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12th MindBrainBody Symposium 2025

March 10-12, 2025
Berlin & Virtual

in the framework of the
International Brain Awareness Week

Mind
Brain
Body
Symposium

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MAX PLANCK INSTITUTE
FOR HUMAN COGNITIVE AND BRAIN SCIENCES
Department of Neurology

12th MindBrainBody Symposium 2025

Welcome

On behalf of Prof. Dr. Arno Villringer, we are pleased to welcome you to the 12th MindBrainBody Symposium (MBB Symposium 2025), which will take place in Berlin and virtual from 10 to 12 March 2025 during the International Brain Awareness Week. It is organized as part of the program of the **Max Planck School of Cognition (MPSCog).** We are looking forward to welcoming especially young scientists, i.e. postdocs, PhD students and students from the fields of cognitive and social neuroscience, cognitive psychiatry and neurology, psychology and behavioral sciences. The symposium program includes keynote lectures, workshops, applicant presentations, poster sessions with a poster prize and the MBB Young Scientist Award.

MBB Poster Prize

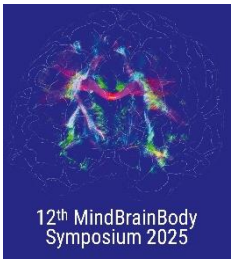
The best evaluated poster among the 110 submitted posters will be awarded the MBB Poster Prize. In previous years, the MBB Poster Prizes were awarded to:

2016: **Katie Groves** (University of Essex)
2017: **Lise Hobeika** (Sorbonne Universités), & **Toni Muffel** (MPICBSLeipzig)
2018: **Friederike Irmen** (Berlin School of Mind and Brain), & **Monika Graumann** (Freie Universität)
2019: **Lina Skora** (University of Sussex)
2021: **Angeliki Charalampaki** (Department of Psychology, HU; Mind&Brain, HU; BCCN; Berlin) & **Artur Czeszumski** (University of Osnabrück, Vrije Universiteit Amsterdam)
2022: **Polina Arbuzova** (Berlin School of Mind and Brain, Humboldt-Universität zu Berlin) & **Pablo Nicolas Fernandez Larrosa** (IFIBYNE, UBA-CONICET, Buenos Aires), &
S*pecial Prize* awarded to **Christoph Bamberg** (School of Psychology, The University of Auckland), **Sidney Carls-Diamante** & **Alice Laciny** (Universitaet Konstanz, Konstanz), **Marika Constant** (Humboldt-Universität zu Berlin), & **Elenor Morgenroth** (Ecole Polytechnique Federale, Lausanne)
2023: **Merve Kutli** (Department of Psychology, LMU Munich), **Sarah Meissner** (ETH Zurich), & **Jessica L. Hazelton** (Brain and Mind Centre, The University of Sydney)
2024: **Tahnée Engelen** (Ecole Normale Supérieure, Paris), **Marie Loescher** (Ecole Normale Supérieure, Université PSL, Paris), **Daniel Kluger** (University of Münster)

MBB Young Scientist Award

Applicants could submit a MindBrainBody project idea that can be carried out in a period of 3 to 6 months to be considered for the MBB Young Scientist Award, which offers to winners the opportunity of a funded research stay at the MindBrainBody Institute in Berlin or at the Department of Neurology at the Max Planck Institute for Human Cognitive and Brain Sciences. Collaborative projects with a home institution are also highly encouraged. Previous MBB Young Scientist Awardees were:

2016: **Paweł Motyka** (University of Warsaw) and Pietro Sarasso (University of Turin) 2017: Birgit Nierula (Institut d'investigacions Biomèdiques August Pi i Sunyer)
2018: **Dorottya Lantos** (Goldsmiths, University of London) & Marina Kliuchko (Aarhus University)
2019: **Alejandro Galvez-Pol** (University College London)
2020: **Mohammad Rostami** (Tarbiat Modares University), **Emma Louise Michalski** (Umeå University), & **Lina Skora** (University of Sussex)
2021: **Tahnée Engelen** (Ecole Normale Supérieure, Paris) & **David Haslacher** (Charité - Universitätsmedizin Berlin)
2022: **Aleksandra Herman** (Nencki Institute of Experimental Biology, Warsaw), **Irena Arslanova** (University of London) & **Shelby Bachman** (University of Southern California, Los Angeles) Supérieure, Paris)
2023: **Jellina Prinsen** (KU Leuven), **Aleksandra Piejka** (Polish Academy of Sciences, Warsaw) & **Sofija Perovic** (Istituto Italiano di Tecnologia, Sapienza University of Rome)
2024: **Niket Aggarwal** (IIT Kanpur, India)



12th MindBrainBody Symposium
March 10-12, 2025
Berlin & Virtual
Program

MAX PLANCK SCHOOL of cognition

Venue: Kaiserin-Friedrich-Haus, Robert-Koch-Platz 7, 10115 Berlin, Germany & Virtual (Time zone GMT +1)

Monday, March 10, 2025	
15:00 - 16:00	**Registration**
16:00 – 16:05	**Opening Remarks**
	Arno Villringer *(MindBrainBody; Max Planck Institute of Cognitive and Brain Sciences [MPI CBS], Leipzig)*
16:05 – 17:05	**Opening Keynote Lecture**
	Tor D. Wager (Dartmouth College, Hanover, New Hampshire) *A neuroscientific perspective on the self-regulation of pain and emotion*
	Chairs: *Arno Villringer & Rosa Grossmann (MindBrainBody; MPI CBS Leipzig)*
17:05 - 18:20	**Panel 1: Presentations by 5 Participants**
	Yuliya Kovalchuk (Charité − Universitätsmedizin Berlin; Max Planck School of Cognition) *Establishing Experience-Dependent Structural Variation of the Individually Mapped Somatosensory Genital Representation Field in Adult Women with Childhood Sexual Abuse Exposure*
	Ignacio Rebollo (German Institute of Human Nutrition [DIfE], Potsdam-Rehbrücke) *From Rest to Digest: How signals from the stomach interact with brain activity*
	Kristin Kaduk (German Primate Center [DPZ], Göttingen) *Neural activity in the dorsal pulvinar reflects cardiac modulation and influences cardiac and respiratory activity*
	Daniel Kluger (University of Münster) *A dynamic link between respiration and arousal*
	Tommaso Tosato (University of Montreal) *Performance modulations phase-locked to action depend on internal state*
	Chairs: *Marta Gerosa & Antonin Fourcade (MindBrainBody; MPI CBS Leipzig)*
18:20 - 20:00	**Reception during Poster Sessions**
18:45 - 19:30	**Poster Session A** **Posters Nr. A01-A24**
19:30 - 20:15	**Poster Session B** **Posters Nr. B01-B24**

Tuesday, March 11, 2025	
09:15 - 10:15	**Keynote Lecture 1**
	Nadine Gogolla (Max Planck Institute of Psychiatry, Munich) *Interoceptive cardiac signals guide emotion state coding in the mouse posterior insular cortex*
	Chairs: *Michael Gaebler & Mia Neubauer (MindBrainBody; MPI CBS Leipzig)*
10:15 – 10:45	**Coffee Break**
10:45 – 12:00	**Panel 2: Presentations by 5 Participants**
	Jost Blasberg (Institute for Psychosocial Medicine, University Clinic Jena) *Investigating facial mimicry in adolescents observing their parents under acute psychosocial stress*
	Aureen D'Souza (German Institute of Human Nutrition [DIfE], Nuthetal) *Affective responses are shaped by interoception and personality*
	Jelena Brasanac (Charité – Universitätsmedizin Berlin) *End-tidal CO2 saturation during circular breathwork supports the emergence of altered states of consciousness*
	Mateo Leganes-Fonteneau (University of Amsterdam; UCLouvain, Ottignies-Louvain-la-Neuve) *Mapping Acute Alcohol Effects on Bodily Sensations: A Cross-Dimensional Interoceptive Approach*
	Fiammetta Zanetti (University of Luxembourg, Esch-sur-Alzette) *Investigating the effects of a cardio-visual full-body illusion on embodiment and body image*
	Chairs: *Alexandra Piejka & Paul Steinfath (MindBrainBody; MPI CBS Leipzig)*
12:00 – 13:00	**Lunch Break**
13:00 – 14:20	**Sponsor Workshops**
	Christoph Aurnhammer & Niclas Brand (Mentalab GmbH) *Mentalab Mobile ExG Workshop*
	Fabio Barollo (ANT Neuro) *From mobile EEG to multimodal Brain-Body interactions assessment*
	Cecile Issard & **Zoe Scott** (NIRx) *fNIRS story fNIRS in motion: advancing neuroimaging for dynamic brain-body interactions*
	Chairs: *Eva De Poi & Firat Sansal (MindBrainBody; MPI CBS Leipzig)*

14:20 – 15:20	**Keynote Lecture 2**
	Markus Ullsperger (Otto-von-Guericke University, Magdeburg) *Neuro- and psychophysiology of performance monitoring*
	Chairs: *Vadim Nikulin & Emma Nesbit (MindBrainBody; MPI CBS Leipzig)*
15:20 – 15:40	**Coffee Break within Poster Session C**
15:25 – 16:10	**Poster Session C** **Posters Nr. C01-C24**
16:10 – 16:55	**Poster Session D** **Posters Nr. D01-D22**
17:00 – 18:00	**Keynote Lecture 3**
	Maria J. Ribeiro (University of Coimbra)
	The psychophysiology of temporal attention
	Chairs: *Lioba Enk & Paul Steinfath (MindBrainBody; MPI CBS Leipzig)*
18:30 – 21:30	**Social Evening (Optional)**
	Pizzeria Marienkäfer *https://www.pizzeria-marienkaefer.de* *Marienstr. 18, 10117 Berlin (Walking distance from the venue: 13 min)*

Wednesday, March 12, 2025

09:00 - 10:00	**Keynote Lecture 4**
	Veronica Witte (Leipzig University Clinic; MPI CBS Leipzig) *Exploring the impact of the gut-brain axis on cognitive aging and decision-making*
	Chairs: *Hadas Okon-Singer (University of Haifa) & Nadine Herzog (MPI CBS Leipzig)*
10:00 – 10:30	**Coffee Break**
10:30 – 12:00	**Panel 3: Presentations by 6 Participants**
	Carlotta Isabella Zona (University of Potsdam) *Label-induced categorization bias in 2D manual pointing*
	Michal Weiss (University of Haifa) *Developing a Machine-Learning-Based Diagnostic Tool for Fibromyalgia Using Multi Modal Approach*
	Carlos Ventura-Bort (University of Potsdam) *The Correspondence between Arousal and the Late Positive Potential using Representational Similarity Analysis*
	Irene Senatore (Berlin School of Mind and Brain, Humboldt-Universitaet zu Berlin) *Mapping Epistemic Priors of Hyperscanning Psychotherapy: The Asymmetry and Reciprocity Blindspots*
	Yvonne Serhan (University of Haifa) *The individuality of connectivity gradients arises from the complexity and dispersion of the embedded networks*
	George Fejer (University of Konstanz) *Altered States of Viscereality: Augmenting Breathwork with Bio-Responsive Virtual Reality to Induce Altered States of Consciousness and Spontaneous Shifts in Breathing*
	Chairs: *Tilman Stephani (Donders Institute, Nijmegen), Kim Hoffmann & Asli Akdeniz (MindBrainBody; MPI CBS Leipzig)*
12:00 – 13:00	**Lunch Break**
13:00 – 14:00	**Special Talks**
	Micah Allen (Aarhus University) *Noradrenergic Beta-Blockade Reveals Distinct Mechanisms of Cardiac and Respiratory Interoception*
	Lioba Enk (MPI CBS Leipzig; Max Planck School of Cognition) *Tracking citation diversity and representativeness – how and why?*
	Chairs: *Alina Studendova & Niket Aggarwal (MindBrainBody; MPI CBS Leipzig)*
14:00 – 14:30	**Coffee Break**
14:30 – 15:30	**Keynote Lecture 5**
	Ivan de Araujo (Max Planck Institute for Biological Cybernetics, Tübingen) *Brain-Body Regulation of Musosal Immunity*
	Chairs: *Maria Azanova & Fivos Iliopoulos (MindBrainBody; MPI CBS Leipzig)*
15:30 – 16:00	**Awards & Closing Remarks**
	Arno Villringer (MindBrainBody; MPI CBS Leipzig)

Keynote Lecture Abstracts

March 10, 2025 at 16:00-17:00

Public Keynote Lecture: **Tor D. Wager**

Department of Psychological and Brain Sciences, Dartmouth College
Hanover, New Hampshire, USA

A neuroscientific perspective on the self-regulation of pain and emotion

Emotion regulation is one of the most important capacities in the human cognitive repertoire. Neuroimaging studies over the past two decades have taught us much about its neural bases, and have led to a "modal model" in which effective regulation involves reductions in subcortical affect-generation processes. I present a series of studies that challenge this model in several ways. Our data show that regions and activity patterns related to early generation of affect are largely unaffected by typical emotion regulation strategies, and that affect generation may be more directly related to activity in transmodal cortical systems than previously thought. These studies also point to strategies that may be particularly effective at regulating early affect-generation systems, including combining self-regulation with classical conditioning and meditative states.

March 11, 2025 at 9:15-10:15

Keynote Lecture 1: **Nadine Gogolla**

Emotion Research Department, Max Planck Institute of Psychiatry, Munich, Germany

Interoceptive cardiac signals guide emotion state coding in the mouse posterior insular cortex

The insular cortex is a complex integrative hub. It processes internal and external sensory inputs, and represents and directly influences complex internal states, such as emotion, immune or homeostatic states. In my talk, I will discuss ongoing work from my lab aimed at dissecting how the insular cortex may integrate different information streams and behavioral variables into a coherent state representation. To this end, we performed whole-cell patch-clamp recordings of individual neurons, as well as single-unit recordings of neuronal populations in the posterior insular cortex during appetitive and aversive conditioning in awake head-fixed mice. To assess state-relevant sensory and behavioral variables, we measured conditioned appetitive and fear behavioral responses, as well as heart-rate activity, pupil diameter, bodily and whisker movement, as well as facial expressions. We then analyzed how these variables contribute to state coding either intracellularly within individual insular cortical neurons, or within insular neuronal populations. We find that the insular cortex combines different information streams to represent oppositely valenced emotion states. In doing so, it relies heavily on interoceptive signals from the heart. Indeed, using beta-blockers to interfere with adrenergic modulation of heart rate in the periphery strongly dampens emotion state representations in the insula.

March 11, 2025 at 14:20-15:20

Keynote Lecture 2: **Markus Ullsperger**

Otto-von-Guericke University Magdeburg

Neuro- and psychophysiology of performance monitoring

Performance monitoring is essential for successful and adaptive goal-directed behavior. Detecting own errors, unfavorable action outcomes, changing demands and novel or uncertain situations enables adaptations ranging from domain-general autonomic reactions and the orienting reflex to domain-specific adjustments in selective attention, action selection and decision making. In addition, performance monitoring also influences affect, motivation, and metacognition. After giving an overview of the neural representation of performance monitoring and post-error adjustments, I will discuss the interactions of conscious error detection ("error awareness") and neural as well as bodily responses. In the end I will present the effect of challenges to performance monitoring and error awareness by sleep deprivation and pharmacological interventions.

March 11, 2025 at 17:00-18:00

Keynote Lecture 3: **Maria J. Ribeiro**

University of Coimbra

The psychophysiology of temporal attention

Temporal attention, or the act of orienting attention to a point in time, enhances sensory perception and speeds up reaction time during the attended period. At the same time, it induces changes in body physiology, including cardiac deceleration and motor inhibition. However, the role of these physiological responses remains unclear. In this talk, I will present ongoing studies where we explore the relationship between perception of external sensory stimuli and changes in body physiology using temporal cueing protocols. Temporal cues induced changes in heart rate, breathing, pupil size, and motor output yet the impact of these responses on neuronal processing appears to strongly depend on task characteristics and is not always evident.

March 12, 2025 at 9:00-10:00

Keynote Lecture 4: Veronica Witte

Max Planck Institute for Human Cognitive and Brain Sciences; Leipzig University Clinic, Leipzig, Germany

Exploring the impact of the gut-brain axis on cognitive aging and decision-making

In this talk I will discuss a link between obesity, diet, and brain health, drawing on neuroimaging data from population-based cohorts and interventional trials. Results indicate that a higher body mass index and visceral fat correlate with accelerated brain aging, while interventional data suggest benefits from weight loss and plant-based diets on brain structure and function. In parallel, I like to share exemplary challenges that call for open science and a more holistic approach to study gut-brain interactions. Overall, previous work underlined the intertwined nature of nutrition, metabolism and brain health, advocating for targeted interventions as a means to enhance brain plasticity.

March 12, 2025 at 14:30-15:30

Keynote Lecture 5: Ivan de Araujo

Max Planck Institute for Biological Cybernetics, Tübingen, Germany

Brain-Body Regulation of Mucosal Immunity

Despite initial skepticism, it has been established that psychological states generated in the brain can affect critical body functions, such as immunity and mucosal barrier integrity. However, circuit models for such mechanisms are generally lacking. This presentation discusses recent developments in deciphering body-brain neuronal pathways, specifically those involved in the regulation of immune organs and defense against pathogens. The circuitry that enables the parasympathetic nervous system, via the vagus nerve, to regulate gut microbiome composition, mucosal permeability, and peripheral immunity will be emphasized. These circuits represent potential entry points for novel neural therapies targeting the immunological effects of psychological distress.

Special Talk Abstracts

March 12, 2025 at 13:00-14:00

Special Talk 1: Micah Galen Allen

Noradrenergic Beta-Blockade Reveals Distinct Mechanisms of Cardiac and Respiratory Interoception

Ashley Tyrer [1] & Micah Galen Allen [1, 2]
[1] Center of Functionally Integrative Neuroscience, Aarhus University, Denmark
[2] Cambridge Psychiatry, University of Cambridge, Cambridge, UK

Introduction: Interoception, the perception of internal bodily states, arises from intricate brain-body interactions across the autonomic and central nervous systems. Noradrenaline plays a pivotal role in perception, arousal, and brain-body interactions, yet its specific contributions to interoception remain poorly understood. In a placebo-controlled, within-subject study (N = 52), we leveraged Bayesian modeling of interoceptive psychophysics to investigate how beta-adrenoceptor antagonism, via beta-blockers, modulates interoceptive performance across cardiac and respiratory domains. ***Methods:*** Fifty-two healthy participants completed a double-blind, placebo-controlled, within-subject crossover trial testing the effects of two beta-blockers—bisoprolol (cardioselective) and propranolol (non-selective)—on interoception. Interoceptive performance was assessed using psychophysical tasks targeting cardiac and respiratory interoception. Hierarchical computational models quantified interoceptive sensitivity, precision, and metacognition for each condition (placebo, bisoprolol, propranolol). ***Results:*** Both beta-blockers significantly improved cardiac interoceptive sensitivity and metacognition ($p < 0.001$), with bisoprolol producing disproportionately greater effects on cardiac metacognition ($p < 0.01$). For respiratory interoception, both drugs enhanced precision ($p < 0.001$) without altering sensitivity or metacognition. Control analyses confirmed participants' unawareness of drug condition and ruled out expectancy effects or physiological confounds. ***Discussion:*** Our findings highlight a dissociation between central and peripheral noradrenergic mechanisms underlying interoception. Cardioselective beta-blockade appears to preferentially enhance metacognitive awareness of cardiac signals, while both selective and non-selective beta-blockade improve respiratory precision without affecting higher-order processes. These results shed light on how targeted modulation of noradrenergic pathways can differentially influence interoceptive domains. Future research will explore how beta-blockade shapes neural representations of cardiac signals, recorded via magnetoencephalography, to further elucidate the role of noradrenaline in interoceptive processing.

Special Talk 2: **Lioba Enk**

Tracking citation diversity and representativeness – how and why?

Enk, L. [1,2,3]
[1] Department of Neurology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig
[2] Diversity & Inclusion Committee, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig
[3] Max Planck School of Cognition, Leipzig

Introduction: Many academics would claim, in good conscience, that they cite works that have contributed to their own, regardless of who has published them. Yet, journals have recently introduced checklists probing for DEI ('diversity-equity-inclusion') actions taken, including sensitivity towards gender balanced citation practices – and indeed, first evidence suggests that a citation bias favouring men is present in neuroscience. When citation awareness is inquired, researchers may wonder how to efficiently track their citing, against which unbiased standard to compare it, and what might influence their citation selection subconsciously. The goal of this project is to automatize a tool that tracks citation diversity for individual use and for equal opportunity monitoring at an institutional level. ***Methods:*** The underlying pipeline is based on an automated service and openly available toolboxes (following Dworkin et al., 2020). Citation diversity is measured via gender and ethnicity approximated through the probabilistic origin of the first names of each publication's first and last authors. When assignment accuracy is low (<.80), publicly used pronouns are researched manually. ***Results:*** Thirty recent publications from the MPI CBS were checked on gender balance using a pilot version of the service (authoring dyads at first/last position: 9 F/F, 1 M/F, 10 F/M, 10 M/M). Following the exclusion of unassignable citations and self-citations, the average reference list with 102.13 (SD = 34.93) cited papers consisted of 10.68% F/F, 9.85% M/F, 21.21% F/M, and 58.26% M/M categorization. Publications by singular female [n: mean (SD) = 1.03 (1.47), median = 0] and male [n: mean (SD) = 8.45 (5.84), median = 8] authors were subsumed under F/F or M/M respectively. ***Discussion:*** This project has the potential to increase DEI measure acceptance through promoting individual reflection on citation practices and the diversity of one's referenced community. Concerns about subfield-specific benchmarking and the adequacy of such diversity approximation remain.

Sponsor Workshops

March 11, 2025 at 13:00-14:20

Sponsor Workshops 1: **Christoph Aurnhammer, Niclas Brand**

Mentalab GmbH

Mentalab Mobile ExG Workshop

This workshop offers a comprehensive introduction to the exciting field of mobile ExG (electroencephalography (EEG), electrocardiography (ECG), electromyography (EMG), etc.) and its applications in understanding the intricate relationship between mind, brain, and body. Participants will gain a foundational understanding of the technical principles behind these physiological measurement techniques, exploring how they capture electrical activity associated with brain function, cardiac activity, and muscle movement. We will showcase compelling examples of research highlights from diverse fields, including neurology (postural control in Parkinson's) and sports science (examining the EEG signature of athletic performance in archers). A highlight of the workshop will be a live demonstration of a real-time brain-computer interface (BCI) application, in which we will control a music synthesizer using brainwaves. This workshop addresses researchers, students, and anyone interested in the cutting edge of neuroscience, physiology, and technology.

Sponsor Workshops 2: **Fabio Barollo**

ANT Neuro

From mobile EEG to multimodal Brain-Body interactions assessment

Parallel to the increasing use of fNIRS in research, Virtual Reality is now used in an ever growing number of labs. We will present a mobile, high-density fNIRS system which integrates with VR, and also with additional measures such as EEG (natively built into the system) and peripheral physiological signals. We will demonstrate how all these tools are integrated and synchronized in order to provide a user friendly experience for researchers. We will also show how this integrated solution can be used in the real world, from simple lab tasks to experiments in the field. In addition, the fNIRS solution presented features a unique high-density design that makes it easier to deal with hair and have a high-level of comfort for participants.

Sponsor Workshops 3: **Cecile Issard & Zoe Scott**

NIRx

fNIRS in motion: advancing neuroimaging for dynamic brain-body interactions

This presentation will showcase functional near-infrared spectroscopy (fNIRS), a non-invasive neuroimaging technique with remarkable advantages, enhanced by our cutting-edge NIRx technology. It will highlight fNIRS's effectiveness in studying cortical oxygenation and brain-body interactions during movement. Its unique ability to allow participants to move freely makes it ideal for research in naturalistic settings. Additionally, the significance of fNIRS hyperscanning will be discussed. This capability is crucial for studying behavioral and neural synchrony during group activities like dancing, where brain and body coordination are vital. The session will conclude with a hands-on demonstration addressing key research challenges, including motion artifacts and motion-induced physiological changes that can impact data accuracy. It will illustrate how our advanced NIRx technology effectively overcomes these obstacles, ensuring high-quality data recording even during movement. By leveraging NIRx technology, researchers can gain valuable insights into the complex interplay between brain activity, body movements, and social synchronization.

Oral Presentation/Talk Abstracts

Panel 1

March 10, 2025 at 17:05-18:20

Panel 1 | Talk 1: Yuliya Kovalchuk

Establishing Experience-Dependent Structural Variation of the Individually-Mapped Somatosensory Genital Representation Field in Adult Women with Childhood Sexual Abuse Exposure

Kovalchuk, Y. [1,2], Schienbein, S. [1], Knop, A. J. J. [1], Bauer, M. [1,9], Brecht, M. [2,4,5,6], Haynes, J.D. [2,3,5,7], & Heim, C. [1,2,6,8]
[1] Charité − Universitätsmedizin Berlin, Institute of Medical Psychology, Berlin
[2] Max Planck School of Cognition, Leipzig
[3] Charité − Universitätsmedizin Berlin, Berlin Center for Advanced Neuroimaging, Berlin
[4] Department of Biology, Humboldt Universität zu Berlin, Berlin
[5] Bernstein Center for Computational Neuroscience, Berlin
[6] NeuroCure Cluster of Excellence, Berlin
[7] Institute of Psychology, Humboldt Universität zu Berlin, Berlin
[8] German Center for Mental Health, Berlin
[9] Charité – Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin and Humboldt-Universität zu Berlin

Introduction: Childhood sexual abuse (CSA) profoundly alters brain development. Previous research identified reduced cortical thickness in the genital representation area of the primary somatosensory cortex (S1) in adult survivors of CSA. However, the previous study did not individually map the genital field. It further remained unclear whether this structural change is the result of early developmental programming or driven by reduced sexual activity in adulthood. This study aims to clarify the neuroanatomical correlates of CSA in the genital cortex, using individual mapping and investigating the relative contribution of early abuse vs. adult sensory experiences. ***Methods***: Preliminary analyses suggest that exposure to childhood sexual abuse has a long-term impact on cortical thickness of the individually-mapped genital representation area of S1 in adult women, which was more pronounced in women who experienced abuse at an earlier age. No significant relationship was found between cortical thickness of the individually-mapped genital field and the frequency of sexual activity in the past year. ***Results:*** Preliminary analyses suggest that exposure to childhood sexual abuse has a long-term impact on cortical thickness of the individually-mapped genital representation area of S1 in adult women, which was more pronounced in women who experienced abuse at an earlier age. No significant relationship was found between cortical thickness of the individually-mapped genital field and the frequency of sexual activity in the past year. ***Discussion***: These early results suggest that the reduced cortical thickness in the genital representation field of S1 in survivors of CSA is driven by early, developmentally inappropriate and aversive sensory exposure. Future research should explore the functional implications of this neurostructural change for sensory perception, as well as investigate potential alterations in thalamocortical connectivity of genital cortex. Future studies should further establish whether reductions in cortical thickness as a function of CSA can be reversed.

Panel 1 | Talk 2: Ignacio Rebollo

From Rest to Digest: How signals from the stomach interact with brain activity

Rebollo, I [1], Banellis, L [2], Niia Nikolova [2], Park, S [1,3,4], & Allen, M. [2,5]
[1] Department of Decision Neuroscience & Nutrition, German Institute of Human Nutrition (DIfE), Nuthetal, Germany
[2] Center of Functionally Integrative Neuroscience, Aarhus University, Aarhus, Denmark
[3] Neuroscience Research Center, Charité-Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Neuroscience Research Center, Berlin, Germany
[4] German Center for Diabetes Research (DZD), Neuherberg, Germany
[5] Cambridge Psychiatry, Cambridge University, UK

Introduction: Signals from the gastrointestinal tract are continuously relayed to subcortical, cortical, and neuromodulatory brain structures, shaping spontaneous brain activity. The stomach generates a slow electrical rhythm (~0.05 Hz, or one cycle every 20 seconds), and fMRI studies have shown that brain activity fluctuates in sync with this gastric rhythm. However, these findings are based on limited sample sizes. This study aimed to replicate and expand previous findings in a larger samples while rigorously controlling for cardiac and physiological artifacts. ***Methods***: An extended network of cortical and subcortical regions showed significant coupling with the stomach. Using a liberal threshold, gastric coupling encompassed much of the cortex. A stricter threshold highlighted the "gastric network," predominantly involving sensory-motor and transmodal regions with significantly overlaps with previous reports of the gastric network using smaller sample sizes. Moreover, the gastric network overlaps with PET maps of different neurotransmitter systems including noradrenaline or serotonine, as well as gene expression and cerebral blood flows maps. Finally, we found significant coupling between the stomach and receptor enriched functional connectivity analysis of norepinephrine, suggesting that neurotransmitter release could be coupled to the stomach activity ***Results:*** An extended network of cortical and subcortical regions showed significant coupling with the stomach. Using a liberal threshold, gastric coupling encompassed much of the cortex. A stricter threshold highlighted the "gastric network," predominantly involving sensory-motor and transmodal regions with significantly overlaps with previous reports of the gastric network using smaller sample sizes. Moreover, the gastric network overlaps with PET maps of different neurotransmitter systems including noradrenaline or serotonine, as well as gene expression and cerebral blood flows maps. Finally, we found significant coupling between the stomach and receptor enriched functional connectivity analysis of norepinephrine, suggesting that neurotransmitter release could be coupled to the stomach activity ***Discussion***: This study demonstrates that brain-stomach coupling is widespread across the cortex during rest, even with stringent artifact correction. The large sample size revealed the full extent of the gastric network, supporting the role neuromodulatory pathways in stomach-brain coupling.

Panel 1 | Talk 3: Kristin Kaduk

Neural activity in the dorsal pulvinar reflects cardiac modulation and influences cardiac and respiratory activity Project proposal: Neuronal activity underlying stimulus-related changes in alpha rhythm amplitude

Kaduk, K. [1,2,6], Vasileva, L. N. [1,2], Schneider, L. [1,2], Bähr, M. [5], Kagan, I. [1,2,4], & Wilke, M. [1,2,3,4]

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Introduction: Increasing evidence highlights the thalamus's role in regulating the autonomic nervous system. The dorsal pulvinar (dPul), with its reciprocal connections to the central autonomic network (CAN), integrates multisensory information and is thought to be crucial for emotional processing. However, its direct influence on cardiovascular and respiratory activity, independent of emotional content, remains unclear. ***Methods***: We found systematic heart-related R-peak-triggered phasic modulation in the firing rate of many neurons (>50% of a sample based on multiple inclusion criteria) in dPul, ventral posterior lateral (VPL), and mediodorsal (MD) thalamus during both rest and task. In addition, many neurons showed predominately positive significant correlations between their firing rate and the heart rate. Pharmacological suppression of dPul reduced task-related performance in all three monkeys and resulted in physiological changes, including decreased heart rate variability (RMSSD) and respiration rate in one monkey and decreased heart rate and increased RMSSD in another monkey. These inactivation-induced changes were reproducible across sessions and did not significantly differ between rest and task conditions. ***Results:*** We found systematic heart-related R-peak-triggered phasic modulation in the firing rate of many neurons (>50% of a sample based on multiple inclusion criteria) in dPul, ventral posterior lateral (VPL), and mediodorsal (MD) thalamus during both rest and task. In addition, many neurons showed predominately positive significant correlations between their firing rate and the heart rate. Pharmacological suppression of dPul reduced task-related performance in all three monkeys and resulted in physiological changes, including decreased heart rate variability (RMSSD) and respiration rate in one monkey and decreased heart rate and increased RMSSD in another monkey. These inactivation-induced changes were reproducible across sessions and did not significantly differ between rest and task conditions. ***Discussion***: We conclude that the neural activity of the dorsal pulvinar is modulated by the cardiac cycle during rest and task. Notably, dPul inactivation altered heart rate and variability, and respiration rate, highlighting its involvement in brain-body interactions and body state-related processing. This challenges the traditional view of pulvinar as purely visuospatial attentional structure.

