuroscience is how sensory inputs are mapped onto motor outputs to enable swift and accurate responses, even in the face of unexpected environmental changes. In this study, we leverage cortico-motor coherence as a window into the dynamics of sensorimotor loops and explore how it relates to online visuomotor control. We recorded brain activity using EEG while participants performed a tracking task that involved transient, unpredictable visual perturbations. Subjects manipulated an isometric joystick while sitting in front of a screen, and the force exerted was converted online into the angular velocity of a visual cursor displayed on monitor. Participants controlled the cursor to track a target, which moved at constant angular velocity along a circular path. During its motion the target underwent a sudden and unpredictable acceleration, before resuming its constant velocity for the rest of the trial. Subjects were asked to perform the tracking as accurately as possible and react to the perturbation as fast and accurately as they could. A feedback of their performance was provided at the end of each repetition. Our results show that coherence between cortical activity and force in the alpha band (8-13 Hz) is associated with faster motor responses, while beta-band coherence (18-30 Hz) promotes more accurate control, which is in turn linked to a higher likelihood of obtaining rewards. Both effects are most pronounced immediately before perturbation onset, underscoring the predictive value of cortico-motor coherence for sensorimotor performance. Single-trial analyses further reveal that deviations from the preferred cortico-motor phase relationship are associated with longer reaction times and larger errors, and these phase effects are independent of power effects. Thus, beta-band coherence may reflect a cautious, reward-oriented control strategy, while alpha-band coherence enables quicker – though not necessarily more efficient – motor responses, indicating a complementary, more reactive control mode. These results highlight the finely tuned nature of sensorimotor control, where different aspects of sensory-to-motor transformations are governed by frequency-specific neural

synchronization on a moment-to moment basis. By linking neural dynamics to motor output, this study sheds light on the spectrotemporal organization of sensorimotor networks and their distinct contribution to goal-directed behavior.

P6.16 | Arousal and Attention Across Development: Evidence From an Auditory Oddball Task

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Unexpected auditory events are a frequent source of distraction in daily life, affecting both children and adults. While such stimuli often impair goal-directed performance, a growing body of research shows they can also improve performance. This beneficial effect is thought to result from a transient increase in arousal mediated by the Locus Coeruleus – Norepinephrine system. Although the relationship between arousal and attention has been central to physiological research in animals and theoretical works, empirical evidence in humans, particularly in children, remains limited. Gaining a better understanding of this interaction is essential for clarifying cognitive development and attention-related developmental disorders. This study aims to investigate the impact of tonic arousal on attention and phasic arousal in 44 children (6 to 8 years old) and 46 adults (18 to 35 years old) using a 3-tone oddball paradigm (80% standard, 10% novel, 10% target sounds). We hypothesized that tonic arousal would impact measures of attention and phasic arousal during an active auditory task differently as a function of age. We modulated tonic arousal by presenting calm and exciting music extracts, as well as exciting videos, before each block of the task (induction period). We recorded behavioral responses (reaction times, response rates) and physiological parameters (skin conductance, pupil dilation, heart rate) during the induction and task periods. Data were analyzed using custom Matlab programs and the Ledalab Matlab toolbox. We used Bayesian statistics to test the effect of induction, age and sound type (standard, novel, target) on measures of attention and arousal. Exciting videos resulted in the strongest level of tonic arousal in both children and adults, during the induction period and the following oddball task, as shown by skin conductance measures. However, the behavioral measures of attention (reaction time and reaction time variability) during the oddball task were found unaffected by tonic arousal in both age groups. Importantly, pupil dilation response to novel sounds, only, was larger in children than in adults, suggesting an increased phasic arousal response to unexpected rare events in children. The present study shows differences in the development of arousal and attention during childhood.

P6.17 | Impact of Development on the Cortical Processing of Postural Sway

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Postural stability and balance control are developmental processes that take time to master. As a result, children are less stable than adults and have more difficulty maintaining stability. However, little is known about the cortical involvement in this process during development. Such involvement could be quantified by assessing the coupling occurring between cortical activity and force plate-measured postural sways, which is a form of corticokinematic coherence (CKC) previously reported in adults. To that end, we recorded the center-of-pressure (CoP) fluctuations and electroencephalographic activity of a total of 25 children (mean ± SD age, 8.24 ± 2.18 years, 11 females) and 29 adults (mean ± SD age, 25.75 ± 2.7 years, 13 females), while they stood upright in four different randomized conditions (eyes open and closed, on a hard surface and on foam pads) for a total of 10 min per condition. Sway amplitude was quantified using two instability parameters: the standard deviation (SD) of the CoP in the antero-posterior direction (SD(rCoP)), as well as its mean velocity (mean(|vCoP|)). CKC was computed between each EEG electrode, and three CoP features: its deviation from the mean (|rCoP|), its velocity (vCoP), and its velocity in absolute value (|vCoP|). Two-way ANOVAs assessed the effect of age group and condition on instability parameters and maximum 2–8-Hz CKC across electrodes. Instability parameters were significantly influenced both by age ($p < 0.001$) and balance condition ($p < 0.001$) but not by their interaction ($p > 0.05$). They were higher in children, and increased with condition complexity. Most importantly, CKC analysis revealed significant effects for all CoP features of both age ($p < 0.01$) and condition ($p = < 0.001$), along with a significant interaction thereof ($p = < 0.02$). CKC was lower in children and increased with condition complexity, though with a more pronounced increase in adults compared with children. In conclusion, although children sway more, their sensorimotor cortical areas represent less faithfully these postural fluctuations. CKC appears to be an objective marker of immature cortical implication in balance maintenance in children.

P6.18 | Prebiotic Modulation of Brain Function in Obesity

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Obesity is increasingly understood as a condition influenced not only by metabolic dysfunction but also by alterations in brain circuits involved in appetite regulation and reward processing. Compulsive eating behaviors, in particular, have been linked to disruptions in the gut-brain axis and central nervous system function. This study investigated the impact of the supplementation with the prebiotic inulin on brain function in individuals with obesity and compulsive eating patterns, particularly regarding the decision-making process related to food choice. The goal was to evaluate whether modulating the intestinal microbiota through supplementation with a prebiotic can contribute to weight control and improved neurofunctional health. A double-blind randomized controlled clinical trial with adult obese subjects (body mass index > 30 kg/m2) was established. This study was approved by the Ethics Committees of the University of Minho and Hospital de Braga. Participants in the intervention group received 16 g/day of native inulin while controls received 16 g/day maltodextrin (placebo), for 3 months. Functional magnetic resonance imaging (fMRI) was used pre- and post-intervention to assess changes in structural and functional connectivity, during resting-state and two tasks related to 1) food cue reactivity, using pictures of healthy and high calorie food, and 2) reward processing requiring participants to bid (0-3 €) on selected examples of high calorie food. At both stages, gut microbiota was also profiled, and eating behavior was analysed using the Portuguese versions of the LOCES Rep(eat)-Q questionnaires. At the present stage, complete longitudinal data from 9 participants has been collected: 5 from the intervention and 4 from the control group. Preliminary analysis indicated that prebiotic-treated subjects decreased the monetary value attributed to high calorie foods. fMRI data will be preprocessed through the fMRIprep pipeline, and connectivity between the prefrontal cortex and limbic circuits will be assessed during the tasks. We expect this project will contribute significantly to the field of neural functioning in obesity, opening new possibilities for effective treatments against obesity and reducing the problems associated with this illness.

P6.19 | Respiration Dynamics as a Means to Facilitate Perception

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Recent work continues to highlight the link between bodily and neural rhythms during human action, perception, and cognition. At rest, for example, the breathing rhythm is systematically coupled to so-called respiration-modulated brain oscillations (RMBOs). In visual perception, respiration phase has been linked to changes in cortical excitability which in turn directly affects perceptual sensitivity. The mechanisms underlying functional body-brain coupling, however, are poorly understood, as are the ways in which they modulate behaviour. From an interoceptive inference perspective, respiration actively aligns sampling of sensory information with transient cycles of heightened excitability to facilitate performance. We present results from a comprehensive human magnetoencephalography study (N = 30) tailored to investigate interoceptive inference accounts of brain body interactions. In a visual near-threshold perception paradigm, participants were more sensitive to visual stimulation when stimuli were presented during the inspiration phase. Since respiration is under conscious voluntary control, this phase-locking is by no means accidental: Participants systematically changed their respiratory dynamics from resting state to the task context – the more strongly they adjusted parameters like respiration rate, the better they performed during the task. This way, spatially and temporally highly predictable stimuli were consistently received during the beneficial inspiration phase, whereas unpredictable stimuli were not. Given that pupillary dynamics provide a well established proxy of noradrenaline-driven changes in arousal states, we investigated pupil responses during the prestimulus window, i.e. between cue onset and target onset. Spatial cues significantly modulated arousal during prestimulus fixation leading up to target presentation, irrespective of temporal cues. Moreover, larger pupil diameter as a response to cued (vs uncued) trials coincided with better individual performance, indicating a systematic influence of predictability-dependent changes in arousal states on behavioural performance. On the neural level, we not only replicated the coupling of behaviourally relevant excitability changes in the visual cortex to the respiratory rhythm, but also demonstrated distinct effects of spatial cues on perceptual alpha activity and of temporal cues on motor preparation in the beta band, respectively. Using multivariate source localised time series from the RMBO network, we were able to show a meaningful influence of respiration phase on network-wide neural dynamics, particularly in the alpha and beta range. These effects of respiration on cortical oscillations directly explain behavioural performance on the individual level and – critically – are flexibly adjusted depending on trial-by-trial variation in stimulus predictability. For the first time, we implemented respiration phase-resolved analyses of whole-network directed functional connectivity using Granger causality. Respiration phase consistently modulated information

flow within the RMBO network, which once more could be linked to perceptual sensitivity. Overall, our results highlight respiratory dynamics as a means to facilitate near-threshold perception through distinct changes in neural network activity and connectivity.

P6.21 | Neural Signatures of Auditory Attention in Cochlear Implant Users vs. Normal-hearing: Bottom-up Theta- Vs. Top-down Alpha Activity

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Cochlear implants (CIs) allow hearing-impaired individuals to regain access to speech; however, the outcome variability remains high. While it's clear that the auditory input through electrical stimulation is different than the acoustic input of normal-hearing (NH) listeners, its effect on cognition is not fully understood. In this study, utilizing an active – and a passive oddball task, we aim to find neural correlates of auditory attention in CI users. Using time-frequency and source reconstruction techniques, we analyzed retrospectively 128 channels EEG data (Schierholz et al., 2021) from postlingually deafened CI users (n = 37) and NH controls (n = 37). The participants performed three-stimulus oddball task, which consisted of standard tones (Standard), infrequent deviant tones (Target) and infrequent unique sounds (Novel). In the active task, they responded via button press to the Target. In the previous study, significant differences in time-domain were found between both groups during Target processing for the P3b latency, but not for its amplitude. In the current study, significant differences in time-frequency domain were found in delta-theta synchronization and alpha-beta desynchronization. Interestingly, while delta-theta synchronization occurred in both tasks, alpha-beta desynchronization appeared only during the active task. Thus, delta-theta synchronization may be more associated with bottom-up processes while alpha-beta desynchronization is exclusively related to top-down attentional processes. In the passive task, delta-theta activity was stronger in NH group compared to the CI, as expected given the difference in their auditory input. However, during active task, CI users exhibited reduced alpha (compared to Standard) not only during Target processing but also during Novel, suggesting an additional cognitive load in CI users compared to NH group. The neural sources of alpha activity were comparable between the two groups, namely inferior parietal lobule, medioventral occipital cortex, middle temporal gyrus, precuneus and cingulate cortex. These areas are known to be parts of both the ventral and dorsal

attention networks, each responsible for bottom-up (salient) and top-down (guided) attentional processes. In summary, this study provides insight into the relationship between oscillatory activities and auditory attention in CI users, as well as the potential of oscillatory activities as objective marker to monitor rehabilitation. Supported by Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), Cluster of Excellence „Hearing4all“ (EXC 2177).

P6.22 | Tracking the Neural Categorization of Hands From Infancy to Adulthood Using Fast Periodic Visual Stimulation

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Early cognitive and social development crucially depends on the ability to perceive and categorize social stimuli. Extensive research documented infants' early preference for faces (Behrmann et al., 2016; Turati et al., 2006), that are known to engage regions within the right ventral and lateral occipito-temporal cortex (Conte et al., 2020) and elicit a right-lateralized categorization response by 4 months (de Heering & Rossion, 2015). Like faces, hands also play a crucial role in social communication (Perry et al., 2016) and are salient stimuli from the first months of life (von Hofsten, 2004). By 8 months, infants' right temporal cortex responds distinctly to human versus mechanical hands (Biondi et al., 2016). Less is known about the neural categorization of hands in comparison to other objects, and how this ability develops across the lifespan. To explore this question, we used Fast Periodic Visual Stimulation oddball paradigm coupled with EEG recording. We recorded EEG activity in a group of adults (N=33), 4- (N=45) and 9-month-olds (N=34), viewing images of naturalistic objects at a rapid rate (6 Hz). Hand images appeared every 5 stimuli (1.2 Hz), creating categorical changes. Results highlighted that the signal was significantly higher than noise across bilateral occipital electrodes at the base frequency (6Hz) for all three age groups (SNR>1.7, z-scores >7.42, ps<0.001). Conversely, the oddball categorization response (1.2Hz) showed a developmental pattern. In adults, amplitude was significantly higher than noise at occipital and parieto-occipital regions (1st-4th harmonics, SNR>1.97, z-scores >25, ps<.001), in 9-montholds only at right-occipital electrodes (1st-3rd harmonics, SNR>1.8, z-scores >16, ps<.001), while no hand categorization was observed in 4-month-olds (all p>0.05). Hands categorization appears to be a multidimensional process, relying on an efficient and distributed network in adults, while in 9-month-olds it seems to involve a more perceptually driven process, localized in right-occipital areas. Moreover, no neural categorization of hands emerged at 4-months; further analyses will covariate infants' grasping abilities to investigate the potential role of sensorimotor experience. These findings pave the way for future investigations into the precise mechanisms and developmental factors that shape the neural representation of hands.

P6.23 | Prefrontal Beta and Theta Bursts Coordinate the Acquisition of Spatial Information

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Encoding, consolidation, and recollection of spatial information is crucial for successful navigation. The neural processes related to consolidation and recollection of spatial information have been widely studied in both humans and animal models. Yet, how spatial information is initially encoded and updated as a function of learning remains unclear. By leveraging intracranial electroencephalographic (iEEG) recordings in patients with pharmaco-resistant epilepsy undergoing pre-surgical invasive monitoring (N=16), this study determined the neural mechanisms that facilitate acquisition and updating of spatial navigation by the hippocampal-neocortical network of the human brain. Subjects were trained on a novel spatial exploration task that consisted of 10 unique 2D mazes. Each maze consisted of a 5x5 grid and had a unique route, identifying background image, as well as start and end coordinates. Maze order was randomized between subjects. Routes were enforced through hidden placement of obstacle coordinates. Navigation to an obstacle coordinate resulted in behavioral feedback that temporarily revealed the obstacle, paused the paradigm, and subsequently reset the paradigm to the starting coordinate of the current maze. Subjects learned to successfully navigate each maze, as shown by a significant reduction in the number of encountered obstacles over time. Single-trial analyses showed that acquisition of new information, here constituting the navigation to an obstacle coordinate, is inherently linked to distinct, transient bursts in the beta frequency band (13-30 Hz) in the prefrontal cortex. On group level, beta burst occurrence was significantly higher for obstacle coordinates. Notably, obstacle encounters that were successfully encoded showed significantly higher theta (4-8 Hz) and lower beta (13-30 Hz) power as compared to obstacles that were not remembered. Surprisingly, beta burst occurrence was also observed upon obstacle coordinates during the subsequent free recall session wherein no behavioral feedback was provided, suggesting that subjects were aware of erroneous navigation. In sum, we show that transient bursts within the beta frequency band provide top-down modulation of information processing to integrate new information into working- and long-term memory.

P6.24 | Effects of L-theanine-caffeine Combination on Selective Attention Among Adolescents With Attention Deficit Hyperactivity Disorder: A Double-Blind, Placebo Controlled, Crossover Study

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Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by impaired attention, hyperactivity, and impulsivity. L-theanine is a nonprotein-forming amino acid found in tea. Caffeine is found in both tea and coffee. Purified L-theanine and caffeine are currently available as nootropic supplements. Ltheanine-caffeine combination is found to improve attention in healthy adults. We aimed to determine the acute effects of the L-theanine (2.5mg/kg body weight) caffeine (2.0mg/kg) combination (T+C) on neurobehavioral and neurophysiological measures of selective attention, compared to methylphenidate (as the positive control), and a placebo, in adolescents with ADHD. We conducted a double-blind, placebo-controlled, counterbalanced, 3-way crossover trial. Nineteen adolescents with ADHD (17 boys; age: 10-19 years) underwent a computerized visual oddball task: They responded to downward-pointing triangles (count: 70, probability: 20%) while ignoring upward-pointing triangles (count: 280, probability: 80%) randomly intermixed within task blocks. Participants completed the task before and 50 minutes after each treatment on three separate days. We measured hits, false alarms, target-distracter discrimination sensitivity (A'), and hit reaction time (RT). A 32-channel EEG was recorded concurrently, and cognitive event-related potentials (ERPs) were derived, and the latencies and amplitudes of P3b ERP (a measure of selective attention) elicited by targets in centroparietal electrodes were measured. The pre- vs. post-dose changes of the outcome measures by T+C were compared with changes caused by methylphenidate and placebo. The results demonstrated no significant differences in hits and discrimination sensitivity ($P>0.05$). A trend toward reduced false alarms was observed with T+C ($P=0.057$) and methylphenidate ($P=0.064$) compared to placebo. Methylphenidate, but not T+C, significantly improved RT compared to placebo ($\triangle=39.17$ms, $P=0.035$). The improvement of P3b ERP amplitude by T+C was significantly greater than that of placebo in CP1 ($\triangle=2.75\mu V$), P3 ($\triangle=3.01\mu V$), and P4 ($\triangle=2.35\mu V$) sites ($P<0.05$), with trend towards amplitude improvement at CP2 ($\triangle=2.42\mu V$; $P=0.06$), and CZ ($\triangle=2.41\mu V$; $P=0.06$). Compared to placebo, T+C exhibited a significant improvement of latency at CZ ($\triangle=30.78$ms; $P=0.047$) with a trend towards improvement at CP2 ($\triangle=31.53$ms; $P=0.079$). These findings suggest that high-dose L-theanine-caffeine combination may enhance neural resource allocation and cognitive processing in selective attention, while reducing false alarms in adolescents with ADHD.

P6.25 | Rhythmic Complexity and Trait Empathy Modulate Internal Motor Simulation in Response to Music

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Theoretical accounts of rhythm cognition propose that internal motor simulation serves a functional role in the predictive processing of beat timings and rhythmic patterns. One potential neural index for internal motor simulation is suppression of mu- and beta power over the sensorimotor regions, previously associated with motor imagery and the observation ofmotor actions. We investigated mu- and beta-power over the sensorimotor regions in response to music stimuli systematically varying in rhythmic complexity, compared to random rhythms. If internal motor simulation is involved in the prediction of upcoming beats, beat-based stimuli should evoke more mu- and beta-suppression in comparison to random rhythms. Furthermore, rhythmic complexity should also modulate mu-suppression. We also investigated the possible contribution of trait empathy, as it has been previously associated with internal motor simulation in the context of musical timing coordination. Participants (40 adults) heard 5 different versions (low, medium, high, and very high rhythmic complexity, and random) of 3 rhythm patterns with drums, keyboard and bass (all 120 BPM). After each of the 15 excerpts, participants rated their experience of groove (i.e., wanting to move to the music), the ease of perceiving a beat, and enjoyment. 64-electrode EEG (BioSemi ActiveTwo) was recorded, and the Interpersonal Reactivity Index (Davis, 1980) was used to measure trait empathy. Average mu- and beta-power over the sensorimotor regions in each rhythmic complexity condition were converted into log-transformed power ratios relative to the random rhythm condition. One-sample t-tests revealed significant suppression (relative to random rhythms) in the medium (mu & beta) and high (beta) complexity conditions. Linear mixed-effects modelling further revealed that groove ratings were significantly (negatively) associated with both mu- and beta-power, and affective trait empathy significantly modulated average power in the low (mu), medium (mu & beta), and high complexity (mu) conditions. The results suggest that the processing of beat-based music may indeed involve internal motor simulation, and that the degree of this internal simulation is associated with rhythmic complexity in a quadratic manner. Trait empathy interacted with rhythmic complexity in predicting average mu- and beta-power, suggesting that social-cognitive capacities may also contribute to rhythm processing.

P6.26 | Identifying Attention Deficits in Brain-injured Patients: A Machine Learning Approach Using Eye-tracking in Immersive vr and its Relation to White Matter Disconnection

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Alertness deficits and Unilateral Spatial Neglect (USN) are common sequelae of Acquired Brain Injuries (ABI)[1], often impairing daily functioning[2,3]. To overcome limitations of conventional assessment tools, Immersive Virtual Reality (iVR) has emerged as a promising solution[4]. iVR enables the simulation of ecologically valid scenarios with precise stimulus control and increasing reliability[4]. Additionally, integrating eye-tracking (ET) into iVR system allows to collect biomarkers indicative of attentional processes[5]. This study evaluates the ability of ET-metrics, collected during novel iVR-based tasks, to detect deficits in alertness and spatial attention in ABI patients. Moreover, correlations between ET-derived biomarkers and white matter tracts disconnection were analyzed to explore the neural correlates of attention deficits. 31 sub-acute ABI patients were included, all exhibiting impairments in tonic alertness and/or spatial attention, as confirmed by standardized attentional tests. Patients also completed an iVR-Free-Viewing Exploration test (iVR-FVE) and two iVR-based tasks assessing alertness and spatial attention wearing an HTC VIVE Pro Eye head-mounted display equipped with Tobii® ET. ET data were processed offline to derive metrics already validated in literature as attention biomarkers. Random Forest algorithms with Leave-One-Out Cross-Validation were implemented to classify patients with alertness deficits and USN. Model performance was evaluated using Receiver Operating Characteristic (ROC). Highest classification accuracy for alertness deficits was achieved combining ET features from iVR-FVE and iVR-based alertness task, specifically: fixation stability (interquartile range of gaze position), blink frequency, fixation count and duration. For USN, the best accuracy was obtained using gaze laterality (percentage of left fixations), gaze-index (time rate spent on one side), first fixation side, and refixations count from both iVR-FVE and iVR-based spatial attention tasks. ROC analyses indicated an Area Under the Curve greater than 0.80 for both models. USN-related ET biomarkers were significantly associated with disconnection in Ventral Attention Network tracts (e.g., Uncinate, Superior-Longitudinal and Inferior-Frontal-Occipital Fasciculi), which play a crucial role in allocating and orienting attention in space. These findings highlight iVR and ET as rapid and ecologically valid methods for identifying attentional deficits. Moreover, bypassing the need for motor or verbal responses, our approach enables early access to care services for a broader range of patients.

P6.27 | Phase-Specific Coupling of Oscillatory Brain Activity during Sleep in Infants

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Sleep supports the consolidation of memory from an early age. The precise temporal coupling of oscillatory brain activity involving cortical slow oscillations (SOs, 0.5-1 Hz), sleep spindles (9-16 Hz), and hippocampal ripples is a fundamental mechanism underlying memory consolidation during non-rapid eye movement (NREM) sleep. Recently, we have observed a temporal coupling between SOs and sleep spindles in one-year-olds, but the developmental course of this coupling mechanism is still unknown. Here we investigated the temporal coordination of sleep spindles and SOs during a nap in infants aged 9 to 16 months. We analysed the occurrence of spindle events (i.e., all peaks and throughs of a spindle) during SOs in peri-event-time-histograms and found that spindle events were not uniformly distributed over the course of an SO. As expected, the number of spindle events decreased shortly before and during the down-state (the hyperpolarized state) of SOs and increased around their up-state (the depolarized state), especially in mid-frontal and mid-central cortical regions. This temporal coupling was stronger in infants older than one year compared to infants younger than one year, but an increase in spindle events from the down-state to the up-state of SOs was present in both age groups. The results suggest that the physiological mechanism of SO-spindle coupling becomes functional in the second half of the first year of life. In the following, we investigate whether this early coupling already affects memory consolidation.

P6.28 | Exploring the Effects of Motor Training Through Immersive Virtual Reality Alone and Combined with Parietal tDCS

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Immersive Virtual Reality (IVR) provides interactive and engaging environments to stimulate motor learning and neuroplasticity. IVR systems allow individuals to practice precise, repetitive tasks with real-time feedback, which is critical for motor learning and rehabilitation. In parallel, transcranial direct current stimulation (tDCS) has been used to modulate cortical excitability and enhance neural processing in motor-related regions. Combining IVR with tDCS may further enhance these effects by modulating activity in targeted brain areas. Herein, we investigated the effects of a 5-day IVR game-training (Beat Saber game for PS4) alone or combined with sham or anodal tDCS over the left posterior parietal cortex, a key structure for visuospatial processing and motor coordination. Seventy-four healthy participants were randomly assigned to one of three groups: IVR alone, IVR + anodal tDCS, or IVR + sham tDCS. Participants performed a battery of motor tasks requiring hand–eye coordination (Box and Blocks, Ruler Drop, Trail Making part A, and Plate Tapping tests) before and after training on days 1 and 5 to assess motor performance and transfer effects. Results showed progressive improvements in game performance from day 1 to 4 and significant motor transfer effects across all tasks, regardless of stimulation condition. tDCS did not enhance outcomes, suggesting potential limitations related to stimulation site and parameters. Our findings highlight IVR's potential for motor skill development, contributing to the growing body of evidence supporting its use as a versatile and accessible tool for motor learning, research and rehabilitation. While tDCS did not enhance outcomes in this context, future research should explore alternative protocols to optimise its efficacy in IVR motor training.

P6.29 | Electrophysiological Insights Into Corollary Discharge: Unraveling Sensorimotor Integration in Self-perception

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The corollary discharge (CD) mechanism is a crucial sensorimotor process that suppresses the conscious perception of self-generated actions. During speech production, an efference copy from the motor cortex to the auditory cortex reduces the perception of self-produced speech, distinguishing it from external auditory stimuli and contributing to selfawareness. Event-related potential (ERP) studies, particularly on the N1 component, show that neurotypical individuals exhibit reduced N1 amplitudes in response to selfgenerated speech compared to passive listening (perceptual suppression). CD dysfunction has been linked to schizophrenia, making it a relevant biomarker for anomalous selfexperiences. This study examined N1 and P2 ERP modulation in neurotypical individuals (n = 63) and its relationship with schizotypal traits, anomalous self-experiences, and agency attribution, assessed using the SPQ-B, IPASE, and HAD Task. Brain activity was recorded under three conditions: TALK (self-generated speech), LISTEN (self-heard speech), and LISTEN OTHER (externally presented speech). Results showed significant N1 suppression in the TALK condition compared to LISTEN and LISTEN OTHER, with no significant N1 or P2 differences between the latter two. Correlational analyses revealed a negative association between N1 suppression and schizotypy, as well as between N1 suppression and high IPASE scores reflecting anomalous self-experiences. These findings suggest that reduced perceptual suppression may indicate subtle disruptions in the CD mechanism, even in neurotypical individuals with schizotypal tendencies. In conclusion, the CD system, assessed through N1 modulation in a TALK-LISTEN-LISTEN OTHER paradigm, serves as a robust electrophysiological marker for self-referential processes. The sensitivity of N1 suppression to schizotypal traits and anomalous self-experiences highlights its potential for investigating self-construction mechanisms and their dysregulation in clinical populations. These results reinforce the role of the CD mechanism as a neurophysiological correlate of self-perception and its disruption along the psychosis spectrum. Keywords: N1, P2, efference copy, anomalous self-experiences, schizotypy.

P6.30 | Shame and the Self: Neural and Phenomenological Signatures of Self-incongruent Autobiographical Memories

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Autobiographical memory emerges from integrating past experiences with a self-model, yet memories that conflict with one's self-concept – eliciting self-conscious emotions such as shame – disrupt this integration and offer a window into self-memory processes. Building on our diary study demonstrating that self-incongruent

memories alter visual perspective and semantic recall structure, we developed an fMRI paradigm to probe the neural mechanisms underlying self-incongruent memory integration. In this ongoing study, forty participants supply four personal episodes in in each of the emotional categories of shame, pride, fear, and contentment, and generate three personalized cue words per memory. During fMRI scanning, these cues prompt silent recall while their brain activity is being recorded. In addition to fMRI, a comprehensive set of phenomenal measures is being collected to gain deeper insight into the content and subjective structure of these memories. We collect heart rate and cheek temperature to index blushing during free verbal recall, which is recorded and transcribed. Participants also complete the Memory Experience Questionnaire (MEQ) and provide self-reports of valence, arousal, and emotional intensity. To assess structure of relationships among memories, we use spatial arrangement and similarity ranking tasks. Our primary aim is to identify neural correlates of selfincongruent memories and relate them to phenomenological and semantic measures to reveal how self-conscious emotions shape autobiographical memory architecture. We will apply multivariate representational similarity analysis (RSA) to compare fMRI activation patterns with subjective similarity matrices. We hypothesize that neural patterns for shame memories will show greater within-category similarity compared to other emotions. We will also examine heterogeneity within positive (pride, contentment), negative (shame, fear), self-conscious (shame, pride), and non-self-conscious (fear, contentment) domains. By correlating RSA-derived neural similarity matrices with participants' subjective similarity ratings, we aim to localize brain regions where perceived and neural memory structures converge. Additionally, we will perform semantic analyses using transformer-based encoders such as BERT to quantify thematic overlap across narratives and test whether shame episodes share distinct semantic features. By integrating neural, phenomenological, and semantic data, this study directly extends our theoretical framework on self-memory integration and outlining the role of self-conscious emotions in self-memory integration.

P6.31 | Naturalistic Assessment of Attention and Related Deficits Through MEG-EEG and Virtual Reality

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Background: Neural underpinnings of attention have been intensely investigated. However, it is unclear how the obtained findings generalize from laboratory conditions to real-life settings. With a novel virtual reality (VR) game, EPELI, our group has paved the way to objectively measure attention in typically developed individuals and participants with attention deficit hyperactivity disorder (ADHD) in everyday situations (Seesjärvi et al. Journal of Attention Disorders 2022, Merzon et al. Scientific Reports 2022). The goal of the current study (https://aspredicted.org/5s5j-q6b4.pdf) is to quantify through combined magnetoencephalography and electroencephalography (MEG-EEG) how neural underpinnings of ADHD unfold in time and to compare the obtained responses with those of typically developed controls. In a recent study our group combined flat-screen version of the EPELI VR task with functional magnetic resonance imaging (Merzon et al. PLOS One 2025). Here, the implementation of MEG-EEG allowed us to increase the spatiotemporal resolution of VR-based investigations of ADHD brain correlates. Methods: We collected MEG-EEG data from 29 adult controls and 22 adults diagnosed with ADHD while they conducted attentionally demanding everyday tasks in a VR environment (EPELI task). The MEG-EEG recordings (Aalto Neuroimaging Infrastructure, Aalto University) were performed with Megin Triux Neo 306-channel neuromagnetometer and simultaneous 32-channel EEG measurement, while collecting task performance, gaze position (Eye Link 1000), electrocardiogram and electro-oculogram, during the flat-screen version of EPELI. Results: We have successfully implemented preprocessing and evoked-response analysis pipelines that combine filtering and independent component analysis. In the preliminary results, we observe reliable evoked responses that are modulated by attention, specifically by target processing and divided for each event category such as task completion and auditory feedback. The present results provide initial evidence of possible group differences, which may reflect differences in orientation of attention. Conclusions: Our study demonstrates that VR can be combined with MEG-EEG to investigate the neural mechanisms of attention and related deficits in ecologically-relevant situations. Behavioral metrics provided by the EPELI task are already validated for clinical ADHD assessment. We conclude that combining VR with MEG-EEG opens new avenues for naturalistic brain – behavior mapping with high temporal resolution.

P6.32 | Cognitive Eye Tracking Tasks as a Tool to Distinguish Adolescents With Depression From Healthy Controls

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Although numerous potential biomarkers for major depressive disorder (MDD) have been identified, there are yet to be any widely integrated into clinical practice (Strawbridge et al., Neuropsychiatry Disorder Treatment, 2017). In addition to inconsistencies within research, the invasiveness of traditional biomarker techniques (e.g., blood, genetic analysis) poses challenges for research and clinical translation. This problem may be addressed via eye tracking; a well-established, non-invasive technique to identify alterations in specific neural networks responsible for cognitive control, arousal, attention, and orienting responses. The goal of this study is to use the interleaved pro-/anti-saccade task (IPAST; Munoz et al., Nature Reviews Neuroscience, 2004) to compare saccade, pupil, and blink behaviour in adolescents with MDD versus healthy control subjects. Each IPAST trial included a central fixation spot whose colour (green or red) indicated whether participants were to make a pro-saccade (look toward peripheral stimulus) or anti-saccade (look away from the stimulus), respectively. We hypothesized that due to various brain areas known to be impacted in depression – which are also implicated in eye movement and pupil control (e.g., frontal cortex, basal ganglia, amygdala) – adolescents with MDD will have impaired saccade performance on this task and display differential pupil and blink response patterns. 50 adolescents with MDD (mean age [M]=15.87, 40 female, Patient Health Questionnaire [PHQ] score=14.1) were recruited from a local psychiatric outpatient program and 50 ageand sex-matched healthy controls (M=15.82, 40 female, PHQ=1.92) were recruited from the community. All participants completed self-report questionnaires for mental health symptoms and performed IPAST. Parametric tests showed that participants with MDD displayed less task-readiness (as indicated by gaze at fixation onset), generated more express saccades across the task, made more anti-saccade direction errors, and had blunted pupil responses compared to control participants, but no differences in blink behaviour. Future analyses will utilize general linear models to investigate whether various psychiatric symptoms correlate with eye movement behaviour. These initial results suggest that eye tracking may be a feasible technique to distinguish adolescents with MDD from control subjects and identify potential eye movement markers for future detection purposes.

P6.33 | Intensity-dependent Auditory Self-generation Effects: Linking Neural and Perceptual Measures

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Self-generated (SG) sounds typically elicit attenuated perceptual and neural responses when presented at clearly audible (supra-threshold) intensities – a well-established phenomenon. Recent findings, however, suggest that this pattern reverses at near-threshold intensities, with SG sounds perceived as louder than externally generated ones. Despite this, few studies have jointly examined perceptual and neural effects of self-generation, and it remains unclear whether perceptual enhancements

are mirrored in neural responses. This study investigated how sound source (self vs. external) and sound intensity (near-threshold vs. supra-threshold) interactively influence auditory processing at both the perceptual and neural levels. Forty-seven participants performed a two-alternative forced-choice intensity discrimination task on sound pairs. The first sound was either SG or externally generated, at fixed near- or supra-threshold intensity. The second sound was always externally generated, with variable intensity (±3 dB). Psychometric curves were fit to second-sound louder responses, and points of subjective equality (PSE) were extracted. Concurrently, EEG was recorded, and the amplitude of the N1 component elicited by the first sound was analyzed. Sound source and intensity interactively modulated auditory processing. As expected, near-threshold sounds elicited weaker neural responses (lower N1 amplitudes and delayed N1 peaks) than supra-threshold sounds. However, intensity effects interacted with sound source effects. In general, the same interaction pattern was found on N1 amplitudes ($F(1,46) = 44.6$, $p < .001$) and PSE ($F(1,46) = 18.6$, $p < .001$): Sensory suppression was found for SG sounds at supra-threshold intensities, while sensory enhancement was found for SG sounds at near-threshold intensities. Remarkably, self-generation eliminated intensity-related differences in N1 amplitudes, effectively equalizing neural response amplitude across intensities. This study expands upon prior behavioral research by integrating neurophysiological measures. The findings provide the first direct evidence that the reversal of self-generation effects at low intensities is reflected at both perceptual and neural levels, confirming a direct correspondence between these two measures. Moreover, the results highlight that action effects on sensory processing are not fixed but flexibly modulated by stimulus properties such as intensity. Results are discussed in the framework of predictive coding, with consideration of arousal-related contributions to sensorimotor integration processes.

P6.34 | When Senses Disagree – Functional Connectivity in the Developing Brain During Audiovisual Conflict

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Functional connectivity (FC) provides insights into how different brain regions form functional networks, communicate and interact. These interconnected networks support complex cognitive functions, including attention, language and conflict processing. Key nodes involved in language perception and comprehension include the left inferior frontal gyrus (IFG) and the left superior temporal gyrus (STG). This study aimed to examine how these nodes interact with other brain regions in children during the processing of short movie scenes with converging or conflicting visual and auditory information. We developed an fMRI movie-watching paradigm including blocks of visual and audiovisual scenes based on cartoon movie sequences from "The Snail and the Whale". The narration was manipulated to create audiovisual congruent (AVcon) and AV incongruent (AVinc) scenes. Functional MRI data were acquired from 95 healthy children (mean age = 8.7 [5.7 - 13y], 48 female). Using the MATLAB toolbox CONN and its default analysis pipeline, FC was compared between audiovisual (AV) congruent and incongruent scenes. The left IFG and left posterior STG were defined as seed regions of the language network. Seed-to-voxel FC analyses were performed, applying a cluster-level family-wise error correction threshold of $p<.05$. Our results revealed distinct patterns of FC associated with AV congruency. During AVcon compared to AVinc scenes (AVcon>AVinc), the IFG exhibited increased FC with left occipital regions, including the lingual gyrus. In contrast, during AVinc compared to AVcon (AVinc>AVcon) scenes, the IFG showed FC to the bilateral superior parietal lobule. The STG showed FC with bilateral occipital and temporal regions during AVcon>AVinc scenes, while during AVinc>AVcon scenes, it was functionally connected to the right superior parietal lobule and bilateral inferior occipital gyrus. These findings suggest that AV congruency modulates functional connectivity within language and sensory integration and attention networks in children. Higher connectivity with occipital and temporal regions during congruent scenes may reflect efficient multisensory integration, while FC to parietal areas during incongruent scenes suggests increased attention demands. The differential FC patterns of the left IFG and STG highlight the context-dependent dynamics of language processing in children, providing a foundation for future analyses of how age and language abilities influence audiovisual (in)congruency processing.

