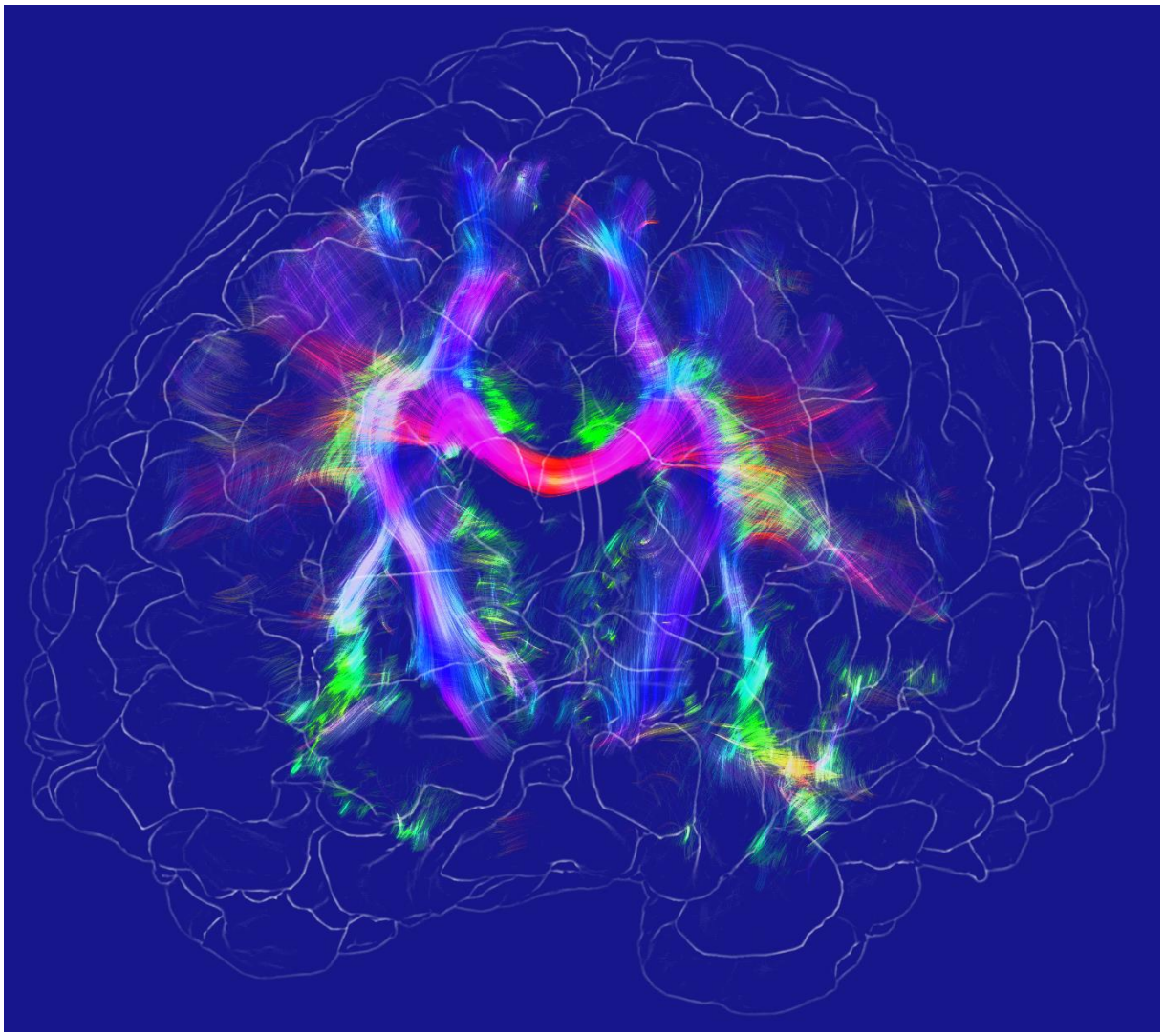

11th MindBrainBody Symposium

March 11-13, 2024
Berlin & Virtual

in the framework of the

International Brain Awareness Week

Mind Brain Body Institute

Mind Brain Body Symposium

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11th MindBrainBody Symposium 2024

Symposium Venue

Kaiserin-Friedrich-Haus, Robert-Koch-Platz 7, 10115 Berlin, Germany
& Virtual

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

11th MindBrainBody Symposium

We are pleased to welcome you to the 11th MindBrainBody Symposium (MBB Symposium 2024), which will take place in Berlin and virtual from 11 to 13 March 2023 during the International Brain Awareness Week. 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 115 submitted posters will be awarded the MBB Poster Prize. In previous years, the MBB Poster Prizes were awarded to Katie Groves (University of Essex) in 2016, Lise Hobeika (Sorbonne Universités), Toni Muffel (MPICBSLeipzig) in 2017, Friederike Irmen (Berlin School of Mind and Brain), Monika Graumann (Freie Universität) in 2018 and Lina Skora (University of Sussex) in 2019; Angeliki Charalampaki (Department of Psychology, HU; Mind&Brain, HU; BCCN; Berlin) & Artur Czeszumski (University of Osnabrück, Vrije Universiteit Amsterdam) in 2021; Polina Arbuzova (Berlin School of Mind and Brain, Humboldt-Universität zu Berlin) & Pablo Nicolas Fernandez Larrosa (IFIBYNE, UBA-CONICET, Buenos Aires) in 2022; and special 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), and Elenor Morgenroth (Ecole Polytechnique Federale, Lausanne) in 2022; Merve Kutli (Department of Psychology, LMU Munich), Sarah Meissner (ETH Zurich), & Jessica L. Hazelton (Brain and Mind Centre, The University of Sydney).

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 winners were Paweł Motyka (University of Warsaw) and Pietro Sarasso (University of Turin) in 2016; Birgit

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

11th MindBrainBody Symposium
March 11-13, 2024
Program

Monday, March 11, 2024	
15:00 - 16:00	**Registration**
16:00 – 17:00	**Opening Keynote Lecture**
	Karin Roelofs (Radboud University Nijmegen, Nijmegen) *Human defensive reactions and their role in decision making*
	Moderators: *Arno Villringer & Samyogita Hardikar (MindBrainBody; MPI CBS Leipzig)*
17:00 - 18:15	**Panel 1: Presentations by 5 Participants**
	Maria Azanova (MPI CBS Leipzig) *Heart rate scales with prediction error*
	Yu Hei Shum (Berlin School of Mind and Brain, Humboldt-Universität zu Berlin) *Strength of nondirectional coupling between cardiac signal and intentional action varies with interoceptive accuracy*
	Akansha Mahesh Naraindas (University College Dublin, Dublin) *Investigating the relationship between body image disturbance, and body-scaled action in Virtual Reality*
	Andrea Zaccaro (G. d'Annunzio University of Chieti-Pescara, Chieti) *Modulation of heartbeat evoked oscillations by cardiac interoceptive attention and respiration*
	Qiaoyue Ren (Ludwig-Maximilians-Universität München, Munich) *Listen to your heart: Attentional trade-off between cardiac and visual domains*
	Chairs: *Eleni Panagoulas & Antonin Fourcade (MPI CBS Leipzig)*
18:15 - 20:00	**Reception**
18:30 - 19:15	**Poster Session A** **Posters Nr. A1-A22**
19:15 - 20:00	**Poster Session B** **Posters Nr. B1-B24**

Tuesday, March 12, 2024	
09:00 - 10:00	**Keynote Lecture 1**
	Patrick Haggard (University College London, London) *Freedom, autonomy and responsibility: what can neuroscience tell us?*
	Chairs: *Marta Gerosa & Elias Reinwarth (MindBrainBody; MPI CBS Leipzig)*
10:00 – 10:20	**Coffee Break**
10:20 – 11:35	**Panel 2: Presentations by 5 Participants**
	Kristin Kaduk (University of Tübingen, Tübingen) *Mood is associated with hunger, and incremental effects of glucose depend on insulin sensitivity*
	Carlos Ventura-Bort (University of Potsdam) *Physiological Harmony or Discord? Unveiling the Correspondence Between Subjective Arousal and Valence and Physiological Responses*
	Zsuzsanna Nemecz (Research Centre for Natural Sciences, Budapest) *Resolving memory interference between non-meaningful stimuli depends on the parahippocampal and perirhinal cortex, not the hippocampus*
	Diego Candia-Rivera (Sorbonne Université, Paris Brain Institute) *Higher-order brain-heart coupling: Insights into affective state and neurodegeneration*
	Thalia Richter (School of Psychological Sciences, University of Haifa) *Personalized cognition-based machine-learning prediction of anxiety and depression*
	Chairs: *Agata Patyczek & Felix Klotzsche (MPI CBS Leipzig)*
11:35 - 12:15	**Virtual Poster Session A** **Posters Nr. A01-A22**
12:15 – 13:00	**Lunch Break**
13:00 - 13:40	**Virtual Poster Session V** **Posters Nr. V01-V16**
13:40 – 14:20	**Sponsor Workshops**
	José Raúl Naranjo Muradás (NIRx) *The scientific journey at the interplay between brain, body, & music: an fNIRS story*
	Omid Abbasi (Virgobit) *Remote Multimodal Data Collection Using Wearables and Smartphones: A Breakthrough for Body-Brain Interaction Research*
	Chairs: *Magdalena Gippert & Nazife Ayyildiz (MPI CBS Leipzig)*

14:20 – 15:20	**Keynote Lecture 2**
	Elvira Brattico (Aarhus University, Aarhus & University of Bari, Bari) *How music learning can change the brain*
	Chairs: *Vadim Nikulin & Maria Azanova (MindBrainBody; MPI CBS Leipzig)*
15:25 – 16:25	**Keynote Lecture 3**
	Christian Büchel (Universitätsklinikum Hamburg-Eppendorf, Hamburg) *How agency, control and expectations modulate pain*
	Chairs: *Lioba Enk & Paul Steinfath (MPI CBS Leipzig)*
16:30– 17:15	**Poster Session C** **Posters Nr. C1-C24**
17:15 – 18:00	**Poster Session D** **Posters Nr. D1-D22**
19:00 – 21:00	**Social Evening (Optional)**
	Pizzeria Marienkäfer *https://www.pizzeria-marienkaefer.de* *Marienstr. 18, 10117 Berlin (Walking distance from the venue: 13 min)*