Panel 1 | Talk 4: Daniel Kluger

A dynamic link between respiration and arousal

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Introduction: Viewing brain function through the lens of other physiological processes has critically added to our understanding of human cognition. Further advances though may need a closer look at the interactions between these physiological processes themselves. Here we characterize the interplay of the highly periodic, and metabolically vital respiratory process and fluctuations in arousal neuromodulation, a process classically seen as nonperiodic. ***Methods***: After substantiating a robust coupling in the largest dataset, we further show that coupling strength decreases during task performance compared with rest and that it mirrors a decreased respiratory rate when participants take deeper breaths. Taken together, these findings suggest a stronger link between respiratory and arousal processes than previously thought. ***Results:*** After substantiating a robust coupling in the largest dataset, we further show that coupling strength decreases during task performance compared with rest and that it mirrors a decreased respiratory rate when participants take deeper breaths. Taken together, these findings suggest a stronger link between respiratory and arousal processes than previously thought. ***Discussion***: Moreover, these links imply a stronger coupling during periods of rest, and the effect of respiratory rate on the coupling suggests a driving role. As a consequence, studying the role of neuromodulatory arousal on cortical function may also need to consider respiratory influences.

Panel 1 | Talk 5: Tommaso Tosato

Performance modulations phase-locked to action depend on internal state

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Introduction: Previous studies have shown that voluntary actions can modulate perceptual performance at specific frequencies, but findings have been inconsistent across studies. We investigated whether perceptual performance shows rhythmic modulation following self-paced motor actions in a large sample size using robust statistical methods. ***Methods***: While no significant rhythmic modulation emerged when analyzing all trials together, we found a consistent ~17 Hz modulation in detection performance during specific conditions: 1) during periods of low overall performance, 2) in trials following missed detections, and 3) in participants who made no false alarms. These effects were significant in both fixed- and random-effects statistical tests. The modulation was accompanied by reduced pupil diameter and increased microsaccade rate, suggesting links to attentional state. ***Results:*** While no significant rhythmic modulation emerged when analyzing all trials together, we found a consistent ~17 Hz modulation in detection performance during specific conditions: 1) during periods of low overall performance, 2) in trials following missed detections, and 3) in participants who made no false alarms. These effects were significant in both fixed- and random-effects statistical tests. The modulation was accompanied by reduced pupil diameter and increased microsaccade rate, suggesting links to attentional state. ***Discussion***: Our findings indicate that action-related perceptual rhythms are not uniformly present but emerge under specific internal states, particularly during periods of lower attentional engagement or higher detection criteria. The consistent modulation at ~17 Hz suggests involvement of beta-band neural oscillations in linking action and perception. This work helps reconcile mixed findings in the literature by demonstrating how internal states can gate the expression of perception-action coupling.

Oral Presentation/Talk Abstracts
Panel 2

March 11, 2025 at 10:45-12:00

Panel 2 | Talk 1: Jost Blasberg

Investigating facial mimicry in adolescents observing their parents under acute psychosocial stress

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Introduction: Empathic stress, the spontaneous reproduction of psychosocial stress by mere observation, has been shown to occur between strangers, romantic partners and in mother-child dyads. However, the mechanisms by which stress is transmitted have yet to be understood. We investigated whether facial mimicry is not only a precursor for empathizing with specific affective states, but also modulates the transmission of psychosocial stress. ***Methods***: A exploratory factor analysis revealed two facial mimicry factors, with the former encapsualting a variety of complex negative expressions and the latter descriptively positive expressions. Furthermore, we found that both subjective and HF-HRV reactivity were boosted by higher adolescent mimicry of parental negative facial expressions, suggesting a pathway of stress transmission. ***Results:*** A exploratory factor analysis revealed two facial mimicry factors, with the former encapsualting a variety of complex negative expressions and the latter descriptively positive expressions. Furthermore, we found that both subjective and HF-HRV reactivity were boosted by higher adolescent mimicry of parental negative facial expressions, suggesting a pathway of stress transmission. ***Discussion***: In conclusion, this study investigated a novel approach in measuring facial mimicry using digital biomarkers derived from videos using a deep neural network. Facial mimicry appears to play an important part in the empathic sharing of parental stress.

Panel 2 | Talk 2: **Aureen D'Souza**

Affective responses are shaped by interoception and personality

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Introduction: People react differently to the same emotional stimuli, but what drives this variability? Here, we show a systematic link between affective experience and individual traits such as personality, anxiety and crucially, interoceptive awareness, i.e. the ability to sense bodily signals and its interpretation. ***Methods***: We identified three distinct participant groups based on hierarchical clustering of questionnaire responses. A "Body-Unaware" group characterized by low interoception, a "Body-Aware" group defined by high interoception and low anxiety, and a "High Anxiety" group marked by increased anxiety and neuroticism. These groups exhibited distinct emotional responses. The Body-Unaware group displayed significantly smaller emotional granularity, with similar subjective ratings across emotional categories. The Body-Aware group experienced significantly more widespread bodily sensations in response to videos, indicating greater body-related emotional engagement. The High Anxiety group showed similar patterns of bodily sensations across video categories, reflecting more stereotypical emotional responses. The three groups also exhibited distinct patterns in how affective ratings mapped onto their bodily sensations. Furthermore, they also showed distinct patterns in how mood moderated the ratings and bodily sensations. ***Results:*** We identified three distinct participant groups based on hierarchical clustering of questionnaire responses. A "Body-Unaware" group characterized by low interoception, a "Body-Aware" group defined by high interoception and low anxiety, and a "High Anxiety" group marked by increased anxiety and neuroticism. These groups exhibited distinct emotional responses. The Body-Unaware group displayed significantly smaller emotional granularity, with similar subjective ratings across emotional categories. The Body-Aware group experienced significantly more widespread bodily sensations in response to videos, indicating greater body-related emotional engagement. The High Anxiety group showed similar patterns of bodily sensations across video categories, reflecting more stereotypical emotional responses. The three groups also exhibited distinct patterns in how affective ratings mapped onto their bodily sensations. Furthermore, they also showed distinct patterns in how mood moderated the ratings and bodily sensations. ***Discussion***: Our findings reveal that inter-individual variability in affective experience is systematically linked to interoception, personality and mood, emphasizing the embodied nature of emotions. These insights highlight the importance of individual traits in shaping emotions, with implications for understanding clinical populations and informing personalized therapeutic interventions targeting the interplay between interoception and emotional regulation.

Panel 2 | Talk 3: **Jelena Brasanac**

End-tidal CO2 saturation during circular breathwork supports the emergence of altered states of consciousness

Brasanac, J.*[1], Havenith, M.N.*[2], Leidenberger, M.*[3], Corvacho, M.[3] , Figueiredo, I.[3], Schwarz, L. [3], Uthaug, M. [4], Rakusa, S. [3], Bernardic, M. [3], Vasquez-Mock, L.[3], Pérez Rosal, S. [3], Carhart-Harris, R. [5], Gold, S.M. [1], Jungaberle, H.[3], & Jungaberle, A.[3]

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* Equal contribution

Introduction: Altered states of consciousness (ASCs), such as those achieved in psychedelic-assisted therapy, show promise for treating mental health disorders but face accessibility challenges due to legal, medical, and financial barriers. Circular breathwork, an accessible technique, has shown potential to improve mental health. This study evaluated the therapeutic potential of two circular breathwork methods—Holotropic and Conscious-Connected Breathwork. ***Methods***: Active breathers experienced a significant reduction in etCO2 (36.7 ± 1.5 to 22.4 ± 0.8 mmHg) and deeper ASCs (experience depth: 3.46 ± 0.11 vs. 2.46 ± 0.20). Lower etCO2 correlated with deeper ASCs (Holotropic: $r = -0.51$, $p < 0.004$; Consciously-Connected: $r = -0.44$, $p < 0.02$). ASCs induced by breathwork were comparable to those produced by a therapeutic dose of psilocybin (11D-ASC: p = 0–0.12; MEQ30: p = 0.50–0.94). Active breathers showed increased well-being ($p < 0.01$) and reduced depressive symptoms ($p < 0.001$) one week after the session. Physiological changes included reduced autonomic nervous system activity ($p < 0.001$) and increased inflammation ($p < 0.001$) immediately post-session. Well-being correlated with subjective experience depth (MEQ30: $r = 0.44$, $p = 0.03$; 11D-ASC Oceanic Boundlessness: $r = 0.54$, $p = 0.006$). Subjective experience also modulated physiological outcomes, with ASC subscales correlating with inflammation changes. ***Results:*** Active breathers experienced a significant reduction in etCO2 (36.7 ± 1.5 to 22.4 ± 0.8 mmHg) and deeper ASCs (experience depth: 3.46 ± 0.11 vs. 2.46 ± 0.20). Lower etCO2 correlated with deeper ASCs (Holotropic: $r = -0.51$, $p < 0.004$; Consciously-Connected: $r = -0.44$, $p < 0.02$). ASCs induced by breathwork were comparable to those produced by a therapeutic dose of psilocybin (11D-ASC: p = 0–0.12; MEQ30: p = 0.50–0.94). Active breathers showed increased well-being ($p < 0.01$) and reduced depressive symptoms ($p < 0.001$) one week after the session. Physiological changes included reduced autonomic nervous system activity ($p < 0.001$) and increased inflammation ($p < 0.001$) immediately post-session. Well-being correlated with subjective experience depth (MEQ30: $r = 0.44$, $p = 0.03$; 11D-ASC Oceanic Boundlessness: $r = 0.54$, $p = 0.006$). Subjective experience also modulated physiological outcomes, with ASC subscales correlating with inflammation changes. ***Discussion***: Circular breathwork induces ASCs comparable to psychedelics, with depth predicting psychological and physiological benefits. These findings support its therapeutic potential as an accessible mental health intervention.

Panel 2 | Talk 4: Mateo Leganes-Fonteneau

Mapping Acute Alcohol Effects on Bodily Sensations: A Cross-Dimensional Interoceptive Approach

Leganes-Fonteneau, M.[1,2], Desmedt, O.[1,3], Allen, M.G [4,5], Wiers, R.W. [2,6], & Maurage, P. [1]

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[6] Center for Urban Mental Health, University of Amsterdam, Netherlands

Introduction: Interoceptive processes may underlie maladaptive patterns of alcohol use. Bodily sensations experienced during alcohol intoxication could therefore reveal distinct mechanistic components relevant for addiction theory and research. Here we apply novel tools to examine how intoxication impacts somatic awareness using bodily maps and a cardiac interoception task. ***Methods***: Acute alcohol administration altered bodily sensations, as reflected by strong sensations in the chest, limbs, and head. Such effects appeared as well in the placebo condition, albeit to a lesser extent. Linear mixed models examined correlates of bodily sensations across placebo and alcohol. We found that the intensity of bodily sensations had physiological correlates, as indexed by modulation of heart rate and breath alcohol content. In the ascending limb, intensity of bodily sensations negatively correlated with subjective feelings of stimulation, and positively with feelings of sedation. Finally, intensity of bodily sensations correlated with the metacognitive sensitivity of cardiac beliefs, suggesting a cross-dimensional integration between bodily sensations and interoceptive awareness. ***Results:*** Acute alcohol administration altered bodily sensations, as reflected by strong sensations in the chest, limbs, and head. Such effects appeared as well in the placebo condition, albeit to a lesser extent. Linear mixed models examined correlates of bodily sensations across placebo and alcohol. We found that the intensity of bodily sensations had physiological correlates, as indexed by modulation of heart rate and breath alcohol content. In the ascending limb, intensity of bodily sensations negatively correlated with subjective feelings of stimulation, and positively with feelings of sedation. Finally, intensity of bodily sensations correlated with the metacognitive sensitivity of cardiac beliefs, suggesting a cross-dimensional integration between bodily sensations and interoceptive awareness. ***Discussion***: These findings underscore the value of bodily mapping in pharmacological research, as the interoceptive components of alcohol intoxication may provide a somatic basis for addictive behaviors. We interpret our results in light of low-sensitivity models, suggesting that individuals who experience reduced bodily sensations during intoxication may be at elevated risk for alcohol use disorder. Future research should investigate how these individual differences in the impact of alcohol on bodily sensations might serve as a risk marker for problematic drinking.

Panel 2 | Talk 5: **Fiammetta Zanetti**

Investigating the effects of a cardio-visual full-body illusion on embodiment and body image

Zanetti, F. [1], Herforth, J.G. [2], Schönbein, K. [3], Botev J. [2], & Lutz, A [1]
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Introduction: Current eating disorder theories suggest patients are locked in a negative and distorted view of their body, not updated by current sensory input. We aim to create a virtual reality (VR) platform to improve body image by targeting multisensory integration. The VR cardio-visual full-body illusion (CVFBI) creates an illusory sense of ownership over an avatar through an outline flashing in synchrony with the participant's heartbeat. This induces somatosensory and interoceptive changes hypothesized to positively affect body image. The exact conditions necessary to achieve strong embodiment and positive effects on body image remain unclear, however, leading us to investigate different implementations of heartbeat synchronicity and asynchronicity. ***Methods***: Seventeen healthy participants (M 53%) were recruited. There were no differences in self-reported embodiment or body image (body satisfaction questions) between conditions. As a psychophysiological indicator of embodiment, skin temperature (recorded from arm and back) did not differ between conditions but showed a positive weak correlation between arm temperature and embodiment. ***Results:*** Seventeen healthy participants (M 53%) were recruited. There were no differences in self-reported embodiment or body image (body satisfaction questions) between conditions. As a psychophysiological indicator of embodiment, skin temperature (recorded from arm and back) did not differ between conditions but showed a positive weak correlation between arm temperature and embodiment. ***Discussion***: Low embodiment scores indicate that none of the conditions induced the CVFBI, nor were there positive effects on body image. The correlation between skin temperature and embodiment was opposite compared to previous studies. This underlines the importance of further studying the existence and utility of the CVFBI, as well as of physiological indicators of embodiment. Developing interventions, which successfully target multisensory integration, appears essential for the treatment of body image disturbance in eating disorders.

Oral Presentation/Talk Abstracts

Panel 2

March 12, 2025 at 10:30-12:00

Panel 3 | Talk 1: **Carlotta Isabella Zona**

Label-induced categorization bias in 2D manual pointing

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Introduction: Classifying items into categories can alter their perception, making them appear more similar to same-category items and more distinct from other-category items. For instance, numbers sharing overlap of the first digit (e.g., 30, 32) are localized as closer than equidistant numbers sharing no such overlap (28, 30) in number-to-position tasks (left-digit bias). ***Methods***: The results supported our hypothesis, as within-category targets were localized as closer to each other than equidistant, between-category targets regardless of vision. Further, this effect was attenuated in participants with better spatial-WM skills. ***Results:*** The results supported our hypothesis, as within-category targets were localized as closer to each other than equidistant, between-category targets regardless of vision. Further, this effect was attenuated in participants with better spatial-WM skills. ***Discussion***: Our novel observation supports the view that numerical knowledge is spatially organized, such that numerical distance may be represented in terms of spatial distance and distorted by ad-hoc categories induced by verbal labels, as inferred from pointing behavior.

Panel 3 | Talk 2: **Michal Weiss**

Developing a Machine-Learning-Based Diagnostic Tool for Fibromyalgia Using Multi Modal Approach

Weiss, M.[1,2], Salameh, H.[1], Zhuravlyova, A.[1], Mansour, E.[3, 4], Hacik, H.[3], & Goldstein, P.[1]
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[2] The School of Public Health, University of Haifa, Haifa, Israel
[3] The Department of Chemical Engineering, Technion-Israel Institute of Technology, Haifa, Israel
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Introduction: Fibromyalgia (FM) is a complex chronic pain syndrome affecting approximately 7.5% of women, characterized by widespread pain, altered stress responses, and comorbidities such as PTSD, depression, and anxiety. FM is considered a mind-body condition, with evidence pointing to the involvement of both the central nervous system and other physiological systems. Nonetheless, the diagnosis of FM remains challenging due to its subjective nature, underscoring the need for objective diagnostic tools that integrate both central and peripheral measurements. ***Methods***: Data preprocessing included fNIRS signal cleaning and feature extraction using connectivity and event-related activity measures, while ANS and VOC data underwent feature engineering to capture physiological and biochemical signatures. Machine learning models were applied to classify FM, comparing ensemble approaches that analyzed individual modalities with an integrated multi-modal strategy. Feature importance analyses identified the contributions of VOCs, ANS, and fNIRS features to diagnostic accuracy, providing insight into the interplay between brain activity, stress responses, and metabolic biomarkers. ***Results:*** Data preprocessing included fNIRS signal cleaning and feature extraction using connectivity and event-related activity measures, while ANS and VOC data underwent feature engineering to capture physiological and biochemical signatures. Machine learning models were applied to classify FM, comparing ensemble approaches that analyzed individual modalities with an integrated multi-modal strategy. Feature importance analyses identified the contributions of VOCs, ANS, and fNIRS features to diagnostic accuracy, providing insight into the interplay between brain activity, stress responses, and metabolic biomarkers. ***Discussion***: This research highlights the value of combining cortical, autonomic, and metabolic measures for objective FM diagnosis. The inclusion of VOCs as biomarkers bridges the gap between central and peripheral mechanisms, offering a comprehensive understanding of FM's pathophysiology and paving the way for personalized diagnostic and therapeutic strategies.

Panel 3 | Talk 3: Carlos Ventura-Bort

The Correspondence between Arousal and the Late Positive Potential using Representational Similarity Analysis

Ventura-Bort, C.[1], Ribes-Guardiola, P.[2], Weymar, M.[1], Poy, R.[2], Segarra, P.[2], Branchadell, V.[2], & Moltó, J.[2]
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Introduction: The Late Positive Potential (LPP), a positive slow wave, maximal at centro-parietal electrodes (from 300-800ms) has been consistently associated with experienced arousal as indicated by increased LPP amplitudes evoked by highly arousing (unpleasant and pleasant) compared to low-arousing neutral stimuli. In the current study, we aim at extending these findings by examining the trial-by-trial correspondence between the LPP amplitudes and experienced arousal, using representational similarity analysis (RSA). ***Methods***: Replicating previous findings, we observed larger LPP amplitudes (quantified with a temporo-spatial Principal Components Analysis) for highly arousing compared to neutral images. Moreover, RSA revealed that the best explaining model was the "Erotic" model, which distinguishes between erotic and non-erotic pictures. ***Results:*** Replicating previous findings, we observed larger LPP amplitudes (quantified with a temporo-spatial Principal Components Analysis) for highly arousing compared to neutral images. Moreover, RSA revealed that the best explaining model was the "Erotic" model, which distinguishes between erotic and non-erotic pictures. ***Discussion***: Considering that erotic images elicited the largest LPP amplitudes, RSA results suggest that the LPP represents the categorical distinction between potentially salient and less salient stimuli. Our findings are in line with a recent proposal suggesting that the LPP, as the P300, is an ERP response to stimulus significance. Future studies assessing the role of significance by manipulating attentional priority and/or likelihood of appearance would help bring more insights into this proposal.

Panel 3 | Talk 4: Irene Senatore

Mapping Epistemic Priors of Hyperscanning Psychotherapy: The Asymmetry and Reciprocity Blindspots

Nicolás Hinrichs [1, 3], Irene Senatore [2], Nara Figueiredo [3], Elena Cuffari [4], & Alejandro Fábregas-Tejeda [5]
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[2] Berlin School of Mind and Brain, Humboldt Universität zu Berlin, Berlin, Germany
[3] Department of Philosophy, Federal University of Santa Maria, Santa Maria, Brazil
[4] Department of Psychology, Franklin & Marshall College, Lancaster, USA
[5] Centre for Logic and Philosophy of Science, Institute of Philosophy, KU Leuven, Leuven, Belgium

Introduction: Recent advances in hyperscanning methods have enabled researchers to quantify interpersonal dynamics by tracking neural correlates of social interactions. These tools hold particular promise for understanding therapeutic change in psychotherapy, such as the patient-therapist relationship. However, the growing reliance on neural synchrony as a marker of relational success raises important epistemological and methodological concerns that call for critical scrutiny at the intersection of philosophy of science and neuroscience methodology. ***Methods***: Our analysis identifies a key asymmetry: while neural data acquisition advances, their interpretation and relation to behavioral frameworks remains underdeveloped. This imbalance stems from the 1) underdetermination of brain data interpretation, 2) the neglect of reciprocity in neuroscientific second-person paradigms and 3) lack of complex mesoscale models to interpret neural dynamics as they relate to cognitive processes within neuropsychiatry in neuroscientific analysis of second-person perspective interaction. ***Results:*** Our analysis identifies a key asymmetry: while neural data acquisition advances, their interpretation and relation to behavioral frameworks remains underdeveloped. This imbalance stems from the 1) underdetermination of brain data interpretation, 2) the neglect of reciprocity in neuroscientific second-person paradigms and 3) lack of complex mesoscale models to interpret neural dynamics as they relate to cognitive processes within neuropsychiatry in neuroscientific analysis of second-person perspective interaction. ***Discussion***: Our analysis raises critical implications for neuroscientific methodologies. Current hyperscanning studies often employ paradigms that implicitly prioritize synchronization as a desirable outcome, thereby framing therapeutic success as a convergent neural phenomenon. We suggest the development of experimental designs that account for the non-linear and contingent nature of therapeutic change, including the potential for productive misalignments or divergences to play a role in fostering growth and understanding.

Panel 3 | Talk 5: Yvonne Serhan

The individuality of connectivity gradients arises from the complexity and dispersion of the embedded networks

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* Equal contribution

Introduction: The brain's intricate organization plays a pivotal role in shaping our individual behaviors. However, the extent of individual uniqueness and the shared principles of brain organization across different individuals are not yet fully understood. ***Methods***: We found that the three most dominant connectivity gradients are highly correlated over time within individuals, and were associated with high fingerprinting performance. Individual uniqueness was associated with the complexity of the networks along a cortical hierarchy, as well as with network dispersion, a measure of the degree of variation in gradient coefficient values. Between subjects' similarity was high along the first connectivity gradient, which captures the dissociation between unimodal and heteromodal cortices, and the second connectivity gradient, which differentiates sensory cortices. ***Results:*** We found that the three most dominant connectivity gradients are highly correlated over time within individuals, and were associated with high fingerprinting performance. Individual uniqueness was associated with the complexity of the networks along a cortical hierarchy, as well as with network dispersion, a measure of the degree of variation in gradient coefficient values. Between subjects' similarity was high along the first connectivity gradient, which captures the dissociation between unimodal and heteromodal cortices, and the second connectivity gradient, which differentiates sensory cortices. ***Discussion***: Our results support the application of low-dimensional gradients for the purposes of both group comparisons and prediction of individual behaviours. Additionally, our work provides insights into the relationship between network dispersion and individual uniqueness of brain organization.

Panel 3 | Talk 6: George Fejer

Altered States of Viscereality: Augmenting Breathwork with Bio-Responsive Virtual Reality to Induce Altered States of Consciousness and Spontaneous Shifts in Breathing

Fejer, G. [1], Holzapfel, T. [1], Hirvonen, T. [2], Gomez Emilsson, A. [3], Blum, J. [4,5], Glowacki, D. [4], Gaebler, M. [6], & Lenggenhager, B. [7]
[1] University of Konstanz
[2] ALIUS Research Group
[3] Qualia Research Institute
[4] University of Schaffhausen
[5] Intangible Realities Lab
[6] Max Planck Institute for Brain and Cognitive Science, Leipzig
[7] Association for Independent Research, Zurich

Introduction: This study explores a novel bio-responsive virtual reality (VR) system designed to augment breathwork and induce altered states of consciousness (ASCs). Our system synchronizes users' breathing patterns with dynamic spatial transformations in VR environments, leveraging embodied cognition principles to enhance immersive experiences through bioresponsive interfaces. ***Methods***: Data collection has been completed, but analysis is pending. We anticipate that increasing the dynamic coupling that creates visual patterns will lead to longer average breath retention durations. Additionally, we expect that modulating the expansion duration of the particles will result in faster or slower inhalation and exhalation rates, depending on the experimental condition. ***Results:*** Data collection has been completed, but analysis is pending. We anticipate that increasing the dynamic coupling that creates visual patterns will lead to longer average breath retention durations. Additionally, we expect that modulating the expansion duration of the particles will result in faster or slower inhalation and exhalation rates, depending on the experimental condition. ***Discussion***: This study introduces a bio-responsive VR framework with parameters for implicitly incentivizing breathing behaviors, demonstrating potential for integrating additional physiological modalities such as heart rate. The system's flexibility allows for dynamic visualization of visceral information in virtual reality by linking particle texture, color, and spatial transformations to various physiological inputs. Future research aims to leverage these interactions to investigate neural integration mechanisms, particularly the role of interoceptive-exteroceptive coupling in shaping our sense of peripersonal space. This approach offers a novel method for probing the neural underpinnings of spatial perception and embodied cognition, potentially advancing our understanding of how the brain integrates internal and external sensory information to create coherent experiences of self and environment.

Poster Lists

Poster Session A
Monday, 10.03.2025 at 18:45-19:30

Poster	First Name	Family Name	Abstract Title
A01	Ainur	Raviqoh	Exploring Metacognition in Autism Spectrum Disorder: Insights into Self-Awareness and Cognitive Processes
A02	Larissa	Behnke	Aaaand Action! Is the primary motor cortex the driver of memory guided action planning?
A03	Aureen	D'Souza	Affective responses are shaped by interoception and personality
A04	Antonin	Fourcade	AffectTracker: Real-time continuous rating of affective experience in immersive Virtual Reality.
A05	WIthdrawn		
A06	Meital	Friedman-Oskar	Age Differences in Incidental Learning of Emotional Information
A07	George	Fejer	Altered States of Viscereality: Augmenting Breathwork with Bio-Responsive Virtual Reality to Induce Altered States of Consciousness and Spontaneous Shifts in Breathing
A08	María Paula	Villabona Orozco	Attentional Focus during Musical Performance: Insights from Motor Metacognition
A09	Marta	Vardzieli	Blood Pressure Reactivity in the Context of Emotion Processing and Regulation
A10	Beatrix	Keweloh	BMI predicts food approach bias in obesity
A11	Teresa	Berther	Body Language: The Stomach Modulates Brain Activity at Rest and during Speech Processing
A12	Mia	Neubauer	Differentiation of Neuropsychological Post-COVID Symptoms Using Heart Rate Variability
A13	Ksenia	Germanova	Cardiac interoception and Motor Preparation in Libet's task
A14	Shamim	Sasani Ghamsari	Cardiac-Brain Interactions in Macaques: Uncovering the Role of the Pulvinar and Other Thalamic Nuclei in Heart Evoked Potentials
A15	Leon	von Haugwitz	Cardiac-cycle and stress effects on behavioral and electrophysiological correlates of attentional inhibition.
A16	Ziliang	Xiong	Characterization of human tickling behavior and associated bodily maps of ticklishness
A17	Kinga	Mazurek	Cognitive Performance and Circadian Rhythms: Implications for Task Scheduling
A18	Eri	Kondo	Consonant clusters and acoustic cues
A19	Shakiba	Moradi	Cross-Modality Augmentation of fNIRS Signals Using fMRI
A20	Guido	Caccialupi	Decoding Effector-Specific Motor Planning of Parametric Grip Force Intensities from fMRI data
A21	Miro	Grundei	Decoding tactile stimulus content from somatosensory and parietal cortices during working memory maintenance
A22	Muazzez Deniz	Barut	The Distinct Antecedents of Social Anxiety and PTSD in a Clinical Sample
A23	Emma	Nesbit	Cardiac cycle, reaching movements and motor imagery (CARMI)
A24	Paul	Steinfath	A Systematic Review of Methods Used in Heartbeat Evoked Responses Research

Poster Session B
Monday, 10.03.2025 at 19:30-20:15

Poster	First Name	Family Name	Abstract Title
B01	Hannah	McDermott	Dissociable dynamic effects of expectation during statistical learning across cortical layers
B02	Ella	Teuscher	DLPFC-ACC target engagement during chronometric interleaved TMS-fMRI predicts task performance
B03	Lara	Ryan	Eating time alters human impulsivity by shifting its link to peripheral dopamine
B04	Maximilian	Schmausser	Effects of long-term transcutaneous auricular vagus nerve stimulation on circadian vagal activity in people with Prader-Willi Syndrome: A case-series
B05	Martina	Saltafossi	Epilepsy, respiration, and cortical excitability
B06	Nhu	Huynh, Dieu To	Female Perspectives in Modern Asian Context: Perceived Sexism and Psychological Well-being
B07	Srividya	Athur Sundaram	Gut-Brain Communication ,How do microbes and sex differences shape eating behaviour in obesity?
B08	Jannis	Friedrich	Higher-Level Cognition under Predictive Processing: Structural Representations, Grounded Cognition, and Conceptual Spaces
B09	Buket	Sen	How intention shapes neural process of moral conflict in borderline personality disorder?
B10	Paula	Linares	Johann Friedrich Herbart: A 19th Century Precursor to Neuroeducation
B11	Deniz	Yilmaz	Investigating Interoceptive Alterations in Schizophrenia Spectrum Disorders: A Multimodal Approach
B12	Fivos	Iliopoulos	Investigating Neurophysiological Synchrony during Natural Conversation: A First Step to EEG Hyperscanning
B13	Fiammetta	Zanetti	Investigating the effects of a cardio-visual full-body illusion on embodiment and body image
B14	Mustafa	Yavuz	Joint-Olfaction: Human dyads show collective benefit in olfactory discrimination and identification
B15	Carlotta Isabella	Zona	Label-induced categorization bias in 2D manual pointing
B16	Rosa	Großmann	Mechanical near-threshold stimulation and the neural correlate of tactile perception
B17	Taiki	Oka	Meta-brain-awareness of affective approach-avoidance bias
B18	Min	Pu	Neuro-metabolic pathway linking high protein meal reducing food craving in humans
B19	Tomás	Codina	Multimodal fNIRS-EEG Sensor Fusion: Review of Data-Driven Methods and Perspective for Naturalistic Brain Imaging
B20	Kristin	Kaduk	Neural activity in the dorsal pulvinar reflects cardiac modulation and influences cardiac and respiratory activity Project proposal: Neuronal activity underlying stimulus-related changes in alpha rhythm amplitude
B21	Sangjoon	Woo	Neural Correlates and Cardiorespiratory Dynamics of Near-Threshold Mechanical Sensory Detection
B22	Jonathan	Buchholz	Neural Correlates of High- and Low-Level Prior in Perceptual Decision Making Under Uncertainty
B23	Marta	Gerosa	Cardiorespiratory Contributions to Sense of Agency and Voluntary Action Initiation
B24	Eva	De Poi	Exploring the effects of dopaminergic modulation on spatio-spectral EEG ynamics during brain-computer interface learning: a double-blind analysis