P6.35 | Neurofeedback Targeting Global Alpha-band Connectivity of Visual Areas to Improve Visual Perception

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Alpha-band (8–12 Hz) functional connectivity (FC) between visual regions and the rest of the brain was found to positively correlate with perceptual performance in neurotypical individuals and with deficit severity in patients with affected visual field. Building on this evidence, the present study investigated whether neurotypical participants could enhance global alpha-band connectivity of visual areas through auditory neurofeedback, and whether this modulation relates to improvements in visual perception. Twenty-eight participants were randomly assigned to either an active group or a control group. Both groups received real-time auditory neurofeedback based on their alpha-band FC, enabling them to learn to modulate their brain activity. Each participant completed two neurofeedback sessions, with 24 minutes of effective training per session. The active group aimed to increase global alpha-band FC of visual areas (V1-3), whereas the control group targeted ipsilateral dorsal and frontal gyri regions. We hypothesized that participants in the active group would enhance alpha-band FC in visual brain regions, leading to improved visual perception. This improvement was expected to be region-specific, meaning that such effects would not be observed in the control group. Visual perception was assessed on separate days, prior to and following the neurofeedback sessions, using six fixed low-contrast stimuli. Neurophysiologically, the results suggest that the active group sustained higher FC in the targeted visual region following neurofeedback training, whereas the control group exhibited a decline over time. This difference between groups became more pronounced during the second day of training. Behaviorally, both groups showed reduced perceptual contrast thresholds following neurofeedback training. The improvements were more notable in males from the active group, suggesting a sex-related difference in neurofeedback effects. In conclusion, neurofeedback can help sustain high alpha-band FC in visual areas; however, extended neurofeedback training may be necessary to enhance this connectivity and induce perceptual improvements. This study is an important step in exploring the potential of neurofeedback to enhance global alpha-band FC in visual areas, potentially leading to new approaches to rehabilitate visual field deficits.

P6.36 | Pre-stimulus Shape Predictions Fluctuate at Alpha Rhythms and Bias Subsequent Perception

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Predictions about future events significantly influence how we process sensory signals. In previous work, we demonstrated that predicted shape representations exhibit oscillatory activity in the alpha band (10–11 Hz) during pre-stimulus intervals. In that study, participants performed a task that was orthogonal to the shape predictions. Here, we extended these findings by having participants perform a shape identification task that directly relied on the shape predictions, allowing us to link the neural correlates of prediction to subjective perception. We used magnetoencephalography (MEG) combined with multivariate decoding to examine the content and frequency characteristics of perceptual predictions and relate them to behaviour. The shape identification task involved auditory cues predicting which shape was likely to appear. To make the identification of the shapes challenging, they were embedded in white noise. First, we found that valid prediction cues improved both identification accuracy and reaction times. Signal detection theory analyses revealed that participants were significantly biased toward reporting the predicted shape (i.e., reduced criterion), without a change in sensitivity (i.e., similar d-prime). We replicated our previous finding that predicted shape representations fluctuate in the alpha band (10–11 Hz). Logistic regression analyses further revealed that this shape-specific alpha power predicted perceptual biases induced by the predictions. That is, when shape-specific alpha power was high, participants were more likely to perceive the predicted shape. In contrast, higher raw sensor-level occipital alpha power was associated with a greater likelihood of reporting the unpredicted shape. These results suggest that content-specific alpha fluctuations and general occipital alpha power serve distinct functions in visual perception. Taken together, our findings demonstrate that sensory predictions are represented in pre-stimulus alpha oscillations and that these oscillatory signals shape how we perceive the world.

P6.37 | Effects of Cognitive Noise on the Temporal Dynamics of Risky Choices

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Real-life choices often require striking a balance between the value of choice outcomes and their likelihood. When taking out flood insurance, for example, it is important to consider both the cost of any damage and the probability of flooding. ‘Rational choice theory’ assumes that risky choices rely on an optimal integration of choice values with their probabilities. The literature, however, is replete with examples of irrational, biased choices, and these observations have motivated piecemeal modifications of the theory. A recently proposed ‘cognitive imprecision theory’ can account for most reported biases in a principled fashion by assuming that noisy subjective representations of choice value and probability are integrated optimally. Here, we developed a novel perceptual game to test a key prediction of this theory, namely, that the temporal dynamics of risky choices and their neural correlates should co-vary with cognitive noise. Forty healthy, adult humans first estimated the

average orientation of a briefly presented circular array of twelve differently oriented gratings and then chose to either play the game or not (risky and safe choices). If they chose to play, they were awarded points proportional to the average orientation in that trial. Noise was manipulated by randomly switching between high and low variability in the orientations of displayed gratings. Computational modelling of behaviour showed that cognitive noise impacted estimates of loss and risk aversion. Similarly, multivariate feature-specific analyses of functional brain activity showed an effect of noise on the precision of neural value representations, lending neurobiological support to the cognitive imprecision theory.

P6.38 | Evaluating the Impact of Cardiac Artifact Removal on Heartbeat and Auditory Evoked Potentials in Wakefulness and Sleep

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Electroencephalographic (EEG) signals are often contaminated by cardiac interference, including the cardiac electromagnetic field artifact and the pulse artifact, the latter caused by pulsating vessels. These artifacts can affect EEG signals, particularly the neural response to the heartbeat, quantified by the heartbeat-evoked potentials (HEPs), due to the inherently fixed temporal relationship to the ongoing cardiac activity. However, a systematic evaluation of how different artifact removal strategies influence HEPs is still lacking. This study evaluates the impact of cardiac artifact removal on high-density EEG (64 channels) recorded during auditory stimulation in wakefulness and sleep, with concurrent electrocardiography (ECG). Specifically, we compare two analysis pipelines: one with and one without cardiac artifact removal. The first pipeline applied standard preprocessing and independent component (IC) analysis to remove eye, muscle, and sweating artifacts. The second extended this approach by identifying and removing ICs exhibiting cardiac artifacts, which could be persistent (present throughout the recording) or appear only during specific segments. The identification of the ICs containing cardiac-related artifacts was based on the Pairwise Phase Consistency (PPC) over time windows -a metric assessing phase alignment between ICs and the ECG, effective in detecting both electromagnetic and pulsatile cardiac artifacts. HEPs and auditory evoked potentials (AEPs) from the two pipelines were statistically compared to assess the impact of the cardiac artifact removal. Persistent cardiac ICs were observed in 3, 2, 1, 4 participants (out of 30) during wakefulness, N2, N3 and REM sleep, respectively. Differences between pipelines were

more evident for HEPs than for AEPs and were most pronounced during wakefulness and REM sleep. Interestingly, although the greatest proportion of signal variance explained by removed components occurred in N2 sleep, no substantial differences between pipelines were observed in that state – suggesting that factors beyond component removal contribute to the observed effects. These findings highlight that the impact of cardiac artifact removal varies across vigilance states, likely reflecting underlying differences in neural and physiological activity. Thus, artifact removal strategies should be tailored to the specific neural context to effectively minimize their influence on both HEPs and AEPs.

P6.39 | Goal-directed Action Planning Relies on Integrated Neural Representations to Bind Goals, Actions and Sensory Outcomes

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Goal-directed actions are performed to achieve specific sensory outcomes. However, theoretical accounts disagree on the role that representations of these outcomes play during action planning. A central question in this debate is whether the brain represents actions in terms of motor commands or in terms of their anticipated sensory outcomes. The present EEG study aimed to address this question by examining whether action-outcome learning leads to the formation of conjunctive neural representations integrating goals, actions, and sensory outcomes. Participants performed goal-directed actions to produce specific sensory outcomes, learning new action-outcome contingencies every block. Using a novel analysis method combining linear decoding with representational similarity analysis, we tracked the representational strength of several task features over time, as well as their nonlinear integration into high-dimensional conjunctive representations. Such conjunctive representations have previously been linked to flexible stimulus-response behavior. Here, we extend this work by investigating their role in learning and planning goal-directed actions. Preliminary results show that conjunctive representations integrating context-dependent action-outcome relationships become active prior to action execution. In addition, we related trial-by-trial fluctuations in these representations to behavioral performance and RT to investigate their functional relevance. Together, these findings suggest that goal-directed action planning fundamentally incorporates anticipated sensory outcomes to guide behavior.

P6.40 | Ignore the Blue Elephant! Effects of Cue Instruction on Feature-based Visual Attention

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Cueing participants in a visual detection task "to attend" to a particular feature, such as color, leads to biphasic early sensory stimulus processing: rapid facilitation of the cued color, followed by delayed suppression of other colors in the display. Is this sequence of facilitation followed by suppression a consequence of the given instruction prioritizing "to attend" over "to ignore" and can it be reversed by means of a reversed instruction? During two EEG recording sessions, we instructed 20 participants either "to attend" to two cued colors or "to ignore" one cued color of three colored random-dot kinematograms (RDKs) by coloring a central fixation cross in the respective colors. Irrespective of the type of instruction, participants were always required to detect coherent motion events in the to-be-attended, i.e., not-to-be-ignored, color with a speeded button press. RDKs flickered at different frequencies, respectively, to enable tracking of attentional resource deployment towards colors using distinct stimulus-driven steady-state visual evoked potentials (SSVEPs). Along with SSVEPs, we analyzed event-related potentials (ERPs) and behavioral performance for to-be-attended/-ignored coherent motion events. When instructed "to attend" and, unexpectedly, when instructed "to ignore", central occipital SSVEPs showed a rapid facilitation of the color presented in the cue and a delayed suppression of the other colors, even when that contradicted the explicit instruction. In ERP analysis, a pronounced bilateral parietal selection negativity (SN), an index of feature-based attentional processing, emerged rapidly after participants were instructed "to attend" but was delayed when the instruction was "to ignore". Moreover, detection was slowed when participants were instructed "to ignore", as compared with "to attend". Thus, the often found attentional dynamics seem not to be related to a prioritization of the facilitation by the instruction „to attend", as they were not reversed by using „to ignore" instead." Rather, even in the „to ignore" condition, the cued (and to be ignored) color seems to be facilitated initially, subsequently hindering top-down feature-based attention as seen in a delayed SN component and slowed responses. This suggests an interaction of top-down guidance and bottom-up influences during feature-based attention.

P6.41 | Correlating Vep Components Across Task Conditions to Reveal Functional Clusters That Offer New Proposals for Their Functionality

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Although functional interpretations exist for many components of the visual evoked potential (VEP), it remains unclear how they fit together within a full visual analysis pipeline. Here, we present analyses that can offer a proposal for this overall picture because it entailed an unusually high number of task conditions and associated signal amplitude variations that can be used to cluster components functionally. The task, which was designed to address separate questions about spatial and feature-based attention (FBA), involved monitoring a spatially cued location to determine whether rare target Gabor patches were left or right tilted. Frequent probe Gabor patches, which were 3.5 times larger, were presented at a range of contrasts and orientations to assess FBA strategies and distinguish between response-gain and contrast-gain patterns of spatial attention. We observed a sequence of component clusters with functionally distinct amplitude fluctuations. A fronto-occipital cluster comprising the frontal N1 and occipital P1 exhibited a pattern of FBA adaptive for target discrimination and a response-gain pattern of spatial attention. A subsequent cluster, which included the parietal N1 and contralateral N2, retracted from the target-tailored pattern of FBA and shifted towards a contrast-gain pattern of spatial attention. This latter shift is consistent with an attention field that grows to match the (larger) probe stimuli in line with the normalization model of attention, which suggests that a rudimentary analysis of easily distinguished stimulus features had been completed. The VEP concluded with a fronto occipital cluster (ipsilateral N2 and P3a), the latter of which was not present for target stimuli, suggesting a role in disengaging attention from irrelevant probe stimuli, consistent with its well established association with attentional re-orienting to distractors. Given the attentional shifts observed following the P1-N1 cluster, the similarity of its topography to the fronto-parietal attention network, and the inhibitory role in attention ascribed to the P1 in the literature, we propose that this cluster adapts attention, following a crude stimulus analysis, to optimize detailed stimulus processing in the subsequent cluster. These proposals offer a detailed account of VEP component functionality that, whether ultimately true or not, will hopefully inspire fruitful future investigations.

P6.42 | Self-other Focus and the Dynamics of Spontaneous Synchrony

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Previous research has shown that rhythmic actions can lead to spontaneous synchronization through sensory feedback, even in the absence of explicit instructions. A key factor facilitating the synchronization process is the dynamic integration and distinction between self and other. The present study investigates both the behavioral and neural dynamics of spontaneous interactions, as well as how shifting attention between self and other influences spontaneous synchronization. In Experiment 1, participants engaged in improvised movements using a "mirror-game" paradigm under three conditions: Instructed, where they were explicitly asked to synchronize; Spontaneous, where they moved at their preference with visual feedback to each other; and Solo, where they moved without visual feedback of the other person. Results revealed a gradient of synchronization, with highest levels in the Instructed condition, followed by Spontaneous and then Solo (Intentional > Spontaneous > Solo). However, the difference between Solo and Spontaneous conditions was more subtle than expected, possibly due to the improvisatory nature of the task. At the neural level, this behavioral pattern was mirrored by increased intra-brain alpha and beta suppression across conditions (Intentional > Spontaneous > Solo), aligning with previous findings suggesting that such oscillations are attenuated during social interactions. In Experiment 2, we examined how manipulating self-other focus influences dynamics of spontaneous synchronization. Participants participated in the same "mirror-game" experiment in five different attentional focus conditions: No instruction about focus (replicating Spontaneous condition of Experiment 1), Symmetrical self-focus (both individuals focusing on themselves), Symmetrical other-focus (both focusing on each other), and two conditions of Asymmetrical self-other focus (one focusing on the self, the other focusing on the partner and vice versa). Preliminary findings indicate that the symmetrical self-focus condition resulted in synchronization levels comparable to the Spontaneous condition where the focus was not defined. This suggests that in the absence of explicit instructions related to focus, individuals tend to prioritize monitoring of their own actions while presumably down-regulating attention to their partner and consequently the emergence of synchronization itself. Together, the two experiments show that while spontaneous synchronization does emerge on behavioral and neural level, it may be constrained by a default self-focused attentional mode.

P6.43 | Electrophysiological Clustering Derived From Deductive and Inductive Reasoning: An Exploratory Meg Analysis

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Reasoning about the world require minimal deductive capacities to extract the basic rules underlying the situations in which we are involved. This type of deductive reasoning, together with inductive reasoning based on specific observations, has been studied. However, the differences between the two, as well as their neurophysiological foundations, still require more detailed investigation. In this study, we hypothesize that there are intrinsic electrophysiological characteristics of deductive thinking that distinguish it from inductive thinking – features which, by their nature, may be detected within their electrophysiological signal. We employed a stimulation paradigm based on the comparison of deductive and inductive reasoning in 20 young participants. During MEG electrophysiological recording, participants performed tasks requiring them either to deduce internal task rules or to follow such rules without deducing them, always using the same stimuli. Thus, each participant completed both deductive and inductive reasoning tasks. The electrophysiological signal, properly cleaned of artefacts and noise and filtered to match specific frequency bands (theta, alpha, beta, and gamma), was processed through a pipeline based on unsupervised machine learning using agglomerative hierarchical clustering. Applying Ward's clustering method, we obtained dendrograms in which electrophysiological signals from various brain regions (restricted to the AAL atlas) were grouped according to their similarity. These dendrograms were cut at a certain level based on coherence and intra- and inter-cluster cohesion metrics, yielding groupings for each frequency band. The frequency bands whose clusters showed the greatest differentiation between deductive and inductive thinking – thus contributing most relevantly to the case under study – were selected and examined in detail. Thanks to the use of machine learning tools, this study offers further insight into distinct frequency bands strongly associated with top-down processing: theta, which showed finely oriented differences in the anterior cingulate cortex between types of thought; and gamma, which revealed a frontalisation of brain activation towards the left dorsolateral prefrontal cortex during deductive reasoning. This information, exploratory in nature but descriptive in analysis, is consistent with previous knowledge while also providing new insights – not only into the areas specifically involved in deductive thought, but into how neuroscience may approach this type of analysis.

P6.44 | When Novel Feels Familiar: Prototype-like Stimuli Elicit Concept-driven Recognition Bias

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Memory research aims to understand how prior conceptual knowledge shapes encoding and recognition. One way to investigate this is by examining how perceptual ambiguity, when a stimulus defies conceptual expectations, affects memory. Does recognition become distorted when a familiar stimulus aligns too closely with existing concepts, or does familiarity facilitate accurate recall? To explore this, we

combined AI-generated stimuli with EEG to study whether conceptual ambiguity influences recognition. Using a latentdiffusion model, we created realistic animal images blending characteristics from different conceptual categories, producing ambiguous classes. Thirty-eight adults viewed images while making rapid category judgments, followed by an old/new recognition test, while EEG data were recorded. Participants exhibited an old-response bias for prototypical images, frequently identifying both studied and novel prototypes as familiar, indicating a conceptually driven familiarity effect. In contrast, blended images elicited more conservative responses, with participants accurately rejecting novel blends more often, suggesting that recognition of blends relied more on visual features than on conceptual expectations. EEG analysis during recognition revealed distinct patterns for prototypes and blends: prototypes elicited an early mid-frontal negativity beginning ~250 ms – an effect commonly associated with familiarity processing – even when the images were novel. These findings suggest that visual encoding is strongly influenced by the underlying structure of conceptual representations.

P6.45 | NMDA Receptor Blocker with Enhanced Membrane-to-Channel Inhibition, CNS Penetration, and Potent Synaptic Inhibition While Preserving Plasticity

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NMDA receptors (NMDARs) are essential for neurodevelopment and synaptic plasticity, but their overactivation contributes to excitotoxicity and neurodegeneration. Although current NMDAR antagonists like memantine are approved for Alzheimer's disease, there remains a need for novel compounds with improved pharmacological profiles. We characterized K2060, a novel dizocilpine-derived open-channel NMDAR blocker that accesses the receptor via the lipid bilayer. We hypothesized that a blocker with enhanced membrane-to-channel inhibition (MCI) could offer potent and selective synaptic NMDAR modulation with favorable tolerability. Using whole-cell patch-clamp recordings in acute hippocampal slices, we evaluated its pharmacological properties compared to memantine. K2060 demonstrated higher potency in inhibiting endogenous synaptic NMDAR mediated EPSCs, while similarly preserving short-term synaptic plasticity, such as paired-pulse facilitation. Pharmacokinetic analysis in rodents confirmed efficient brain penetration and systemic distribution compatible with central nervous system targeting. K2060 was well tolerated in vivo, with maximum tolerated doses of 20 mg/kg in males and 25 mg/kg in females. These findings support K2060 as a promising candidate for modulating NMDAR function in the CNS. Its MCI-driven mechanism, synaptic potency, and favorable safety profile suggest potential therapeutic utility in neurological disorders characterized by excitotoxicity and maladaptive plasticity, including Alzheimer's disease.

6.47 | Neural Dynamics of Socioemotional Conflict: An Erp Study Using a Stroop Paradigm

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Conflict processing, the ability to resolve competing cognitive demands, is a fundamental component of cognitive control, encompassing attentional modulation, inhibition, and working memory. While extensively studied using neutral and emotional stimuli, conflict in everyday life often arises in social contexts where one's surroundings influence decision-making. Common paradigms, such as the Emotional Stroop, capture aspects of affective interference but often lack ecological validity and rarely incorporate explicit social dynamics. To address this gap, we developed a novel experimental paradigm that simulates conflict within an interactive, social framework. Drawing inspiration from the neuroeconomic Ultimatum Game, participants (N = 26) evaluated monetary offers from four agents previously associated with fair or unfair behavior, while their brain activity was being recorded through a 32-channel actiCHamp electroencephalography (EEG) cap. EEG data were preprocessed to remove artifacts and segmented, locked to the moment of conflict. Conflict was operationalized as a mismatch between an agent's established reputation and the fairness of their current offer, eliciting conditions of socioemotional incongruence. Behavioral data revealed significantly slower response times ($p < 0.001$) and reduced accuracy ($p = 0.02$) regarding the offer in incongruent trials. Electrophysiological recordings showed less negative amplitudes in the conflict slow potential (CSP) component for incongruent trials, particularly under unfair conditions ($p = 0.002$), indicating greater recruitment of conflict monitoring and resolution mechanisms at the neural level. Together, these findings demonstrate that social context meaningfully modulates conflict processing at both behavioral and neural levels. By integrating a social, close-to-reality environment into a conflict processing task, this study provides a more ecologically valid way of assessing conflict processing within a social context. These insights have important implications for advancing our understanding of psychiatric and neurodevelopmental conditions in which conflict processing is impaired and underscore the potential of EEG for identifying social cognition neural markers.

P6.48 | Unraveling Memory Engrams for Basic Visual Features

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Neocortical memory engrams are thought to rely on a distributed network of brain regions. However, much remains unknown about how individual components of a complex memory are organized. In the present study, we investigate the formation of memory engrams for basic visual features using a novel behavioral memory task. Here, healthy young adult participants (planned n=80) are shown line drawings of inanimate objects containing uniformly colored and moving dots. They are asked to learn the association between the object and either the color (color group) or the motion direction (motion group) over five encoding-recall repetitions. The experiment involves a total of 40 objects, each paired with one of 30 colors and one of 30 motion directions. The color difference (ΔE*) of the individual isoluminant colors is set at 8.239, while the individual motion directions are separated by 12°. To assess the evolution of memory with continued learning, half of the participants complete a daily online training with adaptive task difficulty for one week to achieve precise color/motion memory. We test memory performance and acquire functional and diffusion weighted MRI data during encoding, after 24 h and after 7 days. Preliminary results (n=8) indicate clear learning effects across repetitions, reflected in decreased distance to the correct associated color/motion (range:0–15) (rep 1: 3.27±1.24 [M±SD]; rep 5: 1.42±0.36]), with comparable difficulty between groups (color: 1.53±0.74; motion: 1.55±0.96). Memory precision increased during the online training to a mean distance of 0.97±0.64 and a color space refined by 27.67±10.59%, similarly in both groups. Our findings demonstrate that already one session of repeated learning induces basic visual feature memory that can be maintained and refined with continued training, enabling us to track its evolution with multimodal MRI.

P6.49 | The Role of Spatial Structure in Human and Model-based Categorization

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Embodied cognition theories propose that spatial frameworks guide abstract thinking and decision-making. We investigated whether spatial memory representations facilitate object categorization, even when categories are non-semantic and lack inherent spatial meaning. Our experiments presented participants with objects arranged on a 4x4 grid, in configurations of varying complexity: one-dimensional (1D) vs. “interdigitated” spatial layouts. Participants first learned an object-location association (spatial) task by using a computer mouse to drag each object to its correct location, followed by a separate categorization task in which they classified the same objects into two categories with left-right keypress responses. We hypothesized that simpler spatial layouts (e.g., 1D left–right) would yield higher accuracy and faster responses than more complex or “interdigitated” arrangements, suggesting that simpler spatial layouts are easier for participants to for later decisions. Trial-level analyses revealed a condition-by-congruency interaction: spatial alignment between

object location and keypress response improved categorization accuracy in the 1D condition to a higher extent than in the interdigitated condition. To evaluate whether standard neural network models could reflect human behavior, we trained multilayer perceptrons (MLPs) on the full experiment, both learning object-space mappings and then assigning categories to the objects following the same exposure and order as human participants. While these models do not involve keypresses and therefore cannot exhibit congruency effects, we examined whether they would form more spatially structured internal representations in the 1D condition. Embedding analyses revealed that the MLP learned more linearly separable category representations in 1D compared to the interdigitated condition, indicating that the simpler spatial layout may have supported more efficient category learning in the model, though it remains unclear whether the learned spatial structure directly contributed to performance. Our findings so far suggest that the spatial structure attached to objects influences their categorization in a separate task without spatial demands. This effect appears to be mediated by spatial congruency and is most pronounced in low-dimensional (1D) layouts. While standard models can extract structure from these layouts, they do not replicate the conditional nature of human performance. Further research using within-subject designs may help clarify when and how spatial representations support abstract decision-making.

P6.50 | The Critical Role of Ventral Premotor Cortex in Mediating Automatic Imitation: A Online rTMS Study

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Automatic imitation – the involuntary tendency to reproduce observed movements even when they are irrelevant to one's goals – is thought to rely on fronto-parietal areas involved in both action observation and execution. These include the ventral premotor cortex (PMv), supplementary motor area (SMA), and the superior (SPL) and inferior (IPL) parietal lobules. However, the distinct functional roles of these regions in automatic imitation remain poorly understood. To investigate this, we conducted two experiments using online repetitive transcranial magnetic stimulation (rTMS) during an imitation inhibition task. Participants responded to symbolic targets while observing task-irrelevant actions that were either congruent or incongruent with their own, resulting in facilitation or interference effects that index automatic imitation. In Experiment 1, we applied rTMS over left PMv, SMA, IPL, and SPL to transiently disrupt their functioning and assess their contribution to imitation-related

facilitation and interference effects. Sham stimulation served as a baseline control. The results showed that PMv disruption reduced automatic imitation by attenuating both facilitation and interference effects. No significant effects emerged following SMA or parietal stimulation. In Experiment 2, we investigated whether these effects were task-specific by including both the imitation inhibition task and a voluntary imitation task where symbolic cues – rather than observed actions – were congruent or incongruent with the required response. Consistent with Experiment 1, only PMv stimulation selectively reduced automatic imitation, while leaving facilitation and interference effects from symbolic cues unaffected in the voluntary imitation task. These results highlight a causal role for PMv in automatic imitation, supporting its central involvement in the automatic translation of observed actions into motor responses, independent of intention, and functionally dissociating it from other frontoparietal regions. More broadly, they suggest that automatic imitation is not a diffuse property of the mirror neuron system, but is selectively mediated by frontal motor regions, particularly the PMv.

P6.51 | Neuro-xr: Blending Neuroscience and Extended Reality to Facilitate Cognitive Investigation

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In recent years, xReality technology (XR; includes augmented, mixed and virtual reality) has become of increasing interest to psychological research, as devices grow more powerful, lightweight and commercially available. In the context of cognitive neuroscience, XR offers a potential solution for bridging the gap between experimental control and ecological validity by presenting immersive, fully-controlled, and naturalistic three-dimensional stimuli. Here, we outline when and how cognitive neuroscientists can make use of XR by combining it with neuroimaging methods, an approach we call Neuro-XR. On the XR side, we give an overview over different XR technologies as well as recommendations for designing XR experiments. On the neuroimaging side, we focus on portable methods, specifically electroencephalography (EEG), functional near-infrared spectroscopy (fNIRS) and optically-pumped magnetoencephalography (OP-MEG). We review the literature to summarise (dis-) advantages of each method and highlight best practices for combination with XR. We also consider potential pitfalls of Neuro-XR and discuss scenarios where this approach may not be the best investigative choice. Thereby, we will enable researchers to judge whether Neuro-XR is suitable for answering their research question and which factors they need to consider when implementing Neuro-XR studies.

P6.52 | Neural Representations of Speech Content Generalize Across Different Production Types

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Human speech allows to convey information via different execution forms. Thus, on the behavioral level, speech content is independent from production and execution forms. However, it remains unclear whether neural representations of speech content generalize across different production types. To address this, we recorded magnetoencephalography (MEG) in human subjects (n=30) that performed a rule-based vocalization tasks on the sub-lexical level. Content (vowel /u/, /ü/ or /ə/) and production (overt or covert) were instructed separately. Utilizing three different vowels allowed us to assess effects of motor effort. Applying multivariate pattern analysis (MVPA), we were able to decode both content and production independently and several seconds before vocalization behavior. We found that, in line with an abstract neuronal representation, content information indeed generalized across production types. Furthermore, substantial decoding of all vowels, even those with similar motor effort, and little cross-decoding between content and production information suggested content representations to be largely independent from motor effort. We characterized the representational geometry of speech content and production in neural space. This revealed that neural content representations are at least two-dimensional, thus, exceeding simple effort dynamics. Together, our results provide insights into the neural dynamics underlying human vocalization and open a new window for noninvasive speech research in health and disease.

P6.55 | Can't Remember to Forget You: Spontaneous Retrieval of No-longer-relevant Intentions

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Prospective memory (PM), defined as the ability to remember and execute intentions, requires the timely activation of intentions and their deactivation once they become irrelevant. This study examined behavioural and neural correlates of intention activation and deactivation in a PM paradigm, considering cue focality. Participants completed a lexical decision task under three sequential conditions: a Baseline, an Active-PM phase with embedded PM-cues, and a Finished-PM phase with previously relevant PM-cues. Word trials analysis revealed that accuracy declined across phases, suggesting a monitoring cost during the Active-PM phase along with a speed-accuracy trade-off after intention completion given the fastest response times

observed during the Finished-PM phase. The latter is also supported by a reduced early (150-250 ms) right frontal positivity in the Finished-PM phase compared to the Baseline and the Active-PM phase. Additionally, mid-latency (225-275 ms) left parietal positivity was larger in both PM phases relative to the Baseline, albeit to a lesser extent in Finished-PM. This suggests that retrieval-related, evaluative, or residual monitoring processes may remain partially engaged (with decreased intensity) once the intention is no longer active. PM-cues showed slower responses than ongoing trials during the Active-PM phase and the opposite pattern during the Finished-PM phase, possibly reflecting a deep encoding of PM intentions. Although there were no focality effects on the comparison between ongoing trials and PM-cues, ERP results revealed that non-focal PM-cues elicited larger early (100-225 ms) negative frontal amplitude in the Finished-PM than Active-PM phase, indicating automatic attentional processing even after the intention was deactivated. Late-latency (300-600 ms) frontal amplitude was more positive for PM-cues in the Finished-PM than Active-PM phase, with a focality-dependent pattern at frontopolar sites: greater positivity for focal cues during Active-PM and for non-focal cues during Finished-PM, suggesting a shift from strategic to automatic retrieval. In the Finished-PM phase, non-focal PM-cues also elicited greater mid-latency (275-375 ms) parietal positivity, reflecting involuntary intention retrieval. These findings highlight the persistence of intention related processing after task completion, particularly for non-focal cues, and support the view that spontaneous retrieval - rather than active monitoring - can maintain cognitive reactivity to former intentions without strategic control.

P6.56 | Body Awareness Predicts Balance in Adolescents

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Introduction. Rapid growth during adolescence posits significant challenges to the central nervous system (CNS), which is required to progressively adapt to changing body proportions especially when interacting with the environment. Body awareness may provide substantial support during adolescence, supporting postural and motor control. The aim of this study is to investigate the association between a self-report measure of body awareness and postural control in adolescents during balance tasks. Methods. 28 female adolescents with a mean age of 13.2 [11 – 16] years were asked to stand upright on a force plate for at least 40s during four experimental conditions. Visual and proprioceptive input were altered by asking participants to keep both eyes either opened or closed (i.e., eye effect) or by making them stand on either a firm or a foam surface (i.e., surface effect). After the balance tasks, participants completed the Awareness Body Chart (ABC, Danner, 2017), rating the perceived awareness of 14 body regions using a 5-point Likert scale. Posturography was used to assess balance.

Wavelet analysis of the center of pressure (CoP), distinguishing between closed-loop (i.e. CoP frequencies < 1 Hz) and open-loop (i.e. CoP frequencies > 1 Hz) components, was used to assess upright postural control mediated by either cortical brain regions or subcortical brain regions and spinal cord. Linear mixed effects regression models were run to estimate the effect of eye and surface on closed-loop values as well as their association with ABC scores of individual body regions. Results. The results indicated negative effects of eye and surface on closed-loop values (βeye = -.739, βsurface = -.753, $p < .05$). ABC scores for the trunk and shoulders led to an increase of closed-loop values (βABC_shoulder = .196, $p = .06$) and a reduction of the surface effect (βsurface:ABC_trunk = .357, $p < .05$). Opposite trends were found for open-loop values. Discussion. Altered visual and proprioceptive information reduced the contribution of cortical brain regions to postural control, in favor of postural adjustment handled by subcortical brain regions and the spinal cord. Self-rated body awareness of the trunk and shoulders partially compensated for these effects.

P6.57 | The Clash of Words: A Multidimensional EEG Approach to Continuous Semantic Conflict in Picture Naming

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How does the brain retrieve the correct word when faced with competing semantic information? Despite decades of research, this question remains unresolved, partly due to inconsistent findings, methodological variability, and poor control over confounding factors. We addressed these challenges through an EEG study designed to investigate event-related potential (ERP) correlates and to clarify how multivariate EEG activity patterns encode semantic and visual similarity between a target picture and a distractor word during picture naming. While EEG was recorded, native Italian speakers performed a Picture-Word Stroop task, where they named target pictures while ignoring superimposed distractor words that were either congruent or incongruent with the picture labels. Crucially, we parametrically manipulated the semantic similarity between targets and distractors using a continuous metric derived from a distributional semantic model. Visual prototypical similarity was also assessed using a deep convolutional neural network. We statistically controlled for confounds such as word frequency, word length, item repetition, picture complexity, and naming agreement to obtain precise estimates of the similarity effects. Linear mixed-effects modeling of the behavioral data revealed that higher semantic and visual prototypical similarities were associated with significantly delayed naming responses. EEG analyses revealed modulations of the N400 ERP component, consistent with increased semantic integration demands, alongside other ERP components related to conflict resolution processes. Representational Similarity Analysis was used to relate dissimilarities in EEG activity patterns to semantic and visual dissimilarity

matrices, revealing that model-based predictions were reflected in the neural data. This suggests that word retrieval operates over graded, context-sensitive representational spaces, supporting continuous and distributed models of semantic memory. This work underscores the value of continuous semantic and visual similarity metrics, moving beyond the traditional congruent vs. incongruent dichotomy and rigid semantic categories. By integrating electrophysiological and representational modeling approaches with continuous metrics, we provided a multidimensional account of word production under interference, offering new insights into how the brain resolves conflict during picture naming.

P6.58 | Psyforge: A Robust Framework for Building Real-time 2D and 3D Experiments

James Bruska (Bruska Technologies LLC)

Immersive behavioral experiments that explore neural mechanisms require precise timing control and robust real-time reactions. Existing experimental programming libraries typically struggle to handle high-frequency and low-latency inputs and outputs in real-time, a requirement for closed-loop systems. This is because the fastest that modern game engines can consistently react is once a frame (usually 30Hz or 60Hz). We introduce PsyForge, an innovative open-source (GPLv3) experimental framework specifically engineered to overcome these limitations when forging 2D and 3D experiments. It implements a safe, multi-threaded, event loop architecture capable of sub-millisecond precision. Similar to other experimental programming libraries, PsyForge also includes common experimental components such as logging, configuration, text display, audio recording, language switching, and an EEG alignment system. Additionally, it is built on top of the Unity game engine, providing integration with Unity's extensive documentation, community assets, and cross-platform compatibility. PsyForge supports most platforms such as Windows, macOS, Linux, iOS, Android, VR, and Web (with convenient psiTurk integration for online studies). With PsyForge, researchers can efficiently and easily create high quality, immersive, cross-platform, 2D and 3D experiments while providing the precise timings required for real-time psychology and neuroscience experiments.

P6.59 | Rehabilitation of Attentional Disorders Following Acquired Brain Injury Using a New Immersive Virtual Reality Protocol: A Feasibility Study

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Attentional disorders are frequently documented following stroke, with significant consequences for rehabilitation and patients' quality of life. While promoting some improvements, current interventions, mainly based on paper-and-pencil tools and/or computerized exercises, show inconsistent efficacy and limited generalization to everyday life contexts. Recently, Immersive Virtual Reality (iVR) has emerged as a promising alternative, allowing intensive cognitive rehabilitation in ecologically valid environments, while maintaining high experimental control. Based on this evidence, the present study aimed to evaluate the feasibility of a new iVR-based protocol for the rehabilitation of attentional disorders. Eighteen patients with attentional deficits following right-hemispheric stroke were included in a new iVR-based cognitive rehabilitation program (MindFocus, MindMaze SA). The rehabilitation protocol consisted of 20 iVR sessions in addition to standard of care, including various gamified activities targeting specific attentional components, with individually tailored adaptive difficulty levels. Attentional abilities were assessed before and after the rehabilitation program using standardized tests on spatial attention and alertness. In addition, eye-tracking data were collected during an iVR task with the aim of exploring potential gaze-based markers that could predict patients' cognitive improvement. Adherence was evaluated by tracking the number of session cancellations. Adherence to the protocol was high, patients completed in average 90% of the programmed sessions. We observed significant improvements in alertness and orienting attention. Moreover, positive correlations emerged between the actual time spent by patients on iVR rehabilitation activities and the improvements achieved. Finally, specific eye-tracking parameters predicted patients' outcomes. These findings demonstrate that the new iVR protocol was well tolerated by patients. More importantly, it is effective in promoting improvements across different components of attention. Finally, the correlation data suggest that the improvement observed depended on the amount of time dedicated to rehabilitating a specific function.