Wednesday, March 13, 2024	
9:00 - 10:00	**Keynote Lecture 4**
	Siri Leknes (University of Oslo, Oslo) *Pain, pleasure and drug effects in the human brain*
	Chairs: *Michael Gaebler & Rosa Christine Grossmann (MindBrainBody; MPI CBS Leipzig)*
10:00 – 10:20	**Coffee Break**
10:20 – 10:55	**Virtual Poster Session B** **Posters Nr. B1-B23**
11:00 – 12:15	**Panel 3: Presentations by 5 Participants**
	Nazife Ayyildiz (MPI CBS Leipzig) *Associations of Retinal Nerve Fiber Layer Thickness, Brain Gray Matter Intensity and Cardiovascular Risk Factors*
	Anna-Lena Eckert (Dpt. of Psychology, Philipps-Universität Marburg, Marburg) *Modelling sensory attenuation as Bayesian Causal Inference across two datasets*
	Miro Grundei (Neurocomputation and Neuroimaging Unit, FU Berlin, Berlin)
	Mismatch responses across the senses
	Philipp Arndt (Biomagnetic Center, Jena University Hospital, Jena) *Artificially induced Mismatch-Training (AIM) and its impact on effective motor learning*
	Simon Hoffmann *scilaunch your research project*
	Chairs: *Asli Akdeniz-Karatay & Tilman Stephani (MPI CBS Leipzig)*
12:15 – 13:15	**Lunch Break**
13:15 –13:50	**Virtual Poster Session C** **Posters Nr. C1-C24**
13:50 –14:25	**Virtual Poster Session D** **Posters Nr. D1-22**
14:30 – 15:30	**Keynote Lecture 5**
	Jonathan Smallwood (Queen's University, Kingston) & **Samyogita Hardikar** *(MPI CBS Leipzig)* *States of mind and brain*
	Chairs: *Maria Azanova & Fivos Iliopoulos (MPI CBS Leipzig)*
15:30 – 16:00	**Closing Remarks**
	Arno Villringer (MindBrainBody; MPI CBS Leipzig)

Keynote Lecture Abstracts

March 11, 2024 at 16:00-17:00

Opening Keynote Lecture: **Karin Roelofs**

Donders Institute for Brain Cognition and Behavior, Radboud University, Nijmegen, The Netherlands

Title: Human defensive reactions and their role in decision making

Behavioural scientists often assume that automatic defensive threat reactions, while essential in explaining animal behavior, only have limited value when it comes to understanding human behavior. There is, however, increasing evidence that defensive reactions, such as freezing, have an impact on subsequent approach-avoidance decisions under acute threat in humans. Understanding the mechanisms that drive such decisions is particularly relevant for patients with anxiety disorders, whose persistent avoidance is key to the maintenance of their anxiety. In recent years, computational psychiatry has made substantial progress formalizing the mechanisms through which we make (mal)adaptive decisions. However, most current models simply ignore the transient psychophysiological state of the decision maker. Here, I argue that the balance between para-sympathetic and sympathetic activity is instrumental in driving the psychophysiological state of freezing, and that it influences approach-avoidance decisions under acute threat in different ways. To illustrate, I first explore the effects of freezing on different kinds of human action decisions under threat. Next, I discuss recent translational (rodent-human) work that has helped to characterize the neural mechanisms implicated in animal and human defensive freezing. Finally, through two prospective longitudinal studies, I show that individual differences in susceptibility to freezing are predictive of the development of anxiety symptoms. Overall, this work suggests that defensive threat reactions and associated psychophysiological states not only affect acute decision making, but also predict long-term symptom development. As such, these factors have great importance for resilience research, and should constitute an integral part of any theory of human decision making.

March 12, 2024 at 09:00-10:00

Keynote Lecture 2: Patrick Haggard

Institute of Cognitive Neuroscience, University College London

Freedom, autonomy and responsibility: what can neuroscience tell us?

Neuroscience takes a mechanistic approach to the operations of the mind. This can seem in stark contrast to the humanistic view that each of us is an autonomous individual agent with a self-consciousness that guides personal action choices. I will argue that human autonomy emerges from the high flexibility and plasticity of the primate cortical motor system, while responsibility emerges from the capacity to learn and exploit arbitrary relations between voluntary actions and their outcomes. Both autonomy and responsibility depend on the distinctive cortical circuitry of the premotor areas of the frontal lobe, and both are accompanied by characteristic conscious experience that underpins individual mental life. Neuroscientific approaches to human volition and autonomy faces two key challenges. The first is the difficulty of capturing the key features of human voluntariness in the controlled conditions of scientific laboratory experiments. The second is the difficulty of balancing mechanistic views of how the brain generates our actions, with our experiences and socio-cultural concepts of selfhood.

March 12, 2024 at 14:20-15:20

Keynote Lecture 3: Elvira Brattico

Aarhus University, Aarhus/Denmark and University of Bari, Bari/Italy

How music learning can change the brain

The training needed to proficiently play a musical instrument varies massively across practices (didactics, styles, cultures) and individuals (listening biographies, attitudes, motivation). While learning to play music, several psychological functions as well as their brain and body underpinnings are shaped over time, across the lifespan. In the talk, I will illustrate the most robust findings on the brain and body changes related to musical expertise and novel results on how such shaping might depend on practice- and person-related aspects. Finally, I will discuss whether and how music learning might promote individual and collective wellbeing. Overall, our neuroscientific findings on adults and preadolescents showed modulation of fronto-temporo-striatal reward, action observation and interoception brain circuits depending on the kind of training and the individual motivational drive. Importantly, the training-related changes were most evident when considering not just the duration of the training but also its intensity and the individual engagement with it. These discoveries have relevant implications for educational strategies and therapeutic applications.

March 12, 2024 at 17:00-18:00

Keynote Lecture 4: Christian Büchel

Institute for Systemic Neurosciences, Universitätsklinikum Hamburg-Eppendorf

How agency, control and expectations modulate pain

Pain, a complex and subjectively experienced phenomenon, involves intricate processing mechanisms at both subcortical and cortical levels. This perceptual construct integrates peripheral input, or nociception, with the internal state of the organism shaped by current factors (e.g., expectations) and past experiences. The ascending pain system, encompassing the dorsal horn of the spinal cord, the periaqueductal gray (PAG), the thalamus, and midline/lateral cortical target areas, plays a pivotal role in pain perception. This system is intricately modulated by the descending pain modulatory system, with crucial hubs located in the anterior cingulate cortex, the PAG, and the rostral ventromedial medulla (RVM). Significantly, both systems converge at multiple points, such as the PAG and dorsal horn, facilitating intricate interactions. Advanced functional magnetic resonance imaging has now provided the means to investigate this processing system in its entirety, allowing for system-level inquiries in humans. This presentation aims to explore physiological pain processing, but also delve into the intriguing realm of agency, control and expectations, offering insights into the interconnected dynamics of pain perception.

March 13, 2024 at 09:00-10:00

Keynote Lecture 5: Siri Leknes

Dept. Physics & Computational Radiology, Oslo University Hospital, Oslo

Pain, pleasure and drug effects in the human brain

Drug use is sometimes driven by a motivation for pleasure, and other times more related to relief of pain and suffering. A key neuromodulatory system implicated in both appetitive and aversive motivation for substance use is the opioid system. Opioids are renowned for their ability to cause euphoria, although the main legal use is for pain relief. Endogenous opioids are also thought to contribute to the psychoactive effects of many other substances, such as antidepressants, stimulants and cannabis. Here, I will critically evaluate the group level evidence on how opioids influence feelings of pleasure and pain in the human brain, drawing on the broader literature as well as on opioid drug studies in healthy and clinical populations.

March 13, 2024 at 14:30-15:30

Keynote Lecture 6: Jonny Smallwood & Samyogita Hardikar

Queen's University, Kingston
MPI CBS Leipzig

States of mind and brain

A core goal of psychology and neuroscience is to understand the patterns of thought that occupy our daily lives and how these contribute to well-being and productivity. Contemporary views suggest that the landscape of ongoing thought is heterogeneous and can be influenced by features of both the person and the context in which they exist. This talk considers recent work that uses experience sampling and advanced brain imaging methods to understand the different features of ongoing experience, their context dependence and how these are supported by different brain systems. These studies reveal distinct pattern of thought that emerge in a context dependent manner in both the lab and in daily life. These include patterns of episodic social cognition, that emerge during social interaction or during states of mind-wandering, and, patterns of deliberate task focus that are linked to the process of executive control and emerge while at work or during complex task in the laboratory and sensory engagement that is a characteristic experience during movie watching. Studies using brain imaging establish that these distinct patterns of thought have specific associations with brain activity, both in sensory systems and in regions of association cortex, including the fronto-parietal and the default mode networks. Together, this work demonstrates that the landscape of ongoing thought is heterogeneous, reflected in the activity of multiple neural systems and supports features of cognition important for engagement in the moment, as well as the capacity to explore distant times and places using imagination.

Sponsor Workshops

March 12, 2024 at 13:40-14:20

Sponsor Workshop 1: José Raúl Naranjo Muradás & Dr. Maria Adelia Albano de Aratanha

NIRx

The scientific journey at the interplay between brain, body, and music: an fNIRS story

In this presentation we will highlight the advantages and distinctive features of functional near-infrared spectroscopy (fNIRS) as a methodology for understanding the mechanisms underlying cognitive processes, and in particular music performance and perception. Aimed at both scientists and clinicians, this session will explore how our cutting-edge NIRx technology can be used to gain insight into these complex processes. The discussion will focus on the application of fNIRS technology, highlighting its ease of use, portability and potential for real-time monitoring of brain activity in mobile settings. We will explain how fNIRS measures the hemodynamic response in the brain to provide real-time insights into neural activity during music performance and perception. In addition, the session will include a hands-on demonstration of how fNIRS can be used to capture the dynamic brain activity of individuals engaged in musical activities. This will illustrate the practical aspects of recording high quality fNIRS brain activity and its relevance to understanding the dynamic interaction between body and the brain. In summary, our presentation will demonstrate the use of fNIRS technology for researchers and practitioners working at the intersection of neuroscience, music, and technology.

Sponsor Workshop 2: **Omid Abbasi**

Virgobit

Remote Multimodal Data Collection Using Wearables and Smartphones: A Breakthrough for Body-Brain Interaction Research

The rapid evolution of digital health technologies has opened up new avenues for collecting comprehensive physiological data beyond the confines of traditional clinical settings. Embracing this paradigm shift, Virgobit is pioneering a suite of customized software development services that empower researchers and clinicians to remotely monitor patients and gather large datasets, even while participants and patients are outside of institutes. Our innovative platform utilizes smartphones as the core data collection hub, seamlessly integrating multimodal data streams from wearable devices, smartphone sensors, and implemented questionnaires. This integration allows us to capture a wealth of physiological information, including EEG, EGG, ECG, HRV, EDA, sleep quality, activity, motion, and other relevant parameters. Our extensive partnership with leading hardware manufacturers enables us to integrate wireless wearable devices seamlessly, providing us with a comprehensive range of data sources. Additionally, we leverage the capabilities of integrated smartphones to collect additional data streams, such as voice, movement, and typing speed. All collected data is securely stored in our dedicated servers hosted at the University of Münster, ensuring compliance with rigorous EU data privacy regulations. Researchers and clinicians can easily access this data through user-friendly dashboards, providing them with real-time insights into their participants' or patients' physiological states. With a proven track record of supporting institutions like the Charité Hospital (Berlin) in monitoring patients with various conditions, including depression and Parkinson's disease, we have demonstrated the effectiveness of our platform in real-world applications. We further extend our support for scientists by enabling rapid feasibility tests in the early stages of their research projects, accelerating the pace of innovation in body-brain interaction research. Our commitment to innovation and collaboration underscores our dedication to transforming the landscape of digital health data collection. Join us as we explore the transformative potential of remote monitoring, paving the way for a data-driven era in body-brain research.