Poster Session C
Tuesday, 11.03.2025 at 15:25-16:10

Poster	First Name	Family Name	Abstract Title
C01	Vittoria	Volpi	Motion-numerical compatibility effects on magnitude processing
C02	Wenhao	Huang	Neurophysiological underpinnings of prolonged exhalation impacting Risk behavior
C03	Ophir	Netzer	Neuropsychological Insights into Trauma Experienced Under Psychoactive Substances
C04	Celia	Blaise	Perception of Body Boundaries Without Vision: How Perspective-Taking and Embodiment Influence Accuracy
C05	Anna	Fischer	Physiological underpinnings of cooperative and competitive decisions in a transparent dyadic foraging game
C06	Angelia	Caparco	Precision of visual working memory is modulated by the cardiac cycle
C07	Alina	Studenova	Project proposal: Neuronal activity underlying stimulus-related changes in alpha rhythm amplitude
C08	Gia	Kutelia	Role of corticosterone on core memory processes in fear conditioned animals
C09	Tilman	Stephani	Self-tickle across cortical layers – a project outline with preliminary results
C10	Anuja	Negi	Semantic Representations with Varying Context during Language Comprehension
C11	Esranur	Yildiran Carlak	Sensory Reweighting in Response to Visual Perturbations: Insights at the Biomechanical and the Cortical Levels
C12	Charlotte	Koch	Sex differences in the associations between visceral fat, brain aging, and cognition
C13	Hilal	Cam	Shifting priorities: Switching between health and indulgence motivational states impacts proactive inhibition towards unhealthy food
C14	Mathis	Lamarre	Similarity across languages is high for both concrete and abstract concepts
C15	Magdalena	Matyjek	Smiling synchrony predicts rapport in autistic and neurotypical interactions
C16	Cindy	Jagorska	Space-Time Interference in Interception
C17	Subba Reddy	Oota	Speech language models lack important brain-relevant semantics
C18	Kamil	Kilic	Structural and Functional Correlates of Oscillatory Dynamics in Sensory Motor System
C19	Dennis	Larsson	Temporal and spatial perception of heartbeat sensations in autistic adults
C20	Tydings	McClary	The COMIC Study – Investigating Brain and Memory Development in Childhood
C21	Carlos	Ventura-Bort	The Correspondence between Arousal and the Late Positive Potential using Representational Similarity Analysis.
C22	Lauren	Charters	The Development of Interoception from 6- 11-Months using Heart-Evoked Potential (HEP)
C23	Kim	Hoffmann	Cortisol awakening response in premenstrual dysphoric disorder and health across the menstrual cycle
C24	Nadine	Herzog	Tackling reward deficiency in obesity: Developing a new fMRI-informed EEG-neurofeedback to modulate striatal food-reward signals

Poster Session D
Tuesday, 11.03.2025 at 16:10-16:55

Poster	First Name	Family Name	Abstract Title
D01	Eda	Demir	The Effect of Acoustic Roughness on Long-term Memory for Emotionally Ambiguous Facial Expressions
D02	Elizaveta	Ivanova	The Emergence of symbolic numerical knowledge in early development – preliminary results of an fNIRS study
D03	Farida	Zeynalli	The Fair and the Furious: Interpersonal Effects of Moral Anger in Economic Bargaining
D04	Eva	Fröhlich	The fair weight of decisions: How body mass shapes social (and economic) decision-making
D05	Lena	Hehemann	The influence of breathing techniques on reaction times in different perception tasks
D06	Dominika	Radziun	The influence of using finger-extending exoskeletons on tactile and proprioceptive localization
D07	Einav	Gozansky	The interactive effect of vagal tone and the menstrual cycle on the efficiency of conditioned pain modulation in healthy females
D08	Paula Guiomar	Alarcón de Antón	Quantification of metacognition of emotion: an EEG and pupillometry study
D09	Anisha	Kanukolanu	The role of balance ability on age-related changes in navigation strategy
D10	Ege	Kingir	Towards a System-Level Physiology of Stimulus Anticipation, Visual Perception, and Decision Confidence
D11	Liron	Rozenkrantz	Tracing Subjective Perceptions to Physical Health Outcomes
D12	Dimitra	Kiakou	Volume of tissue activated and patient characteristics predict deep brain stimulation outcomes in Parkinson's disease
D13	Xia	Zhang	White Matter Alterations in Patients with Heart Failure
D14	Orestis	Stylianou	Whole-Body Networks: A Holistic Approach for Studying Aging
D15	Lydia	Vasileiadou	Rats' empathic behavior: The water chamber experiment
D16	Emrullah	Ecer	Self-Deceptive Enhancement Deteriorates Objective Working Memory Capacity: The Role of Attachment Insecurities and Borderline Personality Traits
D17	Arzu	Ibadullayeva	Dysregulated Dopamine and Reality Monitoring Errors
D18	Muazzez Deniz	Barut	Exploring the Role of Empathy in the Attachment Insecurity-Social Anxiety Link: A Distinction Between Close Persons and Strangers
D19	Narmin	Abasova	Metacognition and epistemic injustice in schizophrenia
D20	Lisa	Stetza	Respiratory modulation of pupil dilation persists during bistable perception
D21	Tiantian	Li	Transcutaneous Vagus Nerve Stimulation Effects on Neuromodulatory BOLD-Activity and Sympathetic Arousal
D22	Maria	Azanova	Trial-dependent effects of cardiac cycle on decision-making under uncertainty
D23	Withdrawn		
D24	Wenyue	Liu	The Neural Correlates of Tactile Mental Imagery

Virtual Attendees' Posters
Recorded presentation on our website

Poster	First Name	Family Name	Abstract Title
V01	Nicolás	Hinrichs	A Multimodal Pipeline for Cognitive Neuropragmatics
V02	Kitty	Goldthorp	Can attentional focus and physical exertion affect interoception?
V03	Anubhav	Monga	Cybernetic Materials for a Theory of Intelligent Systems
V04	Jyotirmaya	Satphathy	Explorations in Pre - Frontal Cortex Skyjack
V05	Avraham	Shmueli	Interoceptive - a resilience factor in subclinical traumatic symptoms
V06	Jyotirmaya	Satphathy	Neuro - Connect in Motivational Dynamics of Business Leadership
V07	Withdrawn		
V08	Omer	Reuveni	Quantifying Variability in Attentional Shifts During Target Switching Using Steady-State Visual Evoked Potentials
V09	Anna	Crossland	Recognising, identifying, interpreting and reacting to internal bodily signals during pregnancy: A scale development study
V10	Withdrawn		
V11	Madeleine	Jones	Tingle-eliciting properties of pleasant, calming and potentially socially relevant audiovisual stimuli: the Autonomous Sensory Meridian Response (ASMR).
V12	Poulami	Kar	Understanding Neurologic Music Therapy through Diffusion Tensor Imaging as an intervention for Parkinson's Disease
V13	Xiaodi	Xia	Adverse Experience, Hippocampal Connectivity, and Epigenetic Modification in Adolescent Depression
V14	Withdrawn		
V15	Suhail Ahmad	Dar	Early Alzheimer's Detection: Integrating Surface-Based Morphometry and Machine Learning for Precise Structural MRI Analysis

Poster Abstracts
Poster Session A

March 10, 2025 at 18:45-19:30
Poster: **A01** **Ainur Raviqoh**

Exploring Metacognition in Autism Spectrum Disorder: Insights into Self-Awareness and Cognitive Processes

Raviqoh, A. [1,2] & Pacholik, A. [1]
[1] Nicolaus Copernicus University, Toruń
[2] Osnabruck University Germany

Introduction: Introduction Metacognition, often described as "thinking about thinking," refers to the ability to monitor, regulate, and reflect on one's own cognitive processes. It encompasses two main components: metacognitive knowledge (awareness of one's cognitive abilities and strategies) and metacognitive regulation (control over these processes to optimize learning and problem-solving). Metacognition plays a critical role in self-awareness, decision-making, and adaptive behavior, serving as a foundation for effective learning and social functioning. Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by challenges in social communication, restricted interests, and repetitive behaviors. While cognitive profiles in ASD vary widely, difficulties in theory of mind (understanding others' mental states) and self-reflective processes have been consistently documented. These challenges suggest potential impairments in metacognitive abilities, which may influence how individuals with ASD perceive and manage their own thinking and learning processes. Understanding the intersection of metacognition and ASD is crucial, as it may provide valuable insights into the cognitive strengths and challenges of individuals with ASD, contributing to more targeted interventions. This introduction sets the stage for exploring how metacognitive processes manifest in ASD, their implications for learning and social interaction, and the potential strategies to support metacognitive development in individuals on the spectrum. ***Methods***: Data collection Process and statistical and Qualitative Analiysis ***Results:*** the results indicate that individuals with ASD exhibit significant challenges in metacognitive awareness and regulation, particularly in areas involving self-assessment, error monitoring, and strategy adjustment. These difficulties are closely linked to core ASD traits, such as deficits in theory of mind and executive functioning. However, individual differences within the ASD group highlight the importance of personalized approaches to support metacognitive development. ***Discussion***: The findings of this study provide valuable insights into the relationship between metacognitive processes and Autism spectrum disorder (ASD). Overall, the results suggest that individuals with ASD face notable challenges in metacognitive awareness and regulation, which are closely linked to their difficulties with theory of mind (ToM), executive functioning and adaptive behaviors. This discussion explores the implications of these findings, their alignment with existing literature, potential limitations and suggestions for future research.

Poster: **A02** **Larissa Behnke**

Aaaand Action! Is the primary motor cortex the driver of memory guided action planning?

Behnke, L. [1,2], Koch, L. [1], & Sauseng, P. [1,2]
[1] University of Zurich, Institute of Psychology, Neuropsychology and Cognitive Neuroscience, Zurich
[2] Neuroscience Center Zurich (ZNZ), University of Zurich and ETH Zurich, Zurich

Introduction: In our daily lives, we constantly transform abstract ideas from past sensations to concrete action plans and execute the according behaviour the moment it becomes relevant. This selection and prospective planning of upcoming actions can be tracked by sensory-motor EEG rhythms (13-17Hz) over cortical motor areas. So far, this line of research relied exclusively on behavioural and EEG findings. Therefore, it remains unclear whether sensory-motor rhythms over the motor cortex serve as the neurophysiological mechanism causing memory-guided action planning. ***Methods***: By applying repetitive transcranial magnetic stimulation (rTMS) at 13Hz we tried to transiently disrupt the distinctive pattern of sensory-motor rhythms during initial action selection in a visual-motor working memory task. We hypothesized that (i) during trials with rTMS delivered to the primary motor cortex, accuracy and reaction times would decrease compared to trials with placebo rTMS. (ii) This difference between rTMS and placebo rTMS was expected to be more pronounced in trials where memory was interfered with during memory retention, compared to trials without interference. ***Results:*** The analysis revealed that the transient rTMS lesion in the primary motor cortex did not significantly affect behavioural outcomes as hypothesized. This suggests that the neurophysiological signatures observed in the EEG may not originate from the primary motor cortex, but potentially from other motor regions such as the premotor area. ***Discussion***: This study suggests that the primary motor cortex might not be the neurophysiological driver of guided action planning. Furthermore, the results highlight the critical need to establish causal links between electroencephalogram (EEG) activity and behavioural outcomes before interpreting neurophysiological signatures as markers of cognitive processes.

Poster: **A03** **Aureen D'Souza**

Affective responses are shaped by interoception and personality

D'Souza, A. [1], Rebollo, I. [1,2], Lazova, A. [1], Yuan X. [1], & Park, S. Q. [1,2,3]
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[2] Neuroscience Research Center, Charité-Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Neuroscience Research Center, Berlin
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Introduction: People react differently to the same emotional stimuli, but what drives this variability? Here, we show a systematic link between affective experience and individual traits such as personality, anxiety and crucially, interoceptive awareness, i.e. the ability to sense bodily signals and its interpretation. ***Methods***: Affective responses (dependent variable) are operationalised as 1) subjective ratings (valence, arousal, disgust, appetite) and 2) bodily sensations, i.e. individual drawings of where in the body and how strong the senses are. 297 participants (126 females, 18–35 years) viewed negative, positive, disgusting, appetizing or neutral video stimuli, and submitted subjective ratings and drawings after each. Psychological questionnaires measuring interoception, anxiety, disgust sensitivity, mood and personality were our independent variables. ***Results:*** We identified three distinct participant groups based on hierarchical clustering of questionnaire responses. A "Body-Unaware" group characterized by low interoception, a "Body-Aware" group defined by high interoception and low anxiety, and a "High Anxiety" group marked by increased anxiety and neuroticism. These groups exhibited distinct emotional responses. The Body-Unaware group displayed significantly smaller emotional granularity, with similar subjective ratings across emotional categories. The Body-Aware group experienced significantly more widespread bodily sensations in response to videos, indicating greater body-related emotional engagement. The High Anxiety group showed similar patterns of bodily sensations across video categories, reflecting more stereotypical emotional responses. The three groups also exhibited distinct patterns in how affective ratings mapped onto their bodily sensations. Furthermore, they also showed distinct patterns in how mood moderated the ratings and bodily sensations. ***Discussion***: Our findings reveal that inter-individual variability in affective experience is systematically linked to interoception, personality and mood, emphasizing the embodied nature of emotions. These insights highlight the importance of individual traits in shaping emotions, with implications for understanding clinical populations and informing personalized therapeutic interventions targeting the interplay between interoception and emotional regulation.

Poster: **A04** **Antonin Fourcade**

AffectTracker: Real-time continuous rating of affective experience in immersive Virtual Reality.

Fourcade, A.* [1,2,3,4], Malandrone, F.* [5], Roellecke, L. [2], Ciston, A. [2,3], de Mooij, J. [2], Villringer, A. [1,2,3,4], Carletto, S.§ [5] & Gaebler, M. [2,3]
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*Equal contributions

Introduction: Affective states fluctuate continuously, yet traditional summary ratings (SR) fail to capture their real-time dynamics. Continuous Ratings (CR) provide a finer assessment of moment-to-moment affective fluctuations, particularly in immersive Virtual Reality (iVR). However, CR may introduce cognitive demands that alter the user experience. AffectTracker, an open-source tool for real-time affect tracking in VR, was developed to address these challenges. It comprises three customizable feedback options: a simplified affect grid (Grid), an abstract pulsating variant (Flubber), and no visual feedback. A first study (Study 1) evaluated the different CR feedback options and is currently under review in a peer-reviewed journal. Study 2 extends this validation by assessing CR in a prolonged, dynamic iVR environment. ***Methods***: Eighty-three participants (Berlin: 42, Torino: 41) continuously rated their valence and arousal using the AffectTracker's Flubber feedback via an HTC Vive Pro touchpad while watching a 23-minute sequence of 360° stereoscopic videos. Pearson correlations assessed CR-SR relationships, and Fisher r-to-z transformation compared these relationships between Study 1 (short, repeated stimuli) and Study 2 (long, varied exposure). ANOVAs examined usability, distraction, emotion representation, and sense of presence, as well as test site, gender, and body posture effects. ***Results:*** CR variability was significantly higher in Study 2, reflecting greater emotional fluctuations over time. CR standard deviation showed the strongest correlation with SR for arousal ($r = .591$, $p < .001$), while CR mean had a weaker association. Usability remained high (SUS = 81.2), and CR did not interfere with sense of presence. No significant differences were found for test site, gender, or body posture. ***Discussion***: AffectTracker effectively captures continuous affective fluctuations in prolonged iVR experiences, supporting its use in affective neuroscience and clinical research.

Poster: **A05** **Withdrawn**

Poster: **A06** **Meital Friedman-Oskar**

Age Differences in Incidental Learning of Emotional Information

Friedman-Oskar, M. [1], Makovski, T. [2], & Okon-Singer, H. [1]
[1] University of Haifa,Haifa
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Introduction: This study investigates how aging influences incidental learning of emotional stimuli within a Visual Statistical Learning (VSL) framework. Younger and older adults viewed streams of images (negative, positive, neutral) unknowingly organized into repeating patterns. By examining recognition and free recall, the study uncovers how emotional valence and age interact to shape learning. ***Methods***: In two experiments, participants viewed image streams without explicit instructions about their structure. Experiment 1 compared negative and neutral stimuli, while Experiment 2 contrasted positive and neutral stimuli. Learning was assessed using recognition tests and free recall tasks. ***Results:*** VSL performance remained robust across age groups, demonstrating that statistical learning persists with age. Negative stimuli enhanced recognition for all participants (Experiment 1), but recall revealed age-specific patterns: younger adults favored negative stimuli, while older adults prioritized positive stimuli, reflecting the positivity effect. ***Discussion***: These findings reveal that emotional valence influences memory differently depending on age and retrieval type. While both age groups excel in recognizing negative stimuli, free recall exposes distinct age-related priorities, positivity for older adults and negativity for younger adults. This highlights how memory strategies evolve with age, emphasizing the role of emotional regulation in aging.

Poster: **A07** **George Fejer**

Altered States of Viscereality: Augmenting Breathwork with Bio-Responsive Virtual Reality to Induce Altered States of Consciousness and Spontaneous Shifts in Breathing

Fejer, G. [1], Holzapfel, T. [1], Hirvonen, T. [2], Gomez Emilsson, A. [3], Blum, J. [4,5], Glowacki, D. [4], Gaebler, M. [6], & Lenggenhager, B. [7]
[1] University of Konstanz
[2] ALIUS Research Group
[3] Qualia Research Institute
[4] University of Schaffhausen
[5] Intangible Realities Lab
[6] Max Planck Institute for Brain and Cognitive Science, Leipzig
[7] Association for Independent Research, Zurich

Introduction: This study explores a novel bio-responsive virtual reality (VR) system designed to augment breathwork and induce altered states of consciousness (ASCs). Our system synchronizes users' breathing patterns with dynamic spatial transformations in VR environments, leveraging embodied cognition principles to enhance immersive experiences through bioresponsive interfaces. ***Methods***: The VR system employs a coupling kernel paradigm to create dynamic interactions between particle textures, resulting in coherent color shifts and particle movements. This implementation simulates increased surface tension, creating visual incentives based on breath detection. Spatial transformations are synchronized with inhalation (expansion) and exhalation (contraction), following Gestalt principles. We applied variations in the degree of dynamic coupling during breath retentions and spatial transformations during inhalation and exhalation to influence spontaneous breathing behaviors, using inhalation, exhalation, and duration as outcome measures. Data collection included psychometric time-series (experience graphs) and standardized questionnaires measuring subjective altered states. ***Results:*** Data collection has been completed, but analysis is pending. We anticipate that increasing the dynamic coupling that creates visual patterns will lead to longer average breath retention durations. Additionally, we expect that modulating the expansion duration of the particles will result in faster or slower inhalation and exhalation rates, depending on the experimental condition. ***Discussion***: This study introduces a bio-responsive VR framework with parameters for implicitly incentivizing breathing behaviors, demonstrating potential for integrating additional physiological modalities such as heart rate. The system's flexibility allows for dynamic visualization of visceral information in virtual reality by linking particle texture, color, and spatial transformations to various physiological inputs. Future research aims to leverage these interactions to investigate neural integration mechanisms, particularly the role of interoceptive-exteroceptive coupling in shaping our sense of peripersonal space. This approach offers a novel method for probing the neural underpinnings of spatial perception and embodied cognition, potentially advancing our understanding of how the brain integrates internal and external sensory information to create coherent experiences of self and environment.

Poster: **A08** **María Paula Villabona Orozco**

Attentional Focus during Musical Performance: Insights from Motor Metacognition

Villabona Orozco , M.P. [1], Seefluth, D. [1], Ciston, A. [2], Sakaki, M. [1] & Filevich, E. [1].

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

Introduction: Musicians often achieve optimal performance through automatic movements while also consciously monitoring actions like finger placement. Although motor control can occur without conscious awareness, research suggests movement information remains accessible to metacognitive monitoring. According to the Focus of Attention (FOA) effect, adopting an external focus—concentrating on a movement's outcome—enhances motor performance compared to an internal focus, which involves concentrating on the movement itself. Despite its broad application, the mechanisms underlying this effect remain poorly understood, particularly in music performance, where research is sparse and varied. ***Methods***: This study aimed to address this gap by examining the role of metacognitive ability—the capacity to recognize successful cognitive performance—in the FOA effect. We hypothesized that young adults would perform better under an external focus, and explored whether individual differences in metacognitive ability to monitor internal (movement-related) versus external (outcome-related) parameters might explain this effect. Amateur guitarists played a melody under different FOA conditions (no instruction, internal focus, external focus). Performance was assessed using semi-automated Music Information Retrieval techniques for pitch and rhythm accuracy, while metacognitive ability was measured using m-ratio in visual (internal) and tonal (external) tasks. ***Results:*** Contrary to predictions, FOA conditions did not significantly affect performance, nor was there an interaction with metacognitive ability. However, participants showed higher metacognitive accuracy when monitoring visual (internal) compared to tonal (external) aspects. ***Discussion***: These findings challenge the universal benefits of external FOA in motor performance and highlight how metacognitive accuracy can vary within individuals depending on the perceptual domain, offering insights into motor skill acquisition.

Poster: **A09** **Marta Vardzieli**

Blood Pressure Reactivity in the Context of Emotion Processing and Regulation

Vardzieli, M. [1]
[1] Berlin School of Mind and Brain, Humboldt University Berlin, Berlin
[2] Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig

Introduction: Emotion regulation strategies influence cardiovascular responses to stress, particularly blood pressure reactivity (BPR). While cognitive reappraisal is associated with adaptive physiological responses, expressive suppression has been linked to heightened cardiovascular reactions. Understanding how these strategies affect BPR is essential for stress and health management. ***Methods***: A systematic review was conducted following PRISMA guidelines, searching PubMed, Scopus, and Google Scholar for studies published after 2010. Inclusion criteria focused on studies assessing blood pressure reactivity (BPR) (systolic/diastolic) in emotionally charged situations while examining the effects of emotion regulation strategies (e.g., cognitive reappraisal, expressive suppression) in non-clinical adult populations. ***Results:*** Results suggest that cognitive reappraisal is associated with lower BPR, reflecting a more adaptive physiological stress response. In contrast, expressive suppression is linked to increased BPR, indicating greater cardiovascular pressure. Several studies highlight the mediating role of psychological stress, showing that reappraisal reduces stress-related cardiovascular activation while suppression worsens it. ***Discussion***: These findings emphasize the cardiovascular benefits of cognitive reappraisal and the potential risks of expressive suppression. Given the impact of emotion regulation on BPR, promoting adaptive strategies may help moderate stress-related cardiovascular risks. Future research should explore causal mechanisms, individual differences, and intervention strategies to improve emotion regulation and cardiovascular health.

Poster: **A10** **Withdrawn**

Poster: **A11** **Teresa Berther**

Body Language: The Stomach Modulates Brain Activity at Rest and during Speech Processing

Berther, T. [1, 2], Rebollo, I. [3], Saltafossi, M. [1, 2], Criscuolo, A. [4], Kotz, S. A. [4, 5], Gross, J. [1, 2], & Kluger, D.S. [1, 2]
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[3] Department of Decision Neuroscience and Nutrition, German Institute of Human Nutrition, Germany
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[5] Max Planck Institute for Human Behavior and Brain Sciences, Department of Neuropsychology, Leipzig, Germany

Introduction: Recent work highlights the slow electrical rhythm generated in the stomach as one of the bodily rhythms orchestrating the spatiotemporal organization of spontaneous brain activity. ***Methods***: Recording electrogastrography (EGG) and MEG data from N = 28 healthy participants, we replicated the spatial structure of the novel gastric resting-state network, while also characterizing the nodes of the network in the spectral domain using a phase-amplitude coupling measure. ***Results:*** Gastric-brain coupling modulated brain activity on a large spatial and spectral scale, encompassing unimodal sensory-motor areas as well as major frequency bands from delta to beta supporting cognitive brain function. Additionally, we extended the spotlight on gastric modulation of the spatiotemporal structure of spontaneous brain activity to a task context, namely rhythmic auditory and speech perception. The gastric rhythm modulated temporal fluctuations in brain activity during rhythmic auditory perception in frequencies between 0.5 and 30 Hz, with comparatively stronger coupling effects for a rhythmic auditory sequence that conveys semantic information. ***Discussion***: These results suggest a link of gastric-brain coupling not only to the processing of sensory and motor information, but possibly also to large-scale brain organisation.

Poster: **A12** **Mia Neubauer**

Differentiation of Neuropsychological Post-COVID Symptoms Using Heart Rate Variability

Neubauer, M. [1,2], Belger, J. [2], Thöne-Otto, A. [2], Villringer, A. [1,2] & Gaebler, M. [1]
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Introduction: Post-COVID syndrome (PCS) is characterized by symptoms lasting more than two months following a SARS-CoV-2 infection (Soriano et al., 2022). Neuropsychological symptoms, particularly fatigue and cognitive impairment, predominate and manifest independently (Hartung et al., 2022). Conventional psychometric tests lack specificity in distinguishing PCS from conditions like depression and do not adequately correlate subjective fatigue with objective performance measures (Schild et al., 2023). Cardiovascular autonomic dysfunction (CVAD), commonly observed in PCS, involves impaired autonomic regulation of the heart rate. Heart rate variability (HRV), a marker of autonomic nervous system function (Fedorowski et al., 2024), is linked to CVAD in PCS through decreased vagal activity (Marques et al., 2023). CVAD contributes to both cognitive impairment and fatigue (Arnold et al., 2015; Tanaka et al., 2015). Thus, analyzing HRV patterns during cognitive tasks may offer a novel approach to differentiating neuropsychological subtypes of PCS. ***Methods***: A total of N = 40 PCS patients (n = 20 fatigue-dominant, n = 20 cognitive impairment-dominant) and age- and gender-matched healthy controls (n = 20) will use a virtual reality-based cognitive memory task, to induce cognitive load. HRV will be analyzed at five intervals (pre-task, three during-task phases, and post-task). Group comparisons will be conducted using mixed-effects models to evaluate HRV dynamics across time points. ***Results:*** We hypothesize that PCS patients will exhibit reduced resting HRV and distinct task-specific HRV trajectories. Primary fatigue leading patients are expected to show a more pronounced HRV decline during cognitive load and impaired post-task recovery compared to patients with primary cognitive impairment. ***Discussion***: HRV patterns may reflect the autonomic nervous system's response to cognitive tasks, providing a potential biomarker for differentiating fatigue and cognitive impairment in PCS. These findings may highlight the clinical utility of HRV analysis to guide subtype-specific diagnostics.

Poster: **A13** **Ksenia Germanova**

Cardiac interoception and Motor Preparation in Libet's task

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Introduction: The Somatic Marker Hypothesis, introduced by Antonio Damasio in 1994, emphasizes the essential role of perceiving 'body states' in decision-making processes. This theory links interoceptive processing to specific brain areas, such as the insula and somatosensory cortex, suggesting their primary function is emotional evaluation of action outcomes. Later, motor initiation was shown to be influenced by the phases of the cardiac cycle [Palser et al., 2021; Al et al., 2023]. and even motor agency was suggested to depend on cardiac input [Herman & Tsakiris, 2020]. Here, we further explore this perspective on cardiac input for motor preparation, advocating for its possible incentive role in movement execution. ***Methods***: We implemented the classical Libet's paradigm with W- and M-experimental condition and 40 self-paced movements per each of the two conditions in naïve participants (n = 41) [Bredikhin et al., 2023]. Heart-evoked potential (HEP) was obtained by averaging all trials excluding the epochs which fell into the interval of < 500 millisecond prior to the button press. Behavioral data were aligned with the cardiac cycle. ***Results:*** We observed the non-uniform distribution of button presses predominantly occurring during the diastolic phase of the cardiac cycle in the W-condition, which provides a link between cardiac interoception and motor control. ***Discussion***: These findings suggest that cardiac interoception relates to motor preparation under conditions of uncertainty, offering a novel interpretation of the W-condition in Libet's task. Moreover, our results reinforce the association between cardiac interoception and the experience of volition in tasks that involve self-paced movements. Overall, our results challenge traditional interpretations of the W-condition and presents an alternative perspective on the 'urge to move' phenomenon.

Poster: **A14** **Shamim Sasani Ghamsari**

Cardiac-Brain Interactions in Macaques: Uncovering the Role of the Pulvinar and Other Thalamic Nuclei in Heart Evoked Potentials

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Introduction: Recent studies show that heart-evoked-potentials (HEPs) are useful for investigation of heart-and-brain interactions, linking cardiac activity to cognitive, perceptual and emotional processes. The thalamic nuclei, including the medial pulvinar and the medial dorsal thalamus, likely play a key role in these interactions due to their anatomical connections to relevant central regions in the autonomous network (CAN) such as amygdala, insula and prefrontal cortex. However, due to the lack of intracranial LFP-ECG studies in those higher-order thalamic nuclei, it remains unclear how cardiac signals are processed in those nuclei. ***Methods***: We recorded Local Field Potentials (LFP) from 1076 sites in 2 monkeys at rest and during visually-guided task performance with concurrent electrocardiograms, and analyzed HEPs in the dorsal pulvinar (dPul), mediodorsal (MD) and ventral posterior lateral (VPL) thalamus during 41 recording sessions. In total we investigated the Time-Frequency Power, and Inter-Trial-Phase-Coherency (ITPC), time-locked to the ECG R-peaks in 624, 247, and 205 sites in dPul, MD, and VPL respectively. ***Results:*** We found that ITPC significantly increased after the R-peak in all three nuclei, and consistent with human iEEG data in insula and other CAN regions, the strongest ITPC enhancement occurred in a time window of 100–250 ms after R-peak, in theta frequency band (4 to 8 Hz). This result indicates a phase resetting mechanism of HEP generation in all three regions, which was consistent across sites and monkeys independent of behavioral task. ***Discussion***: In conclusion, our study on cardiac-brain interactions in awake macaques revealed the evidence of neural representations of cardiac afferent signals in dorsal pulvinar and other thalamic nuclei, supporting the previously proposed mechanism of HEP generation in other brain structures within the central autonomic network.

Poster: **A15** **Leon von Haugwitz**

Cardiac-cycle and stress effects on behavioral and electrophysiological correlates of attentional inhibition.

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Introduction: Variations in cardioafferent traffic are relayed to the brain and have been shown to modulate sensorimotor processing. Stress potentially influences these effects via both humoral and neuronal pathways altering cardiovascular activity and modulating areas of the central nervous system. ***Methods***: We investigated the interaction of cardiac cycle and stress effects by employing a visual change detection task to disassociate response and attentional inhibition processes. 65 participants completed four experimental blocks, responding to lateral luminance changes while ignoring simultaneous orientation changes that occurred either in the same (facilitation condition) or opposing hemifield (conflict condition), or isolated (catch condition). Stimulus presentation was aligned to the ECG, targeting systole versus diastole i.e., phases of high versus low cardioafferent activity. Subjects were randomly assigned to a cold pressor test (CPT) or control condition and were exposed before each experimental block. ***Results:*** The CPT increased saliva cortisol, heart rate, mean arterial blood pressure, and subjective stress and arousal ratings. We found the expected task effects i.e., higher response times and percentage errors in the conflict condition versus matching and isolated luminance or orientation changes. During systole we found increased errors in the conflict condition however misses were significantly reduced compared to diastole. While not significant, we found a trend pointing to decreased errors during systole in the catch condition. In the EEG, N2pc was decreased during systole in catch trials while it was increased when luminance and orientation changes matched indicating altered attentional allocation as one driver of the observed behavioural phase effects. These effects were not affected by exposure to the CPT. ***Discussion***: Our results are in line with previous findings reporting inhibitory effects of cardioafferent traffic on perceptual processes as well as facilitation of response related processes. However, they do not suggest a particular role during stress.