P6.60 | The Relationship Between Insomnia, Cognitive Performance and Depressive Symptoms in Major Depressive Disorder Patients and Healthy Controls

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Sleep problems like insomnia as well as impairments in several cognitive domains are symptoms commonly observed in Major Depressive Disorder (MDD). However, the relationship between these three variables over time is currently elusive. Our goal is to assess the dynamics between insomnia, cognitive performance and depressive symptoms over time by investigating the influences of one domain on the changes in the other domains. To analyze our research question, we gathered data of the longitudinal Marburg-Münster Affective Disorders Cohort Study (MACS) from over 300 patients with MDD and over 400 healthy controls on two timepoints approximately two years apart, including results from a broad neuropsychological test battery and the Hamilton Depression Rating Scale (HAMD). Factor analysis on the test battery provided individual scores for three cognitive domains: processing speed, verbal memory and verbal fluency. Further, we derived insomnia scores from three insomnia items of the HAMD and insomnia-free depression severity scores from the remaining 18 HAMD items. Exploratory data analysis comprised correlation analyses and a random intercept fixed slope multilevel model with depression severity as outcome variable and insomnia as second level predictor. Preliminary findings show that depression severity decreased over time and that depression change is associated with processing speed and insomnia, both their baseline scores and change scores. Further, insomnia change is associated with baseline verbal fluency and baseline depression severity. The longitudinal design of this study in a well curated, representative and large dataset allows the conclusion that cognition, depressive symptomatology and insomnia are closely related over time. However, the purely observational nature of the study as well as numerous possible covariates potentially influencing the associations limit causal interpretations. The presented results serve as a starting point for more complex models to further investigate the meaning of cognitive functioning in the relationship between depression and insomnia.

P6.61 | The Influence of Circadian Rhythm on Brain Tissue Microstructure

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Circadian rhythms are a governing principle of many biological processes, however their impact on neuroimaging biomarkers remains underexplored. Diffusionweighted MRI (dwMRI) is sensitive to changes in tissue microstructure and specifically mean diffusivity (MD) has been shown to reflect plasticity-related processes after learning. Here, we aimed to assess the circadian rhythmicity of brain diffusivity. In study 1, dwMRI of healthy volunteers was acquired at three different time points (0 h, 3 h and 13 h), with the first scan at ~8am (wake group, n=18) or at ~8pm (sleep group, n=17). Gray and white matter MD was lower in the evening than in the morning. Correspondingly, there was a significant negative correlation between MD and time spent awake. The wake group showed a linear decrease in overall MD over the three time points. The sleep group's MD pattern showed a significant quadratic trend, with a decrease in MD in the evening and an increase over sleep. Study 2 is designed to gain a better understanding of dwMRI confounding sources, probing dwMRI at 5 time points across 24 h adjusted for individual chronotype (n=40)and including physiological and behavioral variables with known circadian oscillation (salivary cortisol, body temperature, blood pressure, psychomotor vigilance). Preliminary results replicate and confirm the significant changes in MD with prolonged wakefulness and across sleep and extend it to other indices derived from multi-shell dwMRI. In conclusion, our data identify circadian oscillations as a major confounding source for repeated dwMRI measurements and contribute to improving the sensitivity of dwMRI for engram investigation.

P6.62 | Autism and Aging: An Erp Study of Auditory Change Detection

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A key feature of autism is resistance to change, which may be linked to atypical sensory processing, particularly in the automatic detection of environmental changes. At the neural level, automatic change detection can be studied using event-related potential (ERP) indices, notably the Mismatch Negativity (MMN), which reflects the brain's automatic response to auditory deviations, and the P3a component, associated with involuntary attentional shifts toward novel stimuli. Although MMN and P3a have been extensively studied in autistic children, little is known about their evolution with age in autism. This is especially relevant as the global population of autistic individuals over the age of 60 is expected to reach 21 million by 2050. Therefore, this study aims to investigate how automatic change detection processes, indexed by the MMN (measured over Fz and left and right mastoid sites) and P3a (Fz), change with age in autistic individuals. To date, 43 autistic adults (aged 21–64 years) and 60 non-autistic adults (aged 20–69 years) participated in a passive auditory oddball paradigm involving standard (1000 Hz) and deviant tones (1100 Hz; $p = 0.15$). Preliminary results revealed a significantly greater MMN peak amplitude in autistic individuals compared to non-autistic individuals at the frontal site (Fz). In autistic and non-autistic adults, older participants showed reduced amplitudes compared to younger adults at both frontal and left mastoid sites, and no age-by-group interactions were found at any site. MMN peak latency, as well as P3a amplitude and latency, showed no significant group differences or interactions with age. These findings suggest that while autistic adults exhibit enhanced auditory discrimination, reflected in greater MMN amplitude at the frontal site, the overall time course of aging appears similar in autistic and non-autistic individuals across MMN and P3a components. As individuals with autism age, neural responses related to change detection do not appear to show significant modulation. However, behavioral reactivity to change may diminish over time, even in the absence of neural-level changes. Exploring how these patterns relate to clinical features – such as stereotyped and repetitive behaviors – could offer important insights into the underlying mechanisms.

P6.63 | Attention Bias as a Mechanism in PTSD and Substance Use: Is Eye-Tracking the New Gold Standard? – A Systematic Review and Meta-Analysis

Meyra Sophie Jackson (University of Sussex); **Raquel Nogueira-Arjona** (University of Sussex); **Pablo Romero-Sanchiz** (University of Sussex)

It has been established that post-traumatic stress disorder (PTSD) and substance (mis)use frequently co-occur. Moreover, it has been documented that compared to PTSD or substance use disorder alone, their co-occurrence can result in worse treatment response, higher negative affect, higher relapse rate, and greater overall cognitive impairment. However, common cognitive mechanisms underlying both these disorders are less well explored. One such potential underlying mechanism is attention bias, which can be described as the tendency to focus on certain cues in our environment while ignoring others. Attentional biases have been consistently reported on in substance use, however attention bias findings in PTSD, or a lack thereof, have been of debate. This lack of consistency in attention bias research in PTSD might be due to how attention biases affect information processing in PTSD (and addictions) and how previous attention bias measures (e.g., reaction time-based measures) captured this dynamic process. Thus, the aim of this systematic review and meta-analysis is to explore the different measures of attention bias, specifically focusing on eye-tracking measures. Using eye-tracking based measures of attention bias have increased in popularity, due to their ability to capture overt attentional processes and their temporally dynamic nature. First, the review and meta-analysis will try to establish whether or not attention bias is even detected in patients with PTSD, substance use, or a combination of both, using eye-tracking based measures. Next, various eye-tracking based indices, including e.g., dwell time and initial fixation time, as well as different task and cue types employed in eye-tracking paradigms, will be compared to determine their sensitivity, validity, internal consistency and test-re-test reliability in measuring attention bias in PTSD and substance use. Determining whether or not attention biases are present in PTSD and substance use, as well as how to best capture them, could help improve existing and further develop novel intervention methods aimed at this underlying attentional process. Based on the results of this systematic review, intervention methods such as e.g., attention control training, cognitive bias modification training, and attention bias modification trainings could be adapted to the specific needs of these patient populations.

P6.64 | How Attentional Focus Influences Statistical Learning: A Behavioral and Oculometric Study

Philippe Blondé (Cognitive Science Center, Jagiellonian University, Poland); **Marcin Leszczyński** (Cognitive Science Center, Jagiellonian University, Poland; Department of Psychiatry, Columbia University College of Physicians and Surgeons, New York)

Offline attentional states such as mind wandering are common and lead to task disengagement due to attention being shifted away from external stimuli (perceptual decoupling). Yet recent work proposes that the disengagement of top-down executive control may benefit automatic processes such as statistical learning. We examined this possibility by assessing how offline states influence the extraction of spatial regularities during a visual search task. Twenty-one participants performed a probabilistic cueing task, where they had to locate a T target among L distractors. In the learning block, the target had a 50% chance to appear in one quadrant (the rich quadrant) and 16.7% chance to appear in any other quadrant (scarce quadrants). In the subsequent testing block, target location was equiprobable in all quadrants. Participants answered 10 thoughts probes per block, rating their current attentional focus from 1 (Totally focused on the task) to 10 (Totally focused on my thoughts). During learning, reaction times (RTs) were shorter when the target appeared in the rich quadrant ($\beta = -277.03$, $p < .001$), and the probability of a first saccade toward the rich quadrant increased with time on task ($\beta = 0.004$, $p < .001$). This RT benefit persisted in the testing block ($\beta = -278$, $p < .01$), whereas the saccade bias declined ($\beta = -0.001$, $p < .001$). Offline state did not predict the RT benefit of the rich quadrant during learning block ($\beta = 5.2$, $p = .84$). Yet, the RT benefit diminished with offline state during testing ($\beta = -52.17$, $p < .01$), suggesting that being unfocused is associated with a less persistent bias, potentially because participants better incorporated the new statistical contingencies. Offline state was associated with a decrease in the likelihood of the first saccade toward the rich quadrant in both blocks ($\beta = -0.11$, $p < .001$), indicating participants were less likely to look there when unfocused. Overall, the results provide mixed support for the impact of mind wandering on statistical learning: offline states did not impact the acquisition of the spatial bias but were linked to a faster extinction once it was no longer valid.

P6.66 | Effects of Predictability on Sequence Order Memory

Stratos Koukouvinis (University of Glasgow); **Maria Wimber** (University of Glasgow)

Human memory for sequential events often exhibits directional biases, with stronger forward than backward associations. However, neurobiological evidence suggests that prediction errors (PEs) – violations of learned regularities – may trigger hippocampal reverse replay, potentially enhancing backward linkages. This behavioural study investigates how PEs influence forward versus backward memory retrieval within sequences of everyday objects. We hypothesized that while predictable sequences would show a forward recall bias consistent with previous literature, PEs would weaken this bias by strengthening backward associations. In two experiments, participants (N = 27 and N = 50) learned category sequences of neutral objects (e.g., fruits → tools → clothes), where implicit sequence rules were reinforced via feedback-guided trials. After allowing a day for consolidating the category structure, participants were exposed to image sequences that either followed predictable category

patterns from the day before or included PEs (e.g., an unexpected category violation). After learning, a distractor task (numeric parity judgments) minimized rehearsal. Memory was tested via cued recall for forward ("What came next?") and backward ("What came before?") associations, with reaction time (RT) recorded as the main dependent measure. Generalized linear mixed-effects models compared performance across conditions, with conflicting results between the two experiments. During the first experiment, an interaction effect was detected between before/after direction and PE condition: $\beta = -0.07$, $p = 0.025$, supporting our initial hypothesis. However, Experiment 2 revealed a reversed interaction ($\beta = 0.05$, $p = 0.033$), suggesting a potential boundary condition or variability in PE effects. These mixed findings highlight the complexity of PE influences on memory structure and suggest the need to investigate moderating factors such as consolidation, features of the learned structure and implicit memory effects during testing.

P6.67 | Levels of Inner Speech – An Investigation of Oscillatory Dynamics

Viktoria Groiss (Department of Linguistics, University of Vienna, Austria); **Jutta Mueller** (Department of Linguistics, University of Vienna, Austria)

Inner speech has been hypothesized to exist at different representational levels corresponding to major processing steps of overt speech production, namely at the semantic, phonological, and articulatory level. Yet, evidence for the distinction typically stems from a wide array of items and tasks complicating the investigation of the involved neurophysiological mechanisms. Here, we suggest using an EEG-based working memory task focusing on the encoding and maintenance of verbalizable objects in order to tackle different levels of inner speech. The phonological condition (A) consisted of an encoding phase during which four objects were presented in a spatial grid, a maintenance phase of 7s, and a retrieval phase in which a rhyme judgment based on a new object was performed. Two visuo-spatial control conditions applied the same task structure using a spatial memory task with either the identical object images (B) or scrambled images (C). We collected EEG data from 37 adult participants from 62 scalp electrodes as well as behavioral data. All three conditions were presented within participant in a randomized sequence of blocks (of 40 trials). We are planning to conduct time-frequency analysis using wavelet convolution for the encoding and maintenance phase in each condition. Cluster-based permutation test will be used for significance testing. As the visual input and trial structure are strictly matched across conditions, differences in the frequency domain will be related to task-based (phonological or non-phonological) encoding and maintenance strategies. Condition (A) and (B) allow for lexical encoding and thus we expect power decreases in the alpha and beta frequency bands (though less pronounced for (B)) during encoding in comparison to (C) as this has been found in previous studies. Only condition (A) requires the maintenance of phonological information and thus we expect theta and alpha power to be increased particularly during the maintenance

phase. The results will provide first evidence of the neural mechanisms characterizing phonological inner speech in an experiment with strict input control.

P6.68 | Semantic Control in Episodic Memory Encoding: An Ageing fMRI Study

Fiona Lancelotte (University of Sussex, UK); **Alexa Morcom** (University of Sussex, UK)

Memory for specific events (episodic memory) declines as people age. An important reason for this decline is that memories are encoded less effectively. In this planned functional magnetic resonance imaging (fMRI) study, we will test how the critical interplay between encoding and prior knowledge differs with age. Encoding may decline, despite greater accrued knowledge, because older people are less able to use knowledge flexibly (semantic control). Here, we will investigate the role of reduced integrity of the left inferior frontal gyrus (LIFG). We will also test broader competing theories attributing impaired memory encoding either to a fundamental lifespan shift in neural architecture away from frontal brain networks supporting flexible control, or to a loss of specialised network architecture. We will test 45 young (20-35 years) and 45 older (65-80 years) adults, allowing us to detect a medium-sized effect (d = .6, = .05, .80 power). Participants will encode object images in the scanner using one task tapping the kind of semantic control which boosts subsequent memory in youth, and the other only semantic access. Participants will later then tested on item and source memory for these images and tasks. Using representational similarity analysis, we will extract multivoxel activity for trials that were subsequently remembered vs forgotten within 6 regions of interest linked to visual processing (bilateral fusiform gyrus (FG) and early visual cortex), control (LIFG and left posterior middle temporal gyrus), and memory representation (bilateral hippocampus and ventral anterior temporal lobe). We will compare these neural patterns to representational matrices capturing fine and coarse-grained semantic information, as well as low-level visual properties. In line with previous work, we predict that coarse-grained semantic processing in the LIFG will be associated with unsuccessful memory encoding and detailed semantic processing in the FG with successful encoding. We expect that older adults will represent fine-grained semantic information less strongly in the LIFG and FG – particularly in the semantic control task – and may be biased towards coarse-grained semantic information. This analysis, alongside planned univariate and task-based connectivity methods, will improve the fundamental understanding of memory difficulties in healthy older people.

FRIDAY 19/09

15:30 POSTER SESSION 7 P 7.1 – 7.69

7.01 | Audio-visual Oddball Task as Sensitive MEG Biomarker to Alzheimer's Disease

Alexandra Krugliak (University of Cambridge); **Mats W. J. van Es** (University of Oxford); **Marlou N. Perquin** (University of Cambridge); **Chun Shen** (University of Cambridge, Fudan University); **Jemma Pitt** (University of Oxford); **Haddy Fye** (University of Cambridge); **Cara Alcock** (University of Oxford); **Ece Kocagoncu** (University of Cambridge); **Melek Karadag** (University of Cambridge); **Juliette H Lanskey** (University of Cambridge); **Rebecca Williams** (University of Cambridge); **Andrew J. Quinn** (University of Oxford, University of Birmingham); **Tony Thayanandan** (University of Oxford); **Stephen Lowe** (Lilly Corporate Center); **Vanessa Raymont** (University of Oxford); **Krish D. Singh** (Cardiff University); **Mark Woolrich** (University of Oxford); **Anna C. Nobre** (Yale University); **Richard N. Henson** (University of Cambridge); **James B. Rowe** (University of Cambridge); **the NTAD study group**

Alzheimer's disease (AD) impairs cognition through synaptic and neuronal loss, related to amyloid and tau pathology. For the development of new treatments, potential physiological biomarkers to detect the impact of AD related damage to synapses include magneto/electroencephalography (M/EEG). The New Therapeutics in Alzheimer's Disease study (NTAD) aims to test the sensitivity and reliability of M/EEG-based biomarkers to AD. The entorhinal cortex and hippocampi are affected early by AD, underlying deficits in associative learning. However, their physiological responses are difficult to directly measure with MEG. In contrast, responses from auditory cortices are readily detected by MEG. We therefore developed an audio-visual oddball task (VAB), to combine hippocampus-dependent, cross-modal associative learning with auditory mismatch negativity response. Participants learned to associate image-sound pairs. Then, in the oddball task, these standard audio-visual stimulus pairs were interspersed with deviant trials: either novelty deviants in which images were paired with novel sounds, or associative deviants, in which familiar sounds were paired with mismatching images. We used concurrent M/EEG to measure the deviant responses in cognitively healthy older controls (N = 31) and people with amyloid-positive mild cognitive impairment (MCI) or early AD (N = 55). A subset of patients (N = 17) were re-tested after two weeks to assess the reliability of the VAB. A sensor-level analysis on gradiometers confirmed that controls had a stronger neural response to novel compared to mismatching sounds. In AD/MCI patients, the response to mismatching sounds was increased compared to controls, indicating reduced differentiation between novel and learned sounds consistent with deficits in associative learning. This increase in neural response to mismatched sounds in patients correlated with cognitive impairment (Addenbrooke's Cognitive Examination, ACE-R) and reduced hippocampal volume. Comparing the VAB measures of the baseline and

two-week scans shows moderate to good reliability. An analysis in source space is in progress. Our results confirm hippocampal-dependent MEG responses in the VAB are sensitive to the presence of AD/MCI. With sufficient reliability we propose that MEG is suitable to support experimental medicine studies of AD/MCI.

P7.03 | Feasibility of VR-based Gamma Sensory Stimulation in Mild Alzheimer's Disease: Neural and Acute Behavioral Outcomes

Carolina Reis (Clarity Health Technologies, Inc., DE, USA); **Hamed Azizollahi** (Clarity Health Technologies, Inc., DE, USA); **Eleonora Marcantoni** (School for Psychology and Neuroscience and Centre for Cognitive Neuroimaging, University of Glasgow, Glasgow G12 8QB, UK); **Gabriel Headley** (Clarity Health Technologies, Inc., DE, USA); **Sergi Navarro** (Clarity Health Technologies, Inc., DE, USA)

Gamma sensory stimulation (GSS), delivered as rhythmic flickers of light and sound at 40Hz, has emerged as a promising non-invasive approach for Alzheimer's disease (AD), with early studies suggesting potential disease-modifying effects. Integrating GSS with cognitively engaging content in immersive virtual environments may further support adherence and optimize the cognitive impact of this daily at-home intervention. We conducted a single-session, withinsubject feasibility study to assess whether VR-based GSS paired with an associative memory task is safe, tolerable, and capable of eliciting gamma-band neural activity in individuals with mild cognitive impairment and mild AD (n=11). Participants wore an EEG cap and VR headset while encoding word–image pairs were presented with either 40Hz audiovisual stimulation (active condition) or irregular flicker (sham condition). Memory performance was subsequently assessed across three domains: short-term pair recognition, long-term image recognition, and delayed cued recall. Results confirmed that the intervention was safe, welltolerated, and capable of successfully evoking 40Hz neural activity. Exploratory analyses showed significantly better memory performance in the 40Hz condition across all recall tasks compared to sham ($p < 0.05$). These findings provide proof of concept for VR-based GSS in early-stage AD and suggest that embedding stimulation within cognitively relevant contexts may enhance its impact by engaging functionally targeted brain networks. This supports the rationale for advancing to a larger, longitudinal trial focused on therapeutic efficacy.

P7.04 | Can Narratives be Used as a Tool for Boosting Retention of Educational Materials?

Chloe Brunskill (University of York); **Aidan Horner** (University of York)

Forgetting is often studied as a unitary process, assumed to happen at the same rate and via the same mechanisms. However, recent research suggests that forgetting is

dependent on the nature of the mental representation to be remembered. For example, complex, meaningful materials tend to be forgotten more slowly than arbitrary information or perceptual details. Identifying features of memory representations that are resistant to forgetting could inform teaching practices for enhancing learning and retention. In this study we tested the prediction that embedding educational information within a higher-order narrative would improve retention relative to if the information was learnt as isolated facts. In a within-subject design participants learned facts about historical events, either as a list of sentences in the isolated fact condition or embedded in a passage of text that described the chronological and causal links in the narrative condition. We then tested memory using cued recognition and inference recognition tests both immediately after encoding and after a delay. The delayed test took place either one week, two weeks or three weeks after encoding as a between-subject manipulation, allowing us to compare forgetting rates between the two encoding conditions. Contrary to our predictions, forgetting rates were similar across encoding conditions, despite participants rating information learnt as part of a narrative as significantly more interesting. These findings suggest that while narratives may enhance engagement, they do not boost memory in the short-term or after a retention interval. Follow-up studies with manipulations related to the encoding and test format are needed to further explore the potential benefits of narratives in memory retention and learning.

P7.05 | An ERP, Time-frequency and Decoding Study of Differences and Similarities Between Speech Comprehension and Subvocal Speech Production

Clara Soberats (Center for Mind/Brain Sciences, Università di Trento); **Roberto Zamparelli** (Center for Mind/Brain Sciences, Università di Trento)

As many studies and basic theoretical models have shown, the brain activity underlying language comprehension and production can be very different, since they reflect fundamentally different behaviours. At the same time, however, core language features such as syntactic processing or meaning composition may be shared by both types of language performance (Gambi & Pickering, 2017). Here we present an EEG experiment designed to explore auditory speech comprehension and subvocal production together. Participants (N = 35, mean age: 22.4, 54.5 % female) were asked to listen to 200 sentences that could be either correct (A customer books this table for tomorrow) or semantically anomalous (A customer books this enemy for tomorrow) and then mentally repeat them at the same speed as the auditory sentence. Results from cluster-based tests with Monte Carlo permutations showed a distinct and surprisingly reversed early ERP at the onset of both types of performance (i.e. listening vs. mental repetition): listening onsets show a large frontal P200 that becomes negative at the posterior part of the scalp, whereas mental repetition onsets show an inverted dipole pattern, i.e. a frontal N200 that becomes negative at the parietal and occipital electrodes. Moreover, time-frequency analysis revealed a

parietal-occipital increase and a frontal-central decrease when contrasting mental repetition with listening. Despite these distinctive electrophysiological patterns, Multi Variate Pattern Analysis (MVPA) trained on auditory ERP data and tested in mental repetition achieved >80% accuracy in decoding the condition (correct vs. semantically anomalous sentences). These results suggest the existence neural patterns behind semantic (in)coherence that are shared by comprehension and subvocal production despite their electrophysiological specificities. Overall, MVPA appears as a remarkably sensitive method for detecting commonalities in fine-grained linguistic distinctions. However, further research is necessary to understand which neural aspects common to production and comprehension are indeed captured by the MVPA. References Gambi, C., & Pickering, M. J. (2017). Models linking production and comprehension. The handbook of psycholinguistics, 157-181.

P7.06 | Hippocampal Prediction Errors Arise From Episodic Memories, and Not Generalised Knowledge-based Expectations

Dominika Varga (University of Sussex); **Petar Raykov** (MRC Cognition and Brain Sciences Unit, University of Cambridge); **Elizabeth Jefferies** (University of York); **Aya BenYakov** (Edmond & Lily Safra Center for Brain Sciences, Hebrew University of Jerusalem); **Chris Bird** (University of Sussex)

Prediction errors drive learning by signalling mismatches between prior expectations and reality, but the neural systems supporting these computations remain debated. The hippocampus is implicated in mismatch detection, yet it is unclear what prior contextual knowledge it uses to compare expectations to reality. Using functional MRI (fMRI) and functional Magnetic Resonance Spectroscopy (fMRS), we investigated whether the human hippocampus bases its expectations on episodic memory or generalised world knowledge, and what the neurochemical basis of the hippocampal mismatch signal is. Across three fMRI experiments using video clips of everyday situations, we show that the hippocampus is selectively engaged by mismatches with episodic memories of specific events. In contrast, mismatches with generalised knowledge activate the Semantic Control and Multiple Demand Networks, alongside subcortical regions involved in prediction error signaling. Notably, episodic mismatches also recruit the Default Mode Network. Furthermore, fMRS revealed that episodic mismatch detection is accompanied by an increase in hippocampal glutamate concentration, the brain's primary excitatory neurotransmitter which plays a key role in plasticity in learning and memory. Overall, the findings challenge accounts that propose the hippocampus is a domain-general mismatch detector. Instead, the findings support a specialised role in learning via episodic memory-guided predictions, and provide a neurochemical basis for this process.

P7.09 | Coupled Sleep Oscillations Enable Concept Neuron Reactivation and Information Flow Across the Human Hippocampal – Cortical Circuit

Fabian Schwimmbeck (Dept. for Neurology, Paracelsus Medical University, Christian-Doppler Medical Center, Salzburg, Austria; Center for Cognitive Neuroscience, University of Salzburg, Austria; Dept. of Psychology, Ludwig-Maximilians-Universität München, Germany); **Johannes Niediek** (Machine Learning Group, Technische Universität Berlin, Germany); **Eugen Trinka** (Dept. for Neurology, Paracelsus Medical University, Christian-Doppler Medical Center, Salzburg, Austria; Center for Cognitive Neuroscience, University of Salzburg, Austria); **Thomas Schreiner** (Dept. of Psychology, Ludwig-Maximilians-Universität München, Germany); **Florian Mormann** (Dept. of Epileptology, University of Bonn, Germany)

Effective memory consolidation during sleep is thought to rely on the transfer of reactivated memory traces from the hippocampus to the cortex, yet the mechanisms supporting this essential dialogue remain unclear. To address this, we recorded single-neuron activity in the medial temporal lobe (MTL) of epilepsy patients (N=10) across 21 nights of sleep, following a memory task involving stimuli linked to concept neurons. During non-rapid eye movemen sleep, sharp wave-ripple (SWR) locked neural firing along the hippocampo-cortical circuit indicated directed information flow toward cortical targets. Notably, within SWRdriven activity, experience-dependent concept neurons exhibited elevated co-activation both locally and across MTL regions, indicating selective reactivation of behaviorally relevant information. Cross-regional co-activation of concept cells was markedly enhanced when hippocampal SWRs coincided with cortical slow oscillation – spindle complexes, suggesting an active role of the neocortex in shaping interregional communication. These findings provide evidence that SWRs in humans selectively reactivate experience-related neural ensembles across distributed regions along the hippocampal-cortical route. Notably, synergistic interactions with cortical slow oscillation – spindle complexes appear essential for effective consolidation.

P7.10 | The Role of Rhythmic Activity in the Development of Auditory Processing and Response Inhibition

Finnilä Elena (University of Jyväskylä); **Parviainen Tiina** (University of Jyväskylä); **Kujala Jan** (University of Jyväskylä)

Response inhibition is a crucial component of cognitive control and has been associated with the coordination of neural oscillations. While evoked responses related to response inhibition have been extensively studied in the developing brain, the role of induced oscillatory activity – particularly in the auditory modality – remains less well understood. To address this gap, we investigated induced alpha (8–12 Hz)

and beta (13–20 Hz) oscillations during passive listening and response inhibition (Go/Nogo) tasks in children (n = 67, ages 6–14) and adults (n = 16) using magnetoencephalography (MEG). Beamformer source modeling with individual MRIs was used to localize neural activity, and independent-samples t-tests with FDR correction identified significant task-related modulations. During passive listening, both age groups exhibited early (0–200 ms) alpha increases in the right hemisphere followed by alpha suppression in the left hemisphere. Children additionally showed similar dynamics in the beta band, with more bilateral and prolonged (200–1000 ms) suppression in temporal and inferior frontal regions. No significant group differences emerged. During the Go/Nogo task adults showed increased alpha and beta activity (600–800 ms) within a left-lateralized network mainly in frontal, temporal and occipital areas. Children exhibited earlier bilateral alpha increases (0–600 ms) followed by suppression (400–800 ms) in temporal regions. Rather than an increase, children demonstrated widespread bilateral beta suppression beginning around 200 ms and extending to 1600 ms in somatomotor areas. While alpha-band modulations remained relatively consistent across tasks in children, beta-band responses showed distinct task-specific reconfiguration, with greater and more sustained suppression during inhibition. These findings suggest that although children and adults engage similar regions for auditory processing, they rely on different spectral dynamics to support inhibitory control. Specifically, children may recruit broader, less specialized beta-driven networks, whereas adults utilize coordinated alpha–beta effects within more refined systems. These insights advance our understanding of how oscillatory dynamics support emerging cognitive control, with potential implications for understanding both typical and atypical development of cognitive control and for informing early interventions targeting inhibitory difficulties.

P7.11 | Rejection Sensitivity in Adolescence: Neural Correlates of Negative Affective Emotional Processing

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Rejection sensitivity (RS) – the tendency to anxiously expect, readily perceive, and intensely react to social rejection – is particularly relevant in adolescence. High RS has been associated with mental health problems, including depression, anxiety, and

aggression, and appears to be a stable trait that may be carried into adulthood. Much of the research on the neural correlates of RS focuses on activation in isolated brain regions, but RS likely involves network-level dysfunction, especially in emotion regulation and social cognition circuits. Additionally, there is a strong association between RS and maladaptive emotion regulation strategies, such as rumination and suppression; in contrast, adaptive strategies like cognitive reappraisal are less frequently used or less effective. This study aimed to explore the neural correlates of RS, on a functional connectivity perspective, and associate them with the emotional regulation strategies used by adolescents. The project was approved by the Ethics Committee of the University of Minho. Due to the lack of questionnaires to assess RS, we started by validating the Portuguese version of the Children Rejection Sensitivity Questionnaire (CRSQ). A sample of 1,267 adolescents aged 13–17 (54% female) participated in the CRSQ validation, which demonstrated very good psychometric properties (McDonald's $\omega = 0.92$; 14-day ICC = 0.86). Both the original two unifactorial models as well as a trifactor model proved to be a good fit (CFI > 0.96, RMSEA < 0.06 for all models). To investigate the neural basis of RS, we collected functional magnetic resonance imaging (fMRI) data from a different sample of adolescents (14–21 years old; 66% female) using both resting-state and an emotional regulation task involving social rejection images and the use of suppression or emotional reappraisal strategies. In addition, we applied the validated version of the CRSQ. Our preliminary behavioral results indicate that adolescents considered the social rejection images to be disturbing. They also showed mild to moderate RS scores. Brain connectivity patterns will be assessed in the emotional processing, salience network and default mode network circuits. This study should contribute to enlightening the emotional and neurocognitive challenges faced by adolescents with high RS, ultimately improving mental health outcomes in vulnerable populations.

P7.12 | Is Valence a Low-level Visual Property? Garner Interference Between Valence and Hue in Conscious Perception of Color

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Barrett & Bar (2009) proposed that valence and other components of one's affective response to stimuli could be processed in parallel with visual features, such as color and shape. Similarily, Panichello et al. (2017) suggested that affective information could facilitate faster processing and understanding of visual scenes, effectively infusing conscious perception with valence. This omnipresent valence could play an important role in conscious perception (Cleeremans and Tallon-Baudry, 2022) and could motivate action (Shenhav, 2024). But is valence really a low-level visual property? Following a recent study by Jacobson et al. (2024), we used the Garner interference framework in an attempt to address this question. In this framework, two perceptual dimensions, like color and shape, are said to be separable if they can be

perceived independently. In such cases it is easy to focus on one dimension while ignoring the other. Two dimensions are said to be integrated if they are perceived in a unified way, as with hue and saturation (perceived together as a single color). In that case, it is effortful to focus on one dimension while ignoring the other one. Here, participants took part in a speeded sorting task in which they had to indicate as quickly and as accurately as possible the hue (N=41) or the valence (N=40) of the presented smiley or frowny icon. In the Baseline blocks, smileys varied only along the target dimension. In the Filter blocks, both the hue and the valence randomly varied irrespective of the target dimension. We observed a typical Garner interference, with a facilitation in the Baseline condition compared to the Filter condition, for both groups. This suggests that valence and hue were perceived in a integrated manner. Our results are in line with results from Jacobson et al. (2024), who already found this kind of interference between valence and brightness. Altogether, these results support the idea that valence is a low-level perceptual feature that could infuse all conscious perception and influence behavior.

P7.13 | Optimal Transport as a Model for Sub-letter Orthographic Processing

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How can we capture the brain's representations of letter shapes? Theoretically informed approaches have previously focused on measures of overlap between representations of letters. More recent approaches derive representational spaces from deep learning models trained to recognise letters and words. Here, we implement a novel approach, applying an optimal transport framework to describe the visual similarities of letters. Our approach captures more global shape and spatial information, extending previous approaches using shape overlap, while also providing descriptions that are more computationally explicit than artificial neural networks. In a preregistered EEG study using representational similarity analysis, we demonstrate that optimal transport Wasserstein distance can explain the representational similarity of letters in early periods associated with visual and orthographic processing. We show that this measure outperforms descriptions that capture simple overlap, including during the N1 period of the ERP associated with orthographic processing (150-225 ms, BF=23.37), and that it has similar predictive power to deep learning models. In an exploratory analysis, we further show that an optimal transport metric designed to capture more abstract information about spatial structure, Gromov-Wasserstein distance, aligns better with later activity associated with more abstracted, invariant processing of letter shapes. These results indicate that the optimal transport framework is an elegant and powerful description of visual-orthographic similarity which aligns with neural representations of letters and convincingly captures important

transitions from more low-level featural information to more abstract graphetic representations of letters in the visual system.

P7.14 | When the Brain Prepares to Act: How Response Expectation Shapes Serial Dependence and Neural Representations

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Human perceptual decisions are serially dependent and biased by recent experience. Prior studies have shown that the strength and direction of these biases – whether attractive or repulsive – can vary depending on whether an explicit response was made on the preceding trial. In particular, omitting a response tends to weaken attractive biases or shift them toward repulsion. One possibility is that no-response trials, especially when randomly intermixed with responses, induce an expectation to respond on the next trial. This expectation may reengage attention, enhance the precision of current stimulus representations, and increase their discriminability from past inputs – ultimately promoting repulsive biases. We tested this hypothesis using a classic orientation reproduction task combined with EEG recordings. At the behavioral level, omitting a response on the previous trial increased repulsive serial dependence on the current trial. At the neural level, this was accompanied by enhanced EEG markers of attentional engagement, such as stronger global field power at latencies compatible with attention effects. Inverted encoding model analyses further revealed greater precision in the neural representation of the current stimulus orientation following no-response trials. Together, these findings suggest that serial dependence is not driven by static mechanisms but reflects dynamic fluctuations in task expectation and attentional state.

P7.15 | Rapid rTPJ-driven Signals Encode Malicious Intentions During Implicit Moral Evaluation: A TMS-EEG Study

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Understanding how we attribute blame when witnessing one person harming another provides key insights into moral cognition. Typically, individuals judge an agent more severely when harm is intentional rather than accidental, prioritizing intentions over outcomes. However, the precise neural mechanisms underlying this tendency remain debated. The right temporo-parietal junction (rTPJ), a core mentalizing region, has been frequently implicated in integrating beliefs about others’ intentions with observed outcomes during moral judgments. Yet, its causal interactions with other brain regions during moral evaluation remain unclear. Here, we combined transcranial magnetic stimulation with electroencephalography (TMS-EEG co-registration) to investigate how rTPJ influences the moral cognition network during implicit moral evaluation. Sixty-six right-handed adults watched videoclips depicting interpersonal interactions involving either deliberate physical harm (Intentional Harm, IHS) accidental harm (Accidental Harm, AHS), or neutral actions (Neutral Actions, NAS), while performing an unrelated attentional task. During this task, single-pulse TMS targeted either the rTPJ, left TPJ (lTPJ), or right primary somatosensory cortex (rS1, control) and TMS-evoked potentials (TEPs) were recorded. rTPJ stimulation selectively enhanced early frontal TEPs (~20–65 ms post-TMS pulse) specifically in response to IHS compared to AHS, indicating rapid neural encoding of malicious intent. Source analyses linked this effect to early medial prefrontal cortex (mPFC) activation, suggesting a fast feedforward rTPJ-to-mPFC communication pathway for processing harmful intents. Importantly, stimulation of control regions (lTPJ and rS1) did not yield similar differences, underscoring anatomical and functional specificity. Moreover, stronger rTPJ TEPs under IHS correlated with greater moral condemnation (i.e., lower permissibility ratings), highlighting the behavioral relevance of rTPJ-mPFC interactions. Our findings suggest that the rTPJ quickly processes and relays information about malicious intentions, shaping downstream evaluation in prefrontal circuits. Using TMS-EEG, we provide direct evidence that early rTPJ-driven signals are pivotal for intent-based moral judgments, shedding new light on how mentalizing mechanisms shape moral cognition.