Oral Presentation/Talk Abstracts

Panel 1

March 11, 2024 at 17:00-18:15

Panel 1 | Talk 1 **Maria Azanova**

Heart rate scales with prediction error

Azanova, M. [1,2], Skora, L. [3,4], Studenova, A. [1,2], Al, E. [1,5], Nikulin, V. [1], & Villringer, A. [1,6,7,8]

[1] Department of Neurology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig
[2] Max Planck School of Cognition, Leipzig
[3] Department of Experimental Psychology, Heinrich-Heine-Universität Düsseldorf, Düsseldorf
[4] School of Psychology and Sussex Centre for Consciousness Science, University of Sussex, Brighton
[5] Department of Psychiatry, Columbia University, New York City
[6] Leipzig Research Center for Civilization Diseases, University of Leipzig, Leipzig
[7] Department of Cognitive Neurology, University Hospital Leipzig, Leipzig

Introduction: Recent conceptualizations of cardiac deceleration in adaptive environments suggest that heart slowing improves the precision of perception by reducing the frequency of noisy events associated with heartbeats. Prediction error, the difference between an expectation and an outcome, is key to the learning process and signals a need to integrate new evidence. However, it is unclear how heart rate scales with various prediction errors and how such heart rate dynamics relate to the neural reaction to feedback. ***Methods***: To investigate this, we combined EEG and ECG recordings during a probabilistic learning task in 37 participants. We used computational modeling (Q-learning) to extract prediction errors and Bayesian mixed linear models to examine their interaction with cardiac and neural responses. To study cardiac responses, we assessed the change in the inter-beat interval (IBI) of the first heartbeat after feedback. To study neural responses, we computed average amplitudes of feedback-related negativity (FRN) and P300. ***Results:*** We found that heart rate slowed more with larger prediction errors. Furthermore, only when feedback appeared earlier in the heart cycle phase (i.e., systole) was heart slowing positively associated with P300 but not with FRN. ***Discussion***: Therefore, we show it is possible to detect instant IBI scaling with prediction error. Our findings provide insight into the cardio-behavioral states involved in learning and highlight the critical role of heart slowing. This has further implications for understanding how cognitive processes are affected by disturbances in heart-brain interactions, e.g., for learning in anxiety.

March 11, 2024 at 17:00-18:15

Panel 1 | Talk 2 **Yu Hei Shum**

Strength of nondirectional coupling between cardiac signal and intentional action varies with interoceptive accuracy

Shum, Y.H. [1], Galang, M.C. [1], Gaebler, M. [2], & Brass, M. [1]
[1] Berlin School of Mind and Brain/ Department of Psychology, Humboldt University of Berlin, Berlin, Germany
[2] Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Introduction: Recent models proposed the involvement of cardiac signal in intentional action, particularly when there is not any external information to drive the decision to act. However, mixed findings regarding this proposal were reported. This discrepancy was possibly due to individual variations in the coupling strength, and more importantly, the exact cardiac phase to couple with. In this study, we measured participants' individual nondirectional cardiac bias strength in intentional action, and examined whether this strength was associated with their interoceptive abilities. ***Methods***: Participants (n=50) performed the Veto Libet task and the Heartbeat Counting Task (HBC). In the Veto Libet task, participants generated intentions to press a key, and then decided whether to abort their intentions. Regardless of whether they acted, they reported the moment they intended to act. In each HBC trial participants counted their own heartbeat for a period. After each period participants immediately reported their count and their confidence on the counts. The cardiac bias in the Veto Libet task was measured with the mean resultant length between the cardiac phase and intention/action onsets. The interoceptive accuracy was reflected by the 1-minus-error-rate in HBC, while the interoceptive awareness was indexed by the fisher-transformed correlation between the interoceptive accuracy and confidence rating. ***Results:*** Decisive evidence supported the association between the cardiac bias strength of intention onset and the interoceptive accuracy (r=-0.56; BF10=864), but not in the interoceptive awareness (r=-0.13; BF10=0.26). Moderate evidence supported the absence of association between the cardiac bias strength of action onset and the interoceptive awareness (r=-0.07; BF10=0.2), but not in the interoceptive accuracy (r=0.18; BF10=0.37). ***Discussion***: The current study shows that participants relied on their cardiac signal in formulating intention, while varying with their interoceptive accuracy. Overall, this study suggests the nondirectional approach is promising in studying the involvement of cardiac signal in intentional action.

March 11, 2024 at 17:00-18:15

Panel 1 | Talk 3 **Akansha Mahesh Naraindas**

Investigating the relationship between body image disturbance, and body-scaled action in Virtual Reality

Naraindas, A. [1], Mulvaney, P. [1], Rooney, B. [1], Cooney, S. [1]
[1] University College Dublin, School of Psychology, Ireland

Introduction: Body image disturbance (BID) involves negative attitudes towards shape and weight and is an important symptom of eating disorders (EDs), yet it can also manifest in women without EDs. Women with high BIDs exhibit disruptions in their body schema - a sensorimotor representation of the body for action/action planning. Research indicates that women with clinically high BIDs both perceive their bodies as larger than they are and estimate larger bodily dimensions when asked if they can move through a doorway (aperture). However, real-life environments contain a multitude of socially relevant objects, such as other people's bodies.This study examines body schema distortions in women with high and low BIDs and asks: are these distortions modulated by the presence of other bodies? ***Methods***: This is a between-groups pre-registered (https://osf.io/t4wb5) study, recruiting 60 healthy women grouped into either a high and low BID group based on their scores on the Body Shape Questionnaire. Participants completed a modified VR aperture task involving 51 apertures presented as either two bodies or poles, positioned at varying distances apart. Participants respond either Yes/No regarding their ability to fit through the apertures and shoulder widths (in cm) and BMI data are also collected. ***Results:*** A passability ratio will be calculated (minimum aperture size participants could fit to shoulder width ratio). Mixed-model ANOVAs will determine significant differences and interaction effects between the high/low BID groups, and the body/pole aperture conditions. Data collection is ongoing and will be complete by March 2024. ***Discussion***: This study offers insights into the body image-schema relationship in women with high BIDs providing insights into whether body schema disturbances occur in non-ED populations. The study also emphasises the importance of factoring in realistic social contexts, including the presence of other bodies in the environment, when evaluating body schema.

March 11, 2024 at 17:00-18:15

Panel 1 | Talk 4 **Andrea Zaccaro**

Modulation of heartbeat evoked oscillations by cardiac interoceptive attention and respiration

Zaccaro, A. [1], della Penna, F. [2], Mussini, E. [2], Parrotta, E. [3], Perrucci, M. G. [2,4], Costantini, M. [1,4], & Ferri, F. [2,4]

[1] Department of Psychological, Health and Territorial Sciences, "G. d'Annunzio" University of Chieti-Pescara, Chieti

[2] Department of Neuroscience, Imaging and Clinical Sciences, "G. d'Annunzio" University of Chieti-Pescara, Chieti

[3] Department of Psychology, University of Rome "La Sapienza", Rome

[4] Institute for Advanced Biomedical Technologies, ITAB, "G. d'Annunzio" University of Chieti-Pescara, Chieti

Introduction: Heartbeat evoked potentials (HEPs) are EEG voltage fluctuations that reflect the cortical processing of cardiac signals. In the time-frequency domain, a recent stereoEEG study observed increased heartbeat-related inter-trial coherence with no changes in power, suggesting a phase-reset effect of the cardiac systole on cortical oscillations. However, other studies have reported contradictory results, possibly due to the absence of a suitable control condition. Therefore, heartbeat evoked oscillations (HEOs) in the time-frequency domain remain unclear. In the time domain, we recently observed higher HEP positivity during exhalation compared to inhalation in a task focused on attending to cardiac sensations, likely reflecting heightened cardiac interoceptive attention. In this study, we aimed to investigate whether HEOs can be modulated by cardiac interoceptive attention and by the respiratory phase. ***Methods***: We assessed HEOs (event-related spectral perturbations and inter-trial coherence) in 28 healthy volunteers, separately for heartbeats that occurred during inhalation and exhalation, during the performance of a cardiac interoceptive task (Heartbeat Counting Task) and its exteroceptive control condition (Cardiac-Tone Counting Task). ***Results:*** We found a significant increase in power and inter-trial coherence in the alpha band across the entire time window (from 100 to 600 msec after the R-peak) during exhalation compared to inhalation, mainly located over right centro-parietal electrodes during the cardiac interoceptive task (Heartbeat Counting Task). Contrarily, we found no difference in HEOs between respiratory phases during the exteroceptive task (Cardiac-Tone Counting Task). ***Discussion***: These data suggest that changes in HEOs within the alpha band may serve as a physiological indicator of augmented cardiac interoceptive attention, particularly during exhalation. These changes could also be associated with the selective inhibition or disengagement from competing or distracting exteroceptive stimuli that are outside the focus of attention.

March 11, 2024 at 17:00-18:15

Panel 1 | Talk 5 **Qiaoyue Ren**

Listen to your heart: Attentional trade-off between cardiac and visual domains

Ren, Q. [1], Marshall, A. C. [1], Liu, J. [1], & Schütz-Bosbach, S. [1]
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Introduction: Internal bodily signals, such as heartbeats, can influence conscious perception of external sensory information. Spontaneous shifts of attention between interoception and exteroception have been proposed as the underlying mechanism, but direct evidence is lacking. ***Methods***: We used steady-state visual evoked potential (SSVEP) frequency tagging to independently measure the neural processing of visual stimuli that were concurrently presented but varied in heartbeat coupling. ***Results:*** Although heartbeat coupling was irrelevant to participants' task of detecting brief color changes, we found decreased SSVEP power for systole-coupled stimuli and increased SSVEP phase synchronization for diastole-coupled stimuli, compared to noncoupled stimuli. Furthermore, the coupling of visual stimuli to the systole led to a larger heartbeat evoked potential (HEP) but a smaller N2 component evoked by the color change. The increase in HEP amplitude was related to the decrease in N2 amplitude. ***Discussion***: These findings suggest that cardiac arousal automatically redirects attention from external to internal domains. Our study highlights the dynamic reallocation of limited processing resources between interoception and exteroception across the cardiac cycle.