Poster: **A16** **Ziliang Xiong**

Characterization of human tickling behavior and associated bodily maps of ticklishness

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Introduction: Social touch is essential for navigating interpersonal interactions, integrating cognitive, motor, and somatosensory afferent processes. Among its various forms, tickling uniquely triggers laughter and bodily convulsions, typically seen in playful dyadic activities, such as between parents and their children. However, despite its seemingly trivial nature, tickle remains a widely underexplored human behavior. We do not know how tickle relates to tactile experiences, whether it is influenced by cultural or personality differences, and how ticklish sensations are represented on the human body's topography. ***Methods***: To address these questions, we performed an online study with 448 participants, aiming for a culturally diverse (149 Chinese, 150 Dutch, and 149 Greek) sample. Participants completed a survey about their experiences as a 'ticklee' and/or 'tickler' during their childhood and adulthood, as well as their opinions on tickling. Additionally, they completed a topographical body-coloring task to indicate body areas related to experiencing ticklish sensations. ***Results:*** Our preliminary results revealed that being a 'ticklee' was more common in childhood than adulthood and associated with both pleasant and unpleasant sensations. In contrast, 'tickler' experiences were overall pleasant, indicating a change in perception depending on the behavioral role. Importantly, ticklish sensations were linked to a specific topography, with the neck, armpits, belly, and foot soles identified as the most ticklish areas. Crucially, no cultural differences were found in participants' experiences, opinions, or bodily topography, suggesting a consistent similarity across cultures. ***Discussion***: These findings provide the first comprehensive characterization of tickle behavior in humans, and indicate that tickling experiences are culturally universal.

Poster: **A17** **Kinga Mazurek**

Cognitive Performance and Circadian Rhythms: Implications for Task Scheduling

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Introduction: The study investigates how individuals with distinct chronotypes—morning-oriented vs. evening-oriented—perform on the n-back task (1-back, 2-back, 3-back levels) at different times of day. It aims to illuminate the interactions between chronotype and time-of-day effects on working memory and cognitive load, contributing to the growing body of literature examining cognitive variability in alignment with natural circadian preferences. Contrasting it with fMRI and MRI imagery. ***Methods***: The study's design involves assessing cognitive performance in the morning and evening, allowing comparisons of each chronotype's performance during peak times (aligned with their biological rhythm) and during non-peak times. We showed that morning-oriented individuals will perform optimally in the morning, while evening-oriented individuals will excel in the evening, consistent with findings on circadian modulation of cognitive abilities (Blatter, K., & Cajochen, C. (2007)). The study further explores whether circadian mismatches (e.g., night owls tested in the morning) impact working memory performance and cognitive load, providing insights into cognitive task scheduling based on circadian preferences, as well us looks for differences in MRI scans of participants and their traits. ***Results:*** Demonstrating significant time-of-day effects on working memory tasks, research underscores the importance of considering individual chronotype in task planning to enhance performance and reduce cognitive fatigue. Additionally, this study addresses gaps in research on circadian rhythms and higher cognitive functions like working memory. The findings offer a new perspective on the intelligence and chronotype. ***Discussion***: Findings hold practical implications for understanding chronotype-specific optimization of tasks that require sustained attention and working-memory, particularly as workplaces and educational institutions shift towards flexible scheduling. I aim to foster an understanding on circadian influence and cognitive performance: benefits in educational and occupational settings. I plan to engage attendees in discussing the potential for tailored cognitive testing schedules based on chronotype and the implications of these findings for broader cognitive research methodologies.

Poster: **A18** **Eri Kondo**

Consonant clusters and acoustic cues

Kondo, E. [1]
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Introduction: In English phonetics and experimental phonetics, it is necessary to clarify how the extraction of phonemes as acoustics and the development of intelligence in acoustics and speech are related. The purpose of this research is to investigate whether the height and pitch of sound waves change by the classification and combination of consonants such as fricatives, plosives, and soft plates, and the distribution of individual differences. In addition, based on the hypothesis that the articulation of sounds may not be learned by the movement of the tongue and teeth on learning records, it was noted to include feedback from the instructor to make it supervised reinforcement learning. ***Methods***: As part of the machine learning, students with tablets were asked to play and record audio. For instance, we asked them to play an audio as 'monkey' and 'kangaroo' six times and record these words to indicate the acoustic feature of 'k.' Two types of audio were collected: those recorded both as words and as ones in sentences. Four instructions for eight classes had been already implemented, and a large amount of data on 200 students had been collected. In order to investigate the change in the sound of consonants in a series of consonants, we recorded a series of alveolar nasal sounds and voiceless soft palatal plosives which are referred to 'nk'. ***Results:*** An acoustic feature on consonants' clusters on a series of 'nk' has been investigated on contrast of an acoustic distinctiveness on 'k' in the front of that word. From those distribution on data tolerance, it can be measured as the difference of acoustic distinctiveness. ***Discussion***: With or without acoustic stimuli, the listener decision weight on listening sounds and such as condition may have been explored (Lutfi, 2023). Then, on the basic of unsupervised learning, if the listening weight is increased, the difference in audio will advance.

Poster: **A19** **Shakiba Moradi**

Cross-Modality Augmentation of fNIRS Signals Using fMRI

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Introduction: An explosion of recent work that investigates the alignment between the human brain and language models shows that text-based language models (e.g. GPT*, BERT, etc.) predict both text- and speech-evoked brain activity to an impressive degree. This observation holds across late language regions, which are thought to process both text- and speech-evoked language, but also more surprisingly across early sensory cortices, which are shown to be modality-specific. Since text-based language models are trained on written text, their impressive performance at predicting the activity in (also referred to as alignment with) early auditory cortices is puzzling. This raises the question of what types of information underlie the brain alignment of language models observed across brain regions. ***Methods***: We use residual approach to investigate the reasons for brain alignment of language models involves three main steps: (1) removal of interpretable low-level stimulus features from the language model representations; (2) estimating the brain alignment of the language model representations before and after removal of a particular feature; (3) a significance test to conclude whether the difference in estimated brain alignment before and after is significant. ***Results:*** For text LMs, we find that: Alignment with early auditory cortex (AC) during listening is due to low-level textual features, which correlate with low-level speech features processed in the AC; High alignment in late language regions is not due to low-level features. For speech language models, we find that: Some of the very high alignment with early AC due to low-level speech features, but much residual alignment remains; Alignment in late language regions entirely due to low-level stimulus features. ***Discussion***: Our findings clearly show that despite the growing popularity of text-based and speech-based language models in modeling language in the brain, we are still far from a computational model of the complete information processing steps during either listening or reading.

Poster: **A20** **Guido Caccialupi**

Decoding Effector-Specific Motor Planning of Parametric Grip Force Intensities from fMRI data

Caccialupi, G. [1,2], Schmidt, T.T. [1], & Blankenburg, F. [1,2]
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[2] Humboldt-Universität zu Berlin, Berlin School of Mind and Brain, Berlin

Introduction: Previous fMRI-studies on motor planning have shown that activity in premotor and parietal brain-regions covaries with the intensity of upcoming grip-force execution. Here, we tested how information is transformed from the initial selection of a grip-force intensity through a delay-period until motor-execution in effector-specific brain-regions. We employed a delayed grip-force task during fMRI, in which the to-be-used hand was changed 50% of the time. ***Methods***: During the working memory task, one of four grip-force intensity levels had to be maintained and then executed with either the right or left cued-hand. A second cue was given halfway through the delay-period, indicating whether motor-preparation should switch to the other hand. We applied multivoxel pattern analysis to fMRI-data, using a searchlight approach to test where information about intended grip-force intensity could be decoded during the two delay-periods. Cross-decoding analyses tested where grip-force intensities were coded in an effector-specific or more abstract effector-independent format. ***Results:*** We found an expected brain-network involved in the initial coding of anticipated grip-force intensity, including the left intraparietal sulcus (l-IPS), contralateral angular gyri (l-AngG and r-AngG), middle orbitofrontal (l-mOrb and r-mOrb), and premotor dorsal cortices (l-PMd and r-PMd). During the second delay-period, it was mainly the l-IPS, posterior and lateral premotor, and contralateral primary motor cortices (l-M1 and r-M1) that coded the anticipated grip-force intensity. We found clear lateralization in premotor and motor cortices, demonstrating effector-specific codes. Cross-decoding showed the presence of effector-independent codes in the l-IPS. ***Discussion***: Our results extend the current literature on motor planning by showing above-chance decoding in contralateral (pre)motor-regions, suggesting effector-specific parametric coding of anticipated grip-force during delay-periods. Additionally, we found the l-IPS to contain effector-independent codes of grip-force intensities. Overall, our findings integrate and extend previous reports on the temporal unfolding of neural-correlates of movement planning, from action-selection and maintenance of a motor-plan to motor-execution.

Poster: **A21** **Miro Grundei**

Decoding tactile stimulus content from somatosensory and parietal cortices during working memory maintenance

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Introduction: Working memory (WM) is a core cognitive function essential for goal-directed, adaptive behavior, involving the maintenance and manipulation of relevant information. While most studies have focused on the visual domain, fewer have explored WM for tactile information. In this study, we investigated tactile WM by asking participants to memorize the spatial layout of Braille-like pattern stimuli delivered to their index finger. Using a whole-brain searchlight approach with multivariate pattern analysis (MVPA), we aimed to identify the core brain regions encoding tactospatial WM content. ***Methods***: Twenty healthy participants underwent two fMRI sessions while performing a tactospatial WM task. In contrast to previous studies, we inspected a shorter WM delay phase (6 seconds) using high-resolution fMRI (2 mm voxel size and 1-second TR) in a repeated measures design. ***Results:*** Replicating prior findings, our results confirm that tactospatial WM content can be decoded from both, somatosensory cortices and the posterior parietal cortex (PPC). We extend previous research by demonstrating a temporal progression: somatosensory cortices are engaged during the initial encoding phase, while the PPC retained information later in the delay period. Moreover, performance-dependent decoding accuracy revealed that higher-performing participants exhibited more robust content decoding in the PPC. ***Discussion***: Our findings confirm that tactospatial WM engages a distributed neural network, with somatosensory cortices contributing to initial encoding and the PPC supporting later maintenance. Performance-dependent decoding accuracy highlights individual differences in WM efficiency, emphasizing the PPC's critical role in successful WM processing. These results not only reinforce the parallels between tactile and visuospatial WM networks but provide novel insights into the temporal dynamics and localization of tactile WM processing, offering a foundation for future investigations into WM enhancement strategies.

Poster: **A22** **Muazzez Deniz Barut**

The Distinct Antecedents of Social Anxiety and PTSD in a Clinical Sample

Ecer,E. [1], Barut,M. D. [2],Hellenbrand,S.[3],Sarabia Badillo,V.[4],Kochanowicz,J.[5],Özalp,E.[6], Zielińska,K. [7],Matos,S.[8], & Tomruk,C.N.[9]

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Introduction: People with anxiety and depression are at heightened risk of developing social anxiety and PTSD symptoms. However, there is a notable gap in understanding the distinct antecedents that contribute specifically to social anxiety versus PTSD within clinical populations. While both conditions share common risk factors, such as early-life trauma, attachment insecurities, and maladaptive coping mechanisms, the pathways through which these factors manifest in either social anxiety or PTSD remain underexplored. ***Methods***: Fifty-three Turkish participants with depression and anxiety completed scales measuring attachment insecurities, economic constraints, empathy dimensions (towards close persons and strangers), social anxiety, and PTSD symptoms. Multiple linear regressions were conducted to predict social anxiety and PTSD. Independent t-tests examined gender differences, and moderation analysis tested the role of perspective-taking on the link between attachment avoidance and social anxiety. Analyses were performed using Jamovi. ***Results:*** Multiple linear regression analysis revealed that attachment anxiety ($\beta = .41$, $p < .001$), economic constraints ($\beta = .38$, $p = .002$), and empathic concern towards a close person ($\beta = .41$, $p = .008$) positively predicted social anxiety disorder. However, personal distress and perspective-taking towards both close persons and strangers did not predict social anxiety disorder. Only attachment anxiety ($\beta = .26$, $p = .052$) predicted PTSD. Moderation analysis showed that a higher level of perspective-taking towards a close person serves as a protective factor against social anxiety disorder for individuals with higher attachment avoidance. Independent T-Test indicated that men had higher level of economic constraints and attachment avoidance than women, while women had higher level of empathic concern towards a close person than men. ***Discussion***: Our results highlight the importance of both psychological and economic factors in understanding social anxiety and PTSD within clinical populations. Our study suggests that perspective-taking towards close persons may protect against social anxiety in those with higher attachment avoidance.

Poster: **A23** **Emma Nesbit**

Cardiac cycle, reaching movements and motor imagery (CARMI)

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Introduction: Successful interaction with the external world requires the brain to integrate sensory input from both external modalities and internal organs, such as the heart (Azzalini et al., 2019). Perception is typically enhanced during diastole compared to systole (Birren et al., 1963; Jennings et al., 1992), whereas primary motor cortex excitability, ocular saccades, and active information sampling have been found to increase during systole (Al et al., 2023; Lai et al., 2024; Candia-Rivera et al., 2024). While prior research has primarily focused on simple motor responses, this study investigates how cardiac phase influences reaction times and movement errors in sequential reaching movements. ***Methods***: This secondary analysis utilizes behavioral and electrocardiogram (ECG) data from a previous study (Gippert et al., 2024), which employed a force field interference adaptation task. Three experimental groups were examined: an active group performing two consecutive reaches, a motor imagery group imagining a reach before execution, and a control group executing a single reach. ECG data recorded during the task will be analyzed to assess the relationship between cardiac phase and movement parameters. ***Results:*** Data analysis is ongoing. We hypothesize that reaction times and movement error will be influenced by whether movement initiation occurs during systole or diastole. Additionally, we expect systematic alignment of cardiac phase with movement cues and differences across task conditions. ***Discussion***: Findings will provide insights into the interaction between cardiac rhythms and motor control, expanding our understanding of heart-brain dynamics in complex movement tasks.

Poster: **A24** **Paul Steinfath**

A Systematic Review of Methods Used in Heartbeat Evoked Responses Research

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Introduction: Heartbeat Evoked Responses (HERs) are considered a neural marker of cardiac interoception, reflecting the brain's response to heartbeat-related information. They have been linked to a range of cognitive and emotional processes, yet effects reported in different studies vary widely across scalp regions and time windows. While these inconsistent findings may partially stem from differences in experimental paradigms, unstandardized pipelines and diverse data analysis methods also likely play a role. This review aims to systematically investigate the diverse methods used in HEP research and promote transparency and consistency in future studies. ***Methods***: We conducted a systematic literature search for empirical studies employing non-invasive EEG and MEG to investigate HERs in human participants. We extracted information related to data acquisition, preprocessing, and statistical analysis. ***Results:*** Using PubMed searches we retrieved and screened 749 publications from which 132 articles were included in our review. We observed high variability in processing choices for most acquisition and analysis steps, including ECG lead placement, filtering cutoffs, and approaches to handle cardiac artifacts. The reported time range and electrodes where HERs are evaluated varied substantially across studies. While many studies relied on hypothesis-driven regions of interest based on previous research; others employed two-step procedures with cluster-based permutation tests to identify HER clusters which are then used in subsequent analyses. ***Discussion***: Our findings highlight the need for more standardized and transparent methodological practices in HER research. Variability at various stages from data acquisition to final statistical analysis is present and likely contributes to the heterogeneity of reported HER effects. By providing a comprehensive overview of the methods used in the field, we highlight critical areas where inconsistencies may confound interpretations and propose next steps toward more robust HER investigations. Ultimately, we suggest guidelines for evaluating and reporting HER results and encourage the HER community to systematically examine how different analytical decisions impact HER outcomes.

Poster Session B

March 10, 2025 at 19:30-20:15

Poster: **B01** **Hannah McDermott**

Dissociable dynamic effects of expectation during statistical learning across cortical layers

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Introduction: The brain seemingly generates internal predictions, based e.g. on stimulus associations, to optimise behaviour. Predictive processing has been repeatedly demonstrated in non-invasive studies on human volunteers and in animal models. One commonly reported phenomenon is expectation suppression (ES) or the suppression of neural activity in response to expected stimuli. However, various mechanisms supporting ES have been suggested with conflicting evidence. Furthermore, most studies failed to demonstrate ES as a standalone phenomenon independent of repetition suppression. Our recent EEG study investigating the effects of predictions during associative learning shows that the effects of predictive processing are dynamic at both short and long time scales. In this high-field neuroimaging study, we test if these dissociable dynamics of expectation effects can be explained in the context of hierarchical learning mechanisms. ***Methods***: Neuroimaging was performed using 7T fMRI, focusing on the primary/secondary auditory and prefrontal cortex (parcellated into layers) and the hippocampus (parcellated into subregions). During scanning, healthy volunteers (N=15) completed an associative learning task consisting of paired visual and auditory stimuli, whereby a "leading" image from a scene category is quickly followed by a "trailing" sound from a speech category. Univariate analyses used an event-related general linear model to compare region- and layer-specific activity evoked by expected vs. unexpected sounds. Multivariate analyses focussed on decoding accuracy in valid/invalid trials, and tested for decoding differences in the first half vs. second half of the experiment. ***Results:*** Leave-one-run-out support vector machines (SVM) outline expectation effects on decoding accuracy, both within- and across- trials, between hierarchically lower vs. higher regions of the auditory cortical pathway, as well as between superficial vs. deep cortical layers. ***Discussion***: These results map the previously reported dynamic and opposing effects (sharpening vs. dampening) of stimulus prediction onto hierarchically lower vs. higher cortical regions, including contributions of specific cortical layers.

Poster: **B02** **Ella Teuscher**

DLPFC-ACC target engagement during chronometric interleaved TMS-fMRI predicts task performance

Teuscher, E. [1], Grosshagauer, S. [1], Woletz, M. [1], Vasileiadi, M. [1], Samonov, R. [1], Nohava, L. [1], Soanca, O. [1], Schuler, A.-L. [2], Williams, N. [3], & Tik, M. [1,3]
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Introduction: Transcranial magnetic stimulation (TMS) of the dorsolateral prefrontal cortex (dlPFC) has been shown to increase cognitive performance (Bagherzadeh et al., 2016). Although the gold-standard depression treatment target, i.e. sgACC anticorrelated DLPFC targets could potentially lead to improved performance, to our knowledge this has not been directly tested. Evidence to support this would demonstrate that sgACC modulation not only is an effective treatment for depression but enhances memory and between-subject differences in performance post TMS could be associated with activations in these brain areas. ***Methods***: In this study, we used interleaved TMS-fMRI during a working memory task to assess whether activations in the dlPFC and the anticorrelated sgACC are related to increased performance in response to TMS. Seventeen healthy subjects (8 female, aged 18-38) performed the N-back task during interleaved TMS-fMRI. First-level analyses were performed as in Grosshagauer et al., 2024. ***Results:*** Whole-brain level regression analysis ($p = 0.001$, $k=10$) revealed an association between reaction time and modulation of the sgACC during 2-back trials (peak: -6 46 -4 mm; $T = 4.68$, punc. = 0.001, see Fig. 1) that was contrary to our hypothesis. Stronger sgACC activation, correlates with increased performance in the working memory task. For TMS in 0-back trials increased activations in the dlPFC (peak: -42 30 16 mm; $T = 6.25$, punc. = 0.010, see Fig. 2) predicts slower response while the accuracy of 100% did not change. Further regions include supramarginal gyrus (SMG; peak: 60, -42, 38 mm; $T = 4.62$, punc. = 0.001). ***Discussion***: Together, between-subject differences in task performance measured by reaction time during a working memory task in response to TMS stimulation are associated with certain brain activation patterns. Changes in task performance in response to TMS depend on the task difficulty. Higher cognitive functions as required for the 2-back condition are hindered by sgACC projection, more basic visual processing (i.e. 0-back task) seems to be delayed if dlPFC activation increases due to stimulation. Importantly, measuring neural target engagement during task processing, as enabled by our chronometric TMS-fMRI approach, might enable further personalization of stimulation parameters to enhance efficacy.

Poster: **B03** **Lara Ryan**

Eating time alters human impulsivity by shifting its link to peripheral dopamine

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Introduction: The dopaminergic system is under circadian regulation and plays a key role in impulsivity, which increases later in the day. Food intake acts as a circadian cue and is related to dopamine function, therefore manipulating mealtime can shift internal rhythms and thus has potential to shift dopamine function, such as in impulsive behaviour. ***Methods***: In this pre-registered study (Clinical Trials identifier: NCT04351672, Open Science Framework osf.io/nmt5y) 28 females completed a 10-week, randomised cross-over mealtime intervention, assessing whether shifting mealtime through early (mealtime 08:00-16:00) compared to late (mealtime 13:00-21:00) time-restricted eating (TRE), can shift impulsive behaviour, and how this is related to dopamine shift. ***Results:*** Individuals were more impulsive after eTRE compared to lTRE, at a later internal daytime. Furthermore, behaviour later in the day was predicted by intervention-driven plasma dopamine shift. Finally, habitual fat intake was greater in the evening and this individual time-of-day-dependent habitual fat intake predicted impulsivity at different daytimes. ***Discussion***: Unveiling the time-of-day-dependency of dopamine and fat intake in impulsive behaviour, an underlying mechanism of high-fat diet, and how dopamine function can be manipulated through an easily-implemented TRE intervention, provides a novel perspective on how TRE can optimise human decision-making, relevant for treating metabolic disease and obesity.

Poster: **B04** **Maximilian Schmausser**

Effects of long-term transcutaneous auricular vagus nerve stimulation on circadian vagal activity in people with Prader-Willi Syndrome: A case-series

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Introduction: Prader-Willi Syndrome (PWS) is a genetic neurodevelopmental disorder marked by disruptions in circadian rhythms and autonomic nervous system (ANS) activity, hyperphagia, and episodes of emotional outbursts. Previous trials suggest that both invasive and non-invasive vagus nerve stimulation (VNS) can reduce emotional outbursts in PWS, potentially through its effects on vagal activity. This case series investigated the effects of transcutaneous auricular VNS (taVNS) on cardiac markers of circadian vagal activity, specifically heart rate variability (HRV) and heart rate (HR), and their potential links to improvements in emotional outbursts. ***Methods***: Five individuals with PWS (mean age: 26.9 years; 3 males, 2 females) received four hours of daily taVNS for 12 months, followed by one month of two-hour daily sessions. Outcome measures included daily recording of emotional outbursts and every three months 24-h HRV and HR recordings. Mixed cosinor models were applied to analyze changes in circadian rhythms of HRV and HR. A linear mixed model was used to assess the predictive value of cardiac vagal activity on emotional outbursts. ***Results:*** Circadian amplitudes of HRV and HR were significantly higher at the end of the treatment compared to baseline (all p's < .01). There was a significant increase in the rhythm-adjusted mean of HRV ($p < .01$), while the rhythm-adjusted HR mean significantly decreased, both indicating increased cardiac vagal activity. Higher rhythm-adjusted mean HRV predicted a lower number of emotional outbursts. ***Discussion***: The results suggest that taVNS may be effective by targeting ANS activity in individuals with PWS, contributing to improvements in behavioral regulation.

Poster: **B05** **Martina Saltafossi**

Epilepsy, respiration, and cortical excitability

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Introduction: Epilepsy often involves dysregulation of excitation-inhibition (E:I) balance, reflected in alterations of the 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 patients versus neurotypical controls. This study aims to characterise breathing-related power spectral abnormalities, including periodic and aperiodic activity, in a larger epilepsy cohort. ***Methods***: Fifty epilepsy patients underwent presurgical monitoring with low-density EEG and peripheral signals recordings. After extracting and cleaning one hour of resting-state-like data, respiration phases were obtained. To relate brain activity to respiration, the SPRiNT algorithm will be applied. A moving window approach will estimate the aperiodic component of Fourier-transformed neural data every 250 ms, aligning it with respiration phases. Averaged phase-binned slopes will be computed for each region of interest at the sensor level and subjected to statistical analysis. ***Results:*** A final sample of 39 patients with clean EEG and respiration data was selected. Based on prior findings, we expect respiration to impact cortical excitability in posterior brain regions. Circular representation of the results will reveal whether specific respiration phases are associated with steeper or flatter slopes, indicating transient shifts in inhibitory or excitatory tone. Linear mixed-effects model will further validate the link between breathing rhythm and E:I dynamics by predicting 1/f slope based on respiration phase angle (sine and cosine). ***Discussion***: This study integrates observations of pathological excitability in epilepsy and hyperventilation-triggered seizures within a unified framework. Recent theoretical advancements propose that bodily rhyhms, 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.

Poster: **B06** **Nhu Huynh, Dieu To**

Female Perspectives in Modern Asian Context: Perceived Sexism and Psychological Well-being

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Introduction: The current study examined the construct of perceived sexism and the roles of individual psychological responses to the well-being of young female individuals from higher education and socioeconomic status: the English-speaking community of Japan and Vietnam, whose higher education level and progressiveness led them to higher vulnerabilities to sexism (Wang & Sekiyama, 2024; Ishikawa et al., 2004; Walker, 1997). ***Methods***: Participants were recruited from briefing sessions in Tokyo - Ho Chi Minh City and social media platforms. A mixed-approach study was conducted with (1) online surveys (N = 201) to test contemporary measurements for perceived sexism and level of well-being among young female residents, followed by (2) semi-structured interviews (N = 10). ***Results:*** Education was found to be the only significant predictor of perceived exposure to sexism ($\beta = .553$, $p = .005$) when controlled for individual differences in psychological responses. The Perceived Exposure to Sex Discrimination (PESD) questionnaire with 26 items ($\alpha = .837$) was created to measure both exposure to sexism and the variety of responses. When weighted by perceived exposure to sexism, victimized response type (sadness, shame, insecurity, disappointment) significantly contributed to a lower well-being level ($t = -6.93$, $p < .001$), while the villainized response type (anger, confrontation, comparison, unfairness) pointed to higher well-being ($t = 1.71$, $p = .089$). Furthermore, victimized responses to sexism consistently showed a significant negative impact on the overall well-being of young women who were single ($\beta = -1.21$, $p = .035$), especially Generation Z who were born after 1996 ($\beta = -1.52$, $p = .003$) and those who identified themselves as women ($\beta = -1.52$, $p = .002$). ***Discussion***: The outcomes might explain the inconsistency in past studies on the impact of sexism on the well-being of female individuals across contexts (Schmitt et al., 2014; Borrell et al., 2011), in which specific types of responses may have mitigated the negative influences of sexism on women's psychological well-being.

Poster: **B07** **Srividya Athur Sundaram**

Gut-Brain Communication ,How do microbes and sex differences shape eating behaviour in obesity?

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Introduction: The global rise in obesity is linked to a shift towards pleasure-based eating habits, leading to increased consumption of high-energy foods. This has contributed to a significant increase in overweight and obesity rates worldwide. While weight loss interventions address unhealthy eating patterns and sedentary lifestyles, their long-term success varies among individuals. Emerging research suggests that the gut-brain axis plays a pivotal role in regulating eating behaviors, particularly in unhealthy eating patterns. However, the influence of microbiota and sex differences on eating behavior and weight trajectories remain unclear. ***Methods***: Building upon our understanding of the gut-brain axis and its role in regulating eating behavior, this PhD project aims to investigate the impact of gut-brain interactions and sex differences on eating behavior and related neural correlates in individuals living with obesity. By leveraging existing datasets and employing advanced analytical tools like QIIME2 and Bioconductor in R. ***Results:*** Firstly, we aim to analyze gut microbiome profiles to identify associations with eating behaviors before and after weight-loss interventions. Secondly, using fMRI analyses, we aim to correlate neural regions of interest involved in eating behavior with changes in gut microbiota composition. Finally, based on the findings from the previous aims, we will pilot a targeted microbiota intervention designed to improve gut health and neural processes associated with healthy eating. Thus, the project will lay a foundation to eventually pave the way to develop targeted interventions to advance healthier eating habits and improve long-term weight management in both women and men. ***Discussion***:

Poster: **B08** **Jannis Friedrich**

Higher-Level Cognition under Predictive Processing: Structural Representations, Grounded Cognition, and Conceptual Spaces

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Introduction: Predictive processing posits that prediction-error minimization underlies all perception, action, and cognition. Yet, despite its considerable popularity and explanatory scope, it is unclear how this enables higher-level cognitive abilities, such as representing and reasoning over abstract concepts. ***Methods***: By surveying the domains of embodied cognitive science and philosophy of mind, we can arrive at a biologically plausible and theoretically rigorous description of the format of mental representations. We combine insights from predictive processing, structural representations and grounded cognition to address this issue. ***Results:*** Predictive processing argues from the free energy principle that an anticipatory model of the person-relevant environment is simulated. Structural representations state that these representations are isomorphic to, i.e., retain the relational pattern of, the world. Building on this assembly, grounded cognition research provides four insights into how abstract concepts are represented. First, a hierarchical organization allows abstracting from specific sensory qualities. Second, language glues together sensory qualities into representations that share no intrinsic properties, and acts as a social tool. Third, metaphoric mapping allows fragments of concrete percepts to represent abstract concepts. Lastly, conceptual spaces can represent concepts by generating multi-dimensional spaces consisting of abstract quality dimensions. ***Discussion***: By transplanting these four insights to predictive processing's (structural) hierarchical generative model, we explain higher-level cognition through detached models of perception and action simulations, isomorphic to actual behavior, in abstract conceptual spaces. This constitutes a significant expansion to life-mind continuity approaches by providing specific mechanisms for how the principles driving the emergence of life can account for the sophisticated higher-level cognition in humans. By synthesizing insights from these three literatures, we generate a coherent description of higher-level cognition under predictive processing. We add to predictive processing theories like the free-energy principle, that organisms exapt internal models via metaphoric mapping or conceptual spaces for higher-level cognition.

Poster: **B09** **Buket Sen**

How intention shapes neural process of moral conflict in borderline personality disorder?

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Introduction: Borderline personality disorder (BPD) is a mental disorder characterized by interpersonal difficulties, including challenges with trust and forgiveness. Moral decision-making, which involves the interplay of cognitive and emotional processes, may be impaired in individuals with BPD. This study aims to investigate the neural correlates of moral decision-making in BPD, focusing on the interpretation of intention in harm-based scenarios and the associated neural mechanisms. ***Methods***: This study will include 63 BPD patients and 63 age- and gender-matched healthy controls. Participants complete a computer-based task to assess moral decision-making while undergoing electroencephalography (EEG) and heart-rate monitoring. The task requires evaluating harm-based scenarios as intentional or accidental harm and judging their moral acceptability. EEG analysis focuses on medial frontal negativity (MFN) within 200–350 ms, a marker associated with conflict detection processes, which may play a role in intention interpretation and moral evaluation. Data analysis will include within-group and between-group comparisons, alongside correlations between neural activity and behavioural measures. ***Results:*** We hypothesize that BPD patients will show more negative MFN during accidental harm scenarios, which is associated with increased moral conflict compared to healthy controls. Our preliminary analysis (N=6 BPD, N=6 controls) indicates that BPD patients exhibit a trend toward more negative MFN amplitudes in accidental harm scenarios compared to healthy controls. However, as data collection and analysis is still ongoing, we believe that the final results will provide more robust insights into group differences and explore correlations between neural and behavioural measures. ***Discussion***: These findings provide insights into disrupted intention interpretation and conflict detection in BPD, contributing to the understanding of social cognition deficits in this population. Understanding the neural underpinnings of moral reasoning in BPD could facilitate the development of targeted treatments to enhance intention regulation, thereby improving interpersonal functioning in BPD.