P7.16 | Neural Adaptation to Expected Uncertainty in Neurotypical and Autistic Adults: A Meg Study

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Autism Spectrum Disorder (ASD) is associated not only with social-communicative differences but also with heightened sensitivity to uncertainty, particularly in decision-making contexts. While predictive coding theories propose altered precision

weighting of beliefs and prediction errors in ASD, the neural correlates of these processes during decision formation – rather than post-feedback processing – remain understudied. This study aimed to investigate whether individuals with ASD exhibit atypical neural adaptation to expected uncertainty, particularly during decisions based on stable probabilistic contingencies. We recorded magnetoencephalography (MEG) and pupillometry from 29 neurotypical (NT) and 29 high-functioning adults with ASD as they completed a two-alternative value-based learning task. Participants performed five sequential blocks in which reward probabilities remained stable (70%/30%) but stimuli and reward magnitudes varied. Using a computational modeling approach (Hierarchical Gaussian Filter), we estimated trial-wise belief strength (μ2) and precision (π2), which served as proxies for confidence in expected outcomes. Cortical engagement during the decision period was assessed via suppression of α-β oscillatory power in key regions implicated in decision-making under uncertainty: the medial prefrontal cortex and anterior cingulate cortex (mPFC & ACC), the anterior insula (AIC), and the ventral visual stream (VVS). Behaviorally, both groups successfully learned the probabilistic contingencies and generalized them across blocks. Both showed increased accuracy and faster response times over time, indicating intact rule generalization. However, ASD participants demonstrated significantly lower belief precision and slower growth in confidence, although belief strength reached comparable levels. This discrepancy suggested a latent affective or metacognitive disruption rather than a deficit in learning per se. Neurally, NT individuals showed a gradual decrease in α-β suppression for model-congruent (exploitative) choices across blocks, reflecting improved neural efficiency with learning. In contrast, ASD participants exhibited persistently high or even increasing α-β suppression during exploitative choices. This atypical inflexibility in neural resource allocation was particularly pronounced in the mPFC & ACC and right AIC, areas associated with cognitive control, uncertainty processing, and autonomic arousal regulation. Trial-wise regression analyses revealed further group differences: in NT individuals, greater belief precision predicted reduced cortical activation – indicative of confident, low-effort decision-making. In ASD, this relationship was absent. Moreover, elevated α-β suppression in ASD was associated with both prolonged decision times and increased pupil-linked arousal, indicating increased mental effort and heightened stress response even for preferred, predictable decisions. Post-feedback analyses revealed enhanced posterior α suppression in ASD for all outcome types, suggesting heightened visual attention to feedback regardless of expectedness or valence. While NT individuals showed selective enhancement of α suppression for unexpected negative feedback, the ASD group responded strongly across the board, supporting the notion of generally elevated attentional and affective reactivity to feedback, potentially due to reduced gating of prediction errors. Taken together, our results suggest that high-functioning adults with ASD, while behaviorally able to learn and generalize probabilistic rules, do so with altered cortical dynamics. The elevated and inflexible recruitment of decision-related neural resources – even when decisions become easier and more predictable – reflects a maladaptive neural response to expected uncertainty. This pattern supports the "weak priors" hypothesis rather than the "high and inflexible precision of prediction errors" (HIPPEA) model, as

excessive neural engagement accompanied reduced, not elevated, prior confidence. Furthermore, the disconnection between rising behavioral confidence and unmodulated or increasing cortical activation in ASD participants may reflect a decoupling between cognitive and affective systems. The continued heightened effort and arousal despite decision familiarity point to the possibility of an aversive response to the irreducibility of probabilistic outcomes – where occasional negative results remain possible despite rational expectation of positive ones. Keywords: Autism Spectrum Disorder, Predictive Coding, Decision-Making, MEG, Neural Oscillations, Alpha-Beta Suppression, Rule Generalization, Expected Uncertainty

P7.17 | Testing Competitive Interactions Between Imagery and Perception Using EEG

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Visual mental imagery relies on the top-down activation of visual cortex representations, representations that are also activated during the perception of external visual stimuli. In naturalistic settings, these internally and externally generated signals are often simultaneously present in visual cortex. Given that both imagery and perception draw on similar and capacity-limited neural resources, we hypothesised that they compete for representation, mutually degrading their individual representations as a function of their representational similarity. To test whether imagery interferes with concurrent perceptual processing, and further assess the time course of imagery interference, we decoded multivariate EEG activity patterns evoked by task-irrelevant intervening visual stimuli during imagery. Participants (N=34) engaged in vivid visual imagery of naturalistic scenes, containing objects from one of eight categories, drawn from two domains (buildings or animals). During this imagery delay, we presented intervening visual stimuli belonging to either the same domain (and potentially the same category) or the other domains. We densely sampled (eight objects per trial) neural responses to intervening visual stimuli, decoding both their category and location. Our design allowed us to compare responses to visually identical object stimuli, as a function of their match with imagery content, separately at the domain and category-level. Results showed that the representations of both the category and the location of intervening stimuli were degraded within 200 ms after stimulus onset when participants were imagining an object of the same category. This imagery-related interference was specific to same-category objects. These results indicate that imagery interferes and competes with the perceptual representation of categorically similar objects, shedding light on interactions between internally and externally generated representations in visual cortex.

P7.18 | Sex-specific Behavioral and Molecular Alterations in Adolescent and Adult Rats Prenatally Exposed to Valproic Acid

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Autism spectrum disorders (ASD) are defined by behavioral deficits in social communication, repetitive behaviors and restricted interests. A strong male predominance has been observed in ASD. However, little attention has been paid to how differences in neurobiology may underlie differences in behavior. In order to identify the neurobiological aspects of variability in social interactions and sex-specific manifestations in ASD we explored the correlation between ASD related behaviors and alterations in the expression level of cholinergic (α7 nACh, M1) receptors in the hippocampus and medial prefrontal cortex (mPFC) in animal model of ASD. To induce autism-like animal model, the pregnant rats were intraperitoneally injected 500 mg/kg NaVPA at the gestation day 12.5. Experiments were carried out on control and VPA-treated adolescent (postnatal day 30) and adult (6 months) male and female offspring. Social behavior was evaluated in a three-chamber apparatus. Immunoblotting study was performed to assess level of receptors expression. The behavioral experiments showed that in the sociability phase VPA treated group of both ages and sex showed the same interest in social contacts as the control group. In the social preference phase the VPA treated only adult male rats showed a significantly lower social approach than the control rats - the preference for unfamiliar over familiar rat were not statistically significant ($p > 0.05$). Statistical analyses (Three Way ANOVA) of the expression level of α7 nACh and M1 receptors in the hippocampus and mPFC showed significant difference between male and female rats ($p < 0.001$) and no significant difference between different age groups ($p>0.05$). The significant difference between VPA treated and control groups was detected in the mPFC ($p<0.001$), but not in the hippocampus ($p > 0.05$). In addition significant interaction for M1 receptors was detected between different treatment and age ($p < 0.001$) and significant interaction for α7 nAChR between different treatment and sex ($p < 0.01$) groups. Identifying neurotransmitters alteration in different brain regions is a key component to determining the neurobiological basis of behavioral dysfunction and understanding the high prevalence of ASD in male. Supported by the funding from the SRNSFG: Grant #-FR-22-10650

P7.19 | Spectral Power Changes With Increased Alzheimer's Biomarkers in Cognitively Unimpaired Elderly

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Alzheimer's disease (AD) is associated with spectral slowing on electroencephalography (EEG). Compared to cognitively unimpaired controls, persons with AD show periodic power increases in lower EEG frequencies (delta and theta) and decreases in higher frequencies (alpha and beta). This shift can be captured as the spectral power ratio (SPR): (alpha+beta)/(delta+theta). We previously showed a lower SPR in persons with either mild dementia or amyloid-beta (Aβ)-positive amnestic mild cognitive impairment (aMCI), but not in persons with Aβ-negative aMCI. Moreover, AD-associated alterations were present in the periodic (oscillatory) components of the EEG power spectral, rather than the aperiodic components (slope and offset). Accordingly, we hypothesize that spectral slowing is mechanistically linked to Aβ, and as such, may be present in the preclinical stage of AD, when Aβ is accumulating, but cognition is normal. We sought to test this hypothesis by relating the SPR and periodic activity to plasma Aβ42/Aβ40 levels as surrogate biomarkers of brain amyloid in a cognitively unimpaired population. Eyes-closed resting-state EEG and plasma Aβ42/Aβ40 levels were obtained from 58 adults (32 women, 58-89 years) with normal cognition (MMSE≥27). Aβ42/Aβ40<0.1 was used as a cutoff to indicate a high risk of brain amyloid (N=29). Spectral power was calculated with and without the aperiodic component and compared between high and low Aβ-risk groups. Data were log10-transformed to improve normality. Canonical (uncorrected) logSPR differed significantly between Aβ-risk groups, driven by increased delta power (1-4Hz) and decreased alpha power (8-13Hz). After removing the aperiodic components, the logSPR was no longer significantly different between the Aβ-risk groups, whilst corrected-alpha power remained. In a spatially-resolved analysis we found aperiodic power across 1-30Hz was significantly related to the amyloid ratio across most electrodes. Overall, associations of canonical SPR and band power with plasma Aβ42/Aβ40 in cognitively unimpaired elderly aligns with prior findings showing spectral slowing in clinical AD populations. However, unlike in symptomatic AD, this relationship with early Aβ appears to be driven by a mixture of aperiodic and periodic changes. These results suggest EEG spectral changes may be a sensitive marker of the neurophysiologic impact of AD pathology that precedes clinical and cognitive symptoms.

P7.21 | Who's in the Room Matters: Testing the Effects of Social Distance on Semantic Processing. Evidence from ERPs

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Semantic processing has been shown to be influenced by social presence, with studies indicating that the so-called social N400 exhibits larger amplitude when participants are accompanied by a confederate compared to when they perform the task alone. However, the impact of social distance between the participant and the confederate remains unexplored, despite evidence suggesting that interactions with in-group members, such as friends, tend to elicit stronger neural responses compared to interactions with out-group members, often perceived as less relevant. This suggests that the nature of social interaction may modulate cognitive processing. To investigate this, we used Event-related brain potentials (ERPs) to examine how situating language in social contexts influences semantic processing. Participants completed a sentence reading task, half of them containing semantic anomalies, during three possible situations: either alone, with a friend, or with an unfamiliar person. Our findings indicate that social presence indeed affected semantic processing, consistent with previous research. Specifically, a larger N400 negativity in response to semantic anomalies was observed in both social conditions, suggesting facilitated initial semantic integration; in turn, the P600 component was enhanced in the alone condition, probably reflecting increased reanalysis or integration efforts in the absence of social presence. A detailed analyses revealed that the N400 amplitude was larger when participants were accompanied by a friend than when they were alone, whereas the condition involving an unknown individual yielded intermediate values. The present results suggest that semantic processing could benefit from natural contexts involving different social interactions. In particular, familiar social contexts, such as the presence of a friend, appear to promote stronger semantic processing than less familiar or solitary settings, reflecting a graded influence of social distance. This further emphasizes the role of social distance in modulating semantic processing.

P7.23 | 3-d Visuospatial Ability Modulates Performance and Erp Dynamics in A 2-d Letter Rotation Paradigm

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Mental rotation in 3D is a key cognitive skill involving dynamic spatial transformations, for which pronounced individual differences have been documented. Here we ask whether individual differences in 3D ability can be explained by analogous differences in 2D ability. Measured 3D ability was assessed by the Shepard and Metzler (1971) Mental Rotation Test (MRT) and examined for association with performance and underlying recruitment of neural resources during a 2-D letter rotation task. Participants first completed the MRT and then performed a computerized 2-D letter rotation task in which they had to identify whether letters were standard or mirrored rotated at 0°, 60°, 120°, and 180° while EEG was recorded. Reaction times (RTs) increased with angular disparity, following both linear and quadratic trends. Low, relative to high-scoring, MRT participants showed more pronounced RT increases at higher rotation angles – suggesting steeper increase in cognitive demand – particularly in the mirrored condition. Accuracy patterns aligned with these trends: higher MRT scores predicted greater accuracy at 180°, and faster RTs in the 180° condition. Previous research on mental rotation has consistently reported a posterior event-related potential (ERP) component that becomes more negative with increasing angular disparity – a pattern known as the Rotation-Related Negativity (RRN).Across all participants, ERPs at CPz (450–750 ms) became more negative with increasing angular disparity, consistent with the Rotation-Related Negativity (RRN) effect. Linear and quadratic trends confirmed this pattern. Importantly, individual MRT scores significantly predicted the linear slope of the RRN: higher spatial ability was associated with steeper increases in negativity across angles ($r = -0.31$, $p < .05$). Group-wise visualization showed that high MRT participants displayed a pronounced RRN increase between 60° and 180°, unlike lower- MRT individuals, whose ERP slopes were much flatter. These findings suggest that high spatial ability is associated with more efficient recruitment of visuospatial neural resources under increasing rotational demands.

P7.24 | The Effect of Transcranial Random Noise Stimulation on Language Learning

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Transcranial random noise stimulation (tRNS) is a non-invasive brain stimulation technique that modulates cortical excitability and may enhance neural plasticity and signal-to-noise processing. This randomised, controlled, double-blind study investigated whether tRNS can enhance second language learning in healthy adults. Ninety participants (aged 18–40) were randomly allocated to three groups (N=30 each) using variance minimisation. High-frequency tRNS (100–500 Hz, 1 mA peak-topeak) was delivered over the bilateral dorsolateral prefrontal cortex (F3 and F4) using the Starstim 32 system (Neuroelectrics, Barcelona). In Group 1 (tRNSpre), stimulation was applied during the two-step task instruction only; in Group 2 (tRNSduring), during the learning phase; and in Group 3 (Sham), sham stimulation was applied throughout. Participants then completed the two-step language task and vocabulary test. During the study phase, 40 Swahili – English word pairs were presented on-screen. In the test phase, participants were shown Swahili words and asked to type their English equivalents. A generalised linear model with logit link was used to assess performance, with the sham group as reference and data were weighted for 40 trials per subject. The model was significant: $\chi^2(2)=31.56$, $p<0.001$. Both active groups outperformed the sham group ($p<0.001$), with no difference between the two active conditions. Reaction time analysis via Kruskal–Wallis test also revealed group differences: $\chi^2(2)=12.05$, $p=0.002$. Post-hoc comparisons showed faster responses in both tRNSpre ($p=0.003$) and tRNSduring ($p=0.027$) groups compared to sham, with no difference between the active groups ($p=0.79$). These findings suggest that tRNS, regardless of timing, can significantly improve second language learning performance and processing speed. Keywords: tRNS, DLPFC, language learning, neuromodulation, cortical excitability

P7.25 | Predicting Affective Shifts in Stroop Performance: A Reinforcement Meta-learning Approach

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Cognitive control enables individuals to perform mental tasks and regulate behavior according to internal goals. One common method for assessing cognitive control is the Stroop test, which measures the ability to resolve conflict between competing stimuli. Several studies have argued that the affective evaluation of congruent and incongruent stimuli changes as participants gain experience interacting with a task (Schouppe et al., 2015). This shift in affective evaluation may be explained by the conflict resolution effect, where increasing accuracy in responses leads to more positive evaluations of incongruent stimuli. Presumably, participants need experience completing the task before a negative evaluation of the conflict can become positive (Ivanchei et al., 2021). To capture this change in affective evaluation, we applied a Reinforcement Meta-Learning (RML) model (Silvetti et al., 2018). This model predicts the behavior of an agent in different statistical environments, that is, when diverse

actions are available, with different probabilities leading to a reward, based on the reward prediction error. We used it to model the behavior of a participant undergoing the Stroop test, where the options for possible actions are a report on either the color or the content of the stimulus. The probability of a reward in the model reflects the participant's chance to give the correct answer under different conditions (congruent or incongruent). We use the reward prediction error to reflect a change in the affective evaluation of the stimulus due to learning how to solve the Stroop problem. The simulation results confirmed that at the beginning of the experiment, the RML agent overestimates the reward received for a congruent sample. However, with task experience, affective evaluations shift, becoming more positive for incongruent stimuli. We propose an experimental design to empirically validate the simulation results by comparing them with real behavioral data.

P7.26 | The Effects of Partial Sleep Deprivation on Mind Wandering, Behaviour and Mood

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Insufficient sleep is a common occurrence in modern society and has several consequences on our attention, executive functioning (EF), mood, and brain activity. Mind wandering (MW) is a phenomenon where attention shifts from an external task to internal thoughts. These shifts can take on different characteristics, such as relating to mental content or not (mind blanking, MB), and can be engaged deliberately (D-MW) or spontaneously (S-MW). MW is related to worse EFs and associated with worsened emotional states, both of which are influenced by sleep. Recent findings have suggested that sleep-like slow waves, referred to as local sleep, might precede shifts of attention and can increase with sleep deprivation. Yet, the precise relationship between local-sleep, MW, EFs, and mood remains to be further explored. We recruited 34 healthy adults to a partial sleep deprivation (PSD) protocol, where they slept on average 1.7 hours less for 3 consecutive nights, compared to a period of normal sleep (NS), in a within-subject cross-over design. Participants, while wearing a 32-electrode electroencephalography (EEG), engaged in the finger-tapping random sequence generation task that provided subjective reports of their attentional state (MW, MB, and S/D-MW) on a 4-point Likert scale. The task also provided two objective measures of performance, the variability in the responses (BV) and randomness generation (AE - indexing executive functioning), both of which have been related to MW.

We hypothesized that the PSD protocol would increase MW, MB and S-MW, BV and negative mood, as well as decrease positive mood and AE. We implemented Bayesian hierarchical ordered-probit and linear regression for the MW probes and behaviour, respectively. Results indicated that increasing hours of reduced sleep increased MW, MB, BV, and negative mood, as well as decreased positive mood and AE with time--on-task. As for the EEG, we will present changes in spectral power related to PSD, MW and task performance, as well as to the occurrence of local sleep-like waveforms. Our findings highlight how accumulated sleep debt, even when moderate, may play a crucial role in cognitive lapses and attentional shifts that could impact daily functioning, potentially through neurophysiological mechanisms like local sleep.

P7.27 | Consequences of Social Isolation on Behavior and Hypothalamic Monoaminergic Transmission in Adult Dominant and Submissive Rats

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Nowadays, social isolation stress of humans and its importance in the development of behavioral disorders of psychoneural nature has become mostly current. Studies have shown that intracerebral neurotransmission dysfunction such as serotonine, norepinephrine and dopamine play an important role in the development of anxiety and depression. The results of psychogenic stress depend on individual properties of the nervous system. The aim of research was to study the effects of social isolation on behavior and hypothalamic monoaminergic transmission of dominant and submissive rats. Experiments were carried out on 20 groups (10 control and 10 experimental) on 60 white male rats. Each group contained 3 male and 2 female rats. Experiments performed on male rats only. To reveal dominant and submissive rats, we used two methods, enabling the stronger animal to gain a victory during the food and water-obtaining process. The social isolation of dominant and submissive rats was performed in experimental groups. During the isolation period (14 days) the rats lived in small individual cages under controlled environmental conditions. In order to study behavior of animals, we used “forced swim and “elevated cross maze” tests. We determined the monoaminergic transmission in the hypothalamus (serotonine, dopamine, norepinephrine) and the concentration of the basal corticosterone in plasma by immunoenzyme analyzer ELISA reader. The data were processed statistically by two-way factorial analysis (ANOVA). According to the behavioral tests, due to the social isolation procedure, dominant and submissive rats demonstrated enhanced emotional tension, fear and anxiety-like behavior. In particular, in the “elevated cross maze” test, the time spent on open arms decreased compared to controls, which is particularly clear-cut in the submissive rats. At this stage of stress revealed

significantly increased dopamine but not serotonine concentrations in the hypothalamus. Norepinephrine concentration increased significantly only in dominant rats. The results showed that isolation stress led to the development of anxiety-like behavior in both dominant and submissive rats. Isolation-induced behavioral indices were accompanied by an increase in basal corticosterone in plasma, and concentration of dopamine in the hypothalamus of rats. Research work is supported by Shota Rustaveli National Science Foundation of Georgia, grant FR-23-2770.

P7.28 | Hallucinations in Human-like Chatbots: Effects on Service Satisfaction, Anthropomorphism and Neural Correlates

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Chatbots – computer programs that can converse with humans – are becoming increasingly common in our everyday lives. Modern chatbots based on large language models (LLMs) are able to generate text and to flexibly reply to user input, hence increasing the quality of the conversation compared to simple rulebased models. However, such LLM-based chatbots also have unique issues such as generating text that is factually incorrect or that the user did not ask for (socalled hallucinations). Here, we ask how hallucinations impact user experience and perception and if these effects can be mitigated by employing a human-like chatbot design. We used Google Dialogflow to train rule-based chatbots that offered recommendations for different leisure activities (e.g., restaurants, movies) based on user input. In a pre-registered study, we employed a two-factorial within-subjects design where we manipulated chatbot design (human-like, nonhuman-like) and presence of hallucinations (hallucinating, non-hallucinating). Participants interacted with three chatbots per condition. We measured different constructs related to perceived anthropomorphism (social presence, humanness, moral agency) as well as service satisfaction using questionnaires. We also recorded electroencephalography data to measure midfrontal theta (MFT) as an indicator of cognitive effort and frontal alpha asymmetry (FAA) as an indicator of emotional processing. As expected, hallucinations were associated with decreased anthropomorphism and service satisfaction. Interestingly, these effects were not mitigated by human-like design; rather, hallucinations were associated with a stronger reduction in service satisfaction ratings in human-like compared to non-human-like chatbots. In addition, FAA analysis revealed increased right-hemispheric activation in the hallucinating humanlike condition compared to the hallucinating non-humanlike condition, indicating greater negative emotions and withdrawal tendencies. No effects on MFT were found. In conclusion, our study emphasizes the negative effects of chatbot hallucinations on user experience and indicates that these effects might be exacerbated in humanlike chatbots, potentially due to expectation violations.

P7.29 | Forgetting Object Features When Embedded in a Wider Episodic Event

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Object encoding rarely occurs in isolation. Real world objects are typically embedded in a wider episodic context. Despite that, we often study object memory and forgetting with isolated objects on the screen. We hypothesised that the forgetting of object features differs dependent on whether the object is encoded in isolation or embedded in an episodic event. Two experiments assessed forgetting of object features (e.g., colour and size) when participants studied written descriptions of objects in isolation or embedded in events (including a spatial location, person, and action), testing memory immediately after encoding and 48 hours later. We created two-feature objects by selecting one feature from two (of five) feature categories. Each feature was repeated across objects either 1-5 times, but each object had a unique two-feature combination. Objects were encoded as objects-alone or objects-in-events and tested immediately or after 48 hours. We tested memory for each object feature on separate trials, presenting the object (e.g., ball) and five features, with participants choosing the feature paired with the object at encoding. We analysed memory performance with generalised linear mixed effect models on the trial-level accuracy data. In Experiment 1, we saw less forgetting in the objects-in-events than objects-alone condition. In Experiment 2, where the event structure was disrupted by presenting the object features after the event information, forgetting was similar between the two encoding conditions. Across both experiments, memory performance was inversely related to the number of times features repeated across objects at encoding, showing feature interference, but only when objects were studied in isolation. These data suggest that forgetting of object features is driven by interference when encoded in isolation, but that the simultaneous encoding of wider event information protects against such interference, decreasing forgetting.

P7.30 | Effects of Immersive Virtual Reality Combined With Transcranial Direct Current Stimulation on Implicit Motor Learning

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Motor training is essential for the development and enhancement of functional skills. Technological advances have expanded the possibilities of training through immersive virtual environments, which offer real-time sensory feedback and promote motivation and engagement. The combination of immersive virtual reality (IVR) with transcranial direct current stimulation (tDCS) has been explored as a strategy

to optimize motor learning.Objective: To investigate the effects of three days of IVR training using the game Beat Saber, combined with active or sham tDCS over the left primary motor cortex, on general and sequence-specific implicit motor learning, assessed by the Serial Reaction Time Task (SRTT).Methods: A randomized, placebo-controlled, double-blind experimental study was conducted with 19 healthy participants, divided into two groups: Intervention Group (n=10, IVR + active tDCS) and Control Group (n=9, IVR + sham tDCS). The SRTT was applied before and after training sessions on Days 1 and 3. General motor skill (GMS) and sequence-specific skill (SSS) were analyzed considering online (acquisition) and offline (consolidation) learning effects. Results: Participants showed a progressive improvement in game performance, with significantly increased scores from Day 1 to Day 3, indicating task learning. For GMS, significant improvement was observed pre- to post-training on Day 1, with stable performance between Days 1 and 3. However, offline learning showed significant improvement from Day 1 to Day 3. No significant differences were found between groups. Regarding SSS, a significant effect of multiple sessions was found, as well as consolidation between Days 1 and 3. No group differences were observed for either skill. In conclusion, IVR training promoted implicit general and sequence-specific motor learning, with both acquisition and consolidation effects. Although tDCS did not enhance these outcomes, IVR alone proved to be an effective tool for motor learning and may have valuable applications in rehabilitation and performance training. Keywords: Immersive virtual reality; Motor learning; Transcranial direct current stimulation; Reaction time.

P7.31 | Unraveling Partisan Misinformation: Eeg Insights Into Cognitive Flexibility

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In today's digital era, misinformation poses a threat to people's health, well-being, and democratic rights, shaping public discourse. Understanding its cognitive underpinnings is crucial. Literature on political extremism suggests that those who are on the far right of the spectrum are less sensitive to discerning false claims and more likely to share misinformation compared to moderates and liberals. However, the reasons behind this difference are still unknown. Thus, there is an urgent need to understand the cognitive processes guiding our perception and interaction with digital content. In this study, we examine whether cognitive flexibility – the ability to adapt to new information – explains differences in the rate of misinformation engagement across the political spectrum. Ongoing data collection includes conservatives and liberals in Spain (N = 100), who participate in an EEG study. Participants complete a Stroop task, a classical cognitive conflict task assessing flexibility, and a misinformation task examining participants' likelihood of engaging with partisan misinformation

and their response to fact-checking. To understand the relation between susceptibility to misinformation and the neural correlates of cognitive conflict, we will extract the difference in amplitude of fronto-medial Theta oscillations between conflict and congruent trials. Preliminary behavioral results (N = 62) suggest that participants, on average, were less likely to engage with misinformation after they knew it was false ($\beta = -0.417$, $p < .001$). This overall effect was primarily driven by left-leaning individuals, who showed a significant reduction in misinformation engagement after being exposed to accuracy checks ($p = .005$), while right-leaning participants showed no significant change ($p = .495$). These results align with previous studies that find an increased resistance to fact-checking among right-leaning individuals. We will next compare EEG correlates of cognitive conflict across political groups and test whether these neural signatures predict misinformation engagement and responsiveness to fact-checking. These findings may shed light on the cognitive mechanisms guiding our interaction with political fake news, offering insights into more effective strategies to mitigate misinformation.

P7.32 | Wiping Out the Past: Alpha Oscillations Decorrelate Current Percepts From Prior Stimuli

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Like many natural systems, human behavior exhibits a high degree of autocorrelation. This is evident, for instance, in the observation that perceptual decisions are serially dependent and influenced by prior events. It has been shown that the extent to which decisions reflect serial dependence is not fixed, but fluctuates with internal brain states. However, the neural mechanisms underlying these fluctuations remain poorly understood. Here, using EEG and a classic orientation discrimination task, we focused on trial-by-trial fluctuations in pre-stimulus oscillatory power and their relationship to the strength of serial dependence. We found that higher alpha power before stimulus onset is associated with reduced serial dependence. We propose that spontaneous increases in alpha activity may act like a neural high-pass filter – minimizing low-frequency carryover (serial dependence) from prior trials and enhancing responsiveness to new input.

P7.33 | Cortical Correlates as Signature of Emotional States Induced by Music

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Introduction. Integrative treatments based on music listening have been widely used to treat clinical conditions. However, the process by which music produces these effects and the extent to which they generalize across listeners remains unclear. Electroencephalography (EEG) allows the investigation of the effects of music beyond subjective reports of emotional states. The present study aims to assess the extent to which emotions evoked by music generalize across listeners, and whether emotions are associated with consistent patterns of EEG activity across listeners. Methods. 12 adults with a mean age of 31.9 [24 – 43] years listened to 10 audio recordings of piano music of 60 s each. For each recording, subjective response to music was assessed through 9 rating scales evaluating different emotions. Factor analyses were conducted on subjective ratings to identify latent emotion scales, resulting in two valence scales measuring positive and negative emotions separately. Continuous EEG was recorded throughout the experiment using a 64-channel system. After preprocessing, EEG relative power values in canonical frequency bands were computed. Inter-class correlation (ICC2) coefficients assessed the generalizability of emotion ratings and EEG activity patterns across listeners. Linear mixed effects regression models were used to estimate the effects of valence on EEG power values across brain regions and frequency bands. Results. Emotional responses to audio recordings varied radically across listeners, leading to very low ICC2 for both valence scales (ICC2 < .10). The association between valence scales and EEG responses was more consistent: ICC2 values ranged between .10 and .81 for the effects of positive valence, and between .66 and .83 for the effects of negative valence. Positive valence was associated with significant decreases in the alpha [8 – 13]Hz and increases in the theta [5 – 8]Hz power bands over frontal and central regions, suggesting active engagement and increases in arousal. Negative valence was associated with significant increases in the alpha and decreases in the delta [1-4]Hz power bands over the entire scalp. Discussion. The emotions evoked by music may be highly subjective, but the associated patterns of EEG activity seem to generalize moderately across listeners, especially for emotions with negative valence.

P7.34 | Computational Mechanisms of Temporal Anticipation in Perception and Action

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To interact effectively with our surroundings, we employ strategies to reduce uncertainty. One important source of information is temporal regularities, which enable us to form predictions about when events will occur, and through this, prepare for them in advance (Nobre & Van Ede, 2018). Such preparation was shown to facilitate motor planning, yet the impact of temporal anticipation on perceptual acuity is unknown, and the cognitive computations underlying this process remain debated. To answer these questions, we designed a novel difficult change discrimination task,

where the interval between the first and second stimuli was varied on a trial-by-trial basis, drawing from one of three predefined distributions (uniform, exponential and flipped-exponential) and administered it to N=142 participants online. Our results show that both perceptual sensitivity and motor responses are influenced by temporal structure. We employed computational modelling to study the underlying cognitive operations, identifying the logarithmic transformation of the event hazard rate (HR) as the core transformation. This contrasts with recent studies supporting the reciprocal of the PDF as the underlying computation (Grabenhorst et al., 2019, 2021, 2025). Importantly, we also reveal a key role for temporal estimation noise in shaping the process at two distinct stages: (1) Encoding, when temporal information is learned and represented and (2) Decoding, when it is extracted and used to guide behavior. These findings shed light on the brain's capacity to leverage probabilistic temporal information to guide behavior, advancing our understanding of how temporal structure influences perceptual and motor processing.

P7.35 | Desynchronizing Brain Oscillations With Closed-loop Tacs

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Transcranial alternating current stimulation (tACS) has been shown to entrain endogenous brain oscillations and enhance neural synchronization. However, many neurological disorders, such as Parkinson's disease (PD), are characterized by excessive oscillatory activity – particularly in the beta frequency range (15 – 30 Hz) – which may benefit from desynchronization rather than further entrainment. To address this, we developed a closed-loop tACS-EEG system capable of delivering stimulation in real time, precisely aligned to ongoing brain activity. We tested whether anti-phase tACS (180° out of phase with ongoing oscillations) could effectively desynchronize neural activity. Based on the Stuart-Landau model of coupled oscillators, we hypothesized that short-duration anti-phase stimulation would induce de-entrainment, while longer durations would paradoxically lead to re-entrainment due to the system's tendency to stabilize around external periodic input over time. Twenty-eight healthy participants performed a sustained pinch task at 2% of their maximum voluntary force while EEG was recorded to estimate and forecast the phase of beta oscillations. Stimulation was applied under three conditions: (1) beta-frequency tACS in anti-phase, (2) beta-frequency tACS in-phase, and (3) sham stimulation. Each condition was delivered at four durations: 1, 1.5, 2, and 5 seconds. Cortico-muscular coherence (CMC) in the beta range was assessed using EMG recordings. Results demonstrated that short-duration anti-phase stimulation (<2 seconds) significantly reduced beta-band synchrony and disrupted cortico-muscular coherence, compared to both inphase and sham conditions. In contrast, longer anti-phase stimulation showed enhanced synchronization comparable to in-phase stimulation effects, consistent with a shift toward re-entrainment predicted by the Stuart-Landau model. These findings

provide strong evidence that closed-loop, phase-targeted tACS can be used to actively desynchronize pathological brain oscillations, offering a promising non-invasive therapeutic approach for conditions such as Parkinson's disease.

P7.36 | Resting-state Neural Oscillations in Children With Developmental Dyslexia: A Preliminary MEG Study

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Developmental dyslexia (DD) is consistently associated with atypical functional activity in left-hemispheric regions, such as the inferior frontal gyrus (IFG) (Richlan et al., 2009, 2011). Previous research also focused on resting-state data for studying DD, and determining potential neural correlates of this disorder. Our preliminary study uses the novel fingerprinting approach, with the goal of providing a more time-dynamic perspective of regional oscillatory power related to DD. We investigated 28 critical regions by analyzing their neural oscillations in children with DD and typical readers (TR). To date, the study has recruited 22 children (11 TR, M = 11.4 ± 2.6 years; 11 DD, M = 11.5 ± 2.5 years), all of whom are native Spanish speakers. Each participant underwent 4 minutes of resting-state MEG recording. The preprocessed data were segmented into non-overlapping 1-second epochs, and reconstructed sources. Using the toolbox ToFFi (Komorowski et al., 2023), we extracted the normalized power spectra, averaging them across voxels within each region of interest (ROI). Individual-level spectral profiles from each ROI were clustered and pooled within groups to obtain the group-level spectral profiles. Preliminary results highlighted two regional clusters of interest for the present study. First, we observed reduced left-lateralization in DD, particularly in the left IFG (opercular part and orbital part) and left insula. In TR, these regions exhibited beta-band peaked spectra, whereas their right homotopic counterparts peaked at the delta band. However, such left-lateralized pattern was absent in DD, with both hemispheres exhibiting delta-band peaks. Second, bilateral paracentral lobules showed a reduced oscillatory differentiation in DD compared to TR. While TR exhibited the gamma-band peak in the left paracentral lobule and the theta-band peak in the right, DD showed the alpha-band peak in the left and beta-band peak in the right. These findings suggest reduced left-lateralization in resting-state neural oscillations in DD, especially in the IFG, insula, and paracentral lobules. Future statistical comparisons will investigate the group differences in spectral power and peak frequencies across ROIs. Besides, a group-level classification of regional spectral profiles will be conducted to identify the neural markers distinguishing DD from TR in resting-state neural oscillations.

P7.38 | Noxious and Non-noxious Thermal Stimuli Modulate Perturbational Complexity in Human EEG

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The perturbational complexity index (PCI), grounded in systems dynamic and information theory, quantifies the brain's capacity for differentiation and integration of neural activity. However, while it has been used to characterize consciousness states following transcranial magnetic stimulation, its responsiveness to sensory-evoked perturbations remains underexplored. Here, using two publicly available datasets, we examine PCI sensitivity to changes in cortical dynamics when applied to stimuluslocked EEG responses following thermal stimulation, paired either with topical application of thermosensitive TRP channel agonists (Dataset 1) or with probabilistic manipulation of stimulus transitions (Dataset 2). Fixed effect linear regression models were employed to investigate the relationship between PCI and the independent variables (i.e. temperature, stimulus probability, TRP channel agonist). Results showed that PCI varied with temperature, being the lowest for 42°C stimuli when compared with either 10°C or 60°C (Dataset 1, both $p < .001$), and higher for cold vs heat stimuli (Dataset 1, 10°C vs 60°C, $p = .048$). PCI was not modulated by absolute stimulus probability (Dataset 2, $p = .137$), but was sensitive to changes in TRP channel activation: under cold stimulation, the topical application of menthol or 1% capsaicin reduced neurophysiological complexity compared to the vehicle condition ($p = .012$ and $p = .039$). This pattern may reflect a shift from distributed, integrative processing to more spatially constrained and less differentiated neural dynamics induced by peripheral sensitisation. Critically, these effects were not explained by conventional ERP features such as N2–P2 amplitude or latency, confirming that PCI reflects large-scale cortical dynamics beyond simple evoked responses. These findings demonstrate that PCI can index the brain's response to exogenous, sensory-driven perturbations, capturing changes in neural complexity associated with both stimulus intensity and contextual modulation. This supports its broader applicability as a measure of temporal and spatial and temporal differentiation in the domain of sensory and pain neuroscience.