Oral Presentation/Talk Abstracts

Panel 2

March 12, 2024 at 10:20-11:35

Panel 2 | Talk 1 **Kristin Kaduk**

Mood is associated with hunger, and incremental effects of glucose depend on insulin sensitivity

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Introduction: Hunger is commonly linked to negative mood, and such mood shifts are thought to arise from sensing the body's internal state and its demands for energy. However, it is not clear if circulating levels of glucose affect mood subconsciously or if subjectively sensed metabolic states account for such links. ***Methods***: Here, we continuously monitored the interstitial glucose levels of 83 healthy adults (39 women, BMI: 24± 3.84 kg/m2, range: 18 and 36.7 kg/m2) for four weeks while they completed ecological momentary assessments (EMA, on average 51 ± 15 measurements per participant) to rate their mood and metabolic state. To investigate the impact of glucose levels and metabolic state ratings on mood, we used linear mixed-effect models. ***Results:*** As expected, hungry participants reported lower mood ($b = -0.032$, $p < .001$), and metabolic state ratings were strongly associated with glucose levels ($b = -0.186$, $p < .001$), but glucose levels were not independently linked to mood ($b = 0.001$, $p = .880$). Also, BMI showed no significant association with mood ($b = 0.046$, $p = .132$), suggesting that body weight does not influence hunger-related mood changes. Instead, the effects of metabolic state ratings and glucose on mood were dependent on insulin sensitivity, even within a metabolically healthy sample. ***Discussion***: We conclude that hunger-related mood shifts mostly depend on conscious sensing of the body's internal state, while individual modulatory effects covary with insulin sensitivity. Our study highlights the relevance of considering individual metabolic differences in understanding the psychological effects of metabolic states, offering new fundamental insights into mood regulation mechanisms.

March 12, 2024 at 10:20-11:35

Panel 2 | Talk 2 **Carlos Ventura-Bort**

Physiological Harmony or Discord? Unveiling the Correspondence Between Subjective Arousal and Valence and Physiological Responses

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Introduction: Subjective affective experiences - characterized by their hedonic (valence) and arousing value - are almost inevitably accompanied by physiological changes. Despite this obvious relation, the correspondence between affective experiences and physiological responses is still unclear. Whereas earlier studies suggest that similar affective experiences may evoke specific physiological responses, recent studies point to physiological variation among events evoking similar affective experiences . To unravel this relationship, we investigated the correspondence between physiological reactions and subjective arousal and valence, using representational similarity analysis. ***Methods***: . In two independent samples (discovery sample, N= 483, replication sample N= 64) and three affect-inducing tasks (passive picture viewing, passive sound listening, imagery tasks), skin conductance (SCR) and startle responses, as readouts of arousal and valence, respectively, were compared to models of subjective affect that either assume similar or dissimilar physiological responding among trials evoking comparable affective experiences. ***Results:*** In the discovery sample, decisive evidence for a correspondence between SCR and models of arousal that assume variation (particularly between high arousing events) was found. Similar results were observed in the replication sample. For startle responses, decisive evidence for a relationship with models of valence that assume variation (particularly between unpleasant events) was also found. These findings were, however, not observed in the replication sample. ***Discussion***: Overall, these results indicate that physiological variation may be the norm between trials evoking similar affective experiences and invite to reconsider the relationship between affective experience and physiological reactivity.

March 12, 2024 at 10:20-11:35

Panel 2 | Talk 3 **Zsuzsanna Nemecz**

Resolving memory interference between non-meaningful stimuli depends on the parahippocampal and perirhinal cortex, not the hippocampus

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Introduction: Resolving interference between similar inputs is a critical feature of adaptive memory systems. Computational theories of the medial temporal lobe posit that the Dentate Gyrus and Cornu Ammonis 3 (DG-CA3) subfields of the Hippocampus are ideally suited to reduce interference via a process called pattern separation. There is evidence that some cortical areas upstream of the Hippocampus contribute to interference reduction in a content-specific manner (e.g. reducing spatial or object-related interference), but the DG-CA3 is hypothesized to be a domain general pattern separator. Previous research in humans is almost solely based on mnemonic discrimination tasks involving everyday items, potentially confounding semantic and retrieval processes with pattern separation. ***Methods***: Here we strived to study the pattern separation of objects and spatial locations in a more "process-pure" manner, utilizing non-meaningful fractal images. We acquired full-brain high-resolution functional MRI data of human participants (n=39) while they studied fractals with varying degrees of interference in either their spatial locations or object features. Building upon the idea that the repetition of a stimulus results in a diminished BOLD response in areas involved in the processing of that stimulus (repetition suppression), we expected that regions engaged in the pattern separation of objects or spatial locations would decrease their response to repetitions, but not to highly similar (interference-inducing) items. ***Results:*** Accordingly, we found that the parahippocampal cortex contributes to interference reduction in the spatial domain, while the perirhinal cortex contributes to interference reduction in the object domain. While the CA3-DG region showed strong repetition suppression effects, indicating memory for the repetitions, it did not show the expected maintenance of BOLD signal-strength to similar stimuli in either the object or the spatial interference conditions. ***Discussion***: Altogether, these results are in line with content-specific cortical interference reduction, however, they challenge the view of DG-CA3 as a universal pattern separator.

March 12, 2024 at 10:20-11:35

Panel 2 | Talk 4 **Diego Candia-Rivera**

Higher-order brain-heart coupling: Insights into affective state and neurodegeneration

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Introduction: In recent years, there has been an increasing interest in studying brain-heart interactions. Methodological advancements have been proposed to investigate how the brain and the heart communicate, which has led to new insights into some neural functions. However, most frameworks only look at the interaction of one brain region with heartbeat dynamics, overlooking that the brain has functional networks that change dynamically in response to internal/external demands. ***Methods***: We propose a new framework for assessing the functional interplay between cortical networks and cardiac dynamics from noninvasive electrophysiological recordings. We focused on fluctuating network metrics obtained from connectivity matrices of EEG data. Specifically, we quantified the coupling between cardiac sympathetic-vagal activity and brain network metrics of clustering, efficiency, assortativity and modularity. ***Results:*** We validate our proposal using open-source datasets that involve emotion elicitation in healthy individuals and resting-state data from patients with Parkinson's disease. Our results suggest that the connection between cortical network segregation and cardiac dynamics may offer valuable insights into the affective state of healthy participants and alterations in the network physiology of Parkinson's disease. ***Discussion***: By considering multiple network properties, this framework may offer a more comprehensive understanding of brain-heart interactions. Our findings hold promise in the development of biomarkers for diagnostic and cognitive/motor function evaluation.

March 12, 2024 at 10:20-11:35

Panel 2 | Talk 5 **Thalia Richter**

Personalized cognition-based machine-learning prediction of anxiety and depression

Richter, T. [1,2], Fishbain, B. [3], Stahi, S. [4], Mirovsky, G. [4], Markus, A. [1], Fruchter, E. [5], Hel-Or, H. [4], Richter-Levin, G. [1], & Okon-Singer, H. [1,2]

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Introduction: Psychiatric evaluation of anxiety and depression is currently based on self-reported symptoms and their classification into discrete disorders. Yet the substantial overlap between these disorders and their within-disorder heterogeneity may contribute to the medium success rates of treatments. We investigate a new framework for diagnosis, based on the underlying cognitive mechanisms. A series of studies was aimed to rigorously test differences in cognitive biases that predict diagnosis, and directly compare disorder-specific and transdiagnostic cognitive patterns in predicting the severity of anxiety and depression symptoms. ***Methods***: 237 participants exhibiting different levels of anxiety and depression symptoms, measured by questionnaires as well as clinical diagnoses, took part in the study. Random Forest classifiers and regressors were employed to analyze their performance on a battery of six computerized cognitive-behavioral tests targeting selective and spatial attention, expectancy, interpretation, memory, and cognitive control biases. ***Results:*** Classification models for differentiating symptomatic vs. healthy individuals and depression vs. anxiety groups reached 66%-80% accuracy in both subclinical and clinical samples. Regression models discoverd unique anxiety-specific biases, as well as shared anxious-depressed bias patterns. Furthermore, high fitting rates were obtained when predicting symptom severity in both disorder-specific and transdiagnostic models, with the best fit in transdiagnostic models (questionnaires scores' common range 0-60, MAE= 6.03, RMSE= 7.53). Interpretation and expectancy biases exhibited the highest association with symptoms, above all other individual biases. ***Discussion***: The studies stand as a proof-of-concept for a novel mechanism-based paradigm for diagnosis of psychiatric disorders. The results show successful prediction of levels of anxiety and depression symptoms based on cognitive task performance and machine-learning analysis. The studies uniquely compared disorder-specifc and transdiagnostic views, and provide a novel intermediate approach. The results support the use of mechanism-based dimensional diagnosis for adding precision and objectivity to psychiatric evaluation, leading to more fine-tuned individually-tailored therapy in the future.

Oral Presentation/Talk Abstracts

Panel 3

March 13, 2024 at 11:00-12:15

Panel 3 | Talk 1 **Nazife Ayyildiz**

Associations of Retinal Nerve Fiber Layer Thickness, Brain Gray Matter Intensity and Cardiovascular Risk Factors

Ayyıldız, N. [1], Witte, A. V. [1,2], Hardikar, S. [1], Mueller, K. [1], Beyer, F. [1], Girbardt, J. [1,2], Hassett, J. [1], Anwander, A. [3], Elze, T. [2,4], Wang, M. [4], Rauscher, F. G. [2,5,6], & Villringer, A. [1,2,7]

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Introduction: The retina and the brain both develop embryonically from the neural plate and share common features of anatomy, function and pathology. Cardiovascular risk (CVR) factors affect both the retina and the brain. In this study, we investigate whether retinal thickness obtained with optical coherence tomography (OCT) can serve as indicators of gray matter atrophy in the brain. Specifically, we analyze if circumpapillary retinal nerve fiber layer thickness (cpRNFLT) is associated with brain gray matter density (GMD), and these associations overlap with CVR associated brain GMD differences. ***Methods***: We cross-sectionally evaluated participants with retinal OCT and brain T1-weighted MRI data of the LIFE-Adult population-based study. After exclusion of brain and eye diseases, 769 participants [335F, 434M, age: 54.1±15.8 (range: 20-79y)] were included into the analysis. We performed whole-brain voxel-based morphometry using multiple regression of global mean of cpRNFLT and CVR phenotypes [i.e., status of hypertension, diabetes, smoking and physical activity, and continuous variables of body-mass index (BMI), low-density lipoprotein (LDL), high-density lipoprotein (HDL)] as predictors adjusting for age, sex, total intracranial volume and ocular refraction, and brain GMD as predicted variable. We corrected $p<0.05$ for family-wise-error rate in our all analysis. All hypotheses and analysis procedures were preregistered on the Open-Science-Framework. ***Results:*** cpRNFLT was positively associated with GMD in occipital, inferior temporal, superior parietal and cerebellar regions bilaterally. When using each CVR factor as a regressor, we found that a higher BMI, active smoking, and having diabetes were associated with lower regional GMD, while higher HDL and higher LDL were related to higher GMD. Significant associations between BMI,

diabetes, and LDL with GMD extended to nearly the entire cortex, including areas that were found to correlate with cpRNFLT. ***Discussion***: In this population-based cross-sectional analysis, retinal imaging markers as well as CVR factors (specifically BMI, diabetes status, LDL) associated with markers of brain health in several overlapping brain areas, including the occipital cortex and posterior cortical regions. Longitudinal analyses are necessary to understand the precise nature and direction of the covariance shown here between cpRNFLT, brain structure and CVR phenotypes. LDL finding, additionally needs further investigation as it showed unexpected positive correlations with GMD throughout the brain.