Poster: **B10** **Paula Linares**

Johann Friedrich Herbart: A 19th Century Precursor to Neuroeducation

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Introduction: Johann Friedrich Herbart (1776–1841), a foundational figure in pedagogical and psychological theory, established a systematic framework for education based on psychology and philosophy. Although his theories predate contemporary neuroscience, this presentation explores Herbart's work as a precursor to neuroeducation. ***Methods***: This study employs an interdisciplinary approach, integrating historical-educational analysis with insights from neuroscience. The methodological design is qualitative, focusing on analysis of educational discourses through primary textual sources, combining theoretical-comparative methods. ***Results:*** Herbart's theory of interest posits that interest is a vital psychological mechanism that fosters learning by engaging the learner's cognitive and emotional faculties, which resonate with the current understanding of brain mechanisms underlying motivation, learning, consolidation of experiences and dopamine's role in cognitive engagement. His conceptualization of apperception and circle of thought —where new knowledge connects with prior mental structures, describing the development of mental processes through education— finds striking similarity to modern findings on neuroplasticity and the brain's network-based learning processes. Moreover, Herbart's focus on the interplay between emotions and education aligns with evidence on the amygdala's influence on memory formation and consolidation. Herbart as a precursor to neuroeducation, whose ideas remain relevant to modern understandings of cognitive and learning processes, enriches the field by adding historical depth and offering new perspectives for further research. ***Discussion***: By positioning Herbart's theory within the context of neuroeducation, the discussion underscores its contemporary relevance and highlights the value of linking historical insights to modern neuroscience. It emphasizes how classical theories, like Herbart's, provide a foundational perspective that deepens our understanding of learning processes and inspires new interdisciplinary approaches in the learning sciences.

Poster: **B11** **Deniz Yilmaz**

Investigating Interoceptive Alterations in Schizophrenia Spectrum Disorders: A Multimodal Approach

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Introduction: The ability to perceive one's body by integrating percepts from the internal (interoception) and external (exteroception) world is fundamental to bodily self-consciousness (BSC). In schizophrenia spectrum disorders (SSD), disruptions in BSC, known as self-disorders, are prevalent and have been associated with various symptom domains. While the exteroceptive components of these alterations have been extensively investigated, the interoceptive domains remain underexplored. Here, we hypothesize that individuals with SSD show altered interoception on three levels compared to healthy controls (HC): self-reported interoceptive sensibility, objective interoceptive accuracy, and neural correlates of interoception. ***Methods***: We are recruiting individuals with SSD and age- and gender-matched healthy controls (HC) aged 15 to 65 years. Participants complete an EEG experiment (with ECG and respiration monitoring) that includes resting-state recordings and a heartbeat counting task (HCT), followed by questionnaires assessing interoceptive sensibility. In addition, patients undergo functional and structural MRI scanning. The HCT measures cardiac interoceptive accuracy, while Heartbeat Evoked Potentials (HEPs) extracted from the EEG data give insight into the neural correlates of interoception. ***Results:*** The preliminary analysis (nSSD = 27, nHC = 12) revealed no group differences regarding interoceptive sensibility, interoceptive accuracy, or HEP amplitudes. HEP amplitudes were not modulated by interoceptive attention during the HCT condition. ***Discussion***: Data collection is ongoing, and the small sample size, particularly for HC, limits statistical power. While HCT has methodological limitations, such as reliance on beliefs about heart rate, strict instructions were implemented to mitigate this. Notably, the HCT also functions as a condition to assess the impact of interoceptive attention on HEPs. Future analyses will explore correlations with symptom severity, respiratory interoception, and MRI data focusing on insula to further elucidate interoceptive alterations in SSD.

Poster: **B12** **Fivos Iliopoulos**

Investigating Neurophysiological Synchrony during Natural Conversation: A First Step to EEG Hyperscanning

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Introduction: Speech is a highly complex task requiring multisensory integration, neural tracking, and continuous top-down cognitive control. While extensive research has explored speech at linguistic and phonetic levels, the underlying neurophysiological mechanisms, particularly in natural conversation, remain largely unknown. To address this, we are developing an EEG hyperscanning platform to measure multiple participants simultaneously and assess synchrony correlates at both the individual (e.g., cardiac-neural-speech alignment) and interindividual (e.g., cortical synchrony between interlocutors) levels. As an initial step toward integrating four parallel recordings, this study examines the relationship between speech rate, cardiac activity, and oscillatory dynamics within individuals engaged in dyadic conversation. ***Methods***: We are currently recording EEG, ECG, and eye-tracking data of a single subject, from 20 participant dyads during two tasks: (1) a joint counting task, promoting rhythmic turn-taking, and (2) natural conversation. ***Results:*** Data collection will conclude by March 2025, with analyses focusing on synchrony between cardiac, neural, and speech activity at the individual level, as well as interindividual measures such as speech rate, overlap, and gap duration between speakers. ***Discussion***: These findings will offer insights into the neural coordination underlying real-time speech production and interaction while also helping to refine our methodology and address practical challenges associated with multi-participant recordings.

Poster: **B13** **Fiammetta Zanetti**

Investigating the effects of a cardio-visual full-body illusion on embodiment and body image

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Introduction: Current eating disorder theories suggest patients are locked in a negative and distorted view of their body, not updated by current sensory input. We aim to create a virtual reality (VR) platform to improve body image by targeting multisensory integration. The VR cardio-visual full-body illusion (CVFBI) creates an illusory sense of ownership over an avatar through an outline flashing in synchrony with the participant's heartbeat. This induces somatosensory and interoceptive changes hypothesized to positively affect body image. The exact conditions necessary to achieve strong embodiment and positive effects on body image remain unclear, however, leading us to investigate different implementations of heartbeat synchronicity and asynchronicity. ***Methods***: In the CVFBI active conditions (high embodiment expected), the flash around a realistic avatar started at 0ms or 200ms after the R-peak of the ECG. Control conditions (low embodiment expected) include flashing with a longer delay (500ms), synchronized with self-pre-recorded ECG, +/-20% heart rate, or no flashes. ***Results:*** Seventeen healthy participants (M 53%) were recruited. There were no differences in self-reported embodiment or body image (body satisfaction questions) between conditions. As a psychophysiological indicator of embodiment, skin temperature (recorded from arm and back) did not differ between conditions but showed a positive weak correlation between arm temperature and embodiment. ***Discussion***: Low embodiment scores indicate that none of the conditions induced the CVFBI, nor were there positive effects on body image. The correlation between skin temperature and embodiment was opposite compared to previous studies. This underlines the importance of further studying the existence and utility of the CVFBI, as well as of physiological indicators of embodiment. Developing interventions, which successfully target multisensory integration, appears essential for the treatment of body image disturbance in eating disorders.

Poster: **B14** **Mustafa Yavuz**

Joint-Olfaction: Human dyads show collective benefit in olfactory discrimination and identification

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Introduction: Perception is inherently noisy and prone to errors, particularly in challenging situations. Humans, however, can mitigate individual limitations through communication and calibration of their perceptual judgments, resulting in well-documented "collective benefits" in perceptual decision-making. This raises a critical question: can such benefits extend to modalities like olfaction, where verbal communication is far less common? Many neuroscientific and behavioral studies have indeed highlighted the limited vocabulary for olfactory experiences, especially in Western cultures. Our pre-registered study addresses this gap by investigating whether dyadic collaboration enhances olfactory discrimination and identification, using the standardized clinical Sniffin' Sticks Test as a reliable measure of chemosensory performance. ***Methods***: We recruited 40 participants (mean age = 24.5; 70% women, 30% men) who, initially, completed the Sniffin' Sticks Threshold, Discrimination, and Identification tasks individually. Participants were then matched into dyads based on their olfactory Discrimination and Identification scores, forming either similarly skilled or differently skilled pairs. On testing day 2, dyads undertook the Discrimination and Identification again. In each trial, members of a given dyad first decided privately and then discussed their choice to reach a consensual decision. ***Results:*** Dyads had superior performance in olfactory discrimination and identification compared to the average of individuals in the pair. As predicted, collective benefit was highly correlated with the skill similarity of the individuals. Dyads composed of individuals with similar skill levels achieved robust collaborative benefits in both Discrimination and Identification compared to their solo baselines. Comparable olfactory ability fostered more effective sharing of perceptual evidence and corrected the individual errors. ***Discussion***: By extending joint decision-making research to the olfactory domain, our results broaden the scope of social cognition research across sensory modalities. They also support the indication that collaborative efficacy may depend on pairing individuals with comparable abilities.

Poster: **B15** **Carlotta Isabella Zona**

Label-induced categorization bias in 2D manual pointing

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Introduction: Classifying items into categories can alter their perception, making them appear more similar to same-category items and more distinct from other-category items. For instance, numbers sharing overlap of the first digit (e.g., 30, 32) are localized as closer than equidistant numbers sharing no such overlap (28, 30) in number-to-position tasks (left-digit bias). ***Methods***: In two experiments, we investigated the effects of left-digit bias induced by the verbal labels of numerical targets on angular estimations in a 2D spatial-localization task performed by sighted (n=20) and blindfolded participants (n=23). Participants listened to spoken numbers (1–12.5; 0.5-unit increments, e.g., "three point five") and pointed on a touchscreen to each number's location on a clockface. We hypothesized that targets with overlapping left digits (within-category) would yield more similar angular estimations than targets sharing no left-digit overlap (between-category). ***Results:*** The results supported our hypothesis, as within-category targets were localized as closer to each other than equidistant, between-category targets regardless of vision. Further, this effect was attenuated in participants with better spatial-WM skills. ***Discussion***: Our novel observation supports the view that numerical knowledge is spatially organized, such that numerical distance may be represented in terms of spatial distance and distorted by ad-hoc categories induced by verbal labels, as inferred from pointing behavior.

Poster: **B16** **Rosa Großmann**

Mechanical near-threshold stimulation and the neural correlate of tactile perception

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Introduction: It is a long standing question at what stage of processing the human is able to report that a tactile stimulus is perceived. electroencephalography (EEG) studies applying detection paradigms have revealed that perceived near-threshold stimuli elicit the mid-latency event-related potential (ERP) N140, which is absent when the stimulus was not detected. Earlier ERPs such as the P50, on the other hand, appear to encode physical features of the stimulus. However, the neuronal origin of these effects and their dependence on the stimulation modality remain unclear. ***Methods***: In this study, we are conducting a within-subject EEG experiment comparing the processing of near-threshold mechanical and electric stimuli. Additionally, I am applying source reconstruction to elucidate the origins of the neural correlates of conscious perception. We hypothesize that the neural correlate for mechanical stimulation will occur earlier compared to electrical stimulation. ***Results:*** Preliminary results replicate findings for electrical stimulation, with the N140 identified as neural correlate of detection. Moreover, for mechanical stimulation, a component related to stimulus detection appears to precede the N140 component. ***Discussion***: The observation that the ERP components associated with either mechanical or electrical stimulus detection differ in latency provides new insights about conscious somatosensory perception. These findings highlight the importance of considering stimulation modality in laboratory settings. The next step involves disentangling the sources of the relevant ERP components.

Poster: **B17** **Taiki Oka**

Meta-brain-awareness of affective approach-avoidance bias

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Introduction: Can humans consciously access and understand their own unconscious affective biases? Such biases strongly shape approach-avoidance behaviour, particularly in response to negative stimuli, and awareness deficits of the biases are commonly observed in psychiatric disorders. However, the meta-awareness ability and the neural mechanisms remain unclear because traditional methods could not measure whether people perceive their own affective bias states. This study introduces the concept of meta-brain-awareness: the ability to distinguish one's own neural states associated with affective biases. Developing a novel neurofeedback paradigm, we investigated whether individuals could access their affective bias brain states and identified the relevant neural underpinnings. ***Methods***: Thirteen participants underwent one session of an approach-avoidance task followed by two neurofeedback sessions in an MR scanner. We developed individualised machine learning decoders using the fMRI data during the approach-avoidance task to classify affective bias states from real-time neural activity patterns. Participants were tasked with evaluating their affective bias state based on neural decoder feedback and reporting their confidence levels. This enabled us to measure their ability to perceive their own brain state related to unconscious affective bias, i.e., affective meta-brain-awareness. ***Results:*** Participants could recognise their own brain's approach-avoidance state significantly better than chance ($p < 0.01$ compared to 50%). Confidence ratings positively correlated with successful meta-affective bias detection ($\beta = 0.13$, $p = 0.02$). Multivoxel pattern analysis further revealed a significant classification of meta-brain-awareness success in the orbitofrontal cortex (OFC) and anterior cingulate cortex (ACC) (both pFDR = 0.02 compared to 50%) but not in the ventromedial prefrontal cortex (pFDR > 0.05 compared to 50%) ***Discussion***: This study provides proof-of-concept evidence for investigating affective meta-awareness using decoded neurofeedback and highlights the crucial roles of OFC and ACC in unconscious affective state perception. Our findings advance the understanding of neural mechanisms underlying affective meta-awareness. The paradigm also offers potential applications for understanding metacognitive dysfunction in clinical populations.

Poster: **B18** **Min Pu**

Neuro-metabolic pathway linking high protein meal reducing food craving in humans

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Introduction: Across species, high protein food has been shown to regulate appetite and satiety. However, its underlying neuro-metabolic mechanism remains unknown. Here, we investigate whether a protein-rich diet modulates plasma tyrosine dynamics, a precursor of dopamine, altering dopaminergic brain activity, thereby reducing food craving in humans. ***Methods***: In this within-subject study, 30 healthy participants (23.63 ±3.23 years; 22.90±1.80 kg/m2) were provided with either a high or a low protein breakfast. We then monitored plasma tyrosine dynamics over four hours. Participants were viewing high-or low caloric food pictures, while their brain activity was measured using magnetic resonance imaging (MRI). Four hours after the breakfast, we assessed participant's food craving. ***Results:*** First, high protein breakfast significantly enhanced plasma tyrosine levels and reduced food craving, compared to the low protein breakfast. Specifically, participants, with greater enhancement in plasma tyrosine reported to experience lower food craving following the high protein breakfast. Importantly, we observed a significantly stronger substantia nigra (SN) activity after eating high protein meal, which predicted the reduction of food craving. Strikingly, substantia nigra activity gated the association between tyrosine levels and food craving after eating high protein breakfast ***Discussion***: We provide a strong evidence for dopaminergic mechanism of how high protein diet decreases food craving throughout the day in humans.

Poster: **B19** **Tomás Codina**

Multimodal fNIRS-EEG Sensor Fusion: Review of Data-Driven Methods and Perspective for Naturalistic Brain Imaging

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Introduction: Humans acquire concepts through perception with their senses and through various languages. Although researchers have studied the effects of these different modalities and languages on brain representations independently, little is known about their combined influence. The degree to which a concept refers to a perceptible entity – concreteness – is a crucial factor in these investigations. In English, neuroimaging studies showed that concrete concepts are located close to their corresponding perceptual systems, while abstract concepts are located mainly in regions associated with general linguistic processing. Across languages, behavioral studies showed that cross-lingual similarity is higher for concrete concepts than for abstract concepts. However, very few studies considered bilingual neuroimaging data. Thus, it is unclear whether established patterns of cortical representations in English extend to other languages and how concreteness relates to cross-lingual similarity in the cortex. ***Methods***: We analyzed functional magnetic resonance imaging (fMRI) recordings collected while Chinese-English bilingual participants read narratives in both languages. Voxelwise encoding models were used to model cortical representations of concrete and abstract concepts in each language. We extracted features that represent the semantic content of the stimulus words using word embeddings aligned across languages. Then, we estimated model weights that reflect semantic information represented in each voxel, for each language and participant separately. Low-level features were included as nuisance regressors to account for sensory aspects of reading. The semantic model weights allow us to measure tuning towards concrete or abstract concepts, as well as the similarity of semantic representations across languages. ***Results:*** Tuning towards concrete and abstract concepts is largely shared between English and Chinese. Similarity across languages is high for both concrete and abstract concepts. For abstract concepts, this effect could be driven by emotional words. ***Discussion***: We hope this study advances understanding of language representations in bilingual brains.

Poster: **B20** **Kristin Kaduk**

Neural activity in the dorsal pulvinar reflects cardiac modulation and influences cardiac and respiratory activity Project proposal: Neuronal activity underlying stimulus-related changes in alpha rhythm amplitude

Kaduk, K. [1,2,6], Vasileva, L. N. [1,2], Schneider, L. [1,2], Bähr, M. [5], Kagan, I. [1,2,4], & Wilke, M. [1,2,3,4]

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Introduction: Increasing evidence highlights the thalamus's role in regulating the autonomic nervous system. The dorsal pulvinar (dPul), with its reciprocal connections to the central autonomic network (CAN), integrates multisensory information and is thought to be crucial for emotional processing. However, its direct influence on cardiovascular and respiratory activity, independent of emotional content, remains unclear. ***Methods***: To investigate how dPul affects respiration and cardiovascular indices, we recorded capnograms and electrocardiograms in awake macaque monkeys during rest and task together with dPul's neuronal activity or while pharmacologically suppressing dPul with the GABA-A agonist (THIP). In total, we characterized >1000 neurons recorded in two monkeys in dPul alongside mediodorsal (MD) and ventral posterior lateral (VPL) thalamus, and conducted 66 dPul inactivation sessions with controls in three monkeys. ***Results:*** We found systematic heart-related R-peak-triggered phasic modulation in the firing rate of many neurons (>50% of a sample based on multiple inclusion criteria) in dPul, ventral posterior lateral (VPL), and mediodorsal (MD) thalamus during both rest and task. In addition, many neurons showed predominately positive significant correlations between their firing rate and the heart rate. Pharmacological suppression of dPul reduced task-related performance in all three monkeys and resulted in physiological changes, including decreased heart rate variability (RMSSD) and respiration rate in one monkey and decreased heart rate and increased RMSSD in another monkey. These inactivation-induced changes were reproducible across sessions and did not significantly differ between rest and task conditions. ***Discussion***: We conclude that the neural activity of the dorsal pulvinar is modulated by the cardiac cycle during rest and task. Notably, dPul inactivation altered heart rate and variability, and respiration rate, highlighting its involvement in brain-body interactions and body state-related processing. This challenges the traditional view of pulvinar as purely visuospatial attentional structure.

Poster: **B21** **Sangjoon Woo**

Neural Correlates and Cardiorespiratory Dynamics of Near-Threshold Mechanical Sensory Detection

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Introduction: Recent findings indicate that cardiac and respiratory rhythms can significantly shape near-threshold somatosensory processing. However, most existing research in this area has relied on electrical stimulation, even though in everyday life we typically experience mechanical touch. In this study, we aim to directly compare near-threshold detection of electrical and mechanical stimuli under the same experimental setup. I'm particularly interested in how detection rates might vary depending on the cardiac cycle and the respiratory cycle. Previous research with electrical stimuli suggests higher detection rates during diastole and early expiration, but it's still not clear if the same pattern appears when using mechanical stimulation. ***Methods***: Participants take part in two different types of experiments (electrical stimulation and mechanical stimulation). Each participant's individual threshold is measured beforehand so that we can deliver stimuli right around that near-threshold level. During the experiment, a 62-channel EEG setup records the P60 and N140 components over sensory cortex regions, and Heartbeat-evoked potentials are measured. We also monitor ECG and respiration. ***Results:*** Based on past studies using electrical stimuli, we expect that detection might be higher during diastole and early expiration. We also anticipate that when HEP amplitude in contralateral primary somatosensory cortex is higher, detection could be lower, consistent with earlier research. ***Discussion***: If mechanical stimulation mirrors the phase-dependent patterns observed with electrical stimuli, it could suggest that cardiac and respiratory rhythms play a similar role in shaping near-threshold perception across different tactile modalities. On the other hand, if mechanical and electrical stimulation show distinct patterns, it might indicate that the more natural form of touch is influenced by factors not captured in studies using electrical impulses. This work should provide a clearer picture of how cardiac and respiratory cycles interact with somatosensory detection, and how these effects may vary depending on the nature of the stimulus itself.

Poster: **B22** **Jonathan Buchholz**

Neural Correlates of High- and Low-Level Prior in Perceptual Decision Making Under Uncertainty

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Introduction: Hierarchical Predictive Coding posits that the brain operates as a generative model, integrating higher- and lower-level predictions to minimize environmental uncertainty. High-level priors are often conceptualized as abstract, cognitive beliefs, while low-level priors encode implicit, perceptual content. Despite recent advancements, the neural mechanisms differentiating these hierarchical priors remain unclear. This study aims to further investigate the neural correlates of high- and low-level priors in perceptual decision-making and extend previous work by implementing a single-paradigm, trial-by-trial design. ***Methods***: We record Electroencephalography (EEG) during two variations of a 2AFC- paradigm with a Random Dot Kinetogram (RDK) solely differing in prior manipulation for motion direction. Experiment 1 assesses low-level priors through statistical learning of tone-motion associations. Experiment 2 operationalizes high-level priors as induced belief in glasses allegedly enhancing one motion direction. A baseline condition with a neutral cue comprises no-prior trials. ***Results:*** We hypothesize enhanced criterion shift, increased occipital α-power (8–12 Hz) and attenuated event-related potential (ERP) during the pre-stimulus interval in prior vs. no-prior trials, for high- and low-level prior. Behavioral-neurophysiological associations will be examined via correlations between changes in α-power, ERP amplitudes, and criterion shift. We will explore distinct neural processes of high- and low-level prior in time-frequency- and ERP-space and investigate potential compensatory mechanisms. ***Discussion***: Our research aims to elucidate the distinct neural dynamics underlying hierarchical priors in perceptual decision-making, advancing our understanding of Hierarchical Predictive Coding. These findings have implications for refining computational models of psychiatric disorders characterized by a deviant interrelation of hierarchical priors, such as schizophrenia or autism.

Poster: **B23** **Marta Gerosa**

Cardiorespiratory Contributions to Sense of Agency and Voluntary Action Initiation

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Introduction: Voluntary movements are accompanied by a distinctive experience of control over both actions and their outcomes, known as sense of agency (SoA). Traditionally, SoA has been explained as the accurate prediction of the sensorimotor outcomes of intentional action. Recent frameworks propose that also internal bodily signals shape how motor acts are generated, controlled and self-attributed, with SoA itself emerging from the reciprocal integration of interoceptive and sensorimotor predictions. Notably, voluntary action initiation has been found to preferentially align with specific cardiac and/or respiratory phases, yet the extent to which this coupling between cardiorespiratory rhythms and voluntary actions modulates SoA remains unclear due to inconsistent findings. ***Methods***: Forty-seven healthy, right-handed participants (mean age = 28.68 ± 7.21; age range 18-44; 26 females) completed an intentional binding task while cardiac and respiratory activity was continuously recorded. Participants reported the timing of either voluntary keypresses or brief tones across two Baseline (action or tone in isolation) and two Operant conditions (action and tone consequently). Action binding and tone binding measures were computed to assess the effects of cardiorespiratory fluctuations on voluntary action initiation and SoA via circular and binary analyses. ***Results:*** Behavioral results showed the expected perceptual shifts of the intentional binding effect, reflecting a compression of the perceived interval between intentional actions and their sensory outcomes. Participants reported voluntary actions later in time (i.e., action binding: 39.72 ± 1.75 ms), and tones earlier (i.e., tone binding: -87.00 ± 0.09 ms) than their actual occurrence, in Operant versus Baseline conditions. The preregistered (osf.io/z7g9h) analysis of peripheral physiological data is ongoing and the results of the hypothesized effects of cardiorespiratory phase-locking on SoA in the poster. ***Discussion***: Overall, the current study aims to shed light on the robustness and behavioral relevance of the link between cardiorespiratory fluctuations, voluntary action initiation and SoA.

Poster: **B24** **Eva De Poi**

Exploring the effects of dopaminergic modulation on spatio-spectral EEG dynamics during brain-computer interface learning: a double-blind analysis

De Poi, E. [1,2], Grigoryan, K. [1], Kapralov, N. [1,3], Nikulin, V. [1], Sehm, B. [1], Vidaurre, C. [4,5,6], & Villringer, A. [1,7,8]
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Introduction: The original investigation (ClinicalTrials.gov ID: NCT06729658) examines how dopaminergic modulation via L-Dopa influences brain-computer interface (BCI) learning, neuroplasticity, and the neural predictors of BCI success based on brain structure and function. Neuroimaging analyses will examine L-Dopa's effects on brain structure and functional connectivity. Structural MRI will assess myelination, axonal integrity, and microvascular properties through techniques such as magnetization transfer saturation (MTsat) and diffusion-weighted imaging (DWI). Resting-state and task functional MRI (fMRI) will investigate how dopaminergic modulation impacts large-scale connectivity patterns. The findings aim to inform strategies for enhancing post-stroke motor recovery by combining BCI-based interventions with dopaminergic modulation to potentiate neuroplasticity and improve motor learning. Building upon the primary investigation, the current study is a secondary analysis that aims to systematically examine how dopaminergic modulation via L-Dopa influences neural activity patterns and their relationship to BCI accuracy. ***Methods***: Specifically, we will analyze the spectral and temporal dynamics EEG activity in the mu (8-13 Hz) and beta (13-30 Hz) bands, focusing on event-related desynchronization (ERD) during motor imagery (MI), event-related synchronization (ERS) during inter-trial intervals (ITI), signal-to-noise ratio (SNR) and aperiodic part of spectra in sensorimotor regions, while also examining whether these neural changes contribute to improved BCI learning outcomes. Additionally, we will assess how this pharmacological intervention influences functional connectivity (FC) within motor-related networks. By implementing a double-blind, placebo-controlled design, this study ensures an unbiased evaluation of both neural responses and behavioral performance. Data from both young and older participants will be analyzed to investigate potential age-related differences in dopaminergic effects on neural dynamics and BCI learning. ***Results:*** ***Discussion***: These findings will provide new insights into the neurophysiological mechanisms supporting BCI control and the role of dopamine in shaping motor learning-related plasticity.

Poster Session C

March 11, 2025 at 15:25-16:10

Poster: **C01** **Vittoria Volpi**

Motion-numerical compatibility effects on magnitude processing

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Introduction: Numerical knowledge is spatially organized along a Mental Number Line (MNL), with smaller magnitudes typically associated with the left and larger magnitudes with the right, particularly among Westerners. Vertically, larger magnitudes are associated with upper regions of space, and smaller magnitudes with lower regions. In random-number-generation tasks, participants have shown a bias toward producing small magnitudes when turning left and larger magnitudes when turning right—a phenomenon attributed to motion-induced attentional shifts toward magnitude-congruent regions of space and dubbed "motion-numerical compatibility" effect. ***Methods***: This study investigated whether motion-numerical compatibility affects magnitude processing using a Go/No-Go paradigm. In the baseline blocks, 31 participants judged spoken numbers (1, 2, 8, 9) as larger or smaller than five by pressing vertically or horizontally lateralized response buttons. The button location was either congruent or incongruent with the magnitude's position on the MNL (e.g., congruent: up/right response buttons for numbers larger than five). In the critical blocks, participants pressed the spacebar when the numbers met the current (larger/smaller than five) rule while performing horizontal/vertical head movements. Response latencies were compared for head positions toward magnitude-congruent versus incongruent directions. ***Results:*** Results from the baseline blocks revealed robust spatial-numerical associations: magnitudes were judged faster with magnitude-congruent (vs. incongruent) response-button configurations. In the critical blocks, while no effects of vertical head motion were detected, participants responded faster with their head turned to magnitude-incongruent (vs. congruent) regions of horizontal space. ***Discussion***: Our results replicate previous evidence supporting the association of space and magnitude and provide novel insights on how head motion influences magnitude processing. Specifically, the findings suggest that participants may be influenced by to-be-performed motion, rather than head position, in line with previous work (e.g., Shaki & Fischer, 2014 Exp Brain Res.), suggesting that magnitude-congruent spatial shifts of attention may modulate magnitude processing.

Poster: **C02** **Wenhao Huang**

Neurophysiological underpinnings of prolonged exhalation impacting Risk behavior

Huang, W. [1,2,3], Schmidt, M. [1,2,3], Rebollo, I. [1,2,3], Keweloh, B. [1,2,3], Molter, F. [1,2,3], Lam, L. [1,2,3], Bellucci, G [4], & Park, S.Q. [1,2,3]
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Introduction: Breathing plays a key role in regulating the autonomic nervous system, influencing neural activity, and shaping psychological states. Specifically, prolonged exhalation (ProlEx) breathing pattern enhances parasympathetic activity, offering benefits for stress regulation and emotional control. However, their effects on higher-order cognitive functions, such as decision-making, and its underpinning neuro-physiological mechanisms remain underexplored. ***Methods***: This study examined how prolonged exhalation influences risk choice and its underlying neural and physiological mechanisms. Using a within-subject design, 38 participants (mean age 24.79 ± 5.3 years, 21 females) performed a gambling task under two conditions: prolonged exhalation and normal breathing (Eupnea), while their brain activity was measured by means of functional magnetic resonance imaging (fMRI). We also assessed heart rate variability and respiration. ***Results:*** Results revealed that under prolonged exhalation, reward has a greater impact on risk choice, compared to control breathing. Furthermore, under prolonged exhalation, heart rate variability was significantly enhanced, indicating parasympathetic activation. Further analyses demonstrated that participants with greater HRV increases during prolonged exhalation exhibited heightened sensitivity to rewards. We identified two brain regions—the ventromedial prefrontal cortex (vmPFC) and the precuneus—in which the prolonged exhalation induced HRV enhancement led to greater reward sensitivity. ***Discussion***: These findings suggest that ProlEx breathing enhances the reward's impact on decisions by aligning physiological states with neural adaptations. This study underscores the potential of ProlEx as an application tool to improve decision-making through autonomic and neural regulation, offering insights into the dynamic interplay between physiological states and cognition.

Poster: **C03** **Ophir Netzer**

Neuropsychological Insights into Trauma Experienced Under Psychoactive Substances

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Introduction: On October 7, 2023, the Supernova festival was targeted in a large-scale terror attack, exposing attendees to life-threatening traumatic events (TEs). Trauma exposure has been found to trigger psychological changes and alterations in functional connectivity within key brain networks. Uniquely, many attendees experienced the TE under the influence of mind-altering substances which poses an unknown challenge to survivors' recovery trajectory. ***Methods***: This study investigates the psychological and neural correlates of trauma in survivors of the attack. Participants included survivors and demographically matched controls. Participants completed self-report questionnaires to assess demographics, substance use, and trauma-related constructs (e.g., social interactions), alongside established scales for posttraumatic symptoms (e.g., PCL-5). Participants also underwent two 6-minute resting-state fMRI scans before and after viewing a 6-minute music festival-themed movie stressor. Inter-subject correlation analysis compared neural activity between groups. ***Results:*** Results (n=772) revealed that 72% of participants were under the influence of mind-altering substances during the TE. Those who consumed MDMA reported feeling less overwhelmed, engaging in more social interactions, improved sleep quality, and lower distress levels compared to those who were not under the influence of any substance during the TE. Conversely, participants who consumed Cannabis and/or Alcohol reported higher distress, more severe PTSD symptoms, and poorer sleep quality. Preliminary fMRI findings (n=83) identified significant differences in neural activation during the stressor, indicating altered neural processing in survivors of the attack. ***Discussion***: These findings offer novel insights into how psychoactive substances influence trauma processing and neural activity, highlighting significant alterations in brain connectivity and activity following extreme trauma.