P7.39 | Neutral by Choice: Eliciting Cognitive States of Neutrality in (Auditory) Perceptual Decisions

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Verbal communication often occurs in noisy environments, where listeners may remain undecided about what they heard even after careful consideration. Yet, perceptual decisions are typically studied with forced-choice paradigms, which require decisions even under uncertainty. This limits our understanding of perceptual states of neutrality.To address this gap, we tested whether sensory ambiguity elicits perceptual neutrality in speech perception. In Experiment 1 (n = 36), participants identified minimal pair target words (e.g., satt- Saat) where the duration of the critical phoneme (/a/) was manipulated along a continuum from unambiguously short to unambiguously long around individual perceptual boundaries. Here, neutrality would be due to internal ambiguity. In Experiment 2 (n = 36), the same targets were embedded in speech-shaped noise (SSN). Here, ambiguity would reflect the superposition of external sensory noise and internal ambiguity. On each trial, participants either categorized the target as short or long, indicated indecision, or asked for a repetition of the target. We expected neutral responses to peak at the perceptual boundary, where categorization is most difficult. Further, we hypothesized that shorter target words would be harder to discriminate under SSN, leading to more neutral responses for shorter vowel durations. Regarding reaction times (RTs), we predicted longer RTs for neutral responses if they merely reflected uncertainty. However, if neutral responses were treated as decisions by choice, similar to categorized responses, we expected the RTs to be comparable. As expected, neutral and repeat options peaked near the perceptual boundary, forming an inverted U-shape, more pronounced in Experiment 1. With SSN, the curves broadened, perceptual boundaries were less precise, and shorter words were more difficult to perceive. RTs were generally longer for neutral responses than categorized responses, suggesting uncertainty. However, RTs for neutral responses after a repetition were shorter than without prior repetition, indicating an explicit decision to remain neutral. Overall, our results provide the first

behavioral evidence for perceptual states of neutrality. They show distinct effects of internal and external sources of ambiguity on neutral states. In general, the inclusion of neutrality allows for a more naturalistic understanding of perceptual decision-making.

P7.40 | The Influence of Actively Testing Predictions on Curiosity and Learning

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Both humans and non-human animals have been shown to desire advance information, even when it is not instrumental to a task or reward. Such 'non-instrumental curiosity' is argued to demonstrate the intrinsic value carried by information itself, however little empirical work has explored why this occurs. From a predictive processing perspective, curiosity may reflect our drive to form good predictive models and reduce prediction error over time. In this framework, a candidate reason for our preference for advance information is that it allows us to make better predictions. The beneficial role of actively testing a prediction for learning has been emphasized in work on error-based learning and education. However, this work has been limited in its ability to isolate prediction formation while controlling for differences in uncertainty and information gain. Further, it has often been assumed that predictions are only made when participants explicitly commit to them, which may not hold. Here, we address these limitations and directly contrast curiosity when participants are able to test internal predictions with when they cannot, despite matched information gain. Participants watched animal figures emerging at different locations. In the Predictable context, the animals' locations each followed a Gaussian distribution, and were somewhat predictable. In the Random context, the animals' locations were uniformly distributed and not predictable. In each context, participants also viewed trials in two conditions that differed in terms of whether or not they received advance information about which animal would emerge. Curiosity ratings were given after receiving either the advance information or an uninformative cue. We hypothesized that, if actively testing a prediction drives curiosity, participants would be particularly curious when they are in a predictable context and have advance information, such that they can form a testable prediction about where the animal will emerge. We also included memory probes to explore the role of active hypothesis testing in learning. By testing this predictive processing explanation of the preference for advance information, we aim not only to clarify the computations underlying the effect, but to empirically probe the claims of this potentially unifying framework for understanding curiosity.

P7.41 | Adaptive Suppression and Enhancement in Auditory Search

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The human auditory system is constantly exposed to a wide variety of sounds. Some sounds are behaviourally relevant, while others are irrelevant and potentially distracting. Our understanding of processing distraction is premature, as experimental control conditions to delineate enhancement from suppression have often been lacking. To fill this gap, we introduce irrelevant stimuli that are perceptually salient (i.e., distractors) or non-salient (i.e., controls) into an auditory search task. On every trial, three spatially separate, unique auditory objects (target, distractor, control; German monosyllabic spoken digits) were presented simultaneously. Participants had to identify an amplitude-modulated target and report its identity. Behaviorally, we observed distractor suppression as decreased performance in trials where the current target shared features with the distractor from the previous trial (i.e., negative priming). Target enhancement surfaced in increased performance in trials where the current target shared features with the previous target (i.e., positive priming). Over the course of the experiment, performance in trials with distractors relatively increased, indicating a gradual transition from attentional capture to more successful distractor suppression. In the electroencephalogram (EEG), lateral targets induced relatively higher ipsi- than contralateral alpha power (8–12 Hz) at occipito-parietal electrodes and a larger N2ac component in the event-related potential (ERP), speaking to reactive attentional enhancement. In contrast, lateral distractors evoked a distractor positivity (Pd) component, which has been associated with inhibitory attentional processing in the visual modality before. Our study demonstrates that searching for auditory targets involves separable oscillatory and evoked electrophysiological mechanisms of target enhancement and distractor suppression. In the absence of predictive cues, target enhancement and distractor suppression are modulated by serial dependencies and reactive attentional control mechanisms.

P7.42 | Inter-individual Variability in Event-related Potential is Not Noise

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While EEG is highly effective for detecting high signal-to-noise brain events (e.g., epileptic discharges) and widespread changes in brain state (e.g., sleep phases, coma), its impact in other fields of research, such as psychiatry or cognitive neuroscience, remains otherwise mitigated. We argue that one key reason is the substantial

inter-individual variability inherent to EEG. In particular, population heterogeneity complicates the standardization of pre-processing and analysis procedures and reduces the effect size and generalizability (predictive power) of group-level results. In the present work, we use within-subject experimental designs to demonstrate that individual differences are not noise, but a major stable source of EEG variance. First, in a longitudinal visual evoked potential (VEP) study, we found that individual-level EEG as measured using diverse methods (single electrode potentials, global field power, microstates…) remained remarkably stable over periods of 5 and 10 years (N5y = 90, N10y = 35). This long-term stability was observed across all recorded electrodes and even persisted in individuals with a chronic psychiatric condition (schizophrenia). Such consistency suggests that incidental state-related (e.g., fatigue, stress) and technical (e.g., electrode placement, impedance, pre-processing) factors exert minimal influence on EEG reliability. Moreover, while analyzing data from batteries of visual tasks, we found that individuals had highly similar VEPs across experimental conditions (e.g. same range of amplitude, landmarks…) but also to some extent across completely distinct tasks, such as for example between coherent motion and backward masking. Our results suggest that a dominant portion of the EEG signal variance is explained by individual variability rather than by the effect of a disease or experimental manipulation of interest. In conclusion, individual differences in task-related EEG appear to capture highly stable and generalizable information about the subjects, possibly reflecting variations in anatomy such as in cortical folding pattern.

P7.43 | More Flexible and Partitioned Brain Bimanual Control Network in Young Compared to Older Adults

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Aging causes impairments in coordinating our hands in fine motor movements, possibly linked to a less flexible and efficient recruitment of the brain's processing resources. The aim of this study is to investigate how the brain dynamically reorganizes its functional networks to accommodate task demands in a bimanual fine pinch force control task and how this ability is affected by ageing. We hypothesised that: 1) The task flexibility, i.e. how often nodes switch sub-networks when changing between blocks of less and more complex dynamic bimanual conditions; 2) the segregation of the task-evoked network (TEN) from the rest of the brain; 3) that the number of sub-networks the nodes in the TEN is split up into would all be greater in YA than in OA. We used fMRI in older (OA; N=50, 65-70 y.o.) and younger (YA; N=51, 22-27 y.o.) adults to define a task-evoked network (TEN), defined as the parts of the brain that display increased activity when performing the dynamic bimanual task as compared to static hold conditions (t-contrast, FWE $p < 0.05$). Prior to statistical testing, fMRI data was corrected for motion, heart rate, and respiration, intensity-normalized, and spatially smoothed. Sub-networks within the TEN were identified based on the functional connectivity between TEN nodes for 24 progressive time windows, alternating between less and more complex task conditions. Segregation of TEN was calculated as the normalized difference in connectivity between intra- to extra-network nodes. We found support for hypothesis 1 and 3, specifically that YA showed greater task evoked network flexibility (MYA = 0.123, MOA = 0.116, $p<0.05$, t-test) and number of available sub-networks (MYA = 3.67, MOA = 3.44, $p<0.001$, t-test) within the TEN in than OA. However, segregation of the TEN from the rest of the brain's nodes was not significantly different between the groups (MYA = 0.069, MOA = 0.073, $p>0.05$, t-test). Results are compatible with the notion that YA are better able than OA at allocating neural resources to meet task demands on a more fine-grained scale.

P7.44 | Intranasal Administration of Oxytocin Improves the Maintenance of the Conditioned Reflex of Active Avoidance

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Oxytocin is a neuropeptide primarily known for its roles in social bonding, reproduction, and emotional regulation. Research has also shown that oxytocin can influence learning and memory processes. This study aimed to investigate the effect of intranasal oxytocin administration on the formation, maintenance, and retrieval of long-term memory in a two-way active avoidance reflex. The conditioned reflex in this context is the avoidance response triggered by the cue, which the animal has learned to associate with the negative stimulus. The experiments were conducted on adult rats (220-250 g, n = 16). The response was considered correct if the animal

moved to the opposite side of the cage within 5 seconds of the conditioned stimulus. If the animal failed to respond within this time frame, it received an aversive stimulus (an electric shock) from the electrified floor. Each experiment consisted of 20 trials. Prior to each trial, the animals were daily administered oxytocin intranasally (18 IU) 15 minutes before the experiment for 20 days. Data reliability was assessed using ANOVA. The results showed that control and experimental animals differed significantly in the duration of the latent period of the conditioned active avoidance response. Specifically, the latent period in the control animals was longer than in the experimental animals ($P \leqslant 0.01$). After a two-week rest period, no significant differences were observed between the control and experimental groups. However, after 1 and 2 months, the experimental animals exhibited a significantly higher number of correct responses compared to the control group (In both cases ($P \leqslant 0.01$). Since active avoidance learning involves associating a cue with an aversive stimulus, oxytocin may strengthen this association, enhancing the robustness and persistence of the learned behavior. Oxytocin facilitates the consolidation of emotionally charged memory and helps maintain the conditioned response over time. In conclusion, our findings suggest that oxytocin plays a crucial role in the formation and retrieval of long-term memory, particularly by enhancing emotional memory consolidation. The research was supported by the Shota Rustaveli National Science Foundation N FR-22-13-19

P7.45 | Frequency Tagging Tracks Automatic Capture and Global Feature Spread During Visual Search

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In everyday situations – like finding your keys on a cluttered desk or spotting a friend in a crowd – visual search is challenged by the presence of salient but irrelevant objects, such as brightly colored items or moving people that draw attention away from the target. Top-down guidance based on foreknowledge of the target's features is typically critical for overcoming such distraction and successfully locating the target item.Here, we investigated situations in which foreknowledge of the target's features can paradoxically impair target detection. According to the influential Guided Search model, sought-after features are enhanced in parallel across the visual field, increasing the attentional priority not only of the target but also of distractors that share its features. We therefore hypothesized that search performance would be worse in homogeneous displays – where distractors shared the target's color – compared to heterogeneous displays in which distractors were easily distinguishable by color. To test these predictions, we used electroencephalographic (EEG) recordings in humans to quantify the global, feature-based spread of attentional resources to task-irrelevant items that shared the target's color in a visual search paradigm. Specifically, each of the four search items was tagged with a unique frequency that elicited Steady-State

Visual Evoked Potentials (SSVEPs), allowing us to track attentional allocation to each item at early stages of visual processing. We manipulated participants' foreknowledge by informing them either about the target's shape and color or about its shape alone. Task-irrelevant distractors of different shape either matched the target's color (homogeneous condition) or had distinct colors (heterogeneous condition).Consistent with our hypothesis, search performance was impaired in homogeneous displays compared to heterogeneous ones. Furthermore, enhanced distractor-related SSVEP amplitudes indicated that task-irrelevant items captured attention, with even greater elevations in homogeneous displays. Notably, this template-driven global feature enhancement was time-invariant for both target and distractors, suggesting a parallel up-weighting of attentional priority across the display. Together, these findings demonstrate that feature-based top-down templates can lead to maladaptive attentional allocation by increasing the priority of irrelevant items, and that early visual EEG markers like SSVEPs provide a sensitive readout of the neural dynamics underlying this interplay between bottom-up capture and top-down control.

P7.47 | Fake News Persists: The Semantic Processing of Beyond Emotional States

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The widespread dissemination of misinformation, particularly fake news, has emerged as a critical societal issue. While cognitive and emotional factors are known to influence the perceived credibility and spread of misinformation, the underlying neural mechanisms remain poorly understood. This study examines the impact of emotional state on fake news processing and credibility judgments, using event-related potentials (ERPs) and peripheral physiological measures. A total of 160 news items were selected from Spanish fact-checking platforms, carefully curated to include

conspiracy-themed fake news paired with real counterparts. Each item featured a real headline and a manipulated subtitle differing only in the critical word. Prior to the ERP experiment, two web-based norming studies were conducted: one assessed cloze probability (n = 112) to match expectancy between conditions and control for N400 confounds; the other evaluated plausibility, emotional arousal, and valence (n = 122), confirming that fake news items were perceived as less plausible, more arousing, and more negative than real news. Forty-three native Spanish speakers participated in an EEG experiment, evaluating real and fake news headlines following negative or neutral emotional inductions via short video clips. Brain activity was recorded from 59 scalp electrodes, focusing on the N400 and P600 language-related components in a 2×2 factorial design. Skin conductance and pupillometry provided complementary indices of emotional arousal. ERP results showed no modulation of the N400 component, but a significant P600 enhancement for fake news, indicating increased cognitive reanalysis. Emotional induction did not significantly affect ERP components, although skin conductance data confirmed greater physiological arousal in the negative mood condition. These findings suggest that emotional state does not influence the early or later stages of semantic processing and cognitive evaluation. Understanding these processes advances our knowledge of how misinformation is processed at the neural level and informs strategies to mitigate its societal impact.
Keywords: Fake news; misinformation; N400; P600; emotion; EEG.

P7.48 | Dynamic Modulation of Pupillary Response During Emotional Processing in Parkinson's Disease: Effects of Dopaminergic State and Subthalamic Nucleus Microlesion And Stimulation

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Parkinson's disease (PD) involves non-motor manifestations, including cognitive and emotional deficits. Both dopamine and the subthalamic nucleus (STN) play a crucial role in these impairments. However, the specific contribution of explicit and implicit emotional processing remains poorly understood and requires further investigation. This study aimed to investigate the effects of subthalamic nucleus deep brain stimulation (STN-DBS), STN microlesions (insertional effects), and dopaminergic medication on phasic pupil responses during explicit and implicit emotional processing in patients with PD. Four groups participated in this study: (a) PD patients treated with STN-DBS (n = 13), (b) STN microlesions (n = 8), (c) dopaminergic medication (Med, n = 12), and (d) healthy controls (HC, n = 14). Following neuropsychological evaluation, pupil sizes were recorded via eye-tracking during the presentation of emotional images (positive and negative) under two attentional conditions: (1) explicit—focusing on emotional valence; and (2) implicit—focusing on non-emotional stimulus features. STN-DBS and microlesion patients were tested in a medication-off state to isolate stimulation and lesion effects. STN-DBS patients completed the task under both stimulation-on (DBS 'On') and stimulation-off (DBS 'Off') conditions in a randomized order. Pupillary data were normalized relative to the HC group for cross-condition comparisons. Baseline pupil diameters were comparable across groups, suggesting experimental conditions did not affect tonic pupil size. Patients under DBS 'Off' exhibited a generalized trend toward stronger pupil constriction relative to other groups, though this effect did not reach significance. Late pupil dilation responses were significantly modulated by emotional valence and attentional demand in the DBS 'On', Med, and microlesion groups—particularly during implicit processing of negative stimuli—leading to greater dilation compared to the DBS 'Off' group. Although all PD groups showed visuospatial deficits relative to controls, these deficits were not associated with pupillary responses to emotional stimuli. The findings suggest that STN-DBS, microlesions, and dopaminergic medication similarly modulate autonomic nervous system responses in PD patients, as reflected in restored pupillary dynamics. These effects appear to be differentially influenced by attentional demands and emotional valence, highlighting the complex role of dopamine and STN in cognitive/emotional processing circuitry and non-motor symptoms.

P7.50 | Mapping the Rapid and Dynamic Responses of the Primary Somatosensory Cortex in Empathy for Pain: A Tms-eeg Study

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Empathy is a fundamental skill that allows us to understand and vicariously share others' feelings. Neuroimaging studies have shown that observing someone else in pain recruits not only affective brain regions – such as the insula and anterior cingulate cortex – but also somatosensory cortices (S1/S2) involved in feeling pain in one's own body. Yet, the state-dependent temporal dynamics of S1 connectivity during vicarious pain perception remain poorly understood. To investigate this, we combine single-pulse transcranial magnetic stimulation (TMS) with electroencephalography (EEG) to explore dynamic modulations in S1 causal interactions during empathy for pain. Participants are randomly assigned to receive TMS over either the left or right S1 (active vs. sham). While EEG is recorded, they view scenarios depicting a model's right or left hand undergoing either painful or neutral stimulation. At the end of the session, participants are asked to rate perceived pain and emotional intensities of each picture. We hypothesize that, following active TMS, TMS-evoked potentials (TEPs) over sensorimotor and affective regions will be modulated during observation of painful vs. neutral stimuli, reflecting state-dependent changes in S1 connectivity within the pain empathy network. Additionally, we expect that within-group TEPs changes will be stronger when participants view pain inflicted on the hand contralateral to the stimulated S1 region (i.e right S1 stimulation and left-hand pain observation), indicating body part–specific resonance. This study will advance our understanding of the neural mechanisms underpinning the vicarious experience of others' pain, shedding light on the rapid, dynamic, and somatotopically organized information flow within the pain empathy network.

P7.51 | Concurrent Selection of Internal Goals and External Sensations During Visual Search

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Flexible goal-directed behaviour relies on the selective processing of internal goal representations and external sensations. Yet, internal and external selection processes have classically been studied in isolation, leaving us in the dark how internal and external selection processes are coordinated in time to support behaviour. To address this, we developed a novel visual-search task in which we could simultaneously track selection among internal search goals held in working memory and external search targets in the environment. Capitalising on sensitive gaze and

neural markers of internal and external visual selection, we provide proof-of-principle evidence in humans that internal and external selection processes do not necessarily take turns in a strictly serial manner, but can develop concurrently. We further show how concurrent internal and external selection processes are associated with largely non-overlapping neural activity patterns in the human brain, and how these processes can be performed effectively even when engaging opposite spatial locations in working memory and perception. These findings challenge views portraying brain states as being either internally or externally focused and bring new insight into how internal and external selection processes work together to yield efficient search behaviour.

P7.52 | Auditory Hemispheric Asymmetries in the Light of Ecological Acoustics: The Action-Object Framework

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Sounds are temporal signals that are processed based on their evolving spectral structure. Creating a time-frequency representation of such signals essentially means turning a one-dimensional signal into a two-dimensional function. This transformation comes at a cost: A mathematical constraint, the Gabor-Heisenberg uncertainty principle, dictates that there is a trade-off between temporal and spectral precision when analyzing an acoustic event [1]. This constraint affects sensory processing across all stages of the auditory system. However, because in our context the uncertainty applies to the analysis rather than the signal itself [2], biological systems may circumvent this limitation by performing parallel, complementary analyses of the same signal – enabling perceptual acuity that seemingly 'beats' the uncertainty principle. Here, we evaluate the hypothesis that auditory hemispheric asymmetries (AHA) reflect an evolutionary adaptation supporting parallel processing strategies – one hemisphere favoring high temporal resolution, the other high spectral resolution. To this end, we introduce a normative-level framework – the actionobject framework – as a formalization of the source-filter approach, rooted in ecological acoustics and sound synthesis. We synthesize the literature on ecological acoustics, highlighting recurring themes and recent findings. We argue that normative-level accounts of AHA should consider the ecological context in which the auditory system evolved and currently operates, and should model adaptations accordingly. The action-object framework posits that most natural sounds can be modeled as a force – the action – applied to a resonant object. We propose that AHA may have emerged to optimize the differential processing of actions and objects, maximizing temporal (or spectral) resolution to support the recognition of actions (or objects) in the left (or right) associative auditory cortex [2]. This framework aligns with an existing implementation-level account of AHA, the spectrotemporal modulation asymmetry hypothesis [4, 5],

and incorporates general principles of neural computation [6]. In sum, we situate hemispheric asymmetries within a framework where the behavioral relevance of auditory processing reflects the distinct cognitive demands of interpreting actions and the resonant objects they act upon. References [1] D. Gabor, J. Inst. Electr. Eng. Part III 93, 429-441 (1946). [2] L. Cohen, Time-Frequency Analysis (Prentice Hall, Englewood Cliffs, NJ, 1995). [3] P. Robert, R. Zatorre, A. Gupta, J. Sein, J.-L. Anton, P. Belin, E. Thoret, B. Morillon, Cereb. Cortex 34, bhae292 (2024). [4] A. Flinker, W. K. Doyle, A. D. Mehta, O. Devinsky, D. Poeppel, Nat. Hum. Behav. 3, 393-405 (2019). [5] P. Albouy, L. Benjamin, B. Morillon, R. J. Zatorre, Science 367, 1043-1047 (2020). [6] H. B. Barlow, in Sensory Communication, W. Rosenblith, Ed. (MIT Press, 1961), pp. 217-233.

P7.53 | Rhythmic Light Stimulation Elicits Multiple, Concurrent Neural Responses That Separably Shape Human Cognition

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Rhythmic light stimulation offers solutions to innumerable cognitive and neurological disorders. However, like any neuromodulatory technique, responses to rhythmic light stimulation are highly variable, leading to challenges in replicating lab-based studies and generalising these results to the clinic. Across three MEG/EEG experiments, we show that this variability can, in part, be attributed to rhythmic light stimulation eliciting multiple, coexisting neural responses which have separable impacts on cognition and behaviour. Specifically, we find that (i) rhythmic light stimulation produces distinct neural responses at the fundamental and second harmonic frequencies, (ii) these responses are shaped by endogenous oscillatory dynamics that vary across participants, (iii) second harmonic responses within the gamma band shape the representation of stimulus-specific information, and (iv) the phase of harmonic responses with the alpha-band causally contributes to near-threshold visual perception. We reproduce these effects across datasets, paradigms, and in both gamma and alpha oscillatory bands, suggesting that the complex oscillatory responses elicited by rhythmic light stimulation are a robust and pervasive phenomenon. We propose that the complex nature of neural responses to rhythmic stimulation explain why there can be substantial variability between studies using these techniques, and that accounting for these complex responses may help deliver robust neuromodulatory results that can advance fundamental and clinical human neuroscience.

P7.54 | Time-resolved Neural Processes Underlying Attentional Integration and Selection

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Understanding a complex world involves multiple stages of information processing, including selecting relevant information and integrating sources. Extensive literature on attentional selection demonstrates enhanced processing of selected stimuli, even during preparatory stages. On the other hand, research on integration has primarily explored rule combination, revealing an involvement of the prefrontal cortex. Whereas previous research has explored the mechanisms of attentional integration and selection separately, with different experimental paradigms, a systematic comparison of the neural coding of stimuli under these two demands is lacking. We collected EEG data in a cue-target paradigm to examine the temporal dynamics of stimulus information coding as modulated by selection or integration. Our hypothesis anticipated that the differential demands of processing would result in more discriminable neural patterns of stimuli under selection conditions, whereas integration would be associated with larger similarity in these patterns, during both anticipation and target processing. Representational similarity analysis (RSA) revealed that during target processing the encoding space was structured by the overarching selection vs. integration task demands and the specific stimulus that had to be processed, but not its general category (i.e., animate vs. inanimate stimuli). In contrast to our hypothesis, we did not detect an interaction between task demands and neural patterns coding stimulus information. Also, we did not detect preparatory activity coding the upcoming task demands or target stimuli, which may be driven by more sustained dynamics maintained throughout blocks. Overall, these results offer insight into the neural mechanisms underlying preparatory and target-related processing, exploring how attention operates when directed toward a single versus multiple stimuli.

P7.55 | Effects of Material Properties on Motor-imagery and Precision Grip Grasping

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In order to grasp and manipulate objects adequately, physical properties such as surface, orientation, and material must be accounted for. Different properties are often estimated visually, however, it remains unclear at which steps during the process

of grasping adjustments occur. It has been suggested that factors such as material could be taken into account before initiating grasping, however, it remains unclear whether adjustments are made during planning or movement. In order to investigate, participants were asked to carry out two blocked tasks. In the first task, participants were to reach, grasp, lift, transport, and place a cylinder, made of brass or Styrofoam, at a goal location. Additionally, the material was either visible or wrapped in paper. The cylinders were placed in front of the participants four different orientations (0°, 60°, 90°, 120°). Movements were tracked with an infrared motion tracking system. The second task consisted of a motor-imagery task, where participants were asked to imagine carrying out the movements. While carrying out the imagery task, participants rested their dominant hand at the resting position. To collect timings, a keyboard was placed by their non-dominant hand, participants were then carefully instructed to press the space bar after each completed step of the imagined lifting process specified as start of movement, starting to lift the object, and finally placing the object at the goal position after transport. After each imagery trial, participants were asked to provide a rating from one to four of imagery strength and difficulty. Timings were then collected in the motion tracking data by identifying the same timing of these phases by hand and object movements. Times were averaged for each participant, trials 3 standard deviations outside of the participant mean were excluded. We then performed a repeated measures ANOVA. The results indicate that motor-imagery timings were impacted by object material, suggesting that adjustments to movement planning can occur though imagery.

P7.56 | Neural Adaptations in Multi-alternative Perceptual Decisions

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It is widely accepted that simple perceptual decisions unfold as a process of evidence accumulation. Neural signals resembling accumulation dynamics have been reported across multiple species and paradigms, and in humans include effector-selective mu/beta (8-30 Hz) activity over motor cortex and a centroparietal positivity (CPP), which both build at an evidence-dependent rate and peak at response. The critical question of how decision mechanisms are reconfigured based on the number of choice alternatives has been examined in monkey neurophysiology using a direction discrimination task with either two or four possible response options.[1] Behavioral and physiological measures supported the general accumulation-to-bound framework. Moreover, relevant neural activity began at a lower level on four-option trials but peaked at a common level across trial types. The authors interpreted this larger excursion as the decision system tuning itself to require more evidence before committing to a response. The study also reported a slower rise in firing rates with four options but a similar firing rate at the time of response. We sought to examine

similar mechanisms in EEG signatures of decision formation in humans. Participants viewed clouds of independently moving dots and reported the principal motion direction. Before each trial, a cue indicated whether there would be two or four directions as possible responses. The proportion of dots moving coherently was either low or high, independent of the number of options. Responses were faster and more accurate on trials with greater coherence or fewer response options. In the EEG data, we found a CPP signal with a greater rate of increase for high versus low coherence and two versus four options, in line with previous results. Critically, mu/beta motor preparation signals for two- or four-option trials began to diverge just after the condition cue, reaching a significantly greater desynchronization for two-option trials by evidence onset time ($p = .019$, paired t-test). Motor preparation for both trial types, however, reached a comparable level at response. Similar to the previous study, these combined results reflect how the parameters of evidence accumulation are tuned according to the context of the current decision.[2] [1] Churchland, A. K., Kiani, R., & Shadlen, M. N. (2008). Decision-making with multiple alternatives. Nature neuroscience, 11(6), 693-702. [2] This work was funded by the European Research Council Starting Grant MYODECISION (101077772).

P7.58 | Frequency-specific Oscillatory Network Dynamics Underlying Temporal and Spatial Attention in Humans

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Large-scale network synchronization in the alpha (8–12 Hz) and beta (13–30 Hz) bands has been implicated in top-down control during spatial and temporal attentional processing. However, their specific mechanistic roles in coordinating attention in humans remain poorly understood. We investigated the distinct contributions of alpha and beta network connectivity in a modified spatial attention paradigm. Concurrent magneto- and electroencephalography (M/EEG) were recorded from 41 participants engaged in a covert visual attention task. The task was designed to control for specific temporal anticipation effects that are typically confounded in classical spatial attention paradigms. We estimated source-connectivity and local oscillations from source-modeled brain activity. Our analysis revealed frequency- and time-specific functional dissociations. Inter-areal alpha synchronization displayed structured, time-resolved relationships with both local neural dynamics and behavior. It was foud in dorsal attentional and occipital networks, and its strength correlated with ipsilateral local alpha increases and directional microsaccade shifts, marking the spatial orienting phase. This was preceded by transient early synchronization in slow

frequencies (delta and theta). In contrast, sustained beta synchronization was selectively associated with temporal anticipation, and showed no correlations with local amplitude changes, behavioral performance, nor eye-movements. These findings suggest that top-down attentional control is mediated by evolving frequency-specific mechanisms, wherein the dorsal attention network engages in progressively faster synchronization - from theta to high-alpha - reflecting a dynamic, temporally structured hierarchy supporting both anticipatory engagement and spatial orienting.

P7.59 | Dream Content Analysis in Idiopathic Rem Sleep Behavior Disorder: A Natural Language Processing Approach

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Idiopathic REM Sleep Behavior Disorder (iRBD), a prodromal manifestation of α-synucleinopathies, involves loss of REM-related muscle atonia and frequent dream enactment behaviors. iRBD has been linked to increased dream recall frequency (DRF; i.e., number of dreams recalled in a timespan) and aggressive contents. However, these findings largely stem from retrospective methods prone to recall bias and rater-dependent content analysis. Our study investigated DRF and content differences between iRBD patients and healthy controls (HCs) combining retrospective and prospective approaches. 21 iRBD patients and 21 sex- and age-matched HCs completed retrospective questionnaires assessing DRF, Attitudes Toward Dreams (ATD), nightmare frequency, and dream content. Participants then wore an actigraph and kept a two-week dream diary recording each morning what was going through their mind just before the awakening. Reports were categorized as contentful, white (no content recall), or no dreams. We trained a Long Short-Term Memory (LSTM)

neural network to automatically code 16 predefined content dimensions mapping onto features reportedly altered in iRBD, including affective valence, arousal, social interactions, dreamer's active involvement in events, and limitations of freedom. Baseline verbosity was assessed through a picture description task. Comparisons were performed using Wilcoxon rank-sum tests ($p<0.05$). Retrospective DRF measures showed no differences between groups ($p=0.948$), whereas prospective data revealed significantly reduced DRF ($p=0.049$), and fewer ($p=0.019$) and shorter ($p=0.016$) contentful dreams in iRBD. These effects could not be attributed to differences in ATD or baseline verbosity ($p>0.09$), suggesting a possible reduction in dream recall or complexity. Retrospective reports indicated increased aggressiveness in iRBD dreams ($p=0.00041$), but no differences in nightmare frequency, valence, or arousal ($p>0.18$). Automated scoring confirmed the lack of valence and arousal differences, but also highlighted no group-level differences across other dimensions potentially linked to aggressiveness or altered dream features in iRBD ($p>0.558$). Our findings indicate a dissociation between retrospectively and prospectively determined dream characteristics in iRBD. Prospective and automated methods revealed possible reduced dream recall or narrative complexity in iRBD, without evidence of heightened aggressiveness or negative valence. These results suggest that earlier findings may be partially explained by methodological biases in retrospective approaches.

P7.60 | The Effect of Integrated Cognitive and Aerobic Exercise Training on the Engagement of Pupil-linked Arousal During a Reinforcement Learning Task

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Reinforcement learning studies provide an insight to decision-making processes and learning by trial-and-error. Maintaining decision-making abilities is crucial for healthy aging. Engagement of the arousal systems is part of the decision-related

neural processes that optimize performance. Aerobic exercise strongly increases arousal and might modulate the way the arousal systems are recruited during decision-making tasks. Moreover, cognitive exercises support prefrontal cortex function, which is affected by aging. The aim of this project is to investigate the effects of a 3-months, twice-a-week, program of cognitive training integrated in aerobic exercise training (Activ4Brain program) on the modulation of pupil-linked arousal during RL tasks in older people and its relationship with task performance. The cognitive tasks used in the training program included working memory, cognitive flexibility, sustained attention, decision-making and processing speed. We investigated the impact of the Activ4Brain program on behavioral and pupillary responses across three participant groups: integrated cognitive training and aerobic exercise (Activ4Brain) group, aerobic exercise (AE) group, and control (CNT) group. The Activ4Brain group showed significant performance improvements in the cognitive tasks trained. Behavioral outcomes (accuracy, reaction time) and pupil responses during the reinforcement learning task not included in the training program were analyzed to evaluate the intervention's impact. Participants performed the task across two sessions before and after the intervention. Pupil responses in the Reinforcement Learning task scaled with uncertainty, after choice, and with lack of reward after feedback. However, we found no group x session interactions for either behavioural outcomes or the amplitude of task-related pupil responses. These findings suggest that regular engagement of the arousal system during combined cognitive and aerobic training did not alter the way pupil-linked arousal was engaged in a cognitive task not included in the training program. Keywords: reinforcement learning, pupillometry, cognitive training, aerobic exercise

P7.61 | Neural Encoding of Syntactic Information During Speech Comprehension and Speech Production Planning

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Robust evidence from speech comprehension indicates that neural activity separately encodes acoustic (speech envelope) and syntactic (multi-word phrases) features by tracking their respective timescales. Speech production findings also suggest analogous tracking of acoustic timescales during speech planning (i.e., prespeech onset). However, syntactic encoding during speech production planning is unexplored from the neural tracking perspective. Therefore, it remains unclear whether similar neural tracking mechanisms underlie speech comprehension and speech production. Here we present the design of an EEG experiment examining how multi-word phrases are similarly encoded between speech comprehension and production modalities. We focus on French 2-word phrases (noun color, e.g., "château vert", castle green) that can easily elicit speech production from simple pictures while minimizing

articulation-related EEG artifacts. To control for wordlevel effects, we manipulate the relative number of syllables for each word (1-syllable short vs. 2-syllable long), resulting in two conditions with reversed word timescales (short/long noun long/short color) but similar phrase timescales. French-speaking participants (n ≈ 30) are presented with such phrases as speech stimuli in the comprehension modality (followed by a picture-matching task) and as colored images in the production modality (performing a picture-naming task). EEG trials are first concatenated at positive latencies (post-speech onset) in comprehension and negative latencies (pre-speech onset) in production. Trial-concatenated EEG data are then analyzed through multivariate Temporal Response Function (TRF) forward models considering acoustic-level (listened/produced speech envelope), word-level (word onset), and syntactic-level (phrase onset) regressors. TRF analyses are performed separately across frequency bands corresponding to syntactic timescales (delta band) and also to non-syntactic timescales (theta-alpha-beta bands). Results specifically linking enhanced EEG reconstruction accuracy at deltaband syntactic timescales with within-modality TRF models additionally including the syntactic regressor would suggest similar tracking mechanisms for speech comprehension and production. Comparing cross-modality TRF models (crossing training and test between modalities) and the temporal dynamics of TRF weights would further refine how syntactic information is similarly encoded between modalities. By investigating syntactic encoding in speech production planning from the neural tracking perspective, our experiment proposes a novel approach to characterize the neural mechanisms that support speech processing across both comprehension and production modalities.

P7.62 | Cognitive Impairment in Individuals With Chronic Spinal Cord Injury: A Phonemic Verbal Fluency Task-Based Functional Magnetic Resonance Imaging (fMRI) Study

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Introduction: Individuals with spinal cord injury (SCI) are subject to a substantially higher risk of cognitive impairment impacting different domains such as executive functions (EF). One subdomain of EF affected in SCI is verbal fluency (VF). As cognitive deficits adversely interfere with rehabilitation outcomes in SCI, it is essential to understand the underlying mechanisms of cognitive impairment. Therefore, examining brain alterations may help to advance our understanding of cognitive deficits. This study aims at investigating the neural correlates of VF in SCI using functional

magnetic resonance imaging (fMRI). Methods: Individuals with and without SCI were included. During the fMRI measurement, participants silently performed a phonemic VF task. One hour later the subjects performed the same task outside the scanner, this time the words were said aloud (1 minute per letter). The sum of correct words across all letters was considered as indicator of phonemic VF. Preprocessing of imaging data was performed in SPM12 using standard procedures. With a general linear model group differences in seed-based functional connectivity (FC) were tested. Seeds included regions typically associated with phonemic VF. Moreover, FC was correlated with VF performance. Family-wise error (FWE) correction was applied at a cluster level (pFWE<0.05) to account for multiple comparisons. Results: 26 individuals with chronic SCI (mean age=45.8±11.0, mean time since injury=13.3±11.1 years) and 26 non-injured controls (mean age=43.1±11.5 years) were recruited. The sum of correct words was significantly lower (15% less words) in SCI compared to non-SCI (p=0.02). There was lower FC between the left insula and left superior frontal gyrus (SFG) in SCI compared to non-SCI (pFWE<0.001). In SCI only, VF performance negatively correlated with FC between right insula and postcentral gyrus (r=-0.82, pFWE=0.001), and between left putamen and bilateral precentral gyrus (r=-0.74, pFWE=0.002). Conclusions: FC was altered in regions typically involved in EF. As the insula is a key hub in executive processes, its altered FC with the SFG may be linked to deficits in EF in SCI. Moreover, the FC of regions of the sensorimotor cortex negatively correlated with VF performance, suggesting that the affected sensorimotor network in SCI may interfere with cognitive functions.