March 13, 2024 at 11:00-12:15

Panel 3 | Talk 2 **Anna-Lena Eckert**

Modelling sensory attenuation as Bayesian Causal Inference across two datasets

Eckert, Anna-Lena (1); Führer, Elena (2); Schmitter, Christina (3); Straube, Benjamin (3); Fiehler, Katja (2); Endres, Dominik (1)

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[2] Experimental Psychology Group, Justus-Liebig Universität Gießen, Gießen
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Introduction: To interact with the environment, it is crucial to distinguish between sensory information that is externally generated and inputs that are self-generated. The sensory consequences of one's own behavior tend to induce attenuated behavioral- and neural responses compared to externally generated inputs. We propose a computational model of sensory attenuation (SA) based on Bayesian Causal Inference (BCI), where SA occurs when an internal cause for sensory information is inferred. ***Methods***: Experiment 1 investigates tactile suppression during a stroking movement. Tactile stimuli were suppressed, especially when they were predictable. Experiment 2 showed impaired delay detection between an arm movement and a video of the movement when participants were moving vs. when their arm was moved passively. We reconsider these results from the perspective of BCI. Using a hierarchical Markov Model (HMM) and variational message passing, we first qualitatively capture patterns of task behavior and sensory attenuation in simulations. Next, we identify subject-specific model parameters for both experiments using optimization. ***Results:*** A sequential BCI model is well equipped to capture empirical patterns of SA across both datasets. Using participant-specific optimized model parameters, we find a good agreement between data and model predictions, with the model capturing both probe detections in Experiment 1 and delay detections in Experiment 2. ***Discussion***: BCI is an appropriate framework to model sensory attenuation in humans. Computational models of sensory attenuation may help bridge the gap across different sensory modalities and experimental paradigms.

March 13, 2024 at 11:00-12:15

Panel 3 | Talk 3 **Miro Grundei**

Mismatch responses across the senses

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[2] Berlin School of Mind and Brain, Humboldt Universität zu Berlin, Berlin

Introduction: The human brain is constantly subjected to a multimodal stream of sensory inputs governed by statistical regularities. Brain responses to regularity violations in sensory inputs, such as the mismatch negativity (MMN) and the P3, are increasingly described as signatures of prediction mismatch. However, although previously reported for different senses, such mismatch responses (MMRs) have largely been studied in isolation with a focus on the auditory system. Thus, many of the uni- and cross-modal aspects of mismatch processing and their underlying computational principles remain unknown. ***Methods***: In two empirical studies I have inspected MMRs across the senses using a novel tri-modal roving stimulus paradigm in both EEG (study 1) and fMRI (study 2). The probabilistic sequences consisted of low and high intensity stimuli in the auditory, somatosensory and visual modality and were defined by uni-modal transition probabilities and cross-modal conditional dependencies. We combined average-based approaches with single-trial computational modeling (EEG) and PPI-connectivity (fMRI) to shed light on mismatch processing in the multi-sensory brain. ***Results:*** Across sensory modalities we identified highly comparable response profiles of modality specific early signatures (MMN), involving higher order sensory cortices, as well as modality general late responses (P3) in a fronto-parietal mismatch network. MMRs were parametrically dependent on the number of prior stimulus repetitions and, strikingly, showed additional sensitivity to cross-modal probabilistic dependencies, particularly at later latencies (P3) and within modality general hubs of the extended mismatch network (IPS). Model comparison indicated that the observed single-trial EEG dynamics were best captured by Bayesian learning models tracking uni-modal stimulus transitions as well as cross-modal conditional dependencies. While earlier MMRs tended to reflect confidence-weighted surprise, later MMRs rather reflected model updating. ***Discussion***: Our results solidify and extend previous research indicating similarity of MMRs in different sensory modalities and support the view that MMRs are ubiquitous signatures of probabilistic inference in the brain.

March 13, 2024 at 11:00-12:15

Panel 3 | Talk 4 **Philipp Arndt**

Artificially induced Mismatch-Training (AIM) and its impact on effective motor learning.

Arndt, P. [2,5], Am Ende, H. [2,4], Oppermann, A. [2,5], Köhler, H. [2], Schmidt, A. [2], Brodoehl, S. [1,2], Wagner, F. [1,2,3], Klingner, C. [1,2]

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[4] Else Kröner Graduate School for Medical Students „JSAM“, Jena University Hospital, Jena
[5] IZKF Graduate Program Experimental Medicine, Jena University Hospital, Germany

Introduction: Studies investigating the effect of an unresolvable mismatch over several days identified changes in brain processing that appear to optimize the potential for motor learning. This study delves into the effects of a short-term mismatch induced through Virtual-Reality (VR) on motor learning, aiming to uncover immediate consequences and their significance for the learning process. ***Methods***: In this crossover cohort study, 37 healthy subjects [26 male, 11 female, median age 22 (18-25) years] underwent a comprehensive 5-day motor training. The training session comprised a 15-minute Virtual Reality (VR) game, followed by the Serial Reaction Time (SRT) Task for assessing motor learning abilities. Participants engaged in the study three times, with a minimum 6-week interval between sessions. Before each SRT Task, subjects experienced different VR games depending on the week of participation, categorized as non-mismatch, resolvable mismatch, or unresolvable mismatch, providing a diverse set of stimuli to evaluate motor learning outcomes. Furthermore, Magnetencephalography (MEG) and Electroencephalography (EEG) were used to measure functional connectivity changes. ***Results:*** Preliminary observations suggest a noteworthy enhancement in motor abilities among subjects who engaged in an unresolvable mismatch VR game preceding the SRT Task. Although statistical analyses are pending, these early indications hint at a potential positive impact on motor learning. It is essential to note that this study remains an ongoing process, and further data analysis is underway to provide a comprehensive understanding of the observed trends. ***Discussion***: The results of this study can show whether the effects of mismatch learning can be artificially induced and, more importantly, whether such an effect occurs even after a short period. This study suggests the potential for future development of improved and easily accessible motor rehabilitation methods for neurological patients, particularly relevant to post-stroke patients.

March 13, 2024 at 11:00-12:15

Panel 3 | Talk 5 **Simon M. Hofmann**

scilaunch your research project

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Introduction: Driven by pressing search for discoveries, as researchers we tend to neglect keeping our digital drawer tidy, quickly ending up in a jungle of project files and folders, which ultimately slow down our process. Finding a well-attuned project structure can take months of experience or several project iterations. The (re-)organization of projects can turn out to be a critical time-sink for scientists and their supervisors or (future) collaborators. Here, we introduce scilaunch, a single command-line tool that helps researchers to kick-start their projects. scilaunch initializes a canonical project structure and includes a pre-configured setup for a code environment, version control, and example files and folders, which aim to nudge the users to remain on a reproducible path, while their project grows. ***Methods***: Installing scilaunch requires Python (v.3.8 or higher) and can be easily archived by running pip install scilaunch in the terminal (Linux, macOS, Windows). Now, a new project can be launched by typing scilaunch in the terminal. scilaunch offers to set up a conda environment, in which research code is pre-installed as Python package, which eases code development. Moreover, the structure can be populated with other programming languages as well. For more information see https://shescher.github.io/scilaunch/. ***Discussion***: With scilaunch we provide a tool, which aims to be simple to use and offers a quick start into new projects. Also existing projects can be quickly transferred into the canonical structure provided by scilaunch, that can help research groups and collaborators to operate from a familiar base.

MBB Symposium 2024
Posters

Poster Session A

Poster Number	Presenters	Abstract Title
A01	Antonin Fourcade & Francesca Malandrone	Real-time continuous rating of affective experience in immersive Virtual Reality
A02	Martina Saltafossi	Respiratory rhythm and multisensory perception
A03	Sara Wesolek	Somatosensory evoked BOLD signals with ultra-high temporal resolution
A04	Jona Förster	Tactile vs. electrical stimulation in a conscious somatosensory threshold detection task
A05	Alice Oppermann	Motivation and Recovery: An Analysis of Reward Sensitivity and Motor Learning after ischemic stroke
A06	Gianluigi Giannini	The influence of expectation in Sensory Attenuation
A07	Marlon Esmeyer	Effector-specific neural representations of perceptual choices across different sensory domains
A08	Ioanna Amaya	Thalamocortical connectivity underlying flicker light-induced visual hallucinations
A09	Beatrix Keweloh	Weight Loss Impacts Risky Decisions in Obesity
A10	Alina Studenova	Project proposal: MEEG characteristics correlate with cortical cytoarchitecture
A11	Paul Steinfath	Resting-state heartbeat-evoked potential as a trait marker in anxiety
A12	Lena Lange	Tactile detection & localisation in the grey zone of perception
A13	Chia-Ying Weng	The effects of the whole-body high-intensity isometric resistance training on BDNF, IGF-1, and quality of life in the community-dwelling adults
A14	Autumn Chall	Awe and Positive Affect: The Role of Self-Transcendence and Self-Focused Attention
A15	Kinga Mazurek	Unveiling the Dynamics of Inattentional Blindness: Attention Processes during Magic Tricks with Edited Video Stimuli
A16	Mustafa Yavuz	Social vigilance during perception

A17	Laura Marie Schmidt	Post-COVID Syndrome and the Frontal Brain: A Temporal Dynamics Perspective
A18	Hannah McDermott	Expectation effects on neural sharpening and dampening during statistical learning
A19	Sein Jeung	BIDS-Motion : Brain Imaging Data Structure for Reproducible Motion Research in Neuroscience
A20	Aureen DSouza & Aureen Dsouza & Ignacio Rebollo	Bodily sensations and emotional fingerprints
A21	Felix Klotzsche	Assessing and Comparing Eye Tracking Performance in Virtual-Reality Headsets: A Test Battery
A22	Marta Gerosa & Aishvarya Aravindan Rajagopal	Methodological Flexibility in the Heartbeat Counting Task: a Pre-Registered Meta-Methods Project