Poster: **C04** **Celia Blaise**

Perception of Body Boundaries Without Vision: How Perspective-Taking and Embodiment Influence Accuracy

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Introduction: The ability to distinguish between our body and the external world is crucial for our sense of self, environmental interaction, and sensory processing. Previous studies suggest that the perceptual clarity of this boundary can vary, but precise measures of body boundary perception remain underexplored. In this study, we developed a psychophysical protocol to directly assess how accurately individuals perceive their body boundaries. ***Methods***: Specifically, we compared boundary perception between the hand, which is frequently used and visually attended to, and the ankle, which is less frequently interacted with. Participants were asked to determine whether the midpoint between two tactile stimuli applied on the skin was inside or outside their perceived body boundary. 3D scans of the tested regions were used to determine the true body outline, allowing psychometric functions to be fitted. ***Results:*** Overall, participants showed millimeter-level precision in identifying their body boundaries, even in areas mostly flat, such as the palm, or rarely observed, such as around the ankle. However, accuracy varied depending on the body region. While palm boundaries were judged almost perfectly, wrist boundaries were poorly defined, even when the midpoint lied significantly outside the physical body. Additionally, participants whose anatomy deviated from the average tended to align their responses with a generalized "typical" body model rather than their unique physiology. Interestingly, participants who reported experiencing more third-person dreams performed significantly worse at this task, whereas those who reported more out-of-body experiences were more accurate at judging their ankle boundaries compared to their hand boundaries—a pattern not observed in other participants. ***Discussion***: These findings suggest that body boundary perception differs across body regions and can be influenced by the perspectives one typically adopts in the mind’s eye. Moreover, these results suggest that a shared internal template of body boundaries might override personal anatomical differences.

Poster: **C05** **Anna Fischer**

Physiological underpinnings of cooperative and competitive decisions in a transparent dyadic foraging game

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Introduction: Human interactions have typically been studied in standardised experimental protocols involving economic decision-making tasks. We have developed a transparent interaction platform that allows mutual observation of faces, gestures and non-verbal utterances. ***Methods***: Participants play a game that simulates a dynamic foraging situation with continuous movement. In two game blocks, both partners have the opportunity to collect individual or joint targets, acting competitively or cooperatively. In this experimental setup, socio-emotional cues are dynamically available to both partners and can be used for individual and joint decision making. Behavioural and physiological data (ECG, EEG, EMG) are recorded from both participants while they play the foraging game. We are interested in the physiological and neural underpinnings of cooperative and competitive behaviour in interactive decision making, with a particular focus on heart rate dynamics. ***Results:*** Preliminary results show an increase in heart rate at the start of the game and a decrease in the pause between blocks, but no difference between competitive and cooperative dyads. However, heart rate synchrony between individuals increased during the game blocks within cooperative dyads, but not within competitive dyads. Competitive dyads showed less dynamic change during the game blocks and their heart rate synchrony was highest during the break between blocks. ***Discussion***: Heart rate dynamics seem to indicate arousal before the start of the game and relaxation in later stages. However, it seems that individuals in cooperative dyads readjust and synchronise with each other at the beginning of each game block. In contrast, the lack of dynamics in competitive dyads could indicate increased stress within the blocks, which subsided during the break.

Poster: **C06** **Angelia Caparco**

Precision of visual working memory is modulated by the cardiac cycle

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Introduction: Research indicates that transient bodily fluctuations, such as those linked to the cardiac cycle, impact the processing of external stimuli (e.g. perceptual sensitivity tends to increase during diastole and decrease during systole). While prior studies have explored the influence of the cardiac cycle on early sensory processing, its effects on later stages of cognitive processing remain less understood. This study investigates how the cardiac cycle modulates the precision of visual information retained in Working Memory (WM). ***Methods***: Data previously collected by Nasrawi et al. (2025) were analyzed. 24 participants completed a visual Working Memory (WM) task while their electrocardiogram (ECG) and electroencephalogram (EEG) were recorded. Participants memorized the orientation of two or four tilted bars presented for 250 ms, with one bar cued for reproduction after a retention delay. WM precision, defined as the absolute difference between the target orientation and the reproduced tilt, was evaluated for stimuli encoded in systole and diastole. Additionally, we analysed how WM precision varied as a function of time after each heartbeat (i.e., in consecutive 100ms bins). ***Results:*** Our analysis found no significant effect of cardiac phase (systole vs. diastole) on WM precision. However, when precision was analyzed based on the timing relative to the start of each cardiac cycle, a significant interaction between memory load and cardiac timing was observed. Specifically, stimuli encoded between 100 and 200 ms (with an offset ~300-400 ms) were recalled with greater precision in the high-memory load condition only (load 4). ***Discussion***: These findings provide preliminary evidence that the cardiac cycle influences WM processing, suggesting that transient bodily fluctuations impact not only stimulus perception but also their storage and manipulation. As a next step, we will investigate EEG activity phase-locked to the cardiac cycle to further understand the underlying mechanism.

Poster: **C07** **Alina Studenova**

Project proposal: Neuronal activity underlying stimulus-related changes in alpha rhythm amplitude

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Introduction: Event-related changes in alpha rhythm amplitude on magnetoencephalography and electroencephalography (EEG/MEG) accompany every stimulus processing, as well as motor or cognitive event. High alpha amplitude is believed to correspond to a more inhibited cortex, while low alpha amplitude is thought to be the marker of disinhibition. When a stimulus arrives, neurons transition to a different regime of activity than before the stimulus. This change in neuronal activity is accompanied by a decrease in alpha amplitude, known as event-related desynchronization (ERD). ***Methods***: 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-Apost)/Apre, where Apre is alpha amplitude in the pre-stimulus window and Apost - in the post-stimulus window. In terms of the functional theory, this method (and the formula) supposes that Apost depends on Apre. In terms of the neuronal activity, it means that a certain number of neurons switch from an oscillating regime to another activity (a number that is required). In terms of data, it means that in trials when Apre is high, Apost would also be higher in comparison with trials when Apre is low. However, that's not what the data show. Instead, irrespective of Apre, Apost always seems to drop to a certain level. In terms of the neuronal activity, it could mean that there is a certain level of disinhibition that is needed to process the stimulus. In terms of the functional theory, it could mean that Apre barely influences Apost. Admittedly, the conclusion cannot be readily accepted because there are many sources of alpha rhythm in the brain. ***Results:*** In my poster, I will present a proposal for an experiment that will attempt to resolve the uncertainty. ***Discussion***: -

Poster: **C08** **Gia Kutelia**

Role of corticosterone on core memory processes in fear conditioned animals

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Introduction: Lots of neuroscientific studies combine corticosterone (analogue of cortisol in rodents) injections with fear conditioning to replicate symptoms of post-traumatic stress disorder (PTSD) in rodents and create valid animals models of the disease. However, existing data coming from the clinical and animal research often show controversial effects of stress hormones in PTSD pathogenesis and needs further clarification. Here, using complex approach we investigate effects of corticosterone on core fear memory processes - consolidation, retrieval, reconsolidation and extinction – on the behavioral, cellular and molecular levels in adult mice. ***Methods***: Freezing and open field activity was measured by the software program Videotrack (Viewpoint, France) to analyze behavioral correlates of fear memory before and after memory formation and after 5 days of exposure therapy. ***Results:*** Results indicated that CFC shapes strong fear memories for context, with increased anxiety to neutral auditory cues. Single and chronic corticosterone injections both hinder formation of fear memories and have anxiolytic effects. Moreover, exposure therapy has a significant effect only on the animals with the single corticosterone injections, while no corticosterone and chronic corticosterone groups do not show any improvements. To assess the initiation of synaptic plasticity in the hippocampus, qPCR for the genes SHANK1 (SH3 and multiple ankyrin repeat domains protein 1), FKBP5 (FK506 binding protein 5), HOMER1(Homer protein homolog 1), GRM5 (Metabotropic glutamate receptor 5) was performed. These genes are needed for the formation of new synapses and/or strengthenig exsisting ones. Results demonstrated that single corticosterone injection before CFC causes significant decrease of their expression compared to control (no CFC, no corticosterone injection) and to normal fear memory groups (only CFC, no corticosterone injection). Additionaly, for tagging activated neuronal memory ensembles during fear memory formation we used tripple immunofluorescent staining followed by confocal microscopy to label c-fos expression in different neuronal subtypes of PTSD-associated brain areas: hippocampus, amygdala and anterior cingulate cortex. 2 way Anova with multiple comparisons was used for statistical comparison, P values less than 0.05 were considerd as statistically significant (α=0.05). ***Discussion***: Based on our results we suppose that by downregulating gene expression, corticosterone acts as a protective molecule during acute stress in a dose and time dependent manner. As it impairs synaptic plasticity in the hippocampus, it declines memory consolidation. However, during memory retrieval memory enters into the specific “labile” state, where memory update and/or extinction is most probable. This process has been known as a memory reconsolidation. As synaptic plasticicty is the underlying mechanism for both processes – consolidation and reconsolidation, corticosterone can impair reconsolidation and following fear memory extinction in a similar way, via preventing synaptic plasticity. It could be an interesting point, as PTSD patiens have elevated level of cortisol during the retrieval of a traumatic event. Hence, depending on the dose and timing, stress hormones could reveal protective and aggravating properties in the pathogenesis of PTSD.

Poster: **C09** **Tilman Stephani**

Self-tickle across cortical layers – a project outline with preliminary results

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Introduction: In perception, neural responses are never identical, even to the same sensory stimuli. This variability is particularly evident in the somatosensory domain: Why does the same tactile input feel ticklish when applied by others but not by ourselves? The phenomenon of self-tickle cancellation has intrigued philosophers, biologists, and psychologists for centuries. Motor control theories propose that self-generated movements elicit top-down predictions in the cerebellum that suppress bottom-up tactile input in the somatosensory cortex. However, how these top-down and bottom-up signals interact in the somatosensory cortex – and particularly across its different layers – to cancel self-tickle is unclear. ***Methods***: We aim to unravel these complexities with advanced electroencephalography (EEG), psychophysical modelling and laminar magnetoencephalography (MEG) in a series of three studies with human participants. The project seeks to identify neural markers of tickle sensation, map layer-specific cortical activity in top-down and bottom-up signal integration and apply these insights to understand the neurocognitive mechanisms of self-tickle cancellation. Somatosensory stimuli are presented to the hand palms and foot soles using state-of-the-art haptic robotics, which allows highly controlled yet naturalistic self-touch stimulation. ***Results:*** Preliminary data show that (i) EEG responses to ticklish and non-ticklish externally presented stimuli on the foot sole diverge already early during their neural response cascades, and (ii) distinct responses to self- and other-touch on the foot sole can be measured with MEG, opening the possibility to examine layer-specific neural dynamics in self-tickle cancellation. ***Discussion***: Combining well-established motor control theories with cutting-edge neuroimaging techniques, the findings are expected to provide fundamental insights into how self-generated predictions influence neural computations and enhance our understanding of brain disorders where self-tickle cancellation fails, such as schizophrenia and autism.

Poster: **C10** **Anuja Negi**

Semantic Representations with Varying Context during Language Comprehension

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Introduction: Semantic representations in the human brain are influenced by context. Greater context in stimuli enhances the representation of semantic information across the cerebral cortex. Prior work utilized static embeddings to capture semantic properties of individual words, such embeddings do not account for variations in word senses or contextual nuances. In this study, we systematically compare voxelwise encoding models based on static and contextual embeddings. ***Methods***: Using functional magnetic resonance imaging, we recorded brain responses as participants read words presented under four conditions: narratives, isolated sentences, word clusters of semantically similar words, and isolated words. The stimuli for all conditions were derived from 11 spoken stories from The Moth Radio Hour. We employed a voxelwise encoding modeling approach to explore how different linguistic models represent contextual information. Low-level linguistic embeddings (e.g., phoneme count, word count, letter count, and word length variation per TR), syntactic embeddings (.g., part-of-speech tags, dependency tags, and parse trees), and semantic embeddings (both static and contextual) were extracted separately for each condition. Static embeddings were obtained using traditional models such as GloVe, while contextual embeddings were derived layer-by-layer from large language models (e.g., BERT, GPT, and Llama). We applied banded ridge regression to determine how each embedding type was represented in individual voxels. Prediction accuracy was evaluated by calculating the Pearson correlation coefficient between predicted and recorded BOLD responses, using separate datasets for model estimation and evaluation. Encoding models were fit independently for each voxel, participant, and stimulus condition. ***Results:*** Our results show that both static and contextual embeddings better predicted brain responses when the stimuli contained more context. Notably, the difference in prediction accuracy between static and contextual embeddings became more pronounced as contextual richness in the stimuli increased. ***Discussion***: This research contributes to advancing our understanding of how context modulates linguistic representations in the brain.

Poster: **C11** **Esranur Yildiran Carlak**

Sensory Reweighting in Response to Visual Perturbations: Insights at the Biomechanical and the Cortical Levels

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Introduction: Sensory reweighting refers to dynamic changes in relative contributions of visual, vestibular and proprioceptive sensory systems to balance maintenance proportional to their reliability. Sensory reweighting has classically been assessed based on biomechanical measurements, i.e., changes in body sway magnitudes in response to perturbations or deprivations of sensory information. However, how it is encoded in the brain is less known. Therefore, the present study aims to examine sensory reweighting dynamics under visual perturbations at the biomechanical and the cortical level. ***Methods***: Eight healthy young participants (4 female; mean ± SD age, 26.2 ± 2.2 years) underwent EEG while standing on a force plate in a dark and silent room and watching a moving visual scene projected on a screen as a visual disturbance. In a baseline condition, the perturbation was a probing sinusoidal oscillation at 0.5 Hz with a 0.3 degree amplitude. In three noise conditions, the sinusoidal probe was presented amidst a random noise of amplitude 0.5, 1.0, and 1.5 degrees, which had no energy at 0.5 Hz. FFT analysis quantified spectral power of the steady-state response for the center of pressure (CoP) and EEG signals. The statistical significance of the power at 0.5 Hz was assessed in comparison with surrogate data. ***Results:*** A significant peak of CoP power was seen at 0.5 Hz in the baseline condition. The magnitude of the non-significant peaks decreased as the amplitude of the noise increased. Contrastingly, in EEG signals, a peak of power at 0.5 Hz was not identified in any condition. ***Discussion***: Our CoP results are in line with the classical decrease in the weight assigned to the visual system as vision becomes increasingly less reliable. Surprisingly, visual disturbances did not entrain brain activity captured by EEG, meaning other recording methods or types of analyses have to be used to identify the cortical correlates of sensory reweighing.

Poster: **C12** **Charlotte Koch**

Sex differences in the associations between visceral fat, brain aging, and cognition

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Introduction: Alzheimer's disease (AD) disproportionately affects females, who account for two-thirds of cases, highlighting the need to explore sex differences in how the human brain ages. Brain aging markers include cognitive decline, reductions in hippocampal gray matter volume(HCV)andcorticalthickness(CT),andmarkersofcerebralsmallvesseldisease(cSVD), such as white matter hyperintensities, perivascular space burden and free water in white matter. Visceral adipose tissue (VAT) is a known risk factor for cognitive decline, and accumulates differently by sex. In females, effects of VAT might be modulated by estrogens, especially after menopause, when estradiol levels drop sharply and risk of brain aging increases. However, little is known about the role of VAT in longitudinal trajectories of brain aging and cSVD, esecially with regards to sex and genetic predisposition, such as the apolipoprotein ϵ4 (APOE4) allele, which may exacerbate brain aging processes and lead to sex-specific susceptibility profiles. ***Methods***: This study explores the impact of VAT accumulation on brain aging and elucidates potential sex differences. We hypothesize that larger VAT volume is linked to accelerated re ductions in HCVandCTofAD-relatedregions, increasedcSVDmarkers, andcognitivedecline and with this effect varying between the biological sexes. Data from approximately 900 partici pants, aged 18-85 years, from the LIFE-Adult Baseline and LIFE-Adult Follow-Up study will be analyzed using linear and linear mixed-effects regression models to investigate cross-sectional and longitudinal effects of VAT, age, sex, APOE4 status and lifetime endogenous estrogen ex posure, as well as their interactions on brain aging. ***Results:*** The study was preregistered in OSF, and data access was approved. ***Discussion***: Next, data analyses will proceed according to the registered plan. With our findings, we aim to provide insights into how VAT influences brain aging and cognition, potentially shedding light on sex-based disparities and supporting more personalized therapeutic approaches.

Poster: **C13** **Hilal Cam**

Shifting priorities: Switching between health and indulgence motivational states impacts proactive inhibition towards unhealthy food

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Introduction: Understanding what enables people to resist unhealthy food is crucial for the development of interventions and policies to prevent the detrimental effects of an unhealthy diet on people's health such as obesity and various other diseases. The present study investigated the impact of temporary and malleable motivational states on inhibitory control towards unhealthy food, offering a proof of principle study. To this end, we tested whether a motivational state to eat healthily (versus enjoying tasty food) facilitates inhibition towards unhealthy food at early (i.e., proactive) and/or later (i.e., reactive) stages of inhibition initiation. ***Methods***: In a within-subjects design, participants (N = 36) switched between health and indulgence states while performing both a Go/No-Go Task and a Stop Signal Task using pictures of unhealthy and healthy food or neutral content. ***Results:*** A health-oriented motivational state facilitated inhibition towards unhealthy but not healthy food items when inhibition was initiated early (Go/No-Go Task) compared to the indulgence state. In contrast, switching between states did not influence reactive inhibition as measured in the Stop Signal Task. ***Discussion***: Our evidence highlights the potential of interventions targeting people's malleable motivational states in situations that require them to forgo unhealthy food proactively.

Poster: **C14** **Mathis Lamarre**

Similarity across languages is high for both concrete and abstract concepts

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Introduction: Humans acquire concepts through perception with their senses and through various languages. Although researchers have studied the effects of these different modalities and languages on brain representations independently, little is known about their combined influence. The degree to which a concept refers to a perceptible entity – concreteness – is a crucial factor in these investigations. In English, neuroimaging studies showed that concrete concepts are located close to their corresponding perceptual systems, while abstract concepts are located mainly in regions associated with general linguistic processing. Across languages, behavioral studies showed that cross-lingual similarity is higher for concrete concepts than for abstract concepts. However, very few studies considered bilingual neuroimaging data. Thus, it is unclear whether established patterns of cortical representations in English carry over to other languages and how concreteness relates to cross-lingual similarity in the cortex. ***Methods***: We analyzed functional magnetic resonance imaging (fMRI) recordings collected while Chinese-English bilingual participants read narratives in both languages. Voxelwise encoding models were used to model cortical representations of concrete and abstract concepts in each language. We extracted features that represent the semantic content of the stimulus words using word embeddings aligned across languages. Then, we estimated model weights that reflect semantic information represented in each voxel, for each language and participant separately. Low-level features were included as nuisance regressors to account for sensory aspects of reading. The semantic model weights allow us to measure tuning towards concrete or abstract concepts, as well as the similarity of semantic representations across languages. ***Results:*** Tuning towards concrete and abstract concepts is largely shared between English and Chinese. Similarity across languages is high for both concrete and abstract concepts. For abstract concepts, this effect could be driven by emotional words.

Poster: **C15** **Magdalena Matyjek**

Smiling synchrony predicts rapport in autistic and neurotypical interactions

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Introduction: Autism is characterised by social difficulties often attributed to an intrinsic lack of social competence in autistic (AUT) individuals. However, emerging research suggests that these challenges may stem from a mismatch in interaction styles between autistic and neurotypical (NT) individuals. For example, cross-neurotype dyads (AUT-NT) have been shown to synchronise less in their smiling behaviour than either of the same-neurotype dyads (AUT-AUT or NT-NT). Here, we examine smiling synchrony in same- and cross-neurotype dyads during natural online conversations and its impact on social rapport. ***Methods***: 29 AUT and 28 NT adults participated in 108 dyadic interactions across three dyad types (AUT-AUT, NT-NT, AUT-NT). Participants engaged in a 10-minute interaction (free conversation and a word game) while being audio and video recorded. Smiles were coded offline based on the intensity of action units 6 and 12 using OpenFace, and smiling synchrony was calculated with cross-correlation analysis. ***Results:*** The neurotypes (AUT/NT) did not differ in amount of smiling, and the three dyad types did not differ in the amount of smiling synchrony. However, NT-NT dyads reported significantly higher rapport than the other dyads ($p = .01$). While smiling synchrony was associated with higher rapport across all dyad types ($p = .006$), there was no interaction between dyad type and synchrony on rapport. ***Discussion***: These findings suggest that smiling synchrony contributes to positive social outcomes in both autistic and neurotypical interactions. However, the reduced rapport in cross-neurotype and autistic interactions indicate broader challenges in achieving mutual understanding in these dyads.

Poster: **C16** **Cindy Jagorska**

Space-Time Interference in Interception

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Introduction: Interference between the perception of time and space has been extensively demonstrated in previous research. However, it remains unclear whether this phenomenon is confined to perception or extends to motor actions. To address this question, we reinterpreted the well-established Tau and Kappa effects, examples of time-space interference identified since the 1920s, as a reaching task involving both temporal and spatial predictions. ***Methods***: 40 participants, equipped with a head-mounted display, were presented with three spheres appearing sequentially. Their task was to predict the time and location of a fourth sphere by pressing a controller button at the expected moment and position. If space-time interference affects motor actions, we hypothesized that participants would predict the fourth sphere to appear earlier when the preceding spheres were closer together spatially, and closer to the other spheres when the temporal intervals between the spheres were shorter. Additionally, eye-tracking was employed to examine gaze patterns related to the preparation of motor actions and to measure pupil dilation as a potential marker of cognitive processing. ***Results:*** Preliminary results indicate bidirectional space-time interference in motor actions. Eye-tracking data analysis is ongoing and will provide further insights into the underlying mechanisms. ***Discussion***: These findings offer novel evidence for the interconnectedness of space and time in motor behavior, advancing our understanding of how humans integrate spatial and temporal information when interacting with the world.

Poster: **C17** **Subba Reddy Oota**

Speech language models lack important brain-relevant semantics

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Introduction: Humans possess a remarkable capacity to integrate tools into their body representation, enabling more efficient and flexible interaction with the environment. This study investigates the adaptability of the body's perceptual and motor systems following the use of technological augmentations, specifically finger-extending exoskeletons. ***Methods***: We conducted two separate experiments exploring tactile and proprioceptive localization changes in response to tool use, aimed at understanding how the brain and body adapt to technological modifications. ***Results:*** In the first experiment, 20 participants localized touch on their index and middle fingers before and after 45 minutes of training with finger-extending exoskeletons. The training involved a series of tasks designed to improve fine motor control and facilitate the use of the extended finger grip. The results demonstrated a significant stretch in tactile localization towards the exoskeleton, with an increase in localization uncertainty. Additionally, participants showed improvement in task performance over the course of the training, highlighting rapid adaptation to the tool. In the second experiment, 20 participants engaged in proprioceptive localization tasks, identifying points on both their biological finger and the exoskeletal extension. After familiarization with the exoskeleton, participants experienced a perceptual stretching of finger length and a merging of the representations of their biological finger and the exoskeletal extension. These changes indicate that the body can quickly adapt to new technological augmentations. ***Discussion***: Together, these findings emphasize the adaptability of human perceptual and motor systems following tool use. Even brief training is sufficient to modify tactile and proprioceptive localization, demonstrating how tools can be integrated into the body representation. These insights offer a deeper understanding of the dynamic nature of body representation, which has important implications for the development of assistive technologies and the study of human-tool interaction.

Poster: **C18** **Kamil Kilic**

Structural and Functional Correlates of Oscillatory Dynamics in Sensory Motor System

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Introduction: Beta-band oscillations (13–30 Hz) play a fundamental role in sensory-motor processing, executive control, and movement execution. Traditionally, beta activity has been considered a continuous rhythm; however, recent findings suggest that it occurs in transient bursts rather than sustained oscillations. The functional relevance of these bursts, particularly their diverse waveform shapes, remains poorly understood. This dissertation investigates the structural and functional correlates of beta bursts, focusing on their role in motor control and their relationship with cortical myelination. ***Methods***: The first study will use magnetoencephalography (MEG) to record beta bursts in healthy participants (18–35 years) during resting-state, voluntary movement, and median nerve stimulation tasks. Beta bursts will be analyzed in terms of frequency, power, duration, and waveform shape to determine their functional significance. The second study will integrate MEG with structural imaging to assess the relationship between beta burst dynamics and cortical myelination in sensory-motor areas. Myelin density will be quantified using MRI-based techniques, and its correlation with burst properties will be examined. ***Results:*** We anticipate that beta bursts will exhibit distinct characteristics depending on the task context, with specific waveform shapes corresponding to different behavioral states. Moreover, individual variations in cortical myelination are expected to predict differences in burst properties. ***Discussion***: These findings will enhance our understanding of transient oscillatory events by characterizing the variability of beta bursts and understand their functional roles. Also, it will let us investigate how myelination shapes or plays a role in beta burst features.

Poster: **C19** **Dennis Larsson**

Temporal and spatial perception of heartbeat sensations in autistic adults

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Introduction: Autistic individuals may differ in sensory processing with both hyper- and hypo-sensitivities documented in exteroceptive modalities. Additionally, divergent sensory processing of interoceptive (internal bodily) signals may commonly occur, but empirical research detailing interoceptive perception in autistic people is mixed. ***Methods***: Using an interoceptive Method of Constant Stimuli task, we investigated heartbeat perception in autistic and comparison adult participants, both categorically and along a transdiagnostic spectrum of alexithymia. ***Results:*** Results revealed significant group differences across subclinical measures of anxiety and alexithymia. However, no evidence for a group difference between autism and comparison group was found in terms of precision of heartbeat perception, heartbeat timing judgement, or perceived bodily location of heartbeat sensation. ***Discussion***: Our data suggest a possible floor effect in task performance, and lead us to question whether challenging psychophysics interoceptive tasks have the sensitivity to show nuanced group differences. Moreover, this sensory detection test is limited to the cardiac domain, and therefore may not capture broader interoceptive phenomenology in autism. Future research investigating interoception in the context of autism is needed, with accessible and ecological paradigms across different sensory axes.

Poster: **C20** **Tydings McClary**

The COMIC Study – Investigating Brain and Memory Development in Childhood

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Introduction: The mature human memory system strikes a balance between the ability to recall specific details of past events and the capacity to identify common patterns across these events for effective generalization in new situations. Transitioning to middle childhood, children develop more detailed memories, evidenced by an enhanced ability to differentiate among similar experiences (pattern separation) and to retrieve complete memories from partial information (pattern completion). At the same time, their generalization skills continually advance. Although it is clear that these memory components change from early to middle childhood, longitudinal data are currently lacking to trace their developmental trajectories and covariation, and assess associated neural mechanisms. ***Methods***: To address this gap in the literature, we are conducting a large-scale study using an accelerated longitudinal design with children aged 4 to 8 years. Our comprehensive approach incorporates a variety of memory tasks, alongside questionnaires and cognitive covariates. Moreover, we are collecting structural magnetic resonance imaging (MRI) data and polysomnography recordings to explore the neural and physiological underpinnings of memory development. ***Results:*** The initial timepoint of the study has been completed with 174 participants. The second timepoint is currently underway, and the third is just starting. Preliminary cross-sectional findings indicate age differences in our memory tasks. Importantly, we plan to release the data from the initial timepoint in the foreseeable future, enabling other researchers to benefit from this extensive dataset. ***Discussion***: Given the diverse range of measures collected in this study, it is crucial to develop a thoroughly documented dataset and make it accessible for research purposes. This will facilitate the exploration of additional research questions beyond our primary objectives. Furthermore, organizing the dataset in Brain Imaging Data Structure (BIDS) format with a clear and consistent structure is additionally intended to encourage other researchers to adopt similar practices, promoting transparency and accessibility in data sharing efforts.

Poster: **C21** **Carlos Ventura-Bort**

The Correspondence between Arousal and the Late Positive Potential using Representational Similarity Analysis

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Introduction: The Late Positive Potential (LPP), a positive slow wave, maximal at centro-parietal electrodes (from 300-800ms) has been consistently associated with experienced arousal as indicated by increased LPP amplitudes evoked by highly arousing (unpleasant and pleasant) compared to low-arousing neutral stimuli. In the current study, we aim at extending these findings by examining the trial-by-trial correspondence between the LPP amplitudes and experienced arousal, using representational similarity analysis (RSA). ***Methods***: We tested different models of subjective arousal that either assume similar (Nearest Neighbor, NN, model) or dissimilar (inverted Anna Karenina, AK, model) LPP amplitudes among trials rated with comparable arousal levels, as well as other category-based models. A total of 87 participants underwent a passive picture viewing tasks (30 pleasant, 30 unpleasant and 30 neutral images) while EEG was recorded. Thereafter, the previously seen images were rated in terms arousal. ***Results:*** Replicating previous findings, we observed larger LPP amplitudes (quantified with a temporo-spatial Principal Components Analysis) for highly arousing compared to neutral images. Moreover, RSA revealed that the best explaining model was the "Erotic" model, which distinguishes between erotic and non-erotic pictures. ***Discussion***: Considering that erotic images elicited the largest LPP amplitudes, RSA results suggest that the LPP represents the categorical distinction between potentially salient and less salient stimuli. Our findings are in line with a recent proposal suggesting that the LPP, as the P300, is an ERP response to stimulus significance. Future studies assessing the role of significance by manipulating attentional priority and/or likelihood of appearance would help bring more insights into this proposal.

Poster: **C22** **Lauren Charters**

The Development of Interoception from 6- 11-Months using Heart-Evoked Potential (HEP)

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Introduction: Interoception has been hypothesised to play a significant role in socio-emotional processes such as empathy . However, little is known about its development during infancy. Heart-evoked potential (HEP) has been found to be sensitive to increased attention towards heartbeats , suggesting that HEP can be useful as a metric of interoception in infants. However, existing research on HEP in infancy is scarce, particularly its relation to arousal . Therefore, we tested the hypothesised relations between interoception and arousal responses to peers' emotions throughout infancy. ***Methods***: We collected 6-, 9- and 11-month-old infants' ECG and EEG responses to videos of other infants laughing, crying and babbling. From this task, we extracted heart rate (HR) and HEP mean amplitude as a function of emotion condition. ***Results:*** There were no significant differences in HEP mean amplitude or HR between the emotion conditions for any age group. In 6-month-old infants, higher HEP amplitude was associated with reduced HR during laughter ($r(24) = -.387$, $p = .026$) and neutral babbling ($r(24) = -.409$, $p = .019$). A similar relation was observed for 9-month-olds during second half of the laughter condition ($r(24) = -.390$, $p = .033$). In contrast, for 11-month-old infants, a higher HEP amplitude was associated with increased HR during the first half of the cry condition ($r(24) = .387$, $p = .387$). ***Discussion***: These results suggest that the relationship between HEP and arousal in response to peer emotions could change during infancy, and considering objective measures of changes in arousal could be relevant for understanding the neurocognitive mechanisms of interoception development. Future research could explore individual differences in HEP responses at the behavioural and physiological levels, such as emotion regulation, or relative attention to interoceptive and exteroceptive stimuli.