P7.63 | Rhythmic Fluctuations in Pupil Size Across the Breathing Cycle: Implications for Visual Perception

Martin Schaefer (Karolinska Institutet); **Sebastiaan Mathôt** (University of Groningen); **Ronald Van den Berg** (Stockholm University); **Reza Ebrahimian Baboukani** (Karolinska Institutet); **Mikael Lundqvist** (Karolinska Institutet; Massachusetts Institute of Technology); **Johan N. Lundström** (Karolinska Institutet; Monell Chemical Senses Center; Karolinska University Hospital); **Artin Arshamian** (Karolinska Institutet)

Physiological rhythms, such as breathing and heart rate, are increasingly recognized as modulating perceptual and cognitive processes. In recent work, we identified a novel, systematic fluctuation in human pupil size that follows the phase of the respiratory cycle. Although these pupil size changes are small, they are robust and consistent across a wide range of experimental conditions. Given the known influence of pupil size on visual perception --larger pupils enhancing light sensitivity and smaller pupils improving visual acuity-- this physiological rhythm presents a compelling candidate for modulating perceptual performance over the course of the breathing cycle. To explore this possibility, we collected data from two visual psychophysics experiments: a detection task, where increased pupil size is theoretically advantageous, and a discrimination task, where smaller pupils may support enhanced

visual acuity. In both studies, pupil size and respiratory phase were recorded continuously. Our ongoing analyses will reveal whether behavioral performance fluctuates systematically with the respiratory phase and corresponding pupil size at stimulus onset. This work will thus determine whether endogenous physiological rhythms, such as respiration, can shape moment-to-moment perceptual performance through interactions with low-level sensory mechanisms like pupil-linked light regulation.

P7.64 | Bayesian Inference in Pain-related Processing

Natalia Egorova-Brumley (Melbourne School of Psychological Sciences, The University of Melbourne, Melbourne, Victoria, Australia); **Adrian Gonzales** (Melbourne School of Psychological Sciences, The University of Melbourne, Melbourne, Victoria, Australia); **Claire Lin** (Melbourne School of Psychological Sciences, The University of Melbourne, Melbourne, Victoria, Australia); **Caitlin Hitchcock** (Melbourne School of Psychological Sciences, The University of Melbourne, Melbourne, Victoria, Australia); **Marta I. Garrido** (Melbourne School of Psychological Sciences, The University of Melbourne, Melbourne, Victoria, Australia; Graeme Clark Institute for Biomedical Engineering, The University of Melbourne, Victoria, Australia)

Bayesian inference theory postulates that perception occurs through combining our senses (likelihood) with beliefs (priors). We investigated whether personal experience with pain shapes pain evaluation and how people integrate likelihood and priors to judge the pain of others. We hypothesised that people with more severe chronic pain would rely more on prior beliefs and less on sensory information when asked to judge pain experienced by others. The study was pre-registered (https://osf.io/mnpt9) and involved a version of the "coin task" (Vilares et al. 2012). Participants were required to integrate uncertain sensory information (pain ratings) with prior knowledge (participants' rating accuracy) presented in a two-by-two factorial design. We computed the Global Sensory Weight, a computational parameter reflecting the degree to which an individual relies on sensory vs. prior information when making perceptual judgments. Levels of chronic pain were measured using the Brief Pain Inventory (BPI), a questionnaire that evaluates pain severity of pain and its impact on daily life, or interference (Cleeland & Ryan, 1994). We conducted Pearson correlations between BPI and Global Sensory Weight (averaged across the 4 conditions). In our a priori power analysis (R software: "pwr.r.test") we estimated 80% power to detect r= -0.15 at $p<0.05$ (1-sided test) with N=237. While due to technical difficulties, we were only able to collect complete datasets from N=152, our main analysis showed that the expected effect size was achieved with the reduced sample. Specifically, greater BPI was correlated with smaller Global Sensory Weight (r=-0.15, 1-tailed p=0.03, df=142). Exploratory analyses for each of the 4 conditions showed that pain severity was associated with Global Sensory weights in wide likelihood conditions with narrow (r=-0.2, 2-tailed p=0.01) and wide (r=-0.18, 2-tailed p=0.02) priors.

Further analyses of associations with BPI severity vs. interference scores suggested that the BPI correlation with Global sensory weight was driven by the interference (r = -0.18, 2-tailed p = .029) component of pain rather than severity (r = -0.14, 2-tailed p =0.25). Overall, these results suggest that the degree to which experiencing pain affects daily life activities is associated with an overweighting of prior beliefs relative to sensory information.

P7.66 | Neural Reorganization of Monaural and Binaural Speech Processing in Single Sided Deafness Patients Supplied With a Cochlear Implant Compared to Normal-hearing Subjects

Sonja Rossi (Medical University of Innsbruck, ICONE – Innsbruck Cognitive Neuroscience, Department of Hearing, Speech, and Voice Disorders); **Josef Seebacher** (Medical University of Innsbruck, Department of Hearing, Speech, and Voice Disorders); **Annika Rackl** (Medical University of Innsbruck, ICONE – Innsbruck Cognitive Neuroscience, Department of Hearing, Speech, and Voice Disorders); **Isabella Thurner** (Medical University of Innsbruck, ICONE – Innsbruck Cognitive Neuroscience, Department of Hearing, Speech, and Voice Disorders); **Patrick Zorowka** (Medical University of Innsbruck, Department of Hearing, Speech, and Voice Disorders); **Simone Graf** (Medical University of Innsbruck, Department of Hearing, Speech, and Voice Disorders); **Anja Hahne** (University Clinic Dresden, Saxonian Cochlear Implant Center)

Research Aims: Normal-hearing people do not show any difficulties in extracting fine-grained information from the acoustic signal of each ear in order to interpret the meaning of speech and sounds. This process is undertaken primarily from the left hemisphere in the brain in right-handed people. Acoustic signals presented to the right ear are preferentially processed which is referred to as „Right-Ear-Advantage“. Hearing impaired patients, especially those with a single sided deafness (SSD) have to understand speech with only one ear. This can be supported by hearing aids such as cochlear implants. With the present study we aim at investigating neural mechanisms in the brain during monaural and binaural presentation of speech in SSD patients supplied with a cochlear implant in order to gain more detailed insights into brain reorganization to strengthen speech intelligibility. Design and Methods: Cochlear-implant patients with unilateral hearing impairment at the right ear and age-matched normal-hearing subjects were presented with semantically correct and incorrect sentences via inset headphones. Sentences were presented either monaurally to the left or right ear or binaurally to both ears simultaneously. Brain activity was assessed via the simultaneous application of electroencephalography (EEG) capable to identify fast dynamic changes (such as the N400 component reliably reflecting the difficulty in accessing semantic aspects) and functional near-infrared spectroscopy (fNIRS) able to localize involved brain areas of the language network or compensatory networks. Results and Discussion: Preliminary EEG results show in normal-hearing subjects an increased N400 amplitude for semantically incorrect

compared to correct sentences. This effect is in line with previous studies evidencing the more challenging access to the mental lexicon for incorrect sentences. This effect was present irrespective of whether sentences were presented monaurally or binaurally. Cochlear-implant patients show a similar pattern of results, however, predominantly for the binaural presentation. Preliminary fNIRS results reveal a larger prefrontal activation for correct sentences presented monaurally to the right ear compared to the left one in normal-hearing subjects only. This effect resembles a right-ear advantage, however, the prefrontal activation suggests a more attention-related rather than language-related brain network to be active. CI patients did not show any statistically relevant modulation. Especially the eletrophysiological findings emphasize the importance of supplying the hearing impaired ear with a cochlear implant in order to allow similar processing mechanisms as in normal-hearing subjects during binaural presentation. However, the brain networks of SSD patients supplied with a CI seem to adopt different reorganization mechanisms during monaural hearing in order to compensate for speech intelligibility.

P7.68 | Maturation of Auditory Pitch and Duration Perception in Children With Dld: Insights From a Longitudinal Study

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Developmental language disorder (DLD) is characterized by persistent difficulties in acquiring and using language [1], with difficulties in auditory processing and prosody perception discussed to be one of the core deficits [2–8]. Estonian word prosody features a unique three-way quantity distinction – short, long, and overlong – characterized by syllable duration and pitch contour, which differentiate word meanings and grammatical cases. Behavioral evidence suggests that children with DLD struggle to distinguish the quantity degrees [9]. Our main research question was: How auditory processing of stimuli with distinct quantity degrees (i.e., three-way quantity) changes over one year in DLD children and typically developing controls? Next to testing auditory processing behaviorally, the Mismatch Response (MMR) was used as a neurophysiological marker, as in infancy it was shown to predict future language abilities [10-18] and may also be useful for anticipating DLD outcomes at later ages. The participants were 46 children (24 male) aged 5-7 years, 21 with DLD. EEG data was preprocessed with MADE [19]. Deviant-standard differences were identified using cluster-based permutation tests [20] and changes in MMR amplitude were examined

with linear mixed models (LMM). In the duration change condition, we detected a positive fronto-centrally distributed MMR between 240–340 ms after stimulus onset at first assessment. After one year, at second assessment, we instead found a negative MMR between 390–490 ms after stimulus onset. LMM showed the shift from positive to negative MMR to be significant. Importantly, this shift from positivity to negativity was less pronounced in the DLD group. In the duration+pitch change condition, no MMR was observed at either the first or second assessment in either group. Our results contribute to the understanding of auditory processing development. Consistent with previous studies, we observed a positive-to-negative shift, suggesting the MMR to become more mature in both children with and without DLD [21]. However, the shift as well as the negativity at the second assessment was less pronounced in children with DLD, which is in line with research suggesting less mature auditory processing in children with DLD to be reflected neurophyiologically in a more positive MMR [2,10,22,23]. Note: Chat GPT version 4 was used to check spelling, grammar and suggest phrasing re-organization. [1] Bishop et al., 2017; [2] Kujala & Leminen, 2017; [3] Näätänen et al., 2014; [4] Calet et al., 2021; [5] Cumming et al., 2015; [6] Leonard & Kueser, 2019; [7] Richards & Goswami, 2019; [8] Sundström et al., 2019; [9] Padrik & Hallap, 2016; [10] Bishop, 2007; [11] Cantiani et al., 2016; [12] Choudhury & Benasich, 2011; [13] Friedrich et al., 2004; [14] Friedrich et al., 2009; [15] Guttorm et al., 2005; [16] Schaadt et al., 2015; [17] Schaadt et al., 2023; [18] Weber et al., 2005; [19] Debnath et al., 2020; [20] Oostenveld et al., 2011; [21] Themas et al., 2023; [22] Männel et al., 2017; [23] Schaadt & Männel, 2019.

P7.69 | Demographically Adapted Head Models For Improved Eeg Source Localization Across the Lifespan

Jorge San-Segundo (Universidad Autónoma de Madrid); **Juan Jose Herrera** (Universidad Autónoma de Madrid); **Guiomar Niso** (Instituto Cajal - CSIC); **Oscar Esteban** (University of Lausanne); **Almudena Capilla** (Universidad Autónoma de Madrid)

Source-level reconstruction of brain activity is widely used in cognitive neuroscience to localize the neural generators of electro – and magnetoencephalography (EEG/MEG) signals. This process requires magnetic resonance images (MRIs) of the brain to derive realistic head models. While MEG studies typically co-register individual anatomical MRIs with MEG data, EEG studies often rely on standardized templates. The MNI152 brain template – introduced in 2001 by the International Consortium for Brain Mapping and based on the average of 152 T1-weighted (T1w) MRIs (mean age = 25.0 ± 4.9 years; age range: 18–44; 86 males, 66 females) – has become a widely accepted reference for this purpose. However, the demographic representativeness of this template is limited in terms of age and gender, which introduce anatomical biases, especially when applied to populations outside the original cohort. For instance, the average male brain is approximately 10% larger than the female brain, and substantial anatomical differences are also observed across the lifespan,

particularly during childhood. Given that EEG source reconstruction is less spatially precise than MEG, using more demographically tailored models may improve the accuracy of anatomical localization. In this study, we propose adapting the MNI152 template to generate age- and gender-specific head models for EEG source localization. We compiled over 3,600 T1w MRIs of healthy individuals aged 5 to 97 years from 14 open-access databases. Individual brain surface coordinates were extracted and aligned, and the same processing pipeline was applied to MNI152. We then calculated transformation matrices to warp MNI152 3D coordinates onto each participant's brain surface. Using these data, we constructed regression models to predict transformation parameters as a function of age and gender. Predicted coordinates can be applied to adapt template head models and electrode positions, based on MNI152, to individual participants. As a result, our approach may contribute to a more reliable identification of neural sources in both research and clinical settings, improving the anatomical precision of cortical mapping and strengthening the validity of neurodevelopmental studies across the human lifespan. Additionally, we will ensure open access to the used scripts and resulting data through GitHub (https://github.com/necog-UAM).

SATURDAY 20/09

10:45 POSTER SESSION 8 P 8.1 – 8.62

P8.01 | Cracking the "Law of Silence": Immersive Virtual Reality to Study Decision--Making During Corruption Attempts by Organized Crime Members

Alisha Vabba (Center for Life Nano- & Neuroscience, Fondazione Istituto Italiano Di Tecnologia (IIT) and Sapienza University of Rome, Italy); **Matteo P. Lisi** (Center for Life Nano- & Neuroscience, Fondazione Istituto Italiano Di Tecnologia (IIT) and Sapienza University of Rome, Italy); **Salvatore M. Aglioti** (Center for Life Nano- & Neuroscience, Fondazione Istituto Italiano Di Tecnologia (IIT) and Sapienza University of Rome, Italy)

Mafia-type criminal organizations undermine legal economies by infiltrating businesses and exploiting community complicity through threats, intimidation, and corruption. To explore the psychological mechanisms behind such compliance, we developed a novel immersive virtual reality (IVR) economic game simulating a high-stakes corruption scenario. Participants took on the role of a government official tasked with awarding public contracts, while a virtual agent attempted to bribe them for preferential treatment across multiple trials. Accepting bribes benefitted the participant but harmed a third party, either financially or physically. To simulate real-world mafia threat, some refusals triggered a mild electric shock to the participant's

hand. Preliminary analyses on a sample of 13 participants (8 female) examined the effects of threat (shock vs. no shock) and externality type (financial vs. physical) on corrupt decisions using generalized mixed models. We also assessed participants' sense of agency using subjective ratings and an implicit temporal binding measure – where shorter perceived intervals between action and outcome suggest greater agency. Participants were significantly more likely to accept bribes when under threat, indicating that coercion increases corruption compliance. The nature of the third-party harm (financial vs. physical) did not significantly impact decision-making. Participants felt more responsible when they accepted bribes than when they refused, but threat did not affect self-reported responsibility. However, temporal binding data showed a statistical trend toward increased perceived responsibility under threat. Findings suggest that threat significantly increases willingness to engage in corrupt behaviour, even when harmful consequences for a third party are involved. Our IVR paradigm enables ecologically valid investigation of moral decision-making under coercion and offers a promising tool for future research, including integration with neurophysiological measures like EEG. Understanding coercive psychological dynamics can help explain the persistence of the "law of silence" in organized crime contexts, contributing to efforts aimed at disrupting criminal ecosystems. At the conference we will report on the findings for the full sample of N=50 participants.

P8.02 | Neural Dynamics of Recognition Memory in Autism: Erp Evidence for Differential Engagement of Familiarity and Recollection

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This study investigated how item typicality (typical vs. atypical), encoding type (categorical vs. perceptual), and neurodivergence (autistic vs. neurotypical male adults) affect recognition memory and its neural correlates. Although overall memory discrimination performance was similar between groups, ERP analyses revealed marked differences in the temporal dynamics of memory retrieval. Neurotypical participants showed an early ERP effect, consistent with familiarity-driven processing. In contrast, autistic participants exhibited a later ERP modulation, indicating a greater reliance on recollection-based processes. Importantly, only neurotypical adults engaged neural mechanisms during the post-old/new-response period that reinstated item details for subsequent Remember-Know-Guess judgments. Additionally, the interplay between item typicality and encoding type significantly modulated these neural responses across groups. These results provide compelling evidence that autistic adults may employ distinct neurocognitive strategies to support recognition

memory. Our findings advance the understanding of episodic-semantic interactions and underscore the need to further investigate the role of semantic processes in episodic retrieval in both neurotypical and autistic populations.

P8.03 | Exercise Effects on Bilateral Ventrolateral and Dorsolateral Cortical Activity During Motor Adaptation and Retention of a Visuomotor Adaptation Task in Healthy Adults

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Motor adaptation involves modifying a previously acquired visuomotor map to face a new context (adaptation) and stabilizing it in memory (consolidation)[1]. The DLPFC shows increased activity during the early stages, associated with action planning, while the VLPFC remains involved even after adaptation is achieved[2,3]. Acute intense endurance exercise (iEE) enhances performance in the rotational visuomotor adaptation task (rVMA)[4]. We aimed to explore the effects of iEE in the activity of the DLPFC and VLPFC of both hemispheres across the adaptation and consolidation of an rVMA. Fourteen adults performed iEE before adapting to an rVMA (EX group) and sixteen did not (CON group). rVMA was performed first without rotation (BA) and then with rotation during adaptation (AD1, AD2, AD3) and retentions at 1 h, 24 h, and 7 days (RT1, RT24, and RT7D). Initial directional error (IDE) and oxyhemoglobin changes were computed during all sets. Generalized linear mixed models were used to explore differences between groups and sets. A significant group main effect was found for the IDE values showing that CON presented better performance than EX; however, this difference already appeared at baseline. CON showed higher activity of the right and left VLPFC, especially during adaptation (AD1, AD2, AD3) and RT24; while EX showed the lowest values of activity in VLPFC areas during adaptation (AD1, AD2, AD3). Larger activity of the left DLPFC was found during adaptations in both groups, especially for the AD2 and AD3. On the other hand, EX presented higher activity of the right DLPFC in adaptation (AD1, AD2, AD3) than CON; in fact, CON presented the lowest values of the right DLPFC activity during the three sets of adaptation. In summary, it seems that iEE did not affect the performance of the rVMA during the adaptation and or the consolidation. However, the iEE might promote the activity of

the right DLPFC during the adaption instead of increasing the activity of the VLPFC from both hemispheres.

[1] Krakauer et al., Comprehensive Physiology (2019).

[2] Anguera el al., J. Cogn. Neurosci (2010).

[3] Kumar et al., eneuro (2022).

[4] Ferrer-Uris el al., PLoS One (2018).

P8.04 | Age-related Shifts in the Functional Lateralisation of Attention and Memory

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The inferior parietal lobe (IPL) contributes to the retrieval of episodic memories, and recent research shows a hemispheric lateralisation of function that relates to the distinction between perceptual and semantic memory experiences. The IPL also plays a key role in the allocation of spatial attention, which, importantly, exhibits a similar pattern of hemispheric lateralisation, with the left hemisphere engaged more by semantic information and the right by perceptual. Understanding how attention and memory work together to support memory as we age is critical. Here we used two landmark tasks developed to reliably measure spatial attention lateralisation and explore its relationship to the lateralisation observed in memory. Participants (N=187; 82 female), aged 35-73, completed four tasks including an object encoding task, a perceptually-based landmark task, a semantically-based landmark task, and an object recognition memory task. The results reveal an age-related change in attention specialisation. This is illustrated by a shift from a highly lateralised system dominated by the right hemisphere in younger adults, to a more bilateral system with increasing left hemisphere involvement in older adults. Moreover, hemispheric lateralisation of spatial attention differentially predicted perceptually-rich recollection performance in the two age-groups. To further investigate these age-related changes in attention specialisation, we developed two informationally distinct speeded-response tasks. Younger adults (aged 18-30) showed greater accuracy than middle-aged adults (aged 40-65) on the perceptual task, while the reverse pattern was observed on the semantic task. These combined results suggest an age-related shift from prioritising perceptual details during encoding to a greater emphasis on semantic details. This has implications for understanding early age-related memory change.

P8.05 | Adaptive Evidence Accumulation Supports Parallel Encoding of Competing Alternatives In Volatile Environments

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Decision-making in dynamic environments requires accumulation of sensory evidence in a context where the generative state producing sensory input can change unpredictably to favour either choice alternative. Prior research has shown that individuals adapt their belief-updating strategies in a near-optimal manner. In the normative solution for these tasks, posterior beliefs are restrained from overcommitting to a choice alternative by means of a non-linear scaling, facilitating changes of mind after potential state changes. However, it remains unclear whether the Centroparietal Positivity (CPP), a well-established neural signature of evidence accumulation, tracks this normative accumulation process in volatile contexts. We employed a perceptual contrast discrimination task in which 19 human participants viewed two alternating orthogonal gratings. Across 2–10 successive 160-ms samples, the relative contrast of the gratings was sampled from a Gaussian distribution favouring one of the two alternatives. The underlying generative state could stochastically switch at any sample during the trial. At the end of each sequence, participants reported the most recently favoured alternative. As expected, we observed a recency effect where choices were more heavily influenced by later than earlier samples, but all were choice predictive, indicating that participants accumulated throughout the trial. Correspondingly, the CPP tracked a decision process evolving across samples. Interestingly, the CPP did not decrease as expected at change points if it encoded a single differential decision variable (such as in classic diffusion processes), but instead ramped up further. Conducting time-resolved regressions of CPP amplitude against the variables derived from the normative model, we demonstrate that the CPP tracks the cumulative sum of absolute belief updates, rather than the absolute value of a normative decision variable. These results show that, in this context, the CPP is more closely linked to the dynamic process of belief updating than to the sustained encoding of beliefs. These results further suggest that neural populations representing the competing beliefs may be co-activated in parallel, supporting a representational architecture optimised for volatile environments. These findings have important implications for understanding the neural implementation of decision-making in volatile contexts and shed new light on the nature of the role that the CPP plays in perceptual decision-making.

P8.06 | Pubertal Maturity Dependent Longitudinal Deviations in Brain- and Cognitive Development

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Brain and cognitive development are linked with pubertal maturity. The onset of puberty has substantial individual variability, which is relevant in adolescent studies. In our earlier work, we estimated pubertal maturity levels based on bone age assessments, and compared cognitive and cortical development across groups of teens with accelerated, average and decelerated maturational tempo (aged 11-16 years). Employing WISC-IV to test a broad range of cognitive skills we found an advantage of the accelerated tempo (Kovács et al. 2022). In contrast, acceleration seemed to be a disadvantage in terms of hierarchical cortical organisation reflected by resting state EEG-derived entropy production (Szakács et al. 2024). We hypothesize that the differences in cognitive abilities may simply be a result of maturation-dependent development of local cortical networks, and will disappear at a later age. On the other hand, the accelerated disadvantage in entropy production may indicate an optimal maturational tempo for the formation of large-scale cortical networks, therefore the differences between maturity groups may remain in the long run.To test long-range effects, we reassessed the original adolescent cohort (T1) at the age of 17-21 years (T2). Relying on Gompertz growth modeling we projected the expected developmental trajectories. For each variable, T1 data were used to fit Gompertz models and estimate normative trajectories extrapolated into the T2 age range; these were then compared to independently fitted T2 models. Parameters were optimized using a nonlinear least squares algorithm with randomized initial values within bounded intervals to avoid convergence on local minima. Uncertainty was estimated via a Monte Carlo bootstrapping approach. Statistically meaningful deviations were defined as non-overlapping 83% confidence intervals between T1-based predictions and T2-fitted curves. T2 measurements significantly deviated from T1-based projections in both entropy production and cognitive abilities (Kovács, 2022), potentially indicating COVID-19 pandemic-related developmental setbacks in these variables. With a correction factor to compensate for the latter, we will present the longitudinal brain- and cognitive developmental trends describing accelerated, average and decelerated maturational groups. Keywords: brain development, cognitive performance, entropy production, pubertal maturity, longitudinal study. References: Kovács, I., Kovács, K., Gerván, P., Utczás, K., Oláh, Gy., Tróznai, Zs., Berencsi, A., Szakács, H., Gombos, F. Ultrasonic bone age fractionates cognitive abilities in adolescence. Sci Rep 12, 5311 (2022). https://doi.org/10.1038/s41598-022-09329-zSzakács, H., Mutlu,

M. C., Balestrieri, G., Gombos, F., Braun, J., Kringelbach, M. L., Deco, G., Kovács, I. Navigating Pubertal Goldilocks: The Optimal Pace for Hierarchical Brain Organization. Adv Sci 11, 2308364 (2024). https://doi.org/10.1002/advs.202308364

P8.07 | Ecological Auditory Mapping in Ieeg Using Cortify: A Tablet-based Paradigm Delivery Platform

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Mapping auditory and language function is a crucial step in the pre-surgical evaluation of patients with drug-resistant epilepsy. Intracranial EEG (iEEG) offers both excellent spatial specificity and temporal resolution, but the cognitive paradigms used in clinical settings are often limited in scope and difficult to implement at the bedside. We present Cortify, a tablet-based application designed to deliver auditory and audiovisual stimuli in iEEG environments. The tool allows for ergonomic and flexible administration of cognitive paradigms directly in the patient's room. Cortify synchronizes precisely with neural recordings of the clinical monitoring system using a custom hardware interface, ensuring stimulus – brain response alignment with millisecond-level accuracy. We validated Cortify by replicating standard auditory paradigms commonly used in clinical mapping, demonstrating that broadband evoked and high-frequency amplitude responses obtained with the tablet closely match those from traditional computer-based setups. We then extended the platform to support naturalistic speech stimuli, allowing the joint modeling of both lowlevel acoustic features and higher-order linguistic processing. Cortify provides a practical solution for integrating cognitive testing into routine clinical monitoring at the bedside. By facilitating ecological and engaging protocols without compromising data quality nor clinical monitoring, it enables researchers and clinicians to move beyond passive, repetitive tasks. Its portability and ease of use make it well-suited to diverse clinical contexts and patient needs. By bridging experimental flexibility and clinical usability, Cortify opens new possibilities for functional mapping in iEEG. Ongoing work focuses on extending its use to a broader range of paradigms and patient populations (e.g., childs).

P8.08 | Influence of Retinal Luminance Patterns and Overt Attention on Pupil Dynamics

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While pupil size is predominantly driven by luminance via the pupillary light reflex, other factors such as arousal, top-down cognitive control signals, and attention related processes have also been shown to influence pupil dynamics. However, we currently lack a comprehensive, biologically grounded model that integrates these signals in a mechanistic fashion. E.g., such a model is critically needed to disentangle the contributions of bottom-up and top-down attention on pupil size and to enable more accurate inference of the underlying neural processes in both research and clinical contexts. Here, we take initial steps to build such a model by focusing on two components of the pupil neural control system: luminance-driven modulations (the pupillary light reflex) and overt visual attention. We use a previously published nonlinear muscle model of the pupil and extend it to incorporate participant-specific gaze data collected during a free-viewing task. Data was collected from ~400 participants aged 5-93 years using a video-based eye-tracker (EyeLink-1000 Plus) that recorded monocular eye position and pupil size while participants viewed 10 movies (~1 minute each) composed of 15-17 clips (2-5 seconds each), featuring scenes of people, animals, building, and natural environments. Here we ask how visual-spatial attention mechanisms modulate pupil size to better capture pupil behaviour driven by retinal luminance patterns and salient visual features during naturalistic gaze behaviour. To generate individualised model inputs, we use gaze coordinates to map screen luminance (based on RGB pixel values) onto the retina, producing time-varying estimates of retinal input across eccentricity. Our analysis then proceeds in two steps. First, we estimate how bottom-up luminance at different retinal locations independently contributes to pupil size. Second, we incorporate top-down overt attentional signals using saccades. For each saccade, we extract luminance at the upcoming gaze target and generate an expected pupil response. These dynamics are included as an additional regressor, allowing us to estimate how attention-related signals influence pupil size beyond global lumiance. Together, these analyses suggest that incorporating spatial luminance and attentional signals may offer a better model fit to free-viewing pupil data.

P8.10 | Sensorimotor Beta Oscillations Support Rapid Consolidation of Implicit Motor Sequences

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New motor skills are developed 'online' during active practice and consolidated 'offline' at rest. Recent work has established that offline consolidation can occur rapidly across a scale of seconds during brief rest periods (i.e., micro-consolidation) (Bönstrup et al., 2019; Brooks et al., 2024). Beta oscillations across sensorimotor regions

are known to support motor skill consolidation in the hours-days following practice (Dayan & Cohen, 2011; Dyck & Klaes, 2024), but whether these same mechanisms are implicated in micro-consolidation remains unclear. Seventy-two participants (18-35 years, 40 female) completed 24 blocks of a serial reaction time task with their non-dominant left hand, with concurrent EEG recording (actiCap Brain Products, 64 channel 10-20 montage). Each block included a 10s practice period in which participants responded to visual cues which followed an implicit 12-item repeating sequence, followed by a 10s rest period. Significant improvement in keypresses per second was observed across the training period ($p < .001$, Cohen's $d = 2.35$). This learning was primarily attributable to micro-offline gains occurring during rest periods ($p = .029$, Cohen's $d = .064$). Event-related spectral perturbation (ERSP) analysis revealed increased beta power across sensorimotor EEG channels during rest, relative to active practice periods ($p < .001$, Cohen's $d = 1.04$). Our findings implicate sensorimotor beta activity in the early learning of an implicit motor sequence. Future research is required to establish the causal role of beta oscillations in the micro-consolidation of novel motor skills.

P8.11 | Neurocomputational Dynamics Underlying Multi-day Learning Impacts on Perceptual Decision-making

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It is well established that our ability to make perceptual decisions improves with practice, a process typically referred to as perceptual learning. However, considerable debate persists as to the precise neural adaptations underpinning enhanced perceptual capabilities through learning. In particular, it remains uncertain whether these improvements reflect modulations in early sensory processing and/or later post-sensory stages of the perceptual decision-making hierarchy. Hence, we sought to examine the impact of extended training on the neural mechanisms underpinning perceptual decision-making. To achieve this, we recorded 128-channel EEG data from 23 participants who performed a two-alternative contrast discrimination task over five consecutive days. In this task, they were required to discriminate the direction (left or right) of a tilted grating stimulus based on a change in the relative contrast between two overlaid grating stimuli. We examined earning-related adjustments in sensory evidence encoding (contrast-dependent steady-state visual-evoked potentials, SSVEPs), evidence accumulation (the centro-parietal positivity, CPP), and effector-selective motor preparation (premotor mu/beta). As expected, participants exhibited progressive improvements in response speed, accuracy, and miss rates across training days. EEG findings revealed significant increases in the sensitivity of sensory encoding signals (SSVEP) to the physical evidence and a corresponding increase in the build-up rate of evidence accumulation (CPP). In addition, motor preparation signals exhibited increased starting-levels of desynchronisation as a function

consistent with a lowering of decision boundaries. Together, these results suggest that learning was mediated by two primary mechanisms: (1) corresponding boosts in the representation of sensory evidence and rate of sensory evidence accumulation and (2) strategic adjustments to the decision bounds. In order to consolidate our interpretations, we will apply neurally-informed drift diffusion modelling. In particular, we will probe whether models that are constrained to match certain features of our neural data can provide equivalent or superior fits to behaviour compared to conventional models which typically only allow one parameter to vary as a function of learning.

P8.12 | Criterion Validation of the Riga Cognitive Screening Task With Brain Structure and Electrophysiological Markers

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Cognitive decline in aging and neurodegenerative disorders is characterized by complex neural changes, including cortical atrophy and disruptions in electrophysiological processing. While structural MRI provides detailed anatomical insights, electrophysiological markers like the P300 component offer a dynamic view of cognitive processing. Riga Cognitive Screening Task (RiTa) is a newly developed cognitive screening tool designed to provide a sensitive measure of cognitive decline. Given that cognitive decline is often accompanied by structural brain changes, this study investigates the relationship between RiTa performance, MRI-derived markers of cortical integrity, and P300 event-related potentials, aiming to assess the criterion validity of RiTa as a multimodal cognitive assessment tool. 49 older adults aged 56-84 (Mage = 68.02, SD = 6.781; 32.7% male) with varied cognitive functioning participated in the study. Cognition was assessed using the Riga Cognitive Screening Task (RiTa), which includes 12 tasks measuring orientation, semantic and working memory, reasoning, attention, inhibition, verbal fluency, and motor function. All participants underwent structural MRI scanning to assess cortical atrophy and completed an n-back task 2nd turn to elicit P300 potentials recorded from the Pz electrode. Spearman rank correlation analysis was conducted to assess the relationships between the variables. P300 Pz amplitude negatively correlated with orientation in time and space and inhibition (rs = -.308 and -.295, $p < .05$). Global cortical atrophy negatively correlated with semantic memory, reasoning, and delayed memory (rs = -.284 to -.296, $p < .05$). Left hemisphere medial temporal atrophy correlated with semantic memory, verbal fluency, and reasoning (rs = -.289 to -.413, $p < .05$), while right hemisphere

medial temporal atrophy correlated with verbal fluency and reasoning (rs = -.304 and -.329, respectively, $p < .05$). No relationship was found between cognitive variables and P300 latency. These findings partially support the criterion validity of the RiTa and highlight its potential as a clinically useful multimodal tool. The observed neurocognitive correlations suggest that RiTa captures both structural and functional aspects of cognitive decline. Future development will focus on enhancing its sensitivity to early-stage neural changes to support timely detection and intervention.

P8.13 | Comparing Human and Machine Emotion Recognition in Mimicked and Suppressed Facial Expression Conditions

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With the increasing integration of machine learning into affective sciences, questions about the relative sensitivity of humans versus machines in emotion recognition are becoming central to emotion science. In this study, we investigated how well machine learning algorithms compare to human perception in detecting emotional responses across different expression conditions. We recorded facial expressions, skin conductance responses (SCR), and subjective self-reports from 99 participants ($M = 24.9$; $SD = 6.41$, 38 men) exposed to emotionally evocative images under four distinct instructional conditions (mimic, express, exaggerate vs. suppress expression). Participants also rated images on emotional valence, arousal, and confidence of task attainment. Facial expression data were analyzed using the commercial FaceReader software (Noldus); we also aim to explore extending analyses with the open-source DeepFace algorithm. Preliminary results indicate clear habituation in SCR across repeated exposures in all conditions, characterized by a decline from high to low physiological response. However, no parallel habituation pattern was observed in the machine-detected facial expression outputs. Initial analyses suggest that human observers and FaceReader performed equally at recognizing mimicked happiness ($M = 0.69$; $SD = 0.31$ vs $M = 0.68$; $SD = 0.25$;), but human observers significantly outperformed FaceReader in recognizing mimicked disgust ($M = 0.54$; $SD = 0.34$ vs $M = 0.09$; $SD = 0.12$; $t(3492) = 19.94$; $p < 0.001$; $d = 2.86$) and sadness ($M = 0.23$; $SD = 0.17$ vs $M = 0.03$; $SD = 0.07$; $t(3492) = 9.32$; $p < 0.001$; $d = 1.33$). Additional results will be discussed. These findings highlight current limitations in automated emotion recognition and support the continued relevance of human judgment in affective research.

P8.15 | Age-related Behavioral Alterations Across Lifespan in Rat Model of Autism Induced by Valproic Acid

Manana Dashniani (Ivane Beritashvili Center of Experimental Biomedicine); **Nino Chkhikvishvili** (Ivane Beritashvili Center of Experimental Biomedicine); **Mariam Chighladze** (Ivane Beritashvili Center of Experimental Biomedicine)

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental disorder affecting the functioning of the brain. Much of the research on ASD has focused on children and adolescents, with very few studies focusing specifically on adults, older adults, or longitudinal data. To assess behavioural changes over the life span, the present study conducted behavioral experiments on control and prenatally VPA-treated rats at three ages: prepubertal adolescence (postnatal day 30); adult (6 months) and aged (22 months). To induce autism-like animal model, the pregnant rats were intraperitoneally injected 500 mg/kg NaVPA at the gestation day 12.5. The spatial memory was assessed in the Moris water maze (MWM). Social behavior was evaluated in a three-chamber apparatus. MWM experiments reveled that control and prenatally VPA-treated rats showed significantly decreased latency in reaching the hidden platform ($P<0.001$) and met the learning criteria by the end of the training period. During the probe test, which was performed 24 hours after task acquisition, the VPA-treated rats in each age group showed normal spatial memory abilities, but older rats in the control group exhibited a retention deficit. Assessment of social behavior showed that in the sociability phase of the task the VPA treated group showed the same interest in social contacts as the control group. In the social novelty phase, with an introduction of a novel rat into another wire cage, adolescent VPA-treated and control rats spent more time in the compartment with an unfamiliar rat and spent significantly more time sniffing the wire cage with unfamiliar rat than the cage with familiar ones ($p<0.001$). The VPA treated adult rats exhibited a significantly lower social approach than age matched controls ($p>0.05$). The preference for unfamiliar over familiar rat in adult and aged VPA treated rats as well as aged control rats were not statistically significant ($p>0.05$). In conclusion, we found that spatial memory function in VPA induced rat model of autism is relatively age-resistant, but social behavior is more sensitive to aging. We hope that further research will enhance our understanding of aging in an abnormal central nervous system. Supported by the funding from the SRNSFG: Grant #-FR-22-10650

P8.16 | Boundary Integration in Narrative Dynamics: Tracking Neural and Behavioral Signatures of Narrative Boundaries in Memory

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Understanding a narrative requires building a coherent situation model by segmenting information into discrete events, typically marked by shifts in time, space, or goals. While previous studies using multimodal stimuli suggest this segmentation relies on perceptual cues, we hypothesize that in written narratives event boundaries emerge more rapidly, often at the sentence level, because language can encapsulate an entire situation model within a single utterance. We hypothesized that written narratives are segmented at two hierarchical levels – fine-level boundaries corresponding to utterances, and coarse-level boundaries marking broader situational changes – and that both levels can serve as anchors for constructing a coherent mental model and organizing episodic memory structure. To test this, participants read stories word-by-word in a self-paced task, followed by a distractor and free recall; a second cohort completed the same task with EEG. Stimuli, adapted from Ding and Zacks (2025), included ten short narratives with two semantic conditions: Coarse-level Semantic (CS) narratives, where only coarselevel events were semantically linked, and Fine-level Semantic (FS) narratives, where only sub-events (utterances within coarse events) were linked. Reading times (RTs) increased at both utterance and event boundaries, were modulated by its semantic structure, and predicted later recall of the events. EEG data showed that fine-level boundaries elicited an N400 response suggesting rapid event model updating. These findings indicate that language-based event segmentation may also occur at the utterance level, reflecting compressed event representations and distinguishing it from segmentation in visual narratives.