Poster Session B

Poster Number	Presenters	Abstract Title
B01	Marie Loescher	Cardiac influences on multisensory integration : does self-relevance matter?
B02	Angeliki Charalampaki	The role of tactile information on metacognitive representations of agency
B03	Víctor Fernández Asunción	Complexity Electroencephalographic markers for cognitive decline detection
B04	Kevin Balßuweit	Machine Learning of Cognitive Trajectories in Parkinson's Disease: Predicting STN-DBS Impact with Neuroimaging and Clinical Data
B05	Marina Baroni	"Psycho-plasticity": the link between psychological dimensions and visual plasticity
B06	Stefania Cionca	Dressing the Mind: Shapewear Influences Mind-Body Connection, Altering Body Awareness and Dietary Preferences
B07	Dirk Gütlin	Neuromimetic Predictive Coding: Building Biologically Valid Models with Recurrent Neural Networks
B08	Damla Çifçi	How Artistic Expertise Shapes Individual Differences in Low-level Sensory Working Memory
B09	Withdrawn	
B10	Verena Viktoria Auerswald	Influence of the hypocretinergic System on the functioning of the human reward system – a comparative study at behavioral and neuronal level in people with and without hypocretin deficiency
B11	Marta Chrustowicz	The Influence of Loneliness on the Neurocognitive Aspects of Cognitive Reappraisal in Young Adults
B12	Diana-Eliza Gherman	Exploring the Boundaries of Passive Brain-Computer Interfaces: Mobility, Virtual Reality, and Multimodality
B13	Mirna Hajric	Intrinsic causal network dynamics of emotion regulation capacity and tendency
B14	Tilman Stephani	Excitability modulations of somatosensory perception do not depend on feedforward neuronal population spikes
B15	Jannis Friedrich	Joining Grounded Cognition and Predictive Processing under Structuralism
B16	Zsuzsanna Nemecz	Resolving memory interference between non-meaningful stimuli depends on the parahippocampal and perirhinal cortex, not the hippocampus

B17	Aleksandra Piejka & Szymon Mąka	Loneliness is associated with decreased propensity for altruistic behavior but only for distant others
B18	Eleni Panagoulas	Functional connectivity of pain causing lesions differs from non-pain causing lesions in somatosensory stroke
B19	Daniel Janko & Carlotta Isabella Zona	Exploring the behavioral correlates of hexagonal-grid representations of conceptual spaces
B20	Anindita Bhattacharjee	Neuroimaging-based Drug Repurposing for Clearance of Amyloid-beta in Alzheimer’s Disease
B21	Simon Hofmann	Sampling from the cognitive face space under 3D viewing conditions
B22	Asli Akdeniz	Effects of Prior Stimulation on Tactile Evoked Epidural Field Potentials in Rat S1 Cortex
B23	Jellina Prinsen	Progesterone-induced changes in heart rate across the menstrual cycle and its effect on cardiac interoception – rationale and study design
B24	Agata Patyczek & Elias Reinwarth	Mapping the Brain's Stress Response: Changes in Functional Cortical Gradients

Poster Session C

Poster Number	Presenters	Abstract Title
C01	Lorena Cecilia & Margarita Sison	Machine Learning Models Identify Trajectories into Depression for Argentinean College Students during Periods of COVID-19 Quarantine: A longitudinal survey study
C02	Qiaoyue Ren	Listen to your heart: Attentional trade-off between cardiac and visual domains
C03	Corinna Kühnapfel	Art as Intervention On the Effects of a Street-level Gallery Exhibition on Neighbourhood Connectedness, Satisfaction and Psychological Wellbeing
C04	Alexander J. Hess	Causality in the Allostatic Self-Efficacy Theory of Fatigue and Depression
C05	Dina von Werder	Perceptual and behavioral response to increased CO2 inhalation in patients with post-COVID
C06	Wen Wen	Control over self and others' face: Exploitation and exploration
C07	Cecilia Roselli	How intentionality of actions affects individual and vicarious Sense of Agency towards humanoid robots
C08	Daniel Kluger	Respiration-locked excitability changes in health and disease
C09	Lina Skora	Pupillary markers of noradrenergic activity under brief and long pulses of transcutaneous auricular Vagus Nerve Stimulation.
C10	Lioba Enk	The effect of cardiac phase on distractor suppression and motor inhibition in a stop-signal task
C11	Ulrich Stoof	Integration of multi-modal datasets to relate clinical symptomatology to (neuro)biological foundations in neurological disorders: A case study for intracranial EEG and neuroreceptor densities
C12	Katharina Kühne	No Evidence of the Red-Attraction Effect in Human-Robot interaction
C13	Emine Hilal Cam	The power of motivation: Motivational mindsets facilitate early but not late inhibition towards unhealthy food
C14	Gina-Isabelle Henze	Testing the Triple Network Hypothesis in a Largescale Biopsychological Sample: Neural Responses to Psychosocial Stress
C15	Tahnée Engelen	In search of interoceptive profiles: do the heart, lungs, and stomach influence the motor cortex the same way?
C16	Einav Gozansky	Assessment of Pain Sensitivity in Healthy Females Using Multimodal Approach
C17	Elias Mansour	Continuous Monitoring of Psychosocial Stress by Non-Invasive Volatilomics
C18	Moritz Gerster	Levodopa-induced spectral modulation of STN-LFPs in Parkinson's disease patients - a multi-center comparison
C19	Franziska Wagner	Stroke survivors exhibit initial decreased reward sensitivity, potentially guiding rehabilitation

C20	David Haslacher	Frontal delta oscillations mediate heartbeat perception
C21	Magdalena Gippert	Motor Imagery influences performance beyond the imagined action: Imagery of prior movements enhances motor adaptation
C22	Ana Böke	Can illusory percepts be affected by sensory interhemispheric inhibition? A somatosensory EEG study based on the cutaneous rabbit effect
C23	Rosa Großmann	Investigating Recurrent Processing in Visual Conscious Perception - Methodological Considerations
C24	Maria Azanova	Heart rate scales with prediction error

Poster Session D

Poster Number	Presenters	Poster Title
D01	Simon M. Hofmann	scilaunch your research project
D02	Paula Guiomar Alarcón de Antón	Study on metacognition of affective states
D03	Piotr Bekier	Why cognitive sicence should take over the topic of social fasilitation? - transition from behavioral to cognitive perspective
D04	Fabian Kiepe	Sensory attenuation of self-initiated tactile feedback is modulated by stimulus strength and temporal delay in a virtual reality environment
D05	Shira Baror	Neural mechanisms determining the duration of task-free, self-paced visual perception
D06	Wiebke Nörenberg	Motion masking at saccadic speed is largely invariant to motion amplitude
D07	Melis İnce	Object correspondence across movements at saccadic speed
D08	Lara Puhlmann	Investigating resilience dynamics in the longitudinal resilience assessment (LORA) study
D09	Hannah Am Ende	Mismatch learning in virtual reality (VR) technology in older adults – a pilot-study
D10	Anastasia Malyshevskaya	Where is Monday? Continuous mouse tracking study reveals horizontal space-time association
D11	Jairo Perez-Osorio	High-order cognitive mechanisms modulate the deployment of gaze-guided attention in collaborative scenarios with artificial agents
D12	Jens Madsen	Bidirectional brain-body interactions during natural story listening
D13	Shivendra Singh	Is Consciousness Local or Global? Searching for Old Answers in a Newer Context
D14	Luianta Verra	Dissociating perceptual and value-based generalisation in anxiety and intolerance of uncertainty
D15	Deniz Yilmaz	The Effects of Physical Exercise on Interoceptive Abilities of Patients with Schizophrenia
D16	Emma Bailey	Task-evoked high frequency oscillations in cortex and spinal cord
D17	Alexandros Kastrinogiannis	Increasing eyewitness identification accuracy in lineups using 3D interactive virtual reality (3DIL)
D18	Serap Özlü	Neural Correlates of Anosognosia in Neurocognitive Disorders

D19	Volker Reisner & Leonard König	Re-enactment of encoding-related body movements supports idiothetic path estimation
D20	Withdrawn	
D21	Ondrej Zika	Contextual inference under uncertainty in anxiety
D22	Eva-Madeleine Schmidt	AI-Mediated Communication, Empathy, Prosocial behavior, Facial expressions, Emotions, Responsible AI

Poster Session V

Poster Number	Presenters	Poster Title
V01	Pınar Demir	Comparison of Affordance and Spatial Compatibility Effects in Human and Object Interactions
V02	Angelika Bracher	The parental brain in action: an emotional facial expressions task
V03	Nurfaizatul Aisyah Ab Aziz	Profiling functional connectivity of cortical network from theta brainwave synchronization in response to passive listening of three different Arabic rhythms
V04	Harald Murck	Somatic symptoms of depression overlap with symptoms of normal pressure hydrocephalus - (NPH) effect of inhibition of 11beta HSD2 with glycyrrhizin
V05	Mazira Mohamad Ghazali	Unravelling the Relationship between Knee Osteoarthritis Pain and Cognitive Function
V06	Gayatri Nerpagar	Navarasa (nine emotions in Indian school of aesthetics) Perception Through Core Body Movements
V07	Mohammad Rostami & Nasim Haghi	The effect of intelligent Tumor Treating Fields on reducing the size of glioblastoma brain tumor
V08	Soner Yucetepe	Exploring the Temporal Dynamics of Judgment of Learning Using Categoric Choises
V09	Vijaykumar Nandvadekar	Mind In Ayurveda
V10	Farida Zeynalli	The Fair and the Furious: The Role of the Moral Justifications of Emotions in Resource Distribution Context
V11	Maria Lojowska	Threat-induced prosocial behavior: Enhanced exogenous attention to protect others from harm
V12	Siti Atiyah Ali	Exploring a Bibliometric Analysis of Neuroimaging researches in Dementia: Alzheimer's Disease and Frontotemporal Dementia
V13	Jyotirmaya Satpathy & Ankasha Arif	Operational Research Foundations in Ophthalmic - Based Decisions
V14	Gaia Lapomarda	The bodily-emotional experience of time: temporal interval perception is modulated by anxiety
V15	Jessica Hazelton	Altered spatiotemporal dynamics of interoception in neurodegenerative diseases
V16	Nima Norbu Sherpa	Effects of oral creatine monohydrate augmentation to cognitive-behavioural therapy in depression: an 8-week pilot, double-blind, randomised, placebo-controlled trial

Poster Abstracts

Poster Session A

March 11, 2024 at 18:30-19:15 | Virtual March 12, 2024 at 11:35-12:15

Poster: **A01** **Antonin Fourcade & Francesca Malandrone**

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

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

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Introduction: Subjective experience is crucial in affective states (AS) and typically reported along the dimensions of valence (pleasant–unpleasant) and arousal (high–low) in a 2D "affect grid". Particularly for dynamic stimuli (e.g., movies), continuous ratings (CRs) of affective experience may capture more information than the commonly used post-stimulation summary ratings (SRs). However, real-time CR may alter the experience, e.g., by distracting from the stimulus content. For 360° movies in virtual reality (VR), we designed and evaluated continuous rating methods (RMs) with different feedback types. ***Methods***: Fifty-one participants (31 female, age 27.5±6.2) repeatedly watched four one-minute 360° videos with different emotional contents using three RMs (Flubber, Grid, Proprioceptive) and a Baseline condition without CR. For each trial, participants rated their AS with an affect grid both in real-time (CR) and post-stimulus (SR). User experience and presence questionnaires were also administered. We compared the different RMs to identify the least invasive/distracting as well as trial-by-trial CR and SR for different affect grid measures. ***Results:*** Flubber (feedback with abstract visual representation) was the most preferred RM and had highest satisfaction and emotion representation scores. SRs were most highly correlated with the mean of CRs. There were no significant RM effects on invasiveness scores. Sense of presence scores were statistically equivalent (TOST approach) between RM and Baseline trials. SRs in RM trials were statistically equivalent to SRs in Baseline trials. ***Discussion***: Our findings suggest that real-time continuous assessment of AS during 360° movies in VR is not distracting. CR relates strongly to SR for short stimuli with low affective variability. We plan to collect CRs and electrophysiology also for longer movies with higher affective variability, with the hope that more fine-grained affective experience improves the search for the physiology of AS.