Poster: **C23** **Kim Hoffmann**

Cortisol awakening response in premenstrual dysphoric disorder and health across the menstrual cycle

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Introduction: Studies suggest there are alterations in the cortisol awakening response (CAR) in patients with premenstrual dysphoric disorder (PMDD), as exemplified by delayed cortisol peaks and flatter diurnal cortisol slopes compared to healthy controls. While inconsistent, previous research also associates alterations in CAR with prefrontal serotonin transporter (5-HTT) binding and severity of depressive symptoms. No study has yet investigated the CAR in relation to 5-HTT binding and depressive symptoms in patients with PMDD across the menstrual cycle. ***Methods***: 30 females with PMDD and 29 healthy controls (18-35 years) self-collected 3 saliva samples (awakening, +30min, +60min) to assess the CAR and 5 more samples (9am, 12pm, 3pm, 6pm, 9pm) to assess the diurnal cortisol slope once during the periovulatory phase and once during the premenstrual phase. [11C]DASB positron emission tomography scans were performed to measure 5-HTT non-displaceable binding potential (BPND). Depressive symptoms were assessed using the Hamilton Depression Rating Scale (HAM-D). A series of linear mixed-effects models and Spearman rank correlations were conducted to assess the relationship between cortisol measures, 5-HTT BPND, and depressive symptoms. ***Results:*** A significant interaction between group and cycle phase was found on cortisol peak ($\beta = 0.78$, $p = 0.05$, $d = 0.62$, 95% CI = [0.01;1.56], corrected for awakening cortisol: $\beta = 0.89$, $p = 0.03$, $d = 0.76$, 95% CI = [0.13;1.64]). Cortisol peak concentrations correlated negatively with midbrain 5-HTT BPND during the premenstrual phase ($r = -0.35$, $p < 0.01$, $R^2 = 0.12$) and with HAM-D scores across the menstrual cycle ($r = -0.26$, $p < 0.01$, $R^2 = -0.07$). ***Discussion***: Patients with PMDD demonstrated attenuated and delayed cortisol peaks compared to controls, with underlying associations to the serotonergic system and the severity of depressive symptoms. This study characterised PMDD as a disorder with alterations in the regulation of the stress system.

Poster: **C24** **Nadine Herzog**

Tackling reward deficiency in obesity: Developing a new fMRI-informed EEG-neurofeedback to modulate striatal food-reward signals

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Introduction: Obesity, defined as a BMI ≥30 kg/m², has increased dramatically worldwide, creating a significant burden on healthcare systems. While GLP-1 receptor agonists like Ozempic have shown promise in addressing obesity, their temporary effectiveness, high cost, and side effects still necessitate alternative approaches. Emerging evidence suggests that altered (food) reward signaling may be one crucial factor driving obesity. This study explores the potential of EEG-based neurofeedback (NF) to modulate striatal reward signals as a novel intervention for obesity. ***Methods***: In the first phase of the project, we aim to develop and validate an EEG "fingerprint" for food-reward signaling using deep learning to predict ventral striatal (VS) fMRI BOLD signal from simultanously acquired EEG. In phase two, the validated EEG fingerprint will guide NF training in an independent sample of 15 participants with obesity (BMI 30–45 kg/m²). Participants will undergo six NF sessions to modulate reward signals, with pre- and post-intervention assessments of food reward BOLD responses, BMI, and eating behaviors. ***Results:*** Preliminary findings indicate that the deep learning model can predict task-based striatal BOLD signals from EEG data. This supports the feasibility of developing an EEG-based proxy for food-reward signaling. ***Discussion***: This study tries to lay a foundation for using EEG-NF to modulate striatal reward responses. If successful, this approach could offer an accessible, non-invasive alternative for obesity management. Future work will focus on optimizing the EEG fingerprint and extending its application to larger cohorts for long-term validation.

Poster Session D

March 11, 2025 at 16:10-17:55

Poster: **D01** **Eda Demir**

The Effect of Acoustic Roughness on Long-term Memory for Emotionally Ambiguous Facial Expressions

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Introduction: Acoustic roughness is a percept induced by auditory signals with amplitude modulations within the 30-150 Hz frequency range. Alarming sounds like screams and baby cries elicit this perception. Previously thought to lack ecological meaning, recent research indicates acoustic roughness either grabs attention or signals aversiveness. Literature suggests vocalizations with greater acoustic roughness enhance the aversiveness of negative vocalizations and reverse valence from positive to negative, especially in ambiguous contexts. Emotional facial expressions, prominent daily contextual cues, are often coupled with rough sounds. However, the effect of acoustic roughness on long-term memory for emotional facial expressions remains unexplored. ***Methods***: This study investigated whether acoustic roughness conveys aversion or serves as a general attention-grabbing mechanism using a recognition memory task. Positive, negative, and ambiguous cues were presented as morphed facial expressions. Happy expressions served as positive cues, while fearful expressions were negative cues. Stimuli were from the FACES Database. Participants viewed expressions paired with rough sounds (roughness group), non-rough sounds (no-roughness group), or no sound (silence group) during encoding. Each trial involved one expression from a seven-expression set, with 28 unique expressions encoded. A 5-minute two-back task followed as a distraction phase. In recognition, participants identified previously viewed expressions from the complete morphed set. ***Results:*** Results from 110 participants show no accuracy differences among groups, with low accuracy rates (28%). Analyses of the incorrect trials showed that participants in the roughness and control conditions rated positive facial expressions as more negative compared to participants in the silence condition. ***Discussion***: Though there is a trend towards a stronger negativity bias in the roughness condition compared to the other conditions, this trend is statistically not significant. Thus, our data is inconclusive regarding the aversiveness hypothesis for the effect of acoustic roughness. Findings suggest that the control stimuli used might have been as aversive as the rough stimuli.

Poster: **D02** **Elizaveta Ivanova**

The Emergence of symbolic numerical knowledge in early development – preliminary results of an fNIRS study

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Introduction: The cardinality principle refers to associating number words with specific quantities (e.g., 'five' means 'five things'), forming a foundation for numerical skills (Geary et al., 2018; Wynn, 1990). Despite extensive behavioral research, the brain mechanisms underlying its acquisition remain underexplored. Studies in older children and adults highlight the left parietal region's key role in processing number words and suggest it supports the transition from subset-knowers, who do not understand cardinality yet, to cardinality-knowers (Hyde, 2021). We hypothesized that cardinality-knowers exhibit greater left parietal activation, especially for higher number words compared to subset-knowers. ***Methods***: Ninety-two children (2.9–4.9 years; 46 cardinality-knowers, 46 subset-knowers) completed the give-a-number task for categorization. Bilateral parietal activation was recorded using fNIRS during an auditory numerical adaptation task (adapted from Vogel et al., 2017). The task presented three conditions—number words 'four,' 'eight,' and a quasi-number word 'rin'—in separate 16-second blocks with 10 trials each. Data were analyzed using Brain AnalyzIR (Santosa et al., 2018). ***Results:*** A Mann-Whitney U test revealed significant differences in left parietal activation for the number word 'eight' between cardinality-knowers (Median = 2.186) and subset-knowers (Median = 1.137; $U = 1364$, $p = .008$). No group differences were found for the number word 'four' or in the right parietal region. ***Discussion***: These early findings provide empirical support for theories linking symbolic numerical knowledge to the left parietal region. Understanding number words, particularly higher ones, is associated with increased left parietal activation, highlighting its role in the early stages of numerical cognition.

Poster: **D03** **Farida Zeynalli**

The Fair and the Furious: Interpersonal Effects of Moral Anger in Economic Bargaining

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Introduction: Resource allocation is a complex process shaped by cognitive and emotional factors. Emotions like anger, especially in interpersonal contexts, significantly influence decision-making. However, whether the moral basis of anger affects resource allocation and how cognitive styles interact with anger responses remain unclear. This study examines how moral anger—triggered by perceived unfairness—affects economic bargaining decisions and whether analytical thinking moderates these effects. ***Methods***: Participants were assigned to one of six conditions in a two-factor design: anger type (moral vs. non-moral) and intensity (high vs. low), plus a neutral control. Moral anger was induced by unfair treatment, while non-moral anger stemmed from unrelated frustration (e.g., losing a football match). Participants played both the Ultimatum Game (UG) and Dictator Game (DG) in random order with partners expressing different anger levels. Analytical thinking was assessed using the Cognitive Reflection Test and Base-rate Conflict Test. Money allocations in each game were the primary dependent variable. ***Results:*** Participants allocated more resources in the UG than in the DG, especially when partners displayed high moral anger compared to high non-moral anger. However, analytical thinking did not significantly affect decision-making in either game. The findings suggest moral anger enhances prosocial behavior, increasing fairness-oriented allocations, particularly in bargaining scenarios where rejection is possible. ***Discussion***: These results highlight the interpersonal effects of moral anger, showing that individuals respond more generously to partners experiencing anger rooted in fairness concerns. The findings challenge the view that anger solely fosters competition, suggesting it can enhance cooperation in specific contexts. The lack of analytical thinking effects indicates emotional cues may override cognitive deliberation in resource distribution. Future research should further explore these mechanisms across different economic contexts and moderators.

Poster: **D04** **Eva Fröhlich**

The fair weight of decisions: How body mass shapes social (and economic) decision-making

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Introduction: Fairness perception is fundamental to social decision-making, as demonstrated through experimental economics paradigms like the Ultimatum Game. Recent evidence suggests that physical states, particularly weight status, predicts decision-making processes, independent of food. Here, we investigate whether a reduction in bodyweight also induces changes in decision making. We additionally assess metabolic markers (HbA1c) and psychological factors (mood) and investigate their role in those changes. ***Methods***: In this pre-registered study (OSF: osf.io/v9wek), we investigated social decision-making in a sample of 62 individuals with obesity (T1: BMI = 46.5 ± 4.65 kg/m²; 66.1% female). All participants completed the Ultimatum Game while mood and HbA1c levels were assessed. Subsequently, 38 of those participants underwent a 10-week weight-loss program (T2: BMI = 39.4 ± 3.93 kg/m²; 65.8% female) and repeated assessments. ***Results:*** While there was no substantial evidence for a distinct influence of BMI on social decision-making before the weight-loss intervention, subsequent changes in BMI significantly predicted alterations in social decision-making in individuals with obesity. The weight-loss intervention also improved the metabolic measures (HbA1c), and improved subjects' mood. Both HbA1c and negative mood emerged as distinct mediators between weight loss and decision-making: pre-intervention negative mood increased acceptance behavior, while post-intervention HbA1c levels decreased it. ***Discussion***: Our findings reveal distinct mechanisms underlying social decision-making across different weight statuses, with negative mood and HbA1c playing crucial roles in individuals with obesity. Notably, weight loss fundamentally altered these mechanisms, suggesting that both metabolic and psychological factors dynamically influence social decision-making. Understanding these metabolic and psychological mechanisms could improve weight-loss interventions by accounting for their dynamic influence on social behavior during weight change.

Poster: **D05** **Lena Hehemann**

The influence of breathing techniques on reaction times in different perception tasks

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Introduction: Breathing modulates general brain activity and experimental evidence also suggests that breathing shapes perceptual processes. Moreover, specific breathing techniques can alter physiological processes such as heart rate, and in turn may also modulate perception. This raises a central question: can the application of a breathing technique be used to specifically influence perceptual processes? To address this question, we investigate how different breathing techniques affect reaction times in various perception paradigms. ***Methods***: Participants performed different tasks requiring them to judge auditory, visual and emotion stimuli after performing different breathing techniques. The breathing techniques varied in frequency or inhalation-exhalation ratio. Alongside the behavioural data, we recorded respiration during the application of the breathing techniques and during the task with a thermoreceptor attached to a medical oxygen mask. The reaction times after the application of different breathing techniques were analysed with linear mixed effect models, including breathing technique as random effect. ***Results:*** The analysis of the data reveals that the breathing technique is a statistically significant predictor for reaction time in each of the five analyzed datasets. The data show considerable inter-individual variability, with relatively minor mean effects. ***Discussion***: So far, few studies have investigated how breathing techniques effect performance in laboratory perception tasks. While most studies on breathing techniques focus on their psychological effects, we were able to demonstrate that the application of breathing leads to a measurable change in perceptual performance. How long this effect persists after the application of a breathing technique and the precise mechanisms underlying it remain unclear. To investigate this further, follow-up studies will collect not only behavioral and respiratory but also ECG and EEG data.

Poster: **D06** **Dominika Radziun**

The influence of using finger-extending exoskeletons on tactile and proprioceptive localization

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Introduction: Humans possess a remarkable capacity to integrate tools into their body representation, enabling more efficient and flexible interaction with the environment. This study investigates the adaptability of the body's perceptual and motor systems following the use of technological augmentations, specifically finger-extending exoskeletons. To explore this, we conducted two separate experiments examining tactile and proprioceptive localization changes in response to the use of finger-extending exoskeletons, aiming to understand how the brain and body adapt to such modifications. ***Methods***: In Experiment 1, 20 participants localized touch on their index and middle fingers before and after a 45-minute training session with finger-extending exoskeletons. The training involved a series of tasks designed to improve fine motor control and facilitate the use of the extended finger grip. In Experiment 2, 20 participants performed a proprioceptive localization task, identifying points on both their biological finger and the exoskeletal extension before and after the training. ***Results:*** The results of the first experiment demonstrated a significant stretch in tactile localization towards the exoskeleton, with an increase in localization uncertainty. Additionally, participants showed improvement in task performance over the course of the training, highlighting rapid adaptation to the exoskeleton.
Similarly, in the second experiment, participants experienced changes in proprioceptive localization, including perceptual stretching of finger length and a merging of the representations of their biological finger and the exoskeletal extension. ***Discussion***: Together, these findings emphasize the adaptability of human perceptual and motor systems following the use of finger-extending exoskeletons. Even brief training is sufficient to modify tactile and proprioceptive localization, demonstrating how they can be integrated into the body representation. These insights offer a deeper understanding of the dynamic nature of body representation, which has important implications for the development of assistive technologies and the study of human-tool interaction.

Poster: **D07** **Einav Gozansky**

The interactive effect of vagal tone and the menstrual cycle on the efficiency of conditioned pain modulation in healthy females

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Introduction: Research suggests that the vagus plays a role in analgesia by acting on the descending inhibitory pathways. However, the association between individual vagal activity and inhibition efficiency during the conditioned pain modulation (CPM) paradigm was not directly tested. Additionally, the role of the menstrual cycle, and psychological factors (depression, anxiety, fear of pain, and pain catastrophizing) in the vagal-CPM association remains unclear. ***Methods***: Eighty-six females completed psychological questionnaires and psychophysical assessments [1-minute tonic heat pain (THP) at pain-60 temperature given alone and under CPM[. An electrocardiogram (ECG) was recorded at 5 minutes rest, and 1-minute recordings were done before, during, and after the THP and the CPM paradigms. ***Results:*** CPM magnitude was predicted only by the interaction between resting vagal tone and menstrual cycle day ($p=.009$), indicating that the vagal-CPM association occurred only during the follicular phase. However, psychological factors did not influence the vagal-CPM association. Albeit a non-significant decrease in vagal activity during CPM vs. baseline, CPM-wide distribution of vagal activity during CPM was positively correlated with the CPM magnitude ($r=-0.355$; $p<.001$) ***Discussion***: The findings provide direct evidence of the vagus role in between-subject variance in pain inhibition efficiency. Given that the vagal tone fluctuates across the menstrual cycle due to variations in ovarian hormone levels, our results suggest that the vagus modulates pain sensitivity depending on the cycle phase. Less efficient endogenous pain inhibition and impaired autonomic regulation contribute to chronic pain; therefore, studies should examine the interplay between vagal activity and menstrual fluctuations as contributing factors.

Poster: **D08** **Paula Guiomar Alarcón de Antón**

Quantification of metacognition of emotion: an EEG and pupillometry study

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Introduction: Research in metacognition has traditionally focused on memory and perceptual processes, yet the metacognitive aspect of emotional processes remains almost unexplored. Only one study has attempted to quantify meta-emotion abilities, specifically of recognising the positive dimension of emotion, through a behavioural task. This study aims at quantifying and establishing the construct "metacognition of emotion" (meta-emotion), through a psychophysiological task, focusing on the arousal aspect of both pleasant and unpleasant emotions. ***Methods***: We use an affective picture viewing task with confidence ratings, plus electroencephalographic and pupillometry measurements, to first evaluate the correspondence between participant's neurophysiological correlates of emotion with subjective reports of emotion (''emotional accuracy'') and then their confidence in such evaluations (''meta-emotion ability''), in a large (n = 67) normative sample of healthy individuals, by applying the standard meta-d' model. Participants also complete a battery of questionnaires assessing several psychological constructs. ***Results:*** Being currently in the data collection phase, preliminary results will be presented. After determination of meta-emotion abilities at the group-level, we expect to see that overall, participants' confidence ratings discriminate between correct and incorrect responses, shown both in i) significantly higher accuracy in high-confidence vs low-confidence trials, and ii) a group meta-d' significantly greater than zero. We predict this for both EEG and pupillometry operationalizations of accuracy, and for both positive and negative emotions. We also predict that the meta-emotion measure (M-ratio) will correlate positively with self-report measures of interoceptive and emotion regulation skills, and trait mindfulness; and negatively with alexithymic and autistic traits. ***Discussion***: This study will extend the methodology to quantify meta-emotion abilities, by using EEG and pupillometry measures, by assessing the arousal dimension of emotions. Furthermore, it will provide further evidence to what psychological constructs may be related to this skill, which may have implications for the understanding of mental health disorders and potential mechanisms mediating well-being interventions.

Poster: **D09** **Anisha Kanukolanu**

The role of balance ability on age-related changes in navigation strategy

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Introduction: Understanding reference frame utilization in the aging brain is essential to characterizing changes in aging-related navigation strategies. This study strives to characterize egocentric bias, an aging-related shift in how older adults utilize egocentric (body-centric) and allocentric (environment-centric) representations. We postulate that balance ability influences cognitive and motor resources needed for stable walking and thus affects sampling of visual information associated with allocentric spatial reference frame. ***Methods***: The interactions between walking and brain activity are investigated utilizing mobile brain-body imaging which combines EEG with VR, allowing insights into vestibular inputs and proprioception's role in spatial cognition during navigation. Participants will be placed in a human VR version of the Morris Water Maze task, a well-established, versatile paradigm that allows separation of egocentric and allocentric navigation strategies and assessment of navigation ability. Before testing, participants undergo pre-tests to quantify variables like reference frame proclivity, postural stability, and gait characteristics. ***Results:*** We will present results of the analyses on balance-related variables and motion capture during navigation in this poster while data collection is underway. We expect older adults to show more reliance on egocentric navigation strategy quantified as greater similarity between the trajectories walked during learning and during retrieval. We expect this tendency to increase with greater postural instability. On the other hand, the preference to use an allocentric reference frame, captured by higher average angular velocity of the head at trial onset reflecting a reliance on distal landmarks, will only be beneficial when balance ability is high enough to allow for behaviours necessary for effective sampling of allocentric information. ***Discussion***: In testing the above hypotheses, we investigate the theory that the underlying cause of an observed shift in egocentric from allocentric reference frame in aging population is the split of cognitive and motor resources between the task of walking and processing information from the environment.

Poster: **D10** **Ege Kingir**

Towards a System-Level Physiology of Stimulus Anticipation, Visual Perception, and Decision Confidence

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Introduction: Our brains are in constant communication with the rest of our bodies as we anticipate, perceive, decide, and act on external sensory inputs. Despite a recent surge in the study of brain-body interactions in the context of exteroception; we remain far from reaching a unified explanation of how our bodies modulate exteroception itself, and other cognitive processes that precede or follow. ***Methods***: We recorded breathing, ECG, eye-tracking, and EEG simultaneously while young and healthy subjects (n=28) were engaged in a threshold-level visual stimulus detection task where each trial consisted of a stimulus anticipation period followed by a brief target presentation. Subjects reported whether they 'saw' the target or not, and their confidence regarding this decision in each trial. ***Results:*** Subjects locked their breathing phase to progressing stages of exhalation during stimulus anticipation, which acted together with another anticipatory effect independent of the breathing phase to generate the well-known anticipatory cardiac deceleration (ACD) effect. ACD was not accompanied by modulation of Heartbeat Evoked Potential (HEP) amplitudes, and pre-stimulus HEPs did not predict stimulus detection or confidence. Interestingly, we found no significant effect of breathing and cardiac phases, and heart rate on stimulus detection rate and decision confidence. On the other hand, we found an increased acceleration of heart rate after the target stimulus in trials with high confidence ratings. HEPs derived from the first heartbeats after target presentation was lower in a right fronto-central cluster of electrodes in trials with high confidence ratings. ***Discussion***: While the results already shed light on the time course of cardio-respiratory interactions during stimulus anticipation, the precise role of ACD on visual perception remains unclear. Post-stimulus HEPs could contribute to evidence accumulation between stimulus onset and confidence reports; but extending the stimulus-to-response time window will help us test this hypothesis more accurately.

Poster: **D11** **Liron Rozenkrantz**

Tracing Subjective Perceptions to Physical Health Outcomes

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Introduction: Individuals' subjective perceptions of their own health often emerge as stronger predictors of health outcomes than objective risk factors. Drawing on nocebo research, I will propose a framework for understanding how negative health perceptions may lead to maladaptive outcomes through physiological processes, and provide empirical evidence to support it. In short, we ask: Could perceived health have a causal influence on physical health outcomes? And if so, what are the biological mechanisms underlying this link? ***Methods***: We first developed a short, engaging, evidence-based videoclip about the immune system, and validated its clarity and ability to modify individuals' health perceptions, specifically perceived immunity. Next, fifty participants underwent A randomized-controlled trial, either watching the videoclip (intervention) or not (waitlist), while we collected data about their health perceptions, behaviors and physical health outcomes. ***Results:*** Our intervention significantly altered perceived immunity ($F_{1,48}=8.69$, $p=0.005$, partial $\eta 2=0.15$) up to two weeks after the intervention. Strikingly, it also significantly reduce the number of physical symptoms individuals experienced ($F_{1,19}=5.3$, $p=0.032$, partial $\eta 2=0.22$) and sick leave days, for over 15 days later. In addition, we will present preliminary results indicate that health perceptions could be associated with an altered immune response. ***Discussion***: These results highlight the profound interplay between subjective health perceptions and health outcomes, and propose that health perceptions might not merely reflect health status but actively shape it. Our research seeks to uncover the biological pathways connecting perception to physiology, focusing on the potential role of immune function. This work aims to enhance our understanding of the multi-level factors influencing health and offer new avenues for investigating the mechanisms behind these effects.

Poster: **D12** **Dimitra Kiakou**

Volume of tissue activated and patient characteristics predict deep brain stimulation outcomes in Parkinson's disease

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Introduction: Deep brain stimulation (DBS) of the subthalamic nucleus (STN) is an effective treatment for motor symptoms in Parkinson's disease (PD). However, the mechanisms by which stimulation modulates clinical outcomes remain incompletely understood. This study aimed to predict STN-DBS-induced PD-symptom differences using the volume of tissue activated (VTA) and patient-specific characteristics. ***Methods***: Preoperative T1- and T2-weigthed and postoperative T1-weighted images were obtained from 96 PD patients with bilateral STN-DBS. VTAs were estimated using the Lead-DBS pipeline, incorporating coregistration, spatial normalization, brainshift correction, electrode localization, and VTA simulation. Clinical outcomes were measured during STN-DBS ON and OFF states. To predict the improvements of the symptoms due to stimulation, multiple regression models were employed including Linear Regression (LR), Support Vector Regression (SVR), Decision Tree (DT), Random Forest (RF), Gradient Boosting (GB), and K-Nearest Neighbours (KNN). Predictors were VTA characteristics (size, centre of gravity coordinates) and clinical features (age, disease duration, and sex). Feature selection based on univariate statistical tests was incorporated to identify the most predictive variables. The models were evaluated using Leave-One-Out Cross-Validation with mean squared error (MSE), R2, and Pearson correlation (R) between predicted and true values. ***Results:*** Gradient Boosting illustrated the highest performance achieving an MSE of MSE=42.44, R2=0.24, R=0.53, $p<0.001$ with k=13 features. The features included age, disease duration, and VTA size, coordinates of the centre of gravity, and their mean across both hemispheres. LR and RF achieved almost equally by using fewer features, k=5 and k=11 respectively. Interestingly, SVR required only the total size of VTA for acquiring a comparable high performance (MSE=47.46, R2=0.15). Lastly, KNN and DT were less effective with higher MSE explaining less variability of the data. ***Discussion***: VTA-characteristics, including size and centre of gravity, along with patient age and disease duration, are key predictors of clinical outcomes in STN-DBS, offering potential for refining DBS treatment.

Poster: **D13** **Xia Zhang**

White Matter Alterations in Patients with Heart Failure

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Introduction: Recent research reports heart failure (HF) with structural brain changes particularly in widely distributed brain regions due to an insufficient oxygen and blood flow. While reduced gray matter density and impaired functional brain connectivity have been reported in HF, the long-term impact on brain white matter (WM) microstructure remains unclear. ***Methods***: Diffusion tensor imaging (DTI) images were acquired from 90 subjects. Voxel-based analysis was used to investigate a potential correlation between HF-biomarkers (ejection fraction, EF; N-terminal prohormone of brain natriuretic peptide, NT-proBNP) and WM diffusion parameters including fractional anisotropy (FA), mean diffusivity (MD), radial diffusivity (RD), and axial diffusivity (AD). Voxel- and atlas-based analyses were employed to examine potential WM alterations in HF. ***Results:*** We obtained a significant negative correlation between EF and all diffusivity parameters (MD, RD, AD). In addition, we obtained a significant positive correlation between EF and all diffusivity parameters. Compared to healthy controls and coronary artery disease patients, HF patients showed significantly increased MD. ***Discussion***: Aligning with previous research, our findings demonstrate a significant relationship between HF biomarkers (EF and NT-proBNP) and WM microstructure. The observed association between HF and increase of MD might indicate an additional structural damage in WM regions. Overall, our results suggest that HF patients undergo detrimental WM changes indicating a critical connection between cardiac dysfunction and brain WM alterations in this vulnerable population.

Poster: **D14** **Orestis Stylianou**

Whole-Body Networks: A Holistic Approach for Studying Aging

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Introduction: Aging is a multiorgan disease, yet the traditional approach is to study each organ in isolation. Such organ-specific studies allowed us to gather invaluable information regarding the pathomechanisms that contribute to senescence. But we believe that a big-picture exploration of the whole-body network (WBN) during aging could be complementary. ***Methods***: In this study, we analyzed the functional magnetic resonance imaging, breathing rate and heart rate time series of a young and an elderly group during eyes-open resting-state. By exploring the time-lagged coupling between the different organs we constructed WBNs. ***Results:*** First, we showed that our analytical pipeline could identify regional differences in the networks of both populations, allowing us to proceed with the remaining of the analysis. By comparing the WBNs of young and elderly, a complex relationship emerged where some connections were stronger and some weaker in the elderly. Finally, the interconnectivity and segregation of the WBNs negatively correlated with the short-term memory of the young participants. ***Discussion***: This study: i) validated our methodology, ii) identified differences in the WBNs of the two groups and iii) showed correlations of WBNs with behavioral metrics. We are at the edge of a paradigm shift on how aging-related research is conducted and we believe that our methodology should be implemented in more complex mental and/or physical tasks to better demonstrate the alterations of WBNs as we age.

Poster: **D15** **Lydia Vasileiadou**

Rats' empathic behavior: The water chamber experiment

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Introduction: Whether rodents help a conspecific in distress, was already shown in former experiments. However, in these experiments the factor of a reward in the form of social contact, which obscures the answer to whether the rats helped out of empathy. ***Methods***: Male Sprague Dawley rats were placed in pairs in a two or three chamber apparatus. One of the rats is the Observer and the other is the Target. The Target is placed in 100 mm of water in the wet compartment. Observers were placed in the dry chamber with access to a chain that, when pulled, opened an automatic door which allowed the Target to be released into either the same dry compartment as the Observer or to a dry compartment separate from the Observer. In some groups, the roles were later reversed. Some groups were tested with fake rat Targets or Targets without distress. ***Results:*** The reverse rats, who were initially in the Target's situation, exhibited a faster reaction to the distress of their conspecific than the normal Observers, both with and without the expectation of social interaction. Further, the reverse rats learned the social task faster than the Observers, even when the Target wasn't in distress. In the case of the fake rat, both reverse rats and Observers had an increased latency of a reaction, indicating that the door opening behavior is dependent on the presence of a distressed conspecific. ***Discussion***: The study validated the model of empathy where rats help each other because of shared distress without expecting a social reward.

Poster: **D16** **Emrullah Ecer**

Self-Deceptive Enhancement Deteriorates Objective Working Memory Capacity: The Role of Attachment Insecurities and Borderline Personality Traits

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Introduction: Individuals with higher levels of borderline personality traits tend to exhibit impairments in executive functions, particularly working memory. However, the reasons behind these deficits in working memory remain unclear. In the current study, we aimed to investigate the role of attachment styles and social desirability bias—both of which are linked to the frontal cortex—in shaping working memory capacity in individuals with borderline personality traits. ***Methods***: Four hundred Polish students from SWPS University participated in the study in exchange for course credit. Sixty-four participants were excluded for failing at least one of three attention check questions, resulting in a final sample of 336 participants (298 women, 38 men; age M = 26.75, SD = 8.86). Attachment insecurities served as the independent variables, borderline personality traits as the mediator, social desirability bias (self-deceptive enhancement and impression management) as covariates, and working memory capacity as the dependent variable in the mediation analysis using the JASP SEM model. Participants completed a 2-back task to assess their working memory capacity. To examine the impact of attachment anxiety and avoidance on cognitive load, we calculated the number of correct responses for each trial separately. The mediation analysis included borderline personality traits, while self-deceptive enhancement and impression management were treated as dependent variables to explore their contributions to working memory performance. ***Results:*** We found that under higher cognitive load (trial 3), the relationship between self-deceptive enhancement and working memory capacity became significantly negative. In this condition, attachment anxiety and avoidance posed risks to working memory capacity through higher levels of borderline personality traits. However, under lower cognitive load conditions (trials 1 and 2), these relationships were not significant. ***Discussion***: Our findings suggest that interventions targeting attachment-related vulnerabilities and self-deceptive tendencies may be most effective under conditions of high cognitive demand.