P8.17 | The Seeing Emotion in the Eyes Test (SEE): A Psychometric Evaluation for Emotion Recognition Deficits in Neurological and Psychiatric Populations

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Impairments in socio-cognitive abilities, such as emotion recognition, are considered a transdiagnostic issues commonly observed in neurologic and psychiatric conditions. Standardized assessment of emotion recognition is critical for support diagnostic and rehabilitative processes. In this study, we evaluated the clinical usability and psychometric properties of a novel tool designed to assess emotion recognition through the eye region: the Seeing Emotion in the Eyes test (SEE). We recruited 52 patients with neurological or psychiatric disorders and 52 healthy controls (HC) matched for age, gender, and education. The clinical sample included individuals with acquired brain injury of various aetiologies (n=21), neurodegenerative conditions (Parkinson's disease and frontotemporal dementia, n=12), and schizophrenia spectrum disorders (n=19). All participants completed the SEE, and patients also took the Ekman 60-Faces test to identify emotion recognition deficits. Global cognitive functioning was assessed with the Montreal Cognitive Assessment (MoCA),

Frontal Assessment Battery (FAB), and theory of mind with the Story-based Empathy Task (SET). The SEE test showed excellent internal consistency in HC (Cronbach's $\alpha = 0.808$; Omega = 0.856). A one-tailed Welch's t-test showed that patients scored significantly lower than controls on the SEE total score (M = 21.52 vs. M = 26.29; $t(100.95) = -3.67$, $p < .001$). Based on the Ekman test, the 44% of patients (n=22) were classified as having emotion recognition deficits (i.e. defective group). ROC curve analysis (22 defective patients vs 22 matched controls) revealed good accuracy in classifying patients with emotion recognition difficulties (AUC = 0.819), with an optimal cutoff score of 21 yielding 72.73% sensitivity and 77.27% specificity. Positive and negative predictive values were 76.19% and 73.91%, respectively. Spearman's rank correlations showed that SEE scores were strongly associated with emotion recognition performance (Ekman test) in both defective and non-defective groups (pbonferroni < .01), but not with global cognition, executive functioning, or theory of mind measures. These findings support the SEE test as a psychometrically robust and clinically sensitive instrument for detecting emotion recognition deficits across diverse clinical populations. Its performance appears independent of general cognitive status, highlighting its potential as a transdiagnostic screening tool for socio-emotional dysfunction in psychiatric and neurologic patients.

P8.18 | Temporal Dynamics of Traveling Wave Direction in Response to Visual Stimulation

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During visual processing, human EEG recordings exhibit a distinct pattern of travelling waves in the alpha band: forward waves (FW), propagating from occipital to frontal regions, are dominant during active visual processing, whereas backward waves (BW), traveling in the opposite direction, are predominant in the absence of visual input. Results from previous experiments showed that the temporal dynamics of wave direction (switching between FW and BW) follow a stereotyped modulation driven by the visual stimulus. This most likely reflects largely stimulus-locked (evoked) wave components. However, previous findings and modeling work also suggest the presence of endogenous top-down modulation, specifically reflected in backward waves. In this work, we aimed at systematically characterize the waves' impulse response, which is needed to disentangle these exogenous and endogenous components. To this purpose, we quantified cortical travelling waves while subjects were exposed to rhythmic visual stimulation. Brief flash stimuli were delivered in sequences centered on one of two temporal frequencies (0.6 and 0.8 Hz). For each frequency, temporal predictability of the stimulus was varied in 3 conditions through the bandwidth

(including one perfectly predictable condition, a less predictable condition, and an unpredictable condition). A separate condition with a single, isolated stimulus presentation was included to estimate the impulse response in the un-adapted state. In all conditions, participants were instructed to detect a target embedded in the stimulus occurring at irregular intervals within the sequence. Preliminary results suggest that the dynamics of wave direction can be explained by a linear sum of the stimulus-locked impulse response. Contrary to our hypothesis, pre-stimulus BW waves show no modulation by temporal predictability. These results suggest that the dynamics of alpha wave directionality follow a predictable modulation by visual stimulation, with a return to an endogenous backward-directed baseline state. Our study will provide an important quantitative reference for future studies on alpha traveling waves and add new evidence to the question about their functional role.

P8.19 | Does Machine Generated Music Feel the Same? A Comparative Neuro-cognitive Exploration of Ai Generated and Human-made Clips

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It is no secret that we have already entered into the age of Artificial Intelligence (AI), which is rapidly taking over almost all aspects of life. One growing concern is the question whether AI can replace human creativity? Expression of emotions through art forms, creativity and improvisations is one of the most unique powers of human beings, and is probably one characteristic setting them apart from all other living entities. The question is, with technological advancements, is it possible to train AI, machines, and robots in such a way that they develop the power of reduplicating from the provided art-databases, which are widely available now. And if so, can the results surpass or even compete with human creations? Various software and applications have already been launched, which are capable of generating music of different kinds, as per the commands given. But are these generated audios at par with naturally created music and capable of affecting human perception similarly? Are the emotional content of both music comparable? And most interestingly, do the machine generated music affect human cognitive functions and characteristics in the same way as a human composed music does? All these questions have led to this study, where we have chosen to compare the two forms of music, each from the two basic emotion categories – happiness and sadness, from an existing music database as well as from a popular AI music generation platform – Mubert. First, from the existing database of The International Affective Digitized Sounds (2nd Edition; IADS-2): 4 previously annotated clips each of happy and sad music were selected. Next, using the popular Mubert AI and applying the same annotated clips of IADS-2 database as the prompt, 4 clips each of happy and sad music were generated artificially. In the next two steps, both psychological as well as neural response studies were performed to compare the impact of these two types of music on human cognition. For

the psychological response, data was collected from 100 naive participants, who were asked to rate the 10 emotions (happy, sad, calm, anxiety, amazement, anger, love, annoyance, admiration, interest) in a 5-point Likert scale intensity rating. From the total response, weighted average intensity of each emotion was computed for each of the 16 clips (8 natural and 8 AI-generated). The averaged intensity of the two basic emotions provide interesting results regarding the perception of AI generated and human-made music corresponding to different age groups. For the neural response study, EEG (Electroencephalography, a popular brain imaging technique) was performed on 5 participants where alpha EEG waves corresponding to all 16 clips as input signals were extracted. To study the non-linear and non-stationary EEG waves, robust non-linear technique Multifractal-Detrended-Fluctuation-Analysis (MFDFA) was performed to compute signal fluctuation complexity in the frontal, parietal, occipital and temporal regions of the brain. Results were compared for both the musical categories to understand how differently naturally-created and machine-generated music affected the human brain. The results were statistically verified with ANOVA tests. The present study is a step towards the scientific understanding of how efficiently AI can perform in the field of music creation and emotion generation. We believe this will lead to various novel information and contribute significantly to the balanced blend of technology and creativity in the domain of music production.

P8.20 | Are Neural and Behavioural Measures of Cognitive Control Associated With Adaptive and Maladaptive Risk-taking in Adolescence and Young Adulthood?

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Adolescence is often marked by engagement in risky behaviours. This behaviour has been attributed to a mismatch between slowly maturing cognitive control networks and overactive reward networks, leading to impulsive actions. However, evidence for this is inconsistent and these models do not account for individual differences or differentiate between adaptive and maladaptive risk-taking. More recent theories seek to address these issues, however emerging evidence largely relies on self-report measures. This study examines cross-sectional and longitudinal relationships between adaptive and maladaptive risk-taking and cognitive control in 15-35 year-olds assessed 2-4 years apart (n=73). Cognitive control was assessed using behavioural and event-related potential (ERP) measures derived from a cued-trials task-switching paradigm with electroencephalogram (EEG) recordings to derive behavioural (i.e., switch cost RT) and neural measures (i.e., switch positivity amplitude). Adaptive and maladaptive (i.e., impulsive) risk-taking were assessed using the risk adjustment score from the Cambridge Gambling Task and the probability correct score from the Information Sampling Task, respectively. Linear mixed effects models were used to

examine relationships between these measures, how they change over time, and how they are impacted by age. Cognitive control abilities appeared to peak in early adulthood, with a reduction in switch cost RT from Time 1 to Time 2 for adolescents, but an increase for adults. While the switch positivity amplitude did not vary by time point, it showed a decline with increasing age. There was an age by time interaction on impulsivity with scores increasing over time in adolescents, remaining stable in early adulthood, and declining after age 26. No effects of time or age were observed on risk adjustment scores. At a cross-sectional level, there were no significant relationships between cognitive variables and risk adjustment or impulsivity. However, longitudinal models revealed that switch positivity predicted impulsivity, but not risk adjustment. These findings support models that emphasise individual variability in cognitive control and impulsivity as more accurate predictors of risk behaviour than age alone. They also highlight the need for a consistent definition of constructs such as cognitive control, impulsivity, and adaptive risk-taking across different measurement levels.

P8.23 | The Neural Time-courses of Food Attribute Representations

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When we are at the grocery store, how do we choose which foods to buy? Multi-attribute utility theory posits that people make decisions by firstly appraising multiple attributes of each decision option, then computing an overall value for each option. Previous work has suggested that more basic attributes (e.g., tastiness) are represented more quickly than more abstract attributes (e.g., healthiness) and therefore may be given greater weighting in the decision process. Therefore, we sought to map the specific neural time-courses of different food attributes. In the current study, participants (N = 110) viewed food images while we recorded brain activity using electroencephalography (EEG). A separate group of participants (N = 421) rated the same food images on 12 attributes spanning nutritive properties (healthiness, calorie content, edibility, and level of transformation), hedonic properties (tastiness, liking, negative and positive valence, and arousal), and familiarity (previous exposure, recognisability, and typicality). We used representational similarity analysis to create and compare models of the EEG activity and the food attributes. We performed partial correlation analyses to determine at which time-points food attribute information was encoded in the neural activity. We also controlled for potential confounds associated with low-level visual features. We found that food attributes shared similarities in their time-courses of correlation with the EEG signals. We observed an early peak in the correlation (~200 ms) for healthiness, calorie content, level of transformation, negative and positive valence, and the familiarity attributes, which may reflect early attentional processes evoked by foods that differ in decision-relevant

features. We found later, more sustained windows of correlation for all attributes except arousal from around 400-650 ms, which may correspond to the appraisal processes before the integration of information towards a decision. Our findings suggest that salient features of foods capture attention at short latencies from stimulus onset, facilitating rapid and parallel appraisal of a food on multiple relevant attributes over similar time windows. This type of parallel encoding is contrary to the idea that attributes differ in the speed at which they are represented.

P8.25 | Investigating Individual Variability in Low Gamma Visual Entrainment Using Eeg

Hui Lo (National Taiwan University); **Philip Tseng** (National Taiwan University)

Sensory entrainment – using rhythmic sensory stimuli such as flickering light or sound – can noninvasively synchronize neural oscillations in the brain. Recent studies have highlighted the therapeutic potential of 40 Hz gamma-frequency sensory stimulation, particularly in reducing amyloid burden and improving cognition in Alzheimer's disease, as demonstrated in both animal models and human studies. With growing interest in this approach, optimizing stimulation parameters to enhance efficacy has become a critical goal. To investigate individual differences in responsiveness to gamma-frequency stimulation, we recruited 11 healthy volunteers to participate an EEG experiment. An initial 120-second eyes-open resting EEG was recorded, followed by stroboscopic flicker stimulation using a white LED panel at 11 discrete frequencies ranging from 35 Hz to 45 Hz (in 1 Hz increments). Each frequency was presented for 120 seconds, with a constant 1 ms on-time per cycle across all frequencies, rather than a fixed duty cycle. After each stimulation, an additional 120-second post-stimulation EEG was recorded to assess potential carryover effects. The order of frequency presentation was randomized across participants. To quantify the degree of lower gamma entrainment relative to the background activity, we compared the EEG responses using the signal-to-noise ratio (SNR) of the neural response at stimulation frequency. The SNR was calculated as the ratio of the amplitude at stimulation frequency to the average amplitude within the range of the surrounding ±2 Hz frequency band (excluding the stimulation frequency). Results revealed that all stimulation frequencies elicited significantly higher SNRs compared to baseline, indicating successful induction of steady-state visually evoked potentials (SSVEPs). However, no statistically significant differences in SNR were found between stimulation frequencies. We found that the frequency at which the highest SNR occurred varied across participants, suggesting that inter-individual variability in frequency responsiveness may outweigh frequency-specific effects at the group level. In summary, our findings demonstrate that visual entrainment in the low gamma range (35–45 Hz) reliably enhances EEG power at the stimulation frequency. However, no consistent frequency preference was observed across individuals, underscoring the importance of personalized approaches in future gamma entrainment interventions.

P8.26 | Multisensory Information is Integrated in Behaviour But Not in Early Sensory Representations of Audiovisual Stimuli

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The brain combines information across sensory modalities to infer the structure of the environment. As a result, input from one sensory modality (e.g., vision) can change our perception of inputs from another modality (e.g., audition). For example, in the ventriloquist effect, we perceive sounds as coming from a dummy's moving mouth rather their actual source. Crossmodal influences such as these might occur during early sensory or later cognitive processing stages, which have different implications for how the brain handles multisensory information. Here, we investigated whether information from one modality influences the early 'unisensory' representation from another modality. Across three separate conditions, participants (N = 48) were presented with streams of auditory, visual, or combined audiovisual stimuli at different locations along the horizontal meridian. Crucially, in the audiovisual condition, the auditory stimulus was horizontally offset to the left or the right of the visual stimulus. Participants were tasked with spatially localising the stimuli while their brain activity was recorded via EEG. Neural recordings from the unimodal auditory and visual conditions were used to train separate decoding models to build unisensory representations of stimulus location. We then tested these decoders with neural activity elicited by audiovisual stimuli to investigate how location predictions varied according to the two sources of conflicting information. More specifically, we asked whether a decoder trained on visual input localised audiovisual stimuli toward the offset auditory stimulus, and vice versa. By training the decoder on unimodal auditory or visual stimuli, any bias in audiovisual predictions would indicate a change in the unisensory representation of stimulus location. Participants consistently perceived the audiovisual stimulus to be between the actual location of the auditory and visual components, as expected. By contrast, the cross-trained decoders revealed no directional bias (i.e., they accurately localised the unisensory components of the audiovisual stimuli). In other words, unisensory neural representations of the audiovisual stimuli did were not shifted by under crossmodal conditions. These findings suggest that unisensory representations are robust to crossmodal influences, which may instead occur at later (e.g., decisional) stages in the processing cascade.

P8.27 | Assessing the Consequences of Abstraction in One-shot Perceptual Learning

Carlos González-García (University of Granada)

Achieving robust, long-term increments in knowledge after one single event is a remarkable feat that separates humans from other learning agents. This is the case

in one-shot perceptual learning, where priors are proposed to operate as internal models of the world to optimally parse ambiguous scenarios. However, the representational features of priors in one-shot perceptual learning are largely unknown. Here, I test the hypothesis that the extent to which an abstract representation of a perceptual episode is available will determine the success of online ambiguity resolution. I report the results of a behavioral series that systematically assessed the impact of independently manipulating sensory-specific and abstract priors using Mooney images, which are known to elicit strong oneshot learning effects. To affect abstract processing while preserving concrete aspects of the image, in some trials, both Mooney and unambiguous counterparts were presented upside down, which makes object properties more difficult to extract and impairs access to the semantics of the scene. In these trials, perceptual learning can formally take place (i.e., participants are exposed to a clear, not distorted version of the Mooney images), but I expected the impaired access to abstract information to impact behavioral indices. To manipulate low-level perceptual aspects while preserving abstract processing, in some other trials, unambiguous images were flipped horizontally, compared to the Mooney version of the same image. This manipulation disrupts the processing of concrete information since the pixel-to-pixel mapping changes from Mooney to gray-scale images but allows for the establishment of abstract priors. The results of a series of experiments with these manipulations showed that, as predicted, impairment of semantic access impacted certain indices of one-shot learning. However, they also reveal that participants can gain some information even in these situations or when the pixel-to-pixel mapping changes from ambiguous to unambiguous images. In sum, here I present initial evidence of the effects of abstraction (or lack thereof) in one-shot perceptual learning.

P8.28 | Unconscious Processing of Emotional Body Expressions: Evidence From Physiological Responses to Suppressed Body Stimuli

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Bodies convey intentions and emotions through posture and movement, making them highly salient cues for our visual system and for inferring others' psychological states. Although the role of facial expressions in conveying emotional information is well established, the extent to which body expressions serve a comparable function remains debated. Emotional processing is typically reflected in specific patterns of physiological arousal, which are often automatic and pre-conscious. In this study, we examined the pre-conscious processing of neutral and fearful body expressions using the breaking continuous flash suppression (b-CFS) paradigm. In this method, a dynamic, colorful Mondrian pattern presented to one eye temporarily suppresses target stimuli shown to the other eye, allowing their subliminal presentation. Stimuli consisted of neutral and fearful bodies, presented either upright or inverted.

Participants were instructed to press a button as soon as they detected something emerging from the mask and response times were recorded. During the task, we recorded electrodermal activity (EDA), pupil dilation, and facial electromyography (EMG) to assess physiological responses. Results showed faster detection for upright compared to inverted bodies, supporting the idea of prioritized configurational processing. Neutral bodies were detected faster than fearful ones, consistent with prior findings and likely due to the ambiguity of fearful expressions slowing down their detection. Pupil dilation was greater for inverted compared to upright bodies, reflecting increased cognitive demands, with differences emerging before conscious perception. Importantly, no emotion-specific autonomic responses were observed either during unconscious processing or following stimulus detection. This finding suggests that, in contrast to facial expressions, the emotional content of body expressions may not be processed at subcortical, pre-conscious stages but instead at later cognitive stages. Alternatively, the absence of emotional modulation might reflect the task demands, as participants were not explicitly instructed to attend to emotional content. To further investigate this possibility, we conducted a follow-up study that incorporates an explicit emotion recognition task. Ongoing analyses will clarify whether the limited pre-conscious emotional processing of body expressions reflects an intrinsic characteristic of bodily cues or depends on the extent to which attention is directed toward emotional features by the task.

P8.29 | Expecting the Unexpected in an Uncertain World: Can Adults With Subclinical Anxiety and Autistic Traits Learn Efficiently Under Different Sources of Uncertainty and in Different Environments?

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Navigating uncertainty is fundamental to adaptive learning, yet how individuals with subclinical anxiety and autistic traits process distinct types of uncertainty – stochasticity (irreducible noise) and volatility (unexpected changes) – remains underexplored. This study investigated whether adults from the general population can dissociate these uncertainties across perceptual and reward-based learning tasks and how anxiety and autistic traits moderate these processes. We hypothesised that participants would adapt learning strategies, exhibiting faster learning in volatile conditions and slower learning in high-stochasticity conditions, with anxiety and autistic traits moderating stochasticity's effects. A sample of 150 participants (aged 18-65, 74% female) was recruited via Prolific for an online study using the Gorilla Experiment Builder. Participants completed a reward learning task (2-armed bandit) and a perceptual learning task (cue-outcome association), each with small/large

stochasticity and stable/volatile conditions, alongside the Autism-Spectrum Quotient (AQ) and State-Trait Anxiety Inventory (STAI). Behavioural performance and learning rates were analysed using mixed-effects ANOVA, generalised linear models, and Rescorla-Wagner computational modelling. Moderation analyses assessed AQ and anxiety effects. Results confirmed adaptive learning across tasks, with faster learning rates in volatile compared to stable conditions and slower rates in high-stochasticity conditions. ANOVA revealed significant task-condition interactions ($F(3,894)=20.46$, $p<.001$, $\eta^2=.5803$), with stochasticity impacting perceptual learning accuracy more strongly (correct: 0.67 in perceptual task vs. 0.59 in reward task). Trait anxiety moderated stochasticity's negative effect on reward learning performance (beta=-0.107, p=.014), with higher anxiety linked to reduced accuracy in noisy environments. AQ scores moderated stochasticity's effect on reward learning rates (beta=-0.011, p=.020), suggesting more conservative strategies in individuals with higher autistic traits. No moderation was observed for volatility. These findings underscore domain-specific and domain-general mechanisms in uncertainty processing and highlight how subclinical traits influence learning under noise. Future research should employ advanced computational models to further elucidate these interactions, offering insights into transdiagnostic approaches for anxiety and autism spectrum conditions. Key terms: Decision-making, uncertainty processing, computational psychiatry, perceptual learning, reward learning.

P8.30 | Propagation of the N400 to Subsequent Words After Lexical Anomalies Depends on the Syntactic Attachment Point

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The N400 component is widely interpreted as an index of local semantic processing (individual word level), but its role in sentence-level meaning integration remains debated (Brouwer & Crocker, 2017; Hagoort, 2019). There is also growing evidence that the Late Positive Component (LPC) is elicited by efforts to integrate local meaning within sentence structure (Shen et al., 2016). We present an EEG study investigating whether the N400 and LPC are sensitive to syntactic attachment points. Specifically, we ask whether the N400 or LPC triggered by a lexical anomaly propagate to subsequent words, and whether this effect is modulated by constituent structure. We hypothesize that words following an anomalous lexical item within the same constituent would elicit an N400 or LPC, whereas equidistant words outside the constituent would not. To test this, we created 200 Italian sentences with a consistent SVO+Modifier structure: [Determiner, Noun, Verb, Determiner, Noun, Preposition, Noun]. Sentences were rendered semantically correct or anomalous by manipulating the congruency between the verb and the object noun. Half of the prepositional phrases (PPs) were attached to the object noun (Extended-DP condition), and half to the verb (VP-modifier condition), producing four conditions: Correct VP-modifier

(A customer books this table for tomorrow), Correct Extended-DP (A rabbit eats various herbs of the garden), Incoherent VP-modifier (A customer books this enemy for tomorrow), and Incoherent Extended-DP (A rabbit eats various levers of the garden). We controlled for semantic distance between the object and PP-noun using cosine similarity on word2vec vectors; DP-VP conditions did not differ significantly ($t = 1.012$, $p = 0.312$). Sentences were presented auditorily to 29 native Italian speakers. Cluster-based tests with Monte Carlo permutations revealed a significant ($p < 0.05$) centroparietal N400 at the object noun and a parietal-occipital LPC when comparing correct and incoherent sentences. The LPC extended to all subsequent words in anomalous sentences, independent of PP attachment point. In contrast, N400 effects at the noun within the PP appeared only in incoherent Extended-DP condition. These findings suggest that semantic integration difficulties cascade across the sentence, but the N400 is more sensitive than the LPC to constituent structure and syntactic dependency. References Brouwer, H., & Crocker, M. W. (2017). On the proper treatment of the N400 and P600 in language comprehension. Frontiers in Psychology, 8(AUG), 1-5. Hagoort, P. (2019). The neurobiology of language beyond single-word processing. Science, 366(6461), 55-58. Shen, W., Fiori-Duharcourt, N., & Isel, F. (2016). Functional significance of the semantic P600: Evidence from the event-related brain potential source localization. NeuroReport, 27(7), 548-558.

P8.31 | Audiovisual Multisensory Processing in Complex and Dynamic Contexts: A Behavioural Approach

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Multisensory integration underpins everyday decisions by allowing the brain to fuse information from several senses with stored knowledge. Most audiovisual (AV) studies, however, still employ static, simple designs, leaving the impact of multiple contextual variables in rich, dynamic scenes unknown. We used videos with both visual and auditory information, varying visual clarity (clear, blurred), semantic match (coherent, incoherent), cross-modal congruence and repeated concepts using different examples. Reaction time (RT) patterns served as behavioural distances for representational similarity analysis (RSA). We predicted (i) an interaction between visual transformation (blur) and AV congruence that would reduce RTs; (ii) main benefits of semantic coherence and of concept repetition through novel exemplars; (iii) that RT-based RSA would recover the six semantic categories represented in the stimulus set. Forty adults (18-40 yrs) performed a semantic AVmatching task. Each trial began with a cue indicating a semantic concept, followed by a target that was audio (A), visual (V), or AV. Visual inputs were clear or blurred; AV pairs were either semantically coherent or incoherent with the cue. Across four blocks, 105 concepts were presented once and later re-presented with a new exemplar. We computed mean RTs and

accuracies for each condition. RT data also served to compute pairwise distances between concepts (|ΔRT|), forming a 105 × 105 behavioural dissimilarity matrix. This matrix was compared with a binary semantic-category model (same vs. different category) via RSA. A repeatedmeasures ANOVA (Modality [A, V, AV-congruent, AV-incongruent] × Blur × Coherence × Repetition) tested the effects of sensory and semantic manipulations. A hierarchical GLM was also used to model RTs. RSA results were assessed using Spearman correlations between behavioural and model matrices. Main effects and their four-way interaction were significant ($p<.05$). Blur slowed V trials but sped AV trials, supporting inverse-effectiveness. Semantic coherence and repetition shortened RTs, with the strongest effect in blurred AV-congruent trials. The GLM explained 53 % of RT variance ($p<.001$). RSA confirmed that RT patterns reflected the six predefined semantic categories. RTs reveal how the brain re-weights sensory cues, resolves semantic conflict, and generalises across exemplars – offering a compact behavioural marker of multisensory integration shaped by conceptual category.

P8.32 | Control of Movement Vigor During Interpersonal Sensorimotor Coordination

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Humans exhibit an exceptional variety of interactive behaviors, many of which appear to carry rewarding value. In fact, the decision-making process which supports interindividual sensorimotor coordination (often referred to as joint action [JA]) inherently relies upon the subjective evaluation of the interaction. Yet we do not know whether this mechanism results in shaping the pace at which actions are planned and executed (i.e., movement vigor) in a JA setting. Here, we designed a behavioral. JA experiment to explore (in an ecological scenario) if movement vigor is sensitive to the request of mutual coordination inherently embedded in social interaction. We adapted a bimanual task to become an unimanual JA task where participants had to reach and unscrew the cap of a bottle which was held either by a confederate

(JA condition) or a mechanical clamp (No_JA condition). We investigated motor invigoration by measuring behavioral (reaction time [RT]; movement time [MT]), kinematic (velocity and acceleration) and kinetic (electromyography [EMG]) features of reaching movements. The results demonstrate that during JA interaction participants express higher movement vigor (compared to the control No_JA condition) characterized by shorter RTs and MTs, lower trajectory variability, and higher mean velocity and peak acceleration. Moreover, behavioral and kinematic results are complemented by kinetic evidences which show that such motor invigoration is reflected by earlier and higher EMG activation. Notably, this multi-scale pattern of modulations was absent in the return phase which follows action completion (i.e., after subjects reached their target), therefore ruling out trivial effects of other task constraints in explaining JA-dependent vigor modulations, and further suggesting that movement invigoration is specifically linked to actions directed towards haptic interaction with the partner. In conclusion, here we provide evidence, across multiple scales (behavioral, kinematic and kinetic variables), that joint action coordination modulates movement vigor, thus reflecting the fact that social interactive settings drive commitment and are inherently rewarding.

P8.33 | Neural Encoding of Articulatory Features in L2 Listening: Evidence for a Non-monotonic Relationship With Proficiency

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Speech perception benefits from the reconstruction of non-auditory information. In particular, motor processes can contribute by internally simulating the speaker's articulatory movements with increased engagement as task difficulty rises. However, it remains unclear whether this motor support depends on language proficiency. In this study, we investigated (i) whether second-language listeners exhibit neural encoding of articulatory features and (ii) how this encoding varies with individual differences in proficiency. We hypothesized, respectively, that internal articulatory simulation would occur during second-language listening and that its relationship with proficiency follows a non-monotonic function (i.e. Inverted U-shape). We recorded the electroencephalographic (EEG) activity of 26 native Italian speakers listening to English sentences, while performing a rhyming task to ensure attentive listening. Stimuli were selected from the USC-Timit dataset, which includes aligned audio and 3D kinematics of the speaker's vocal tract measured via electromagnetic articulography (EMA). Additionally, participants underwent two linguistic assessments: a comprehension test in which they listened to and transcribed English sentences, and a speech production task in which they read aloud other sentences. Objective performance scores were derived by computing the similarity between high-dimensional embeddings of participants' written and spoken outputs and the original stimuli, using the Wav2Vec2 network and OpenAI's text embedding model. These two highly

correlated metrics ($r = 0.77$, $p < 0.001$) were then averaged into a unified proficiency score. We used Partial Information Decomposition (PID) to measure unique EEG encoding of articulatory features (the amount of articulatory information the brain could not extract from the acoustic signal) in the Theta band. A cluster-based permutation test revealed significant unique encoding of articulatory features (one-tailed, $p < 0.05$). Encoding strength showed two opposing trends: it increased with proficiency at lower levels and decreased at higher levels. A piecewise regression model ($R^2 = 0.40$, p-value(B_0) = 0.434, p-value(B_1) = 0.003, p-value(B_2) = 0.001) captured this shift, supporting our hypothesis of two underlying phenomena: the progressive development of an acoustic–motor map in low-proficiency subjects, and a gradual reduction in reliance on motor support at higher proficiency levels, resembling the pattern observed in first-language studies, where articulatory encoding is reduced during less demanding listening tasks.

P8.34 | Cardiac Activity is Associated With Changes in Microstates of the Electroencephalogram

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The brain and the heart communicate bidirectionally, primarily through the autonomic nervous system. Among the tools for investigating this interaction, electroencephalographic (EEG) microstates – quasi-stable scalp topographies reflecting global brain integration – can offer novel insights into brain-heart dynamics, which is scarce in the literature. This study investigated the relationship between microstates and cardiac activity by simultaneously recording EEG and electrocardiograms from 103 healthy participants during resting state. Our analysis revealed temporal associations between specific microstates and cardiac events: microstates A, D, and E showed distinct probability of occurrence throughout the cardiac cycle, with microstate A exhibiting increased probability during R and T waves of the electrocardiogram. Furthermore, the occurrence probabilities of microstates A and E varied with the phase of low-frequency heart rate variability (LFHRV). These findings provide evidence for the coupling between peripheral cardiac processes and central brain activity, suggesting that EEG microstate patterns reflect cardiac-related activity.

P8.35 | Examining the Neural Networks Supporting Reading and Working Memory in Young Children

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Reading is closely linked to working memory (WM), as reading tasks usually involve simultaneous information processing and storage. The close relation between WM and reading could be because of overlapping activation patterns in their neural networks. It is therefore vital to better understand the extent to which reading and WM are subserved by common neural substrates, as it could facilitate the development of effective screening tools. This study used resting-state functional MRI (fMRI) to examine brain regions supporting reading and WM in young children. 16 Singaporean children (5-7 years; 10 males) were included in the analyses. Restingstate fMRI images (TR=1500 ms; TE=30 ms) were acquired using a Siemens Prisma 3T MR scanner. Reading and WM were measured using Singapore Ability Scales Word Reading and Test of Auditory Processing Skills-Fourth Edition Number Memory Reversed subtests. Standard pre-processing steps (including field map correction, slice-time correction, realignment and scrubbing) were performed on the fMRI data. Group independent component analysis (ICA) was performed, with 20 components extracted. Spatial correlation analyses identified components with the highest spatial overlap with the reading (including the inferior occipital gyrus (IOG), fusiform gyrus (FFG), superior temporal gyrus (STG), precentral gyrus (PrCG), intraparietal sulcus (IPS), supplementary motor area (SMA), inferior frontal gyrus triangularis (IFGtr), middle frontal gyrus (MFG), and thalamus (THAL)) and WM (including the middle occipital gyrus (MOG), SMA, MFG, FFG, PrCG and IFGtr) networks, which were confirmed by one-sample T-test (FDR-corrected<0.05). Region of interest (ROI)-ROI analyses demonstrated significant correlations between the regions of the reading and WM networks respectively. This study further investigated the relationship of the neural networks and cognitive performance on a smaller subset of participants (12). Multivariate Analysis of Covariance (MANCOVA) performed found significant association between WM performance and the PrCG (FDR-corrected<0.05); ROI-ROI analyses showed significant correlations between the WM network and WM performance, consistent with the current literature. However, no significant correlations were found between reading performance and reading network. Notably, the reading network was based on regions identified in a previous meta-analysis that included older children, which may explain the lack of significant findings in younger children, supporting the need for further research.

P8.38 | Longitudinal Evaluation of the Electrophysiological Plus Sensory Profiles of Young Children

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Early childhood is a sensitive period of development, marked by a high degree of cerebral plasticity, and high between and within individual variability in the acquisition of cognitive and social abilities. Electroencephalography can be used to study this cerebral variability and has revealed not only a high degree of heterogeneity between children, but also some intra-individual variability in certain children. Our aim was to explore maturation of electrophysiological sensory profiles with a longitudinal approach. 19 children (10 girls) aged between 2,5 and 6 years old (mean age at T1: 9.8 months (± 10) [30 64]) assessed at two points separated by 13.8 ± 1.1 months. Event-related potentials to stimuli in different sensory modalities (visual, auditive and tactile), and with different levels of complexity (stimuli of low perceptual level, complex and social stimuli) were recorded. For each participant, we analyzed ERP components peak amplitudes and latencies for each condition (modality by complexity level). Inter-trial consistency was included as a measure of intra-individual variability. A hierarchical cluster analysis on the Euclidian distance between participants calculated using the difference between T1 and T2 on all EEG parameters revealed 2 clusters (Cluster 1: N = 8; Cluster 2: N = 11). Preliminary analyses showed that children in cluster 1 had higher visuo-spatial abilities at T1 than children in Cluster 2 (p = 0 .053); however, age, sex and phonological abilities did not differ between clusters. In the visual blocks, ERP amplitudes between T1 and T2 decreased in cluster 1 but increased in cluster 2. P100 to complex stimuli was earlier in cluster 1 regardless of the condition. In the auditory domain, lateralization differed between clusters regarding both amplitudes and latency; and P1 amplitude war larger for voices in cluster 2. Deeper analyses are ongoing to further understand these two maturational profiles. This study provides evidence of different maturational profiles of children during the early childhood that appears more linked to visuo-spatial skills than chronological age. These profiles traduce different cerebral processing of sensory information. The main limitation of this work is the limited number of participants, considering the wide heterogeneity of cerebral development.

8.40 | When Fashion Meets (neuro)psychology: The Neurocognitive, Emotional and Behavioral Impact of Message Framing in Sustainable Clothing Choices

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Current literature reveals the existence of a gap between consumers' favourable attitude towards sustainability and their actual (ir)responsible clothing consumption patterns. In Europe this has a significant negative impact on climate, water and soil resources. Every year, 6 million tonnes of textiles are discarded by consumers. The need for strategies to raise awareness of consumer behaviour is crucial. We aim to understand whether information about clothing sustainability can influence neural activity and behaviours of the consumer, by assessing how different framing messages can influence neurocognitive and emotional evaluations and clothing purchasing behaviour. We will implement a multimodal approach, integrating brain activation measurement techniques (Electroencephalogram) with cognitive and emotional measures. Participants will be assigned to one of three groups, with each receiving one of three framing message conditions: positive, negative or neutral. Specifically, the positive framing messages will present information in a positive way (sustainable benefits), the negative present information in a negative way (environmental consequences) and the neutral. Research on message framing shows that the way certain messages are presented can influence how people react or feel. Studies have shown that individuals respond differently to the same information depending on whether it is presented in terms of gains (positive framing) or losses (negative framing). We will then assess how these different message framing conditions influence sensory evaluations (e.g., comfort, quality) of two different garments, one with a sustainable origin vs one that is non-sustainable. We expect participants to rate the sustainable t-shirt more favourably (H1). Next, we will administer a virtual shopping task where participants are given the choice to buy items with and without a sustainable logo. We expect that the group sensitized by the positive framing messages will present (H2) a greater acceptance of sustainable pieces during the shopping task, as well as (H3) a Prefrontal Asymmetry marked by more intense left cortical activity (related in the literature with positive/acceptance responses) to sustainable itens. These results may provide novel insights into how the framing of sustainability messages can modulate both brain activity and behaviour, offering a neurocognitive basis for designing more effective interventions to promote responsible fashion consumption.

P8.41 | The Rise and Fall of Decision Making During Physical Exercise

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Evidence regarding the effect of physical effort on cognitive performance is mixed, with some studies suggesting improvements, particularly at low to moderate intensities. The variability in findings is partly due to a lack of standardised protocols and the limitations of behavioural measures in capturing cognitive functions at the process level. In this study, we aimed to investigate how physical effort affects control parameters by combining a conflict task with cognitive modelling, administered at

established moderate and heavy intensity domains. To this end, thirty-two participants completed the Eriksen flanker task while cycling at 50, 80(90), and 110(130) Watts for females (males), respectively. During the exercise, we measured heart rate, oxygen uptake, blood lactate, and subjective ratings of physical and cognitive fatigue. Mixed-effects models revealed a significant decrease in reaction times with increasing intensity but no effect on accuracy. Interestingly, fitting the diffusion model of conflict (Ulrich et al., 2015) using the DMCfun package (Mackenzie & Dudschig, 2021), indicated this was driven by a linear decrease in boundary separation, an inverted U-shape in the drift rate parameter, but not by peak latency or amplitude. This suggests that participants exhibited reduced response caution at higher intensities, an initial improvement in attentional efficiency followed by a decline, consistent with the Yerkes-Dodson law (1908), but no differences in automatic activation by the distractors across intensities. Together, our findings offer new insights into the exercise-cognition relationship, highlighting the need for more sensitive indicators obtained through the modelling of behaviour.