Poster: **A02** **Martina Saltafossi**

Respiratory rhythm and multisensory perception

Saltafossi, M. [1], Zaccaro, A. [2], Kluger, D. S. [1,3], Perrucci, M. G. [4,5], Ferri, F. [4,5], Costantini, M. [2,5]

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Introduction: The brain continuously processes information coming from both the external environment and visceral signals generated by the body. This constant information exchange between the body and the brain allows rhythmic signals originating from the heart and lungs, among others, to influence perception. In previous work, we have shown that cardiac cycle phase interacts with multisensory integration, i.e., the non-linear combination of information coming from multiple senses. Here, we investigated respiratory modulations of reaction times and multisensory integration in a simple detection task. ***Methods***: Forty healthy participants were presented with unimodal (Auditory, Visual, Tactile) and bimodal (Audio-Tactile, Audio-Visual, Visuo-Tactile) stimuli while respiratory activity was recorded. Linear mixed effects models were performed on reaction times and the Race Model Inequality approach was employed to quantify multisensory integration, with a specific focus on respiratory phases. ***Results:*** First, respiration was found to significantly modulate reaction times irrespective of the stimulus type, with distinct temporal dynamics for unimodal and bimodal stimuli. Notably, reaction times were slower during the expiration-to-inspiration phase. Then, the Race Model Inequality analysis revealed higher multisensory integration for Audio-Tactile and Audio-Visual stimuli during expiration-to-inspiration phase. Participants also adapted their respiratory cycle, as their response onsets preferentially occurred during early expiration. ***Discussion***: These findings indicate that respiration is not merely a bottom-up mechanism but is actively adjusted to optimize the signal-to-noise balance between interoceptive and exteroceptive signals. From a predictive processing perspective, these results suggest that respiration acts as a "master clock" aligning external information sampling with fluctuating states of neural excitability. This intricate interplay between respiration and neural processes sheds light on the dynamic nature of multisensory integration and its modulation by peripheral factors.

Poster: **A03** **Sara Wesolek**

Somatosensory evoked BOLD signals with ultra-high temporal resolution

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Introduction: While functional magnetic resonance imaging (fMRI) is very well established as a tool in neuroimaging and neurocognitive research, it is limited by a comparatively low temporal resolution (typically around one to two seconds). ***Methods***: Here, we apply and improve a method, previously introduced by Nagy et al. (2023), which combines an event-related stimulation paradigm with subsequent data reordering. For this, we applied electrical median-nerve stimulation with temporal accuracy of the fMRI imaging slices. The application of the stimuli was timed to occur simultaneously with each slice once and the slices were reordered according to their delay to the stimulus, thus reconstructing the BOLD-signal following the stimulation. By reordering the slices, we can increase the temporal resolution to the time it takes to acquire one slice, i.e. 60 ms. In combination with multiband acquisition, the amount of necessary trials, and therefore measurement time, can be further reduced. ***Results:*** We show that this method allows to precisely sample the hemodynamic response in the somatosensory system with high signal-to-noise ratio. Further analyses revealed different hemodynamic responses in primary and secondary somatosensory cortex. ***Discussion***: We propose that this method provides the basis for future research which could greatly improve the sensitivity of statistical analysis of fMRI data through increased flexibility regarding individualized and voxel-specific BOLD-responses.

Poster: **A04** **Jona Förster**

Tactile vs. electrical stimulation in a conscious somatosensory threshold detection task

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Introduction: Research on conscious somatosensory perception in the past has mainly relied on electrical stimulation, whereas tactile stimulation has been less frequently used. Comparisons between different stimulation modalities are particularly scarce. Here, we directly compare the event-related potentials evoked by tactile vs. electrical peri-threshold stimulation, using a matching task to control for post-perceptual processes. ***Methods***: EEG was recorded continuously, while participants received either electrical pulses to the left median nerve (n=24) or tactile stimulation at the left index finger (n=25). Simultaneously, they received a visual cue indicating either the presence or absence of a pulse. In order to control for confounding processes, participants did not directly report their experience, but indicated via saccades whether they experienced a match or a mismatch between their tactile experience and the visual cue. Because conscious perception is highly collinear with stimulus intensity and detection probability, we formulated several simple models and used Bayesian model selection to determine which of the models best explains post-stimulus ERP activity, both within and across datasets. ***Results:*** We find that early potentials (P50 and P100) were attenuated for undetected relative to detected trials, only for tactile but not for electrical stimuli. Moreover, an early (~90 ms) negative component was present only for detected tactile stimulation. While the early and mid-latency components were driven mostly by detection and detection probability in the tactile and by stimulus intensity in the electrical stimulation condition, late (>300 ms) components were mostly driven by detection in the tactile and by detection probability in the electrical stimulation condition. ***Discussion***: Our findings suggest that post-stimulus processing is dependent on the type of stimulation used, and that early ERP amplitudes may already index tactile detection. This contrasts with previous research using electrical stimulation that had indicated mere scaling with stimulus intensity.

Poster: **A05** **Alice Oppermann**

Motivation and Recovery: An Analysis of Reward Sensitivity and Motor Learning after ischemic stroke

Oppermann, A.[1,2], Maas J. [1,2,4], Rogenz, J. [1,2,4], Opitz, L. [1,2,4], Am Ende, H. [1,2], Köhler, H. [1,2]; Schmidt A. [1,2], Brodoehl S. [1,2], Klingner CM. [1,2], Wagner, F. [1,2]

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Introduction: Stroke is a leading cause of acquired disability globally, presenting substantial challenges in neurological rehabilitation. The spontaneous reorganization of cerebral networks and learning limitations are significant during the rehabilitation process. Despite the known importance of behavioral rehabilitation, the specific role of the brain's reward system in post-stroke learning abilities is not well-understood. Hypothesis: Based on our previous findings (Wagner et al., 2023), we postulate that the reward system's functionality is intrinsically linked to motor learning abilities after a stroke. We suggest that both systems experience a parallel recovery process, with an existing gap in understanding the interplay between the recovery timelines of motor learning and reward system restoration. ***Methods***: This cohort study involves 20 stroke patients (mean age: 67, range: 55-80 years), comprising 16 male and 4 female participants, evaluated at t 3-4 months post-stroke. Motor learning and reward system functionality were assessed using, the Monetary Incentive Delay (MID) task during MEG specifically for connectivity analysis. A (VR) learning environment was employed across five days to control for daily fluctuations and to facilitate the study of motor learning consolidation. ***Results:*** The patients exhibited reduced reward sensitivity, requiring greater monetary incentives for performance improvement, and faced learning deficits. These behavioral deficits correlated with altered functional connectivity patterns observed during the MID task, highlighting that stroke can disrupt the reward system and modify behavioral performance. Importantly, the degree of learning impairment was closely linked to the level of reward sensitivity impairment independent of lesion localization. (Coherence Analyses are ongoing) ***Discussion***: By demonstrating the connection between stroke, reward sensitivity, and learning ability, this research contributes valuable knowledge to the field, suggesting why some stroke survivors continue to experience long-term challenges despite rehabilitation. The findings underscore the necessity of assessing reward sensitivity in stroke patients to optimize rehabilitation protocols, thereby maximizing their recovery potential.

Poster: **A06** **Gianluigi Giannini**

The influence of expectation in Sensory Attenuation

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Introduction: Sensory Attenuation (SA) is the phenomenon for which stimuli produced by ourselves are perceived as less intense compared to stimuli generated by others. In recent years, however this view has been challenged as some suggests that attenuation is a phenomenon mostly linked to prediction and not intentional actions. With the present study, we aimed at interrogating this question. ***Methods***: The study consisted of a VR setup and a simultaneous EEG recording. Participants were required to either actively touch or passively get touched by a virtual ball that gave them (or not) an electrical stimulation at the finger, in a probabilistic manner. Participants had to learn through sequences of 25 trials the probability to receive a stimulation within that sequence. Through this paradigm we were able to compare actively generated to passively perceived stimulations while controlling for predictability effects. We analysed EEG data at ball touch using a univariate general linear model approach. ***Results:*** Late SEPs (P200-300) were found to be significantly affected by movement and by the expectation of touch. More specifically, the ERP amplitude generated by the electrical stimulation was reduced in conditions in which participants (i) actively moved and (ii) learned that the stimulation was more likely. Additionally, we found a parametric effect, showing that the suppression associated to the movement condition was linearly modulated by the expectation of touch. ***Discussion***: Our results confirm the existence of SA and, at the same time, show the presence of an attenuation effect for predicted stimuli, which linearly sums on the attenuation generated by active movements. These results shed new light on the mechanisms underpinning SA and its neurophysiological correlates and question the primary role of action in Sensory Attenuation

Poster: **A07** **Marlon Esmeyer**

Effector-specific neural representations of perceptual choices across different sensory domains

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Introduction: It is very difficult to find consistent neural markers underlying perceptual decisions in humans. One of the main problems is that in most decision-making tasks, decisions are inextricably linked to task-related confounds such as the response. By disentangling the choice content from choice direction and the physical response, we were able to show in prior studies that the decision content is nevertheless likely to be represented effector-specific (i.e. in brain areas associated to the required motor response). However, as these studies focussed exclusively on somatosensory perception, we used a visual adaptation of the delayed match-to-comparison task to test whether perceptual decisions would be represented similarly across sensory modalities. ***Methods***: In our delayed match-to-comparison task participants had to compare the frequency of two sequentially presented visual flicker stimuli. With our task design, we rendered categorical choice-related signals independent of choice direction and response selection. To identify brain regions which contain choice-related information, we applied a multi-voxel pattern analysis (MVPA) whole-brain searchlight approach. We computed a conjunction analysis across studies in different modalities to reveal choice-signal specific activation. ***Results:*** The MVPA revealed above-chance decoding accuracies in areas surrounding the left intraparietal sulcus (IPS) and the left premotor dorsal cortex (PMd), respectively (both at $p < 0.05$, FDR-cluster corrected). The conjunction analysis with the data from the prior vibrotactile study confirmed one cluster with an above-chance accuracy in the IPS ($pFDR < 0.05$). Also the PMd showed above-chance accuracy when tested at $p < 0.001$, uncorrected. ***Discussion***: Our results indicate that categorical choice information contained in the IPS and the PMd is not only independent of common task confounds but can also be found across different sensory modalities. Overall, this supports the notion of a cross-modal, effector-specific representation of perceptual decisions if a response effector is pre-specified.