Poster: **D17** **Arzu Ibadullayeva**

Dysregulated Dopamine and Reality Monitoring Errors

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Introduction: Reality monitoring is vital cognitive function which allows people to distinguish between internally generated ideas and real-life events that occurs in external world. This ability affects other cognitive functions by enabling individuals' accurate and clear perception, memory, and decision-making. In this study we also want to point out the essential effects of neurotransmitter Dopamine on cognitive functions as well as reality monitoring. Optimal dopamine levels ensure cognitive flexibility, regulating motivation, facilitating learning, processing rewards, and managing prediction errors. Dysregulations in dopamine secretion can lead impairments in reality monitoring and errors in perception of reality as it is which can lead to decision-making biases, emotional instability, and social withdrawal, delusions and hallucinations. ***Methods***: This study critically examines existing literature and research on reality monitoring and the role of dopamine in modulating reality monitoring. We analysed the impact of elevated and reduced dopamine activity on cognitive functions, neural pathways, brain parts including the prefrontal cortex, hippocampus and connected these results to behavioural and psychological effects and diseases. ***Results:*** Dysregulated dopamine release disrupts prediction error signalling, a vital component of reality monitoring. Hyperdopaminergic states exaggerate significance of irrelevant internal stimuli, leading to hallucinations and delusions. On the other hand, hypodopaminergic activity undermines cognitive control and memory accuracy, which is increasing risk of confusion between self-generated and external information. These impairments affect not only cognitive functions but also emotional regulation, social interactions and adaptive behaviours, leading to increased anxiety, impulsivity and social isolation. ***Discussion***: Understanding effects of dysregulated dopamine and reality monitoring errors is crucial. Distorted reality monitoring caused by imbalanced dopamine levels leads to psychotic symptoms which contribute to clinical disorders including Schizophrenia. In Bipolar Disorder fluctuating dopamine levels, be factor in manic and depressive episodes by shifting reality monitoring. Even in non-clinical individuals, mild dopamine imbalances can result to distortions in cognitive functions by affecting reality monitoring. To improve overall life quality of individuals suffering from such dysregulations, neuromodulation techniques and cognitive behavioural therapies can be used.

Poster: **D18** **Muazzez Deniz Barut**

Exploring the Role of Empathy in the Attachment Insecurity-Social Anxiety Link: A Distinction Between Close Persons and Strangers

Ecer,E.[1], Barut, M. D. [2], Hellenbrand,S.[3], Sarabia Badillo,V.[4], Kochanowicz,J.[5], Özalp, E.[6], Zielińska,K.[7], Matos,S.[8], & Tomruk,C.N.[9]
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Introduction: This study aims to address the gap in the existing literature by examining the distinct roles of empathy towards close persons versus strangers in the relationship between attachment insecurities (anxiety and avoidance) and social anxiety. Previous research has not clearly distinguished between these two types of empathy, and the underlying mechanisms linking attachment insecurities to social anxiety remain unclear. ***Methods***: The sample consisted of 253 participants (187 women, 65 men; median age = 28) without any diagnosed mental disorders. We used Structural Equation Modeling (SEM) in Jamovi to examine the relationships between variables. Attachment insecurities (attachment anxiety and attachment avoidance) were included as independent variables, while social anxiety was the dependent variable. The dimensions of empathy, specifically personal distress and empathic concern toward a close person and a stranger, were analyzed as mediators in the relationship between attachment insecurities and social anxiety. We implemented a moderation analysis to examine whether the relationship between attachment insecurities and social anxiety was moderated by perspective-taking toward a close person and a stranger. ***Results:*** Results revealed that attachment anxiety was positively associated with social anxiety through higher personal distress towards both close persons and strangers. Attachment anxiety was related to social anxiety through higher levels of empathic concern towards strangers but not towards close persons. In contrast, attachment avoidance was linked to social anxiety through lower personal distress towards close persons, higher personal distress towards strangers, and lower empathic concern towards close persons. ***Discussion***: Our results reveal the underlying mechanisms in the attachment-social anxiety link by highlighting the differential roles of empathy towards close people and strangers. We suggest that attachment anxiety exacerbates social anxiety through heightened emotional sensitivity in both close and unfamiliar social contexts, while attachment avoidance reflects selective emotional responses based on the proximity of the person and the level of perspective-taking.

Poster: **D19** **Narmin Abasova**

Metacognition and epistemic injustice in schizophrenia

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[1] Nicolaus Copernicus University, Toruń

Introduction: This opinion highlights the complex issue of incorporating metacognition into schizophrenia treatment and the epistemic injustice when it is overlooked. ***Methods***: Consider a real situation: During an interview, a patient with schizophrenia, after experiencing strong hallucinations, asked a doctor, "Doctor, I know it's impossible. But… is it possible that I saw x? Could x really happen?" To protect the patient's privacy, the specific content of the hallucination is omitted. Also, our focus is not on the experience itself but on the doctor's response: "I believe that you experienced x. I believe you saw x. But x was not real." ***Results:*** We claim that prioritizing the metacognitive experiences of individuals with schizophrenia and thereby respecting their first-person authority (FPA) has significant implications for treatment strategies. ***Discussion***: To this end, we will first discuss the relation between FPA and metacognition. This is essential to demonstrate why metacognitive therapies should be a focus in schizophrenia treatment. Integrating metacognition into schizophrenia therapy will then constitute the next point of our considerations. Finally, we will discuss the dangers of undermining FPA for therapeutic success, while also addressing the risks of overemphasizing FPA at the expense of necessary medical oversight

Poster: **D20** **Lisa Stetza**

Respiratory modulation of pupil dilation persists during bistable perception

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Introduction: During rest pupil dilation fluctuates with the respiratory rhythm. Whether this relation of bodily signals persists during cognitive or perceptual tasks remains unclear. We investigate this phenomenon in a perceptual task requiring participants to report perceptual changes in bistable visual stimuli. ***Methods***: Participants viewed the Necker cube for an extended time period (75 seconds each trial) and indicated perceptual reversals. Alongside the behavioural task, we acquired eye tracking data as well as respiration data via a thermoresistor attached to a medical oxygen mask. ***Results:*** Besides specific eye movement and pupil dynamics around the time of perceived reversal, we quantified pupil dilation as a function of the respiratory phase, by binning the phase. This revealed that pupil dilation peaks during the transition from inspiration to expiration and reaches its minimum during the expiration-to-inspiration transition. ***Discussion***: Our results provide insights into the interaction between bodily rhythms and cognitive processes. It is known that pupil dilation covaries with the phase of respiration and our data show that this persists during prolonged viewing of bistable shapes. However, a number of studies investigating modulatory effects of respiration on pupil dynamics found inconclusive results which may point to a more nuanced relationship between bodily rhythms, pupil dynamics and cognition. The variety of cognitive task used in those studies come with a considerable range of task difficulties, raising the question whether tasks difficulty causes the diversity of results. To further investigate the relationship between bodily rhythms, pupil dynamics and cognitive demands we modified the task by incorporating a memory component into half of the trials and are currently recording additional physiological parameters, including ECG and EEG.

Poster: **D21** **Tiantian Li**

Transcutaneous Vagus Nerve Stimulation Effects on Neuromodulatory BOLD-Activity and Sympathetic Arousal

Li, T.* [1,2], Kulesza, A.* [1,3], Seo, S. [1], Weinhardt, S. [1], Ludwig, M. [4,5], D'Agostini, M. [7], Bodammer, N. [1], Santoro, D. [1], Mohammadi, S. [6], Lindenberger, U. [1], & Dahl, M. [1]
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Introduction: Neuromodulators, such as noradrenaline, regulate sympathetic arousal and higher-order cognitive functions. Recent animal research indicates that invasive electrical stimulation of the vagus nerve, a key bidirectional body–brain communication channel, activates neuromodulatory centers in the brainstem such as the locus coeruleus suggesting it as a promising tool to experimentally modulate neuromodulatory processes. However, direct evidence from humans is scarce and inconsistent. This study explores how non-invasive transcutaneous auricular VNS (taVNS) affects vagal and neuromodulatory brainstem nuclei, critical for sympathetic arousal and cognition. ***Methods***: We test 50 healthy younger adults who will undergo concurrent brainstem-focused fMRI, pupillometry, respiration, and heart rate measurements during tVNS. On each trial, participants receive a brief (1s) electrical pulse delivered to the cymba conchae (where ascending vagal projections are present) or the earlobe (control) on the left ear. Stimulation at each site takes place on separate days, with counterbalanced order across participants. Stimulation intensity is individually calibrated for each site, with three amplitude levels (40%, 60%, and 80% of personal maximum) administered in a parametric design. In addition, quantitative MRI is acquired to differentiate brainstem structures based on their underlying tissue properties. This provides the opportunity to map activity in the brainstem nuclei of interest more precisely and link it to its structural properties. ***Results:*** Preliminary data show that tVNS elicits larger pupil dilation compared to control, suggesting successful manipulation of neuromodulatory processing. Additionally, pupil dilation increases parametrically with stimulus intensity across both locations in a dose–response relationship. Initial qMRI results show successful visualization of neuromodulatory nuclei of interest, including the LC and substantia nigra. Further physiological and imaging findings will be presented at the conference based on the ongoing data collection. ***Discussion***: This work aims to provide foundational knowledge on how tVNS modulates brainstem activity and peripheral responses, offering insights into its potential for both experimental and clinical purposes.

Poster: **D22** **Maria Azanova**

Trial-dependent effects of cardiac cycle on decision-making under uncertainty

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Introduction: The effects of the cardiac cycle on perception and action are widely studied nowadays. However, these effects are still poorly understood for more complex cognitive processes, such as learning and decision-making under uncertainty. Inspired by recent research showing that early and late trials within probabilistic learning involve different processes, we consider them separately to study cardiac cycle effects. ***Methods***: We recorded EEG and ECG during a probabilistic learning task in 34 participants. We used Bayesian models to examine the effects of the cardiac cycle on behavioral and neural variables. Our main behavioral measures were switching and staying. The former assessed whether participants changed their strategies after negative outcomes, and the latter assessed whether they persisted with current strategies after positive outcomes. The main neural measures of interest were feedback-related negativity, P3a, and P3b. ***Results:*** Across all trials, we observed no significant effects of systole or diastole on behavioral or neural reactions to outcomes. In early trials, combined switching and staying proportion was greatly enhanced in systole ($p < .0001$), highlighting its role in salience-driven, immediate reinforcement. This effect was linked to increased P3a amplitude reactivity to positive versus negative outcomes in systole when comparing early and late trials ($p < .05$). ***Discussion***: In line with previous literature, we observe salience-related effects of the cardiac cycle in early trials. We show how those might manifest in a complex process of probabilistic learning, possibly via interactions with frontal dopaminergic networks involved in working memory. In later trials, when decision-making is more strategy-driven, we see no evidence for the involvement of the cardiac cycle. These results indicate that cardiac cycle effects, while present in many settings, are specific to some areas and processes, opening up questions for further investigation.

Poster Session V

Recorded presentations can be found on our website

Poster: **V01** **Nicolás Hinrichs**

A Multimodal Pipeline for Cognitive Neuropragmatics

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*Equal contributions

Introduction: The semantic-pragmatic continuum highlights the interplay between stable linguistic meanings and context-sensitive language use. Addressing this complexity requires an integrative approach combining cognitive linguistics, computational tools, and multimodal data. We present a proof-of-concept pipeline leveraging annotated datasets and NLP models to explore pragmatic phenomena such as turn-taking, implicatures, and speech acts. This pipeline lays the groundwork for future investigations into the neural correlates of pragmatic processing. ***Methods***: Using multimodal corpora enriched with frame-semantic annotations, we aligned pragmatic frames to linguistic, visual, and auditory data. A quadrantal framework conceptualized the interaction between semantics and pragmatics across cognitive and computational axes. The methodology emphasizes linking annotated datasets with computational models to map pragmatic meaning-making in real-time communication. ***Results:*** The pipeline demonstrated the feasibility of integrating frame-semantic annotations with multimodal inputs for analyzing pragmatic phenomena. NLP-driven analyses successfully aligned frame-level annotations with contextual variations in turn-taking behavior and pragmatic function, offering insights into how meaning unfolds dynamically in interactional settings. ***Discussion***: This proof-of-concept highlights the potential of integrating multimodal annotation and computational modeling for mapping the semantic-pragmatic continuum. While the neuroscientific aspects remain aspirational, the framework establishes a foundation for future studies incorporating neural data. Practical applications include improving NLP systems for context-aware communication and developing datasets for studying real-time pragmatic processing.

Poster: **V02** **Kitty Goldthorp**

Can attentional focus and physical exertion affect interoception?

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Introduction: 'Interoception' is our internal sense; iterative brain-body signalling occurs automatically to maintain homeostasis, but conscious interoception varies across individuals (e.g. heartbeat awareness). Maladaptive interoception can develop after traumatic life experiences, however interoception can be improved through mindful body-based activities. Guidance to notice internal bodily sensations was incorporated into Outdoor Education, successfully engaging children with a history of complex trauma in Interoceptive Awareness Opportunities (IAOs), with anecdotal improvements reported. The effects of IAOs on objective interoceptive accuracy (e.g. ability to detect heartbeats) was unknown. ***Methods***: An IAO was tested on 79 adults after exercising on a cycling ergometer, under two physical exertion intensities (light/vigorous, within-subjects,) and two attentional focus conditions (interoceptive/exteroceptive, between-subjects). Participants in the interoceptive group focused on their pulse after exercise, whereas the exteroceptive group completed a screen-based task. All participants completed a Heartbeat Discrimination Task (HBDT) to assess their cardiac interoceptive accuracy before exercise and when their heartbeat had returned to baseline post-exercise. We also assessed cortical processing of the heartbeat via EEG recording of the Heartbeat Evoked Potentials (HEP). Psychometric data was obtained, including Adverse Childhood Experiences (ACEs). ***Results:*** HBDT data was analysed according to signal detection theory: Positive Predictive Value (PPV), D prime (d') and Area Under Receiver Operating Characteristic Curve (AUROC curve). Members of the interoception group had significantly higher PPV scores. The interoception task also appeared to improve HBDT performance (d') but only among participants who self-reported higher interoceptive awareness. Vigorous exercise produced significantly poorer AUROC scores in people with more ACEs, particularly if assigned to the exteroceptive group. HEP analysis is in progress. ***Discussion***: HBDT results indicate that attending to the heartbeat following exercise can improve cardiac awareness even when the heartbeat has returned to resting. The optimal exercise intensity regarding body-based interoceptive mental health interventions for people with a history of trauma warrants further research.

Poster: **V03** **Anubhav Monga**

Cybernetic Materials for a Theory of Intelligent Systems

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Introduction: This article addresses how second-order cybernetics, as a schema, facilitates the theoretical enablement of intellligent systems without reducing the comprehension of intelligence, as a concept, to passive operationality of "automated optimisation" in so-called artificial intelligence systems. There is a huge chasm of operations and problems which are computationally ineffective in ontology of algorithmic procedural systems. I present a synthetic analysis of various writings on systems theory and cybernetics which justify the claim that the evolution of life defy the deterministic weltanschauung of mechanistic dynamics. ***Methods***: This paper is designed as a synthetic analysis of various writings on systems theory and cybernetics. I discuss approaches and implications of defining intelligence in terms of "ontological expansion" (Denizhan) or in terms of "eigenfunction problem" (von Foerster). I will go through arguments made by Denizhan, Negarestani, Rosen, Kineman, von Foerster and others and conclude with a discussion on ethical individuation of intelligent systems. ***Results:*** 1. Phase space of Turing computation is a subspace of larger computational phase space which is unprestatable and unreducable; 2. Living systems necessarily belongs to this larger space with models not enclosed in Turing computational space; 3. Second order cybernetics brings insight into the entailment structure of intelligent systems. ***Discussion***: In this article, I consider Denizhan's definition of intelligence based on the interactive space of ontological expansion which, as a formulation of intelligence, is virtually identical to the eigenfunction problem of syntax and semantics in their dialogical interdependency where one derives from the other and contextualizes the other, or in other words, where one acts as the boundary condition for the other.

Poster: **V04** **Jyotirmaya Satpathy**

Explorations in Pre - Frontal Cortex Skyjack

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Introduction: The pre - frontal cortex, a small almond-shaped structure located deep within the brain's temporal lobes, is a critical component of the limbic system, which is responsible for processing emotions, regulating emotional responses, and encoding emotional memories. While the pre - frontal cortex plays a crucial role in various aspects of human behavior and cognition, its influence on estimate-making processes, particularly in decision settings, has garnered increasing attention in recent years. The pre - frontal cortex's involvement in estimate-making can be attributed to its three primary functions emotional processing, fear (fight, fright and / or flight) and anxiety responses, and emotional memory. ***Methods***: how the pre - frontal cortex's functions influence estimate-making processes within decision settings, with a particular focus on the impact on leader well-being and productivity. ***Results:*** The pre - frontal cortex's functions as a cognitive tripod, encompassing emotional processing, fear (fight, fright and / or flight) and anxiety responses, and emotional memory, play a pivotal role in shaping estimate-making processes within decision settings. While the pre - frontal cortex's influence can be beneficial in certain contexts, it can also present challenges that may negatively impact leader well-being, productivity, and organizational performance. By implementing strategies such as emotional intelligence training, mindfulness practices, leader assistance programs, and fostering a supportive organizational culture, organizations can mitigate the potential adverse effects of pre - frontal cortex-driven estimate-making and promote positive cognitive health among workforce. ***Discussion***: recognizing and addressing pre - frontal cortex's influence on estimate-making is crucial for creating a healthy and productive work environment, where leaders can make informed and emotionally intelligent estimates that contribute to long-term success of the organization. A very simple acronym that we have propounded is MOVERS - Meditation, Ocean or similar such breath work practice, Visualization, Exercise, Reading affirmations and scribing negative thoughts 05 to 10 minutes a day is the way to achieve mastery over ‘Pre - Frontal Cortex Skyjack’

Poster: **V05** **Avraham Shmueli**

Interoceptive - a resilience factor in subclinical traumatic symptoms

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Introduction: Experiencing a traumatic event can lead to negative psychological and physiological effects. Following the devastating events of October 7th, over 30% of Israelis screened positive for post-traumatic stress disorder (PTSD). This tragic situation also offers an opportunity to deepen our understanding of the mechanisms underlying trauma-related stress disorders in the subclinical population. We explored theories suggesting that interoception (i.e., sensing the body from within) mediates between the physiological state and trauma-related psychological symptoms. ***Methods***: We utilized a novel heart rate discrimination task to assess interoceptive bias, sensitivity and metacognition, alongside a self-report questionnaire to evaluate interoceptive awareness, trauma, and dissociation symptom severity. Lastly, we measured the heart activity in response to a stressor. ***Results:*** Our findings revealed the interconnections between symptoms, physiology and interoception. First, the power of low-frequency heart-rate variability (HRV) negatively correlates to symptom severity. Second, Self-report evaluation of interoception negatively correlates to symptom severity but positively correlates with low-frequency HRV power, suggesting interoception is linked to adaptive physiology and enhances psychological resilience. Lastly, a distinct clinical subgroup, presenting both PTSD and dissociative symptoms, demonstrated greater bias in heartbeat estimation—a marker of altered interoception. ***Discussion***: These results highlight the importance of interoception in understanding individual differences in resilience following trauma. Especially, given the increasing number of integrative mind-body psychotherapy approaches being used in treating trauma-related disorders. The current study provides the basis for follow-up research on the NOVA festival survivors.

Poster: **V06** **Jyotirmaya Satpathy**

Neuro - Connect in Motivational Dynamics of Business Leadership

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Introduction: Over decades, management has experienced various leadership styles. Each shapes how business leaders make decisions, set goals in organizations. Motivation underpins these strategies, rooted in neurological processes where neuro-transmitters regulate behavior in business context (natural sciences perspective). Paper aims to explore correlation between neuro-transmitters and business decisions with focus on prefrontal cortex to arrive at decisions. Methodology is based on Anxiety Test of Business Leaders (N = 03). Response of Amygdala neurotransmitter is tested through electrical stimulation to detect anxiety, neuro processing, emotional regulation and decision making abilities. Study examines cerebral processes which business leaders pursue for positive outcomes or avoid threats. Methodology incorporates anxiety test to evaluate anxiety levels, neuro processing and decision making abilities in high-achieving leaders. Results demonstrate that intrinsic or extrinsic factors play crucial role in shaping motivational dynamics of business leaders. Experiments suggest link between neural activity, anxiety, and outcomes in decision-making. In Conclusion, paper emphasizes inter-connectedness of neuro-transmitters in influencing motivation levels business leaders'. ***Methods***: Methodology is based on Anxiety Test of Business Leaders (N = 03). Response of Amygdala neurotransmitter is tested through electrical stimulation to detect anxiety, neuro processing, emotional regulation and decision making abilities. Study examines cerebral processes which business leaders pursue for positive outcomes or avoid threats. Methodology incorporates anxiety test to evaluate anxiety levels, neuro processing and decision making abilities in high-achieving leaders. ***Results:*** Results demonstrate that intrinsic or extrinsic factors play crucial role in shaping motivational dynamics of business leaders. Experiments suggest link between neural activity, anxiety, and outcomes in decision-making. In Conclusion, paper emphasizes inter-connectedness of neuro-transmitters in influencing motivation levels business leaders'. ***Discussion***: Studies on neural correlates of peak performance show that combination of optimal neuro-chemical profiles, efficient brainwave activity and functional connectivity are linked to high achievement. Dopaminergic system and connection between DMN and prefrontal cortex are crucial for maintaining motivation and cognitive control. qEEG results show that alpha and gamma wave activity is essential for reaching flow states and improving creative outputFinally, emerging techniques such as (TMS) and neurofeedback present opportunities for improving brain function and greatest potential performance.

Poster: **V07** **Withdrawn**

Poster: **V08** **Omer Reuveni**

Quantifying Variability in Attentional Shifts During Target Switching Using Steady-State Visual Evoked Potentials

Reuveni, O. [1,2,3], Eidelman-Rothman, M., [1], Keil, A. [4], Kritzman, L. [1,5], Okon-Singer, H. [2,3,6] & Levit-Binnun, N. [1]
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Introduction: The ability to flexibly shift and sustain attention is central to cognitive functioning and plays a pivotal role in both psychological well-being and the development of psychopathologies. However, there remains a critical need for precise tools to measure the neural mechanisms underlying these shifts, especially at the individual level. ***Methods***: We employed a frequency tagging paradigm to investigate attentional shifts using steady-state visual evoked potentials (ssVEPs). Participants viewed overlapping stimuli flickering at distinct frequencies, allowing us to isolate neural responses to specific targets. The task required directing attention to an initial target, followed by a switch to a new target based on a cue. This design enabled us to measure attentional engagement, disengagement, and reengagement with high temporal resolution. ***Results:*** Group-level analysis revealed clear temporal dynamics of attentional shifts, with disengagement occurring 480 ms and reengagement 370 ms after the cue. Individual-level analyses highlighted distinct patterns, including participants who exhibited both shifts, only one shift, or neither. Among those with both shifts, the timing varied widely, spanning over 1850 ms, indicating substantial individual differences in the order and latency of attentional shifts. ***Discussion***: These results highlight the potential of frequency tagging as a robust method for quantifying attention shifts and for identifying individual attentional profiles. The implications of these findings for understanding attentional control and designing interventions will be discussed, along with methodological considerations for applying this approach in cognitive and clinical research.

Poster: **V09** **Anna Crossland**

Recognising, identifying, interpreting and reacting to internal bodily signals during pregnancy: A scale development study

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Introduction: During pregnancy women perceive, interpret and react to bodily signals like fatigue and hunger (interoception) differently to the general population due to vast psychological and physiological changes during this time. Current self-report interoception scales may not be valid for pregnant populations due to this, therefore we aimed to develop a pregnancy specific interoception scale using a mixed methods approach. ***Methods***: A series of stages of scale development were undertaken starting with gathering qualitative data from focus groups of pregnant women to understand their bodily experiences during pregnancy. This data was then analysed and, with consideration of interoceptive theory, a scale to measure pregnancy specific interoception was developed. Interviews with pregnant women, post-natal women and midwives (N=14) provided qualitative feedback on the interpretability and relevance of each item of the scale, and then the scale was piloted with pregnant women and midwives (N=50). Validation data was collected from a large sample (N=400 after exclusions) who completed the scale online, along with scales measuring other constructs that have been found to relate to interoception in the general population, including mental health. Explorative Factor Analysis (EFA) was conducted to reveal the latent factor structure, verified by Confirmatory Factor Analysis (CFA) on a different sample (N=300 after exclusions). ***Results:*** Fifty-three items were initially created, which was then reduced at each stage of feedback to 40 items. The outcome of the EFA was a 27-item, 7-subscale structure, including subscales relating to the influence of external factors on interoception, and about how sensations are interpreted. CFA confirmed the structure was valid. ***Discussion***: It is important to understand how interoception is experienced during pregnancy because it is considered a transdiagnostic factor across various mental health conditions, for which pregnancy represents increased vulnerability. This newly developed scale attempts to effectively and accurately measure the interoceptive experience during pregnancy.

Poster: **V10** **Withdrawn**

Poster: **V11** **Madeleine Jones**

Tingle-eliciting properties of pleasant, calming and potentially socially relevant audiovisual stimuli: the Autonomous Sensory Meridian Response (ASMR)

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Introduction: Sensory information is central to social connection, though little is known about how we process specific sensory stimuli in affective terms. Autonomous Sensory Meridian Response (ASMR) may provide clues as to how multisensory information acquires a social and affective character. ASMR is a phenomenon in which certain auditory and visual sensory inputs produce strong, subjectively salient positive affective responses. ASMR responders report increased relaxation and reduced stress, alongside "tingle" sensations which often begin in the head and spread to other parts of the body. ***Methods***: In two online studies, we explore social and non-social features of tingle-eliciting audiovisual "trigger" stimuli in ASMR, assessed by self-reported tingle sensation frequency. This is a step towards investigating physiological and neural underpinnings of affective sensory processing. ***Results:*** ASMR responders in study 1 (n=159) and study 2 (n=63) reported a higher degree of tingles than controls, although with high variability in intensity and frequency of responses, reflecting heterogeneity. In study 1, intact stimuli were marginally more effective in eliciting tingles compared to scrambled stimuli. A combination of speech sounds and object manipulation were most effective for eliciting tingles. Study 2 revealed that all ASMR stimuli in which higher and lower frequencies were filtered out were less effective than intact videos. Exploratory analyses revealed a preference for viewer-directed action and implied attention. ***Discussion***: The preference for gentle speech and implied attention may speak for the importance of body-proximate and social-relevant information in ASMR, while the greater effectiveness of stimuli with intact high and low sound frequencies may also indicate an important role for proximity. However, no clear preference for social compared to non-social categories emerged in either study. Future research will use psychophysiology and fMRI to investigate potential mechanisms relevant for the integration of multisensory and affective information, to expand our knowledge of the social dimensions of ASMR experience.

Poster: **V12** **Poulami Kar**

Understanding Neurologic Music Therapy through Diffusion Tensor Imaging as an intervention for Parkinson's Disease

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Introduction: Parkinson's Disease so far does not have a clinical cure. Beat-based and rhythmic music stimulation have significant effect in developing compensatory neuroplasticity in their cerebellar-thalamocortical network, which helps them with better movement and various executive functions. Our goal is to understand cognitive construction of music perception through different auditory features and their shared neurological resources with movement, which help Parkinson's patients to develop compensatory neuroplasticity. ***Methods***: We used both cognitive and neurological components with PROMS (Profile for Music Perception Skills) and DTI (diffusion tensor imaging) in functional MRI. We collected data from 80 participants - 36 musicians and 44 non-musicians - to be able to identify training-independent auditory features and associated neural correlates. ***Results:*** Behavioural findings from PROMS-S suggested that for all auditory features, training effect was observed. Principal Component Analysis revealed cognitive construction of music perception through auditory features, where non-musicians had highest loading for tempo, making it a clinically relevant feature for targeted auditory intervention. Melody and rhythm are unique features for musicians, found through factor analysis, while tempo and rhythm for non-musicians, making these two features independent of specific training, and explains the relevance of beat-based and rhythmic intervention playing significant role in defining plasticity in literature. Findings from DTI suggests that musicians have higher white matter integrity in internal capsule, which plays an important role in movements. We see higher white matter integrity in genu of Corpus Callosum for musicians for features like rhythm, while non-musicians show higher white matter integrity for temporal and rhythmic features in splenium, suggesting possible double dissociation in beat perception between genu and splenium among musicians and non-musicians. ***Discussion***: These behavioural and neurological findings help in understanding cognitive construction of music perception and the neurological mechanisms of processing these features, which in turn help in movement.

Poster: **V13** **Xiaodi Xia**

Adverse Experience, Hippocampal Connectivity, and Epigenetic Modification in Adolescent Depression

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Introduction: Adverse experiences are key contributors to the onset and progression of major depressive disorder (MDD). These experiences may influence resting-state brain activity and epigenetic modifications, but their combined impact remains poorly understood. This study investigated the relationship between adverse experiences, hippocampal resting-state functional connectivity (rs-FC), and DNA methylation (DNAm) in adolescents with MDD. ***Methods***: The study included 139 adolescents with MDD and 59 healthy controls (HCs). Participants completed structured assessments of adverse experiences during adolescence, and DNAm was measured from peripheral blood samples. Seed-based rs-FC analyses were conducted, with the bilateral hippocampus as the regions of interest (voxel-level $p < 0.001$, cluster-level $p < 0.05$, GRF corrected). ***Results:*** Adolescents with MDD reported significantly higher levels of adverse experiences compared to HCs. In the MDD group, increased rs-FC was observed between the left hippocampus (HIP.L) and left parahippocampal gyrus (PHG.L), as well as between the right hippocampus (HIP.R) and right temporal pole (TPOmid.R). Additionally, the peripheral blood DNAm was negatively correlated with adverse experiences and specific hippocampal connectivity patterns. ***Discussion***: These findings suggest that adverse experiences during adolescence may drive alterations in hippocampal connectivity patterns and epigenetic modifications, contributing to the potential pathophysiology of MDD. The integration of neuroimaging and epigenetic analyses offers promising direction for identifying biomarkers and informing early intervention strategies.

Poster: **V14** **Withdrawn**

Poster: **V15** **Suhail Ahmad Dar**

Early Alzheimer's Detection: Integrating Surface-Based Morphometry and Machine Learning for Precise Structural MRI Analysis

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Introduction: Alzheimer's disease (AD) is distinguished by substantial brain atrophy, which is notably visible in structural MRI imaging. There has been little investigation into cortical deterioration in specific sub-cortical regions as the disease develops from Mild Cognitive Impairment (MCI) to Alzheimer's, with the goal of eventually exploiting the extracted features in early diagnosis. As a result, the current study concentrates on that element of research. ***Methods***: Using ADNI data, examine 68 sub-cortical regions' deterioration in the transition from MCI to Alzheimer's over 6 months to 3 years, focusing on surface-based morphometry (SBM) parameters: Cortical Thickness (CTh), Gyrification Index (GI), and Sulcal Depth (SD). A Healthy Control group was similarly assessed for SBM parameters. ***Results:*** It involved Identification of sub-cortical regions with significant atrophy in SBM parameters in MCI-AD group and Healthy Control group at 6 months and 3 years. Within the MCI-AD group, Cortical Thickness exhibited the most variation, followed by Sulcal Depth and Gyrification. Concomittantly, the Machine learning models were trained with the affected sub-cortical regions, and certain classifiers demonstrated superior performance at different stages (6 months, 1 year, 2 years, and 3 years) in classifying MCI-AD models against Healthy Controls ***Discussion***: Notably, some models exhibited enhanced performance as the temporal distance decreased from the actual diagnosis stage (i.e., 3 years). Model performance was assessed using Accuracy Measure, F1-Score, and AUC curve. Implications: By employing surface-based morphometry parameters on sub-cortical regions derived from a parcellation atlas in Structural MRI, we can pinpoint regions with shape decline. Simultaneously, applying machine learning models to this selected set of sub-cortical regions allows for early and accurate disease diagnosis.

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