P8.42 | Dissociable Spatiotemporal Dynamics of Object-based and Feature-based Internal Attention Revealed by Meg

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Internal attention plays a critical role in selectively prioritizing information in working memory (WM), enabling flexible, goal-directed behavior. However, it remains unclear whether attentional modulation operates through shared or distinct neural mechanisms when directed toward features versus objects – an important distinction for understanding content-specific dynamics of cognitive control. To address this, we designed a retro-cue paradigm with two task types: feature-based attention (Dimension Cue Task, with color and orientation cues) and object-based attention (Object Cue Task, with left and right cues). Both tasks were identical except for the cues, allowing for direct comparison of attentional mechanisms. Magnetoencephalography (MEG) data were recorded from 46 participants, and source localization estimated induced alpha power (8–14 Hz) during the post-cue interval. Regions of interest (ROIs) were defined by intersecting anatomically predefined masks with significant clusters from repeated-measures ANOVAs. Time course analyses of ROIs characterized dynamic cortical oscillatory patterns. Behaviorally, both cue types significantly improved WM precision compared to random cues, with object-based cues producing a greater retro-cue benefit than feature-based cues – suggesting more effective attentional prioritization. Neurally, object-based and feature-based attention followed a broadly similar temporal sequence, starting with early visual cortex engagement, that may reflect attentional reorientation in working memory. However, feature-based attention predominantly recruited a more focal, left-lateralized

network, while object-based attention engaged a broader and more sustained bilateral activation, particularly in regions associated with frontoparietal and cingulo-opercular networks. This more extensive and prolonged alpha suppression may underlie the enhanced behavioral benefit seen for object-based cues, as it likely supports more robust and flexible updating of memory representations. Together, these findings demonstrate that internal attention modulates working memory through dynamic, task-dependent brain networks. While both cue types show overlapping spatiotemporal patterns, the distinct processing pathways they engage highlight the flexibility of neural architectures that support internal prioritization. This dissociation underscores the importance of content-specific mechanisms in cognitive control and offers insight into how the brain allocates attention within memory to guide behavior.

P8.43 | Virtual Third Arm Embodiment: Prolonged Experience Affects Both Implicit and Explicit Incorporation of Extra Limbs

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The cognitive representation of the body is malleable, allowing for the incorporation of external effectors. In recent years, there has been a growing interest in the embodiment of supernumerary limbs, opening the door to the study of motor augmentation, which could be highly beneficial in the clinical field. Although promising, this area of research is still new and not fully explored. Therefore, our main objective is to understand the effect of prolonged exposure to an extra virtual arm (through an head-mounted display) on both implicit and explicit measurements of the embodiment phenomenon, while also analyzing the possible presence of an 'uncanny-valley' like effect. We expect an increase of extra arm embodiment across days in both implicit and explicit measurements, and a smoothening of a possible uncanny-valley effect across the continuous use of the virtual limb. On the first day, after familiarizing with the automatically moving extra arm, participants underwent a first "Embodiment" session, completing the Cross-modal Congruency Task (CCT), the Reachability Judgement Task (RJT), and two questionnaires – namely the Avatar Embodiment Questionnaire (AEQ) and the Human-Robot Interaction Evaluation Scale (HRIES). Subsequently, participants were required to actively control the third arm through diaphragmatic modulation in a reaching task. To conclude, participants repeated the "Embodiment" session. The same procedure was maintained for 5 days. To infer embodiment, we

analyzed the trend of the Cross-modal Congruency Effect (CCT) and the sample's performance in the "Far" condition (RJT) across days and sessions. We analyzed the individual items and indices' scores of the AEQ from Day 1 to Day 5 to study the shift in perception of the virtual extra arm; the same procedure was completed for the analysis of the HRIES, to explore the evolution of the uncanny-valley effect after the prolonged exposure. We can infer the effector's embodiment from the statistically significant results obtained in both CCT and RJT. As for the AEQ, there was a significant increase in the sense of Body Ownership and Agency across time. Lastly, in the last experimental day, subjects became acquainted with the virtual extra arm, seeing it as more "human-like" and less disturbing (HRIES).

P8.44 | How Does the Structure of Our Social Connections Manifest in Interpersonal Interactions and Inter-brain Dynamics?

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Each person is surrounded by a specific pattern of social connections. Some people might serve as links between distinct social groups, while others can be part of a single community. On the individual level, previous research has linked differences in social network structure to variations in brain network connectivity (Hyon et al., 2022) and neural responses to external stimuli (Baek et al., 2022; Schmälzle et al., 2017). On the group level, a person's importance in a social network has been related to behavior and neural dynamics in conversations with people from the same network (Sievers et al., 2024). But to what extent do social network characteristics predict behavior and brain dynamics in a bottom-up fashion – even if interacting individuals have never met before? We simulated a simple dyadic social encounter in the lab: strangers sat opposite one another wearing 64-channel EEG and produced circular movements with their right index fingers. They were free to synchronize or act independently, and a screen either blocked or allowed a view of their partner's hand. Afterward, each participant completed a survey detailing their social network, from which we derived 20 network parameters, such as density, number of friends, etc. We recruited 104 Danish volunteers, who formed 52 dyads (21 mixed, 16 male, and 15 female). Greater spontaneous movement synchronization was predicted by the smaller number of close friends in a dyad (corrected p-value < 0.01) and greater similarity across all network parameters (corrected p-value < 0.01). In addition, when leader-follower relations emerged, people with a larger number of network communities relative to the partner adapted (or "followed") less ($r = -0.54$, corrected p-value < 0.01). On a neural level, alpha and beta desynchronization were greater when the participants could see each other's hands, but we did not observe the expected increase in phasebased inter-brain synchrony in this condition. We plan to further investigate the inter-brain dynamics using more nuanced methods and relate that to social network parameters. The current findings point to a connection between the

way people construct their social networks and how they behave in new interactions with strangers.

P8.46 | Exploring the Dynamics Between Response Time Variability, Temporal Accuracy in Rhythm Tapping, and Language Abilities

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Converging evidence indicates that atypical rhythmic abilities may serve as a risk factor for difficulties in language acquisition. Our previous study (Kautto, Railo, & Mainela-Arnold, 2024) suggested that domain-general temporal variability in cognitive processes, reflected by response time (RT) variability, could contribute to individual differences in language abilities. In the present study, we further explored the relationship between RT variability, rhythm tapping accuracy and language skills, with the aim of enhancing our understanding of the underlying dynamics connecting these factors. RT variability in relation to language abilities has received little attention in earlier research and its relationship to individual differences in rhythmic abilities has, to our knowledge, not been studied before. Because of the rapid and rule-based nature of speech signal, both temporal precision and sufficient stability of processing are crucial for acquiring language, and thus deserve special attention in relation to individual differences in language abilities. We recruited 15-year-old participants (n = 223) from the STEPS Cohort Study. Language abilities were assessed using standardized tests. Participants completed tasks measuring rhythm tapping (self-paced and metronome-paced) and two-choice RTs (identifying presented character as a letter or a number). RT variability within participants was analyzed using a distribution fitting approach (expontentially modified gaussian). For rhythm tapping data, we calculated individual standard deviations for intervals between the button presses. We first modelled the relationship between these measures of variability and language abilities. As expected, strong language abilities were associted with lower within-individual variability in both tasks. We also explored the relationship between the two measures of temporal variability. Our preliminary results suggest that variability in RTs and temporal accuracy in rhythm tapping are related to some degree but may also have unique explanatory power to individual differences in language abilities. These results help bridge the gap between findings on intra-individual cognitive variability and rhythmic abilities in the context of language development. Kautto, A., Railo, H., & Mainela-Arnold, E. (2024). Introducing the Intra-Individual Variability Hypothesis in Explaining Individual Differences in Language Development. Journal of Speech, Language, and Hearing Research, 67(8), 2698-2707.

P8.47 | Co-varying Eye Movements and Power Modulations of Alpha Oscillations During Working Memory

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It is commonly agreed that power modulations in alpha oscillatory activity serve as an inhibitory neural mechanism, selectively routing information within cerebral circuits. In visuo-spatial attention, alpha oscillations enhance the processing of relevant targets and suppress potential distractors. However, there are inconsistencies regarding alpha power modulations with increasing load in common working memory (WM) tasks. Particularly, high WM load is associated with either decreased or increased alpha power, depending on the type of WM task deployed. This study (N = 120) utilized simultaneous EEG and eye-tracking to examine the relationship between alpha power modulation and oculomotor action in the context of an N-back and a Sternberg task. The study aimed to explore whether different gaze patterns during these tasks offer explanatory value in addressing the variations in alpha power with WM load. Preliminary analysis (N = 57) confirms the established modulations, where increasing WM load in the N-back task leads to a decrease in posterior alpha power, and, conversely, an increase of posterior alpha power in the Sternberg task. Furthermore, the tasks exhibited distinct gaze patterns, depending on the WM load condition. Most importantly, the modulations of posterior alpha power were associated with the concurrent changes in the gaze metrics.This study highlights a novel research avenue linking alpha oscillations, eye movements, and working memory, providing valuable insights for understanding the neural mechanisms underlying the brain's control of eye movements.

P8.48 | Caught Between Options: A Study of P300 Modulation by Task Difficulty in Probabilistic Reward Learning

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The P300 event-related potential (ERP) is a neural marker often linked to cognitive effort, typically showing reduced amplitude and increased latency with rising task difficulty. While these effects are well-established in structured cognitive tasks, less is known about how the P300 responds during probabilistic reward learning, where difficulty arises naturally from uncertain outcomes. This study tested whether task difficulty modulates P300 in a probabilistic reward learning task and compared

learning in gain- vs. loss-focused contexts. Twenty-three participants learned reward probabilities (0.7, 0.5, or 0.3) of three stimuli through feedback-based trial and error, followed by a testing phase requiring that they select one of two stimuli without feedback. Task difficulty was manipulated by varying reward probability differences and the availability of the highest-reward option. EEG was recorded from 64 channels and preprocessed using EEGLAB and ERPLAB. Data were filtered (0.1 – 30 Hz), ICA-cleaned, and segmented around stimulus onset. P300 amplitude and latency were extracted from Fz, Cz, and Pz (300 – 425 ms), and signal quality was validated using bootstrap-based signal-to-noise ratio thresholds. Behavioral data were analyzed using generalized linear mixedeffects models (GLMMs), ANOVAs, and chi-square tests. Results showed that participants learned to choose higher-reward options over time but struggled to distinguish between options with similar reward probabilities. Accuracy declined and reaction times increased with difficulty. Yet, reaction times did not systematically decrease over time, suggesting sustained deliberation. Moreover, contrary to expectations, participants responded fastest to the most rewarding stimulus but were slowest to avoid the least rewarding one, suggesting that hesitation and uncertainty, not learning strength, drove slower decisions. Loss-focused learning improved accuracy, particularly in difficult trials. Despite behavioral effects, P300 amplitude and latency remained unchanged, suggesting that difficultyrelated effects in this task were either driven by response conflict rather than cognitive resource depletion or that the overall task difficulty was too high to elicit measurable differences in neural processing.

P8.49 | Cross-modal Emotional Transfer Between Naturalistic Music and Art Stimuli: Associations With Behavioural Traits and Audiovisual Features

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Background: Recent work has documented associations between visual and auditory stimuli and specific emotions, and the ability for stimuli such as sad music to transfer its emotional content cross-modally to visual stimuli. Research has focused on simple, unnaturalistic stimuli and the effects of different auditory or visual feature combinations on emotional transfer remains unstudied. Furthermore, how emotional transfer effects may differ with neurodivergent conditions also remains unstudied. Experimental procedures: 40 (18-40; 30 females) participants, all Chinese international students quantified their autistic trait via the AQ50 survey. In the main task, participants undertook many trials in which they were presented cross-modally, one before the other, with emotionally salient music and art stimuli, of either positive, negative or neutral valence, and either emotionally congruent or incongruent across modalities. Participants then rated the likeability, emotional content and intensity of the latter-presented target stimulus and their perceived congruency of the stimulus pair. Hypotheses: Emotional transfer will occur more strongly and more reliably in trials with negative auditory primes than in positive and/or visual prime conditions

and in participants with lower autistic trait. Emotional transfer rates and intensities will also depend on audiovisual features of the stimuli and/or specific combinations of these features. Analysis: Multiple algorithms will be used to decompose the art and music stimuli into a range of features including colour, pitch, etc. Cross-decoder analysis and partial information decomposition of audiovisual integration areas will be used to identify neural correlates of cross-modal emotional transfer and a linear mixture model will identify its associations with autistic trait and audiovisual features of the stimuli. Results: Negative audio primes transferred emotion significantly more reliably than positive and/or visual primes, however there was no difference between positive audio primes and visual primes of either valence. Visual prime emotional transfer rates, particularly with positive primes, reduced slightly with autistic trait. Feature analysis is yet to be performed and is exploratory with no strong expectations of particular results. Discussion: These results show cross-modal emotional transfer with a bias for negative, auditory primes persists when using paired naturalistic stimuli, and suggest this paradigm may be useful for studying autism.

P8.50 | Effects of Synchrony on Behavioral and Neurophysiological Indices of Pain Empathy

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Digitally mediated interactions have become increasingly common in our daily lives, which has unclear implications for social cognitive and affective processes. Here, we sought to elucidate the influence of the presence of another individual on pain empathy. A previous study, comparing a direct, face-to-face interaction with live video calls, showed no change in behavioral empathic responses to the others' pain with reduced physical presence of the other person, whereas there were subtle neural and physiological presence effects on pain empathy. In the current study, we manipulated the synchrony within a social interaction ("temporal presence") by comparing a live video call to watching a prerecorded video. We hypothesized that the lack of synchrony would reduce behavioral and neural responses to others' pain. Thirty-five participants were alternately assigned to roles as targets and observers of painful electric stimulation, while their behavior and electrophysiological data were recorded. In eighty trials per presence condition, twenty levels of shock intensities were applied, and observers rated the targets' pain intensity and their own unpleasantness watching the targets. EEG analyses included hypotheses-driven time-frequency and exploratory whole timefrequency-electrode space analyses. Statistical analyses were conducted using linear mixed models, which tested an interaction of shock

intensity and presence condition. We found that reduced temporal presence led to conserved behavioral empathic responses to others' pain. Mu suppression, a common neural marker of empathy, was not sensitive to others' pain. Both hypotheses-driven and exploratory analyses revealed that midfrontal theta activity and right posterior alpha power were sensitive to observed pain intensity of others, but not to temporal presence. However, the latency of the increase in pain-related theta was longer in the "video recording" condition than in the "video call" condition. This indicates that mediated interactions have an impact on the temporal dynamics of resonating with others' pain. Our results suggest that the temporal presence of another person does not affect behaviorally assessed pain empathy and has only subtle neural effects when resonating with the others' pain. Future studies will need to examine the effects of social presence on empathy in more naturalistic settings and with attention to prosocial aspects of empathy.

P8.51 | Bimodal Emotion Recognition in Action Videogame Players: Does Gaming Influence Multisensory Emotion Integration?

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Recent studies suggest that action videogame players (AVGPs) exhibit superior attention control compared to non-videogame players (NVGPs) in various attentional tasks. However, the impact of gaming on emotion perception remains inconsistent. While most studies have focused on the visual domain, fewer have explored the multisensory integration of emotional social stimuli, particularly with dynamic stimuli. This is important as emotional processing often involves multiple sensory modalities. In the present study, eighty-one participants (41 AVGPs, 40 NVGPs) completed an "Emotion Categorization" task using audio-visual dynamic stimuli that conveyed four emotions (happy, angry, fearful, and neutral). These stimuli were presented either unimodally (face) or bimodally (face and voice). Participants categorized the facial emotional expressions in the visual modality while also attending to the auditory stimuli, as in the bimodal condition, they were required to determine whether the emotion conveyed by the voice was congruent or incongruent with the visual stimuli. Based on previous research, we expected both groups to perform best (slower

reaction times and increased accuracy) in the congruent bimodal condition, and worse in the incongruent bimodal condition. Importantly, AVGPs were anticipated to outperform NVGPs overall due to enhanced attention distribution across modalities, resulting in better performance. The incongruent condition was further explored to assess whether AVGPs were less affected by incongruence or experience greater interference while maintaining better overall performance. Finally, emotional processing in AVGPs was explored to determine whether they process angry stimuli more efficiently, as suggested by the General Aggression Model, or if no significant differences in bimodal emotional integration exist between the groups. Generalized linear mixed models were used to analyze accuracy (binomial distribution) and reaction times (gamma distribution), accounting for fixed effects (group, condition, emotion) and random effects (participant). Results revealed that AVGPs outperformed NVGPs in both accuracy and speed, without compromising their ability to signal incongruence. Moreover, AVGPs did not show differential responses to specific emotional content compared to NVGPs. These findings suggest that action videogame experience enhances emotional recognition and integration of emotional social cues across modalities, without supporting previous research linking this activity with worsened emotion recognition for specific emotions.

P8.52 | Moment-by-moment Phenomenology Combined With Eeg and Performance May Provide Novel Insights Into the Experience of Mild Cognitive Impairment

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Alzheimer's disease (AD) affects over 50 million people globally (World Health Organization, Dementia Factsheet, 2025). It can cause changes in conscious experience well beyond those observed during healthy aging (Huntley et al., 2021). To better elucidate phenomenological and neural changes associated with aging and AD, scientists at Bitbrain collected EEG data during a cognitive training neurofeedback task in healthy older adults and in participants with mild cognitive impairment (MCI). To enhance our understanding of conscious experience in MCI, this project also aims to pioneer the use of temporal experience tracing (TET) (Jachs et al., 2022; Lewis-Healey et al., 2024), which enables participants to retrospectively report their

memory of how their subjective experience evolved continuously over time, in MCI patients and assess its utility in that population. Our dataset comprises 8-27 EEG neurofeedback sessions with corresponding TET per subject across 33 healthy older adults (ages 60-80) and 17 MCI participants (ages 60-90), yielding hundreds of rich neurophenomenological recordings. Beyond the neurofeedback training, participants additionally completed periodic cognitive testing, using the Sternberg task (Sternberg, 1966), allowing exploration of the relationships among fluctuations in cognitive, neural, and phenomenological outcomes. Preliminary results from linear mixed-effects models suggest overall diverging TET time courses between MCI and healthy participants' traces for performance, control, mental fatigue, and mental effort. For example, in comparison to healthy participants, who reported increasing performance over the course of the session, MCI participants reported decreasing performance over time (FDR-corrected $p<5x10-7$). Additionally, MCI participants reported lower starting control and mental fatigue than did healthy participants, but both traces by MCI participants increased more rapidly (FDR-corrected $p<5x10-6$ and $p<5x10-5$, respectively) than did those for healthy participants. In addition to highlighting TET's potential to capture subtle differences in experience in this population, these results suggest altered temporal dynamics of conscious experience as a function of MCI. In combination with EEG and cognitive performance metrics in anticipated future analyses, this approach aims to uncover integrated neural, behavioral, and experiential signatures of cognitive decline, and to offer novel insights into the conscious experience of aging and early-stage dementia.

P8.53 | Effect Of Smartphone Use on Attentional and Pre-Attentional Information Processing

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Almost 70% of the world's population uses smartphones, and this number is growing. Using a smartphone is motivating as it offers immediate feedback and rapidly changing novel experiences. At the same time, it places high demands on information processing capabilities, as it requires processing information from multiple channels (i.e., multitasking). In this study, we experimentally examine whether acute smartphone use has positive (alertness, training) or negative (fatigue, errors) effects on attentional and pre-attentional information processing. A total of 86 people participated in the intervention study (aged 18-57, average age 28 years): one group was allowed to use their smartphone for 70 minutes between laboratory measurements, while the other group did not use a smartphone and instead engaged in traditional paper-pencil activities. To simulate real-life smartphone use, we asked participants to frequently switch activities during the intervention. Information processing was assessed before and after the intervention using various tasks (numerosity estimation, stop-signal task, 2-back working memory, vMMN vs. aMMN, i.e., visual and

auditory mismatch negativity measured a difference in averaged ERP curves for the rare deviant and frequent standard stimuli), and background questionnaires recorded smartphone usage (E-SAPS18, Smartphone Addiction Proneness Scale questionnaire, Kwon et al,., 2013, in Estonian Rozgonjuk et al., 2016) personality (EE.PIP-NEO short version, Mõttus et al., 2006); and emotional well-being (EEK-2, Aluoja et al., 1999). The study also asked for subjective fatigue ratings between tasks. The entire series of experiments demonstrates both positive and negative relationships between smartphone use and information processing. For example, the group with a high risk of smartphone addiction had worse auditory mismatch detection compared to the group with a low risk of smartphone addiction (when assessed based on mismatch negativity amplitude). At the same time, a training effect was observed in working memory performance, which was greater the higher was the E-SAPS18 score. The presentation provides a systematic overview of these results.

P8.54 | The Effects of Hippocampal Estradiol Receptors on Learning and Memory Processes

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The stress experienced during early postnatal life can significantly impact the stress-sensitive hippocampal regions in adolescents. To induce moderate stress during the early postnatal period (PN), we used the Chronic Immobilization Stress (CIS) model, applied from PN0 to PN20 (2 hours per day). Immobilization stress also caused social stress, as the pups were separated from their mothers, leading to both short-term and long-lasting negative effects. The hippocampal CA1 field contains both ERα and ERβ receptors, and estradiol's action on these receptors in this region plays a crucial role in modulating synaptic plasticity, learning, memory, and neuroprotection. Moreover, estradiol exerts both alerting and antidepressant effects. To determine which types of estradiol receptors are involved in mediating the cognitive changes induced by CIS, we identified both ERα and ERβ receptors in the hippocampal CA1 field using an immunoassay method at PN31 and PN80 in adult female rats (n=10 in each group). The impact of early-life CIS on cognitive function was assessed using the elevated multi-branch maze test, which is highly sensitive to hippocampal dysfunction at PN31 and PN80 in adult female rats (n=10 in each group). Data reliability was assessed using ANOVA. Increased corticosterone levels in response to early CIS led to a significant reduction in both ERα and ERβ content in the hippocampus at PN80 ($P \leqslant 0.01$), compared to intact rats. At this age, intact rats began avoiding dead-end branches of the maze from the third day of training. In contrast, CIS-treated rats

continued to make mistakes even on the seventh day of testing. In conclusion, both ERα and ERβ in the hippocampal CA1 region are involved in regulating neuroplasticity, synaptic remodeling, and cognitive processes such as memory consolidation. This is critical for both learning and protecting hippocampal neurons from stress-induced damage. The relative balance between ERα and ERβ in the CA1 field may determine the functional outcomes of estradiol signaling in the brain. A reduction in the levels of these receptors may negatively affect the rats' learning capacity. The research was supported by the Shota Rustaveli National Science Foundation N FR-22-1319

P8.56 | Event-related Potentials (ERP) Study of Associative Learning in Children and Adolescents

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Associative learning is fundamental for adaptive behavior, yet the developmental dynamics of EEG event-related potentials (ERPs) across different stages of associative learning remain underexplored. This study aimed at investigating the N1, P3, and N4 ERP components during both the learning and rehearsal phases of an associative learning task, with a focus on age-related changes. We hypothesized that ERP activity would decrease at later learning stage and in older participants. A total of 169 healthy participants were divided into three age groups: 7-11 years (N=49), 12-16 years (N=61), and 17-20 years (N=59). Participants completed 48 runs of a feedback-based, trial-and-error task requiring discovery of a covert rule linking the side of stimulus presentation (left/right) to the corresponding keyboard response. Only correct runs, in which the rule was acquired within the first three trials, were analyzed. EEG was recorded using a 64channel ANTNeuro eego mylab amplifier. Preprocessing in EEGLab toolbox included downsampling (512 Hz), bandpass filtering (0.3-40 Hz), interpolation of bad channels, ICA-based artifact removal, rereferencing to linked earlobes, and sliding window-based artifact rejection. Amplitude and latency values for N1, P3, and N4 were extracted for both stimulus onset and feedback events at early and late stages of each run. Data from anterior and posterior regions were averaged from nine electrodes around FCz and POz, respectively. Results were analyzed using Stage x Age x Sex repeated measures ANOVA. Early trials (1-3) showed shorter anterior N1 latency ($F=23.3$, $p<0.001$) and larger anterior ($F=91.7$, $p<0.001$) and posterior ($F=48.6$, $p<0.001$) P3 amplitudes in response to feedback compared to late trials (4-7). Younger participants had larger posterior P3 ($F=18.8$, $p<0.001$) and more negative anterior N4 ($F=22.0$, $p<0.001$) amplitudes to stimulus onset, as well

as longer anterior N1 latency (F=7.7, p=0.008), more negative anterior N1 amplitude (F=24.1, p<0.001), and greater posterior P3 amplitude (F=6.2, p=0.034) to feedback. These results indicate more intensive cognitive processing of feedback during initial rule learning compared to rehearsal, and a decrease in ERP amplitudes with age, suggesting increased neural efficiency. This research was funded by the Committee of Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. BR27198099).

P8.57 | Exposure to High Level of Testosterone During Fetal Development Impaired Social Behavior by Interrupting Neurexin and Neuroligin Binding

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Social communication disorder is a characteristic symptom of Autism spectrum disorder (ASD). Another curious characteristic of ASD is its remarkable gender differences. The male/female ratio for children with ASD is about 4 or 5 to 1. This gender bias is thought to be related to testosterone level during fetal development. Neurexin and Neuroligin are important synaptic adhesion molecules and responsible for the synapse formation or maintenance during the brain development. Both also have gotten a lot of attention as responsible genes of ASD. Neurexin binds to Neuroligin at synaptic cleft, and this intercellular binding might be the key event to the manifestation of social communication disorder. Thus, we hypothesized that ASD could be explained by the impairment in Neurexin and Neuroligin binding. In the previous study, we have found that testosterone interrupts the binding of Neurexin and Neuroligin in vitro, suggesting the roles of testosterone in the ASD onset. We have also found that the structure of Neurexin is similar to Sex-hormone Binding Globulin, and Neurexin also binds to testosterone, leading to inhibition of the intercellular binding of Neurexin and Neuroligin in vitro. Since there were no mutations in Neurexin and Neuroligin in our experiments, our results might explain the mechanisms of the sporadic ASD onset. Therefore, we hypothesize that high level testosterone interrupts NeurexinNeuroligin binding, leading to the synapse formation and social behavior deficits in vivo. We injected testosterone to pregnant mice and assayed their neonate brain. In our assay, Neurexin-Neuroligin binding was decreased by the testosterone injection. We also investigated the social preference behavior. Interestingly, male mice showed social novelty impairment, whereas female mice showed sociability impairment by testosterone injection. On the other hand, the performances of novel object recognition task and Y-maze task were not changed. Our results suggest the missing link of sporadic ASD-causing mechanisms by Neurexin, Neuroligin and testosterone.

P8.58 | Differential Engagement of the Multiple Demand Network During Semantic Processing of Words and Numerals

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Numerical semantics tend to engage a frontoparietal network more than non-numerical semantics. The differential engagement of frontoparietal regions could be attributed to visuospatially grounded place-value representations and a spatially-oriented "mental number line" in numeral processing supported by a domain general "multiple demand (MD) system". Alternatively, distinct systems could be engaged to represent numerical and non-numerical semantics regardless of difficulty. However, direct neural evidence for an enhanced frontoparietal engagement related to visuospatial working memory (VSWM) during numerical semantics processing remains limited, as inferences based on spatial overlap of brain activation could be an artifact of group-averaging. Focusing on the level of individual subjects, we hypothesized that semantic processing of numerals would engage the MD network more than non-semantic processing of numerals, and semantic and non-semantic processing of letter strings. Using a dense-sampling approach, ten adults completed four sessions of 3T fMRI scans. Participants completed a mixed block/event-related delayed-match-to-sample task comprising same-different judgments on digit strings, letters and novel characters, and magnitude comparisons involving multi-digit numerals or object words referring to physical size. A VSWM network localizer, often used to pinpoint the MD network, was used to define subject-specific MD regions involved in VSWM functionally (hereafter, "VSWM-MD"). We extracted VSWM responses from known MD regions during the encoding phase of each trial to isolate processing of character strings independent of decision-making responses. The VSWM-MD network responded significantly above baseline only for the same-different judgements of novel character strings, which were also greater than familiar alphanumeric characters, regardless of task demands. The lack of VSWM-MD network engagement for alphanumeric strings is consistent with findings that processing words and numerals becomes automatized with experience. Contrary to our prediction, semantic encoding of object words elicited greater VSWM-MD network engagement than encoding numerals in both hemispheres and encoding of nonwords in the left hemisphere. These findings suggest that semantic processing of words, particularly when grounded in physical object attributes, may place stronger demands on the MD network than processing of symbolic numerical magnitude. Crucially, the commonly observed frontoparietal activation for numerical semantics cannot be attributed to the recruitment of VSWM resources of the MD network.

P8.59 | Domain-general Effects of Musical Expertise on Cortical Entrainment to Naturalistic Music and Speech: A Meg Investigation on Professional Musicians

Noemi Bonfiglio (Basque Center on Cognition, Brain and Language); **Mikel Lizarazu** (Basque Center on Cognition, Brain and Language); **Jiaqi Mao** (Basque Center on Cognition, Brain and Language); **Anastasia Klimovich-Gray** (University of Aberdeen); **Nicola Molinaro** (Basque Center on Cognition, Brain and Language)

Recent frameworks of rhythm processing propose a common neural basis for processing speech and music, supported by a number of studies showing that musical training can benefit the speech domain. In these frameworks, auditory entrainment, the process by which cortical activity time-locks to the auditory input, is a key mechanism, which allows to encode salient information at moments of maximal neural sensitivity. Previous findings suggest that musical expertise enhances entrainment to both music and speech, particularly in difficult listening situations. Such domain-general effects might be due to increased sensitivity of the (sub)cortical auditory pathways to sounds, and/or to stronger connectivity between auditory and motor cortical regions, leading to increased top-down modulation of activity in the auditory cortex. In this study, we asked whether expertise-related increase in cortical entrainment would be elicited by naturalistic stimuli presented in clear listening conditions, and whether such effects would be related to audiomotor connectivity, measured as the phase relationship between auditory and motor cortices in delta (0-4 Hz) and theta (4-8 Hz) frequency bands. We compared MEG data from expert musicians and controls with no playing experience, while they listened to two-minutes short stories and excerpts of piano music. We quantified entrainment as the coherence between the MEG signal and the auditory stimuli, and found that musicians exhibit stronger entrainment than controls to both speech and music in delta band. Moreover, during speech listening, musicians showed stronger delta connectivity between STG and IFG in the left hemisphere; during music listening, they showed stronger delta connectivity between STG and premotor cortex and stronger theta connectivity between STG and primary motor cortex in both hemispheres. These connectivity measures did not predict the strength of entrainment, however, for speech stimuli, delta connectivity between left STG and left IFG predicted increased leftlateralization of entrainment in controls but not in musicians. We suggest that musical expertise increases sensitivity to acoustic features in the auditory cortex, leading to stronger entrainment, as well as audiomotor connectivity independently. Additionally, increased auditory sensitivity might render entrainment less reliant on modulations from regions outside the auditory cortex in clear listening conditions.

P8.60 | Effect of Dual-task Exercise on Cognitive and Physical Function in the Elderly With Mild Cognitive Impairment: A Randomized Controlled Pilot Study

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Background: Dual-task (DT) exercise training is a multidimensional exercise intervention that combines motor and cognitive tasks to affect the motor-cognitive interplay of the brain. Patients with mild cognitive impairment (MCI), which is associated with an increased risk of developing Alzheimer's disease, often need early intervention. We aimed to develop a DT exercise program and investigate whether it improves cognitive and physical function in elderly individuals with MCI. Methods: Twelve adults aged 65 years or older with MCI were randomized to either the exercise group (n=6) or the control group (n=6). The exercise group underwent 8-week, 3 times a week, 60-minute group exercise sessions, which included moderate-to-high intensity exercise and simultaneous cognitive tasks. The control group performed 60 minutes of light intensity home exercise 4 times a week for 8 weeks. Dual task cost (DTC), cognitive function, physical function, body composition, level of physical activity, and exercise psychology were assessed at baseline and after the intervention. Results: The exercise group exhibited significant improvements in DTC and cognitive function in the card sorting, verbal learning, Boston Naming, and Stroop Color and Word tests. In terms of physical function, the Short Physical Performance Battery, gait speed, and leg lean mass significantly improved. The exercise group showed significantly greater physical activity and satisfaction with the intervention than did the control group. There were no adverse events during the intervention. Conclusions: The DT exercise program improved cognitive and physical function in elderly individuals with MCI.

P8.61 | External and Internal Cue-target Overlaps Influence Memory Exclusion Task Performance But Not Selective Retrieval

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Selective retrieval occurs when individuals retrieve target memories which are relevant to their current goals, rather than retrieving other non-target memories. Previous research has shown that retrieval is more selective when external retrieval cues have high perceptual overlap with target memories, but non-selective when cues overlap more with non-target memories. This suggests that both external cues and internally-maintained memory goals are important. Here, we investigated the interplay between external and internal control and between target and non-target

cue overlap for achieving selective retrieval. In this behavioural and electroencephalographic (EEG) study, twenty-nine participants studied pictures and auditory names of objects, each paired with either a beach or an office scene. They then completed a memory exclusion task in which they judged whether each object name referred to an object studied as an auditory name with a target scene (beach or office). Targets therefore always overlapped strongly with both the external cue (the visual object name) and the internal goals (the representation of the currently targeted beach or office scene), but we varied the non-target overlap. Non-targets could overlap with external cues but not internal goals (auditory word studied with the non-targeted scene), or with internal goals but not external cues (picture studied with the targeted scene), or could overlap little with either (picture studied with the non-targeted scene). People rejected non-targets faster and more accurately than targets, but non-target rejection performance was reduced by overlap with either internal goals or external cues. Targets and non-targets elicited statistically indistinguishable left parietal event related potential (ERP) old/new effects from 500-800ms post-stimulus, relative to a new-item baseline, suggesting that recollection was not significantly target selective. Together, the data suggest that while targets were recollected as expected, high overlap non-targets at least were also rejected by being recollected. Individual differences in the left parietal ERP magnitude were also associated with accuracy for targets only, suggesting that the non-selective retrieval occurred despite a target prioritisation strategy (in line with instructions). These findings suggest that selective retrieval may be difficult when targeted and other memories cannot be distinguished by diagnostic internal and/or external cues.

P8.62 | An EEG Frequency Tagging Approach to Measure Automatic Phonetic Categorizations

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The human brain exhibits marked plasticity during development, with early linguistic exposure shaping phonetic sensitivity and language processing. Infants are born with perceptual sensitivities that extend to non-native speech sounds and that progressively attune to their native phonemic repertoire within the first year of life. Given the challenges of obtaining reliable behavioural responses from this population, a standardized electrophysiological measure that extracts fast, objective neural signatures of phonetic categorizations could offer a valuable tool for assessments in early ontogeny. To this aim, we validated in adults an EEG frequency tagging paradigm to automatically detect phonetic contrasts of speech sounds. In Experiment 1, we first tested the suitability of the phonetic properties of both native (Italian) and

non-native (Hindi) synthetic syllables through a two-alternative forced choice task in which participants were asked to discriminate syllables pairs that differed in consonant type. In Experiment 2, we implemented an EEG frequency tagging experiment, employing triplets of syllables presented at a base rate of 3.333 Hz, with oddball stimuli presented at 1.111 Hz (one every two standard stimuli) to detect brain automatic discriminations. Behavioural data from Experiment 1 confirmed that Italian participants accurately discriminated native syllables but performed poorly on non-native Hindi contrasts. Results from Experiment 2 showed robust neural responses at the base frequency, reflecting auditory tracking. Moreover, we found significant neural responses at the oddball frequency and its harmonics extracted from the EEG frequency-domain representation, revealing the sensitivity of this technique to detect automatic discrimination between different consonants with varying levels of discrimination difficulty according to their linguistic properties (manner, place and voicing) and exposure in early development (native vs. non-native contrasts). Our findings suggest that this paradigm may potentially be integrated into future assessments of linguistic abilities, offering a novel tool for tracking phonetic aspects of language in both typical and atypical auditory development especially when behavioral responses are difficult to be obtained, such as in early ontogeny.

The International Conference on Cognitive Neuroscience (ICON), established in 1980, has a long-standing tradition of promoting scientific collaboration and interdisciplinary exchange in the field of human cognition. Held in Porto, ICON 2025 brought together an international community of researchers to share new discoveries, ideas, and perspectives on the neural basis of cognition. This volume reflects the diversity and scientific excellence of the conference, capturing the spirit of collaboration in the field. The authors gratefully acknowledge the scientific contributions and dedicated support of the speakers, presenters, Scientific Committee, volunteers, sponsors, and all those who made ICON 2025 possible.

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