Poster: **A08** **Ioanna Amaya**

Thalamocortical connectivity underlying flicker light-induced visual hallucinations

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Introduction: Visual hallucinations occur in diverse pathologies and altered states of consciousness; however, they are difficult to investigate due to unpredictable onsets and coexistence with other physiological changes. Flicker light stimulation over closed eyes induces visual hallucinations in healthy participants, facilitating a well-controlled experimental setup to investigate their underlying neural mechanisms. Previous work found that 10 Hz flicker light increases thalamocortical connectivity. Recently, an arrhythmic flicker condition was introduced that elicits fewer hallucinatory effects while retaining the same amount of visual stimulation. This allows the testing of connectivity changes that are specific to the experience of visual hallucinations. ***Methods***: Resting-state fMRI data was collected (N=20) for 10 Hz flicker and an arrhythmic control that also delivered 10 flashes per second. Participants assessed their hallucinatory experience following each condition. To quantify thalamocortical connectivity, thalamic and visual regions were parcellated using the AAL3 and probability maps of visual topography; thereafter, ROI-to-ROI functional correlations were calculated. Moreover, using a block design and univariate analyses, the cortical activation during rhythmic and arrhythmic flicker was tested. ***Results:*** We found that 10 Hz rhythmic flicker selectively increased connectivity between ventral thalamic nuclei and upstream visual cortices (e.g., hV4, LO1) compared to arrhythmic control. Furthermore, the rhythmic>arrhythmic contrast revealed activation clusters in upstream visual cortices (FWE corrected $p<0.05$) consistent with regions displaying increased connectivity. Cluster peaks were situated in bilateral LO1. ***Discussion***: Our findings indicate that increased connectivity between ventral thalamic nuclei and upstream visual cortices reflect the intensity of flicker-induced visual hallucinations. As the rhythmic and arrhythmic flicker conditions deliver equal amounts of physical stimulation, it renders the results specific to the rhythmicity and corresponding differences in reported visual phenomena. Furthermore, given that ventral nuclei do not relay visual inputs, it suggests that the thalamocortical hyperconnectivity represents a higher-order function of the thalamus, such as coordination of overall cortical activity.

Poster: **A09** **Beatrix Keweloh**

Weight Loss Impacts Risky Decisions in Obesity

Keweloh, B. [1,2,3], Terenzi, D. [1,2,3,4], Froehlich, E. [1,3], Coricelli, C. [1,2,3], Stürmer, P. [5], Rohmann, N. [5,6], Wietzke-Braun, P. [5], Beckmann, A. [5], Laudes, M. [5,6], Park, S. Q. [1,2,3]

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Introduction: Risk decision making is shaped by individual psychological and metabolic state. Individuals with obesity show not only altered risk behavior, but also metabolic and psychological abnormalities. The aim of the present study was to investigate whether a substantial weight loss in individuals with severe obesity will 1) normalize their metabolic and psychological state and 2) will change their pattern of decision guidance. ***Methods***: We assessed the effect of glycated Hemoglobin (HbA1c) and mood on risk behavior in individuals with obesity (n=62, 41 women; BMI, 46.5 ± 4.8 kg/m2; age, 44.9 ± 14.7 years) before and after 10-week weight loss intervention. ***Results:*** Results showed that this intervention reduced participants' risk behavior, which was significantly predicted by their changes in BMI. Before intervention, mood, but not HbA1c significantly predicted decisions. After the weight loss, mood no longer, but HbA1c significantly predicted decisions. ***Discussion***: Our findings shed light on the psychological and metabolic mechanisms underlying altered risky decision making in severe obesity and can inform the development of strategies in the context of weight loss interventions.

Poster: **A10** **Alina Studenova**

Project proposal: MEEG characteristics correlate with cortical cytoarchitecture

Studenova, A. [1,2], Ströckens, F. [5], Bludau, S. [3], Dickscheid, T. [3,4,6], Simsek, A.N. [3], Cam-CAN, Amunts, K. [3,5], Villringer, A. [1,7], Nikulin, V. [1]

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Introduction: EEG and MEG are non-invasive methods used to measure brain activity in humans. Typically, brain activity is decomposed into features such as the power of oscillations in canonical bands, the shape of the oscillatory cycle, and aperiodic dynamics. These features have distinct scalp distributions that are conserved between participants and the datasets. For instance, alpha rhythm power is high in occipital regions, whereas beta rhythm power is high over somato-motor cortices. While different in dynamical pattern, brain regions are also different in their cellular architecture. For instance, primary visual areas have a particularly thick layer IV, whereas primary motor cortices have a thick layer V. This study proposes that the cytoarchitectural composition of the cortex may at least partially underlie the dynamical landscape. ***Methods***: To link electrophysiological dynamics to cytoarchitecture, we will use resting-state EEG and MEG data and cytoarchitectural data from postmortem brains. For EEG, we will use the LEMON dataset, 209 participants, 61 electrodes. For MEG, we will use the Cam-CAN dataset, 507 participants, 102 magnetometers, and 204 orthogonal planar gradiometers. In EEG and MEG, we will primarily focus on the power of oscillations in different bands, peak frequencies, shape of oscillations, and aperiodic properties of spectra. For cytoarchitectural data, we will use the BigBrain, which is an ultrahigh-resolution model of the postmortem brain of a 65--year--old male, and the Julich-Brain Atlas v3.1, which includes data from ten postmortem brains. ***Results:*** Our initial analysis shows a certain consistency in spectral properties between the EEG and MEG datasets. In a poster, we will present more data and a detailed study plan with specific hypotheses. ***Discussion***: The study will expand fundamental knowledge about the origins of brain dynamics in the human brain. Linking brain dynamics to cellular architecture may also elucidate the functional role of brain rhythms and aperiodic activity.

Poster: **A11** **Paul Steinfath**

Resting-state heartbeat-evoked potential as a trait marker in anxiety

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Introduction: Anxiety disorders are accompanied by alterations in the interoceptive system, making affected individuals more sensitive to their bodily sensations. However, the pathophysiological mechanisms underlying these alterations remain poorly understood. Previous research shows that heartbeat-evoked potentials, neural responses to heartbeats, during tasks may be linked to interoceptive ability. In a registered report, we plan to study if heartbeat-evoked potentials at rest can explain inter-individual variability in anxiety symptoms, and thus serve as a trait-like measure. ***Methods***: To this end, we will test if resting-state heartbeat-evoked potentials are positively associated with anxiety scores in the LIFE-Adult-Study dataset: a large, pre-collected sample of participants (3462). We will use 20-minute resting-state 32-channels electroencephalography and electrocardiography recordings and the Generalized Anxiety Disorder questionnaire. Furthermore, we will control for a broad range of physio- and psychological measures such as age, heart rate variability, BMI, blood pressure, and depression scores. Currently, the heartbeat-evoked potential field faces a challenge establishing robust effects due to the lack of broadly accepted standards in data processing. To address this problem and to account for reduce pipeline-related effects, we will register a multiverse of analysis pipelines that will differ in baseline, filtering, ICA, and statistical analysis settings. We will use a permutation approach, cross-validation, and GLM to illustrate how sensitive the result is to the choice of a pipeline. ***Results:*** Results are not available at this stage. ***Discussion***: Given that the study of altered interoception in clinical populations is a promising prospective field, we expect that clinical practice could benefit from the conclusions regarding the trait properties of heartbeat-evoked potentials and from clear methodological recommendations on how to compute them.

Poster: **A12** **Lena Lange**

Tactile detection & localisation in the grey zone of perception

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Introduction: Numbtouch and hemispatial neglect, two neurological conditions often following one-sided brain injury, can possibly give us insight into mechanisms of tactile detection and localisation. Numbtouch patients, with damaged primary sensory areas, are able to correctly localise unperceived tactile stimuli, while neglect patients, with intact ascending sensory pathways and cortices, are unable to perceive stimuli when they are presented to their neglected body side. We aimed to establish a near-threshold stimulation paradigm that integrated tactile detection, skin-based localisation as well as manipulation of stimulus location in external space. ***Methods***: Weak electrical stimuli of constant near-threshold intensity were applied to two fingers of the left hand. Participants completed a yes/no detection task and a 2-alternative-forced-choice localisation task. Throughout the experiment, they changed the position of their stimulated hand several times between anatomical and crossed position. In a young healthy sample, we aimed to replicate previous behavioural findings of above-chance correct localisation of undetected tactile stimuli. EEG data was recorded to investigate the electrophysiological underpinnings of this undetected tactile localisation. Furthermore, we explored the effect of hand position in external space on tactile detection and localisation within an intact somatosensory system. ***Results:*** We found no influence of hand position on tactile localisation and a negligible effect on detection. Our electrophysiological results confirm the role of SEP components and neural alpha oscillations in tactile detection and related processes. Previous findings of electrophysiological and behavioural correlates of mapping tactile stimuli into peri-personal space were only partially replicated. We argue that above-chance correct localisation of trials reported as undetected does not reflect unconscious stimulus processing but rather demonstrates how binary response designs fail to capture nuanced degrees of perception. ***Discussion***: Our results empathise the importance of rigorously ensuring stimulus unawareness when investigating unconscious sensory processing and call for careful consideration of the challenges posed by near-threshold paradigms.

Poster: **A13** **Chia-Ying Weng**

The effects of the whole-body high-intensity isometric resistance training on BDNF, IGF-1, and quality of life in the community-dwelling adults

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Introduction: Brain derived neurotrophic factor (BDNF) and insulin-like growth factor (IGF)-1 play the important role of resistance exercise (RE); however, the results regarding the effect of RE on BDNF and IGF-1 varies, which could be explained by exercise modalities. Therefore, the main purpose was to examine the basal effect of the whole-body isometric resistance training (WB-IRT) on BDNF, IGF-1, and quality of life (QoL), as well as determine the association between BDNF, IGF-1, and QoL in community-dwelling adults. ***Methods***: Forty-six community-dwelling adults were randomized to 12 weeks of WB-IRT (31 participants, 61.45 ± 8.93) or control group (15 participants, 60.87 ± 7.28). WB-IRT included the high intensity and load exercise modality with isometric muscle strength by the protection of the spotters. Blood samples were collected at baseline and at least one month after this program for plasma BDNF and IGF-1 assays, which is defined as the basal effect. WHOQOL-BREF questionnaire was used to assess their QoL. ***Results:*** There was significant interaction of group and time in plasma BDNF concentrations ($p = 0.014$) and QoL ($p = 0.018$), rather than plasma IGF-1 concentrations ($p = 0.168$). Plasma BDNF concentrations was significantly elevated from pre-exercise to post-exercise in WB-IRT group ($p < 0.001$), rather than control group ($p = 0.382$). Mental health was significantly decreased from pre-exercise to post-exercise in control group ($p = 0.008$). Furthermore, multivariate regression analyses showed there was the significant association between change of plasma BDNF concentrations and QoL ($\beta=0.515$, $p = 0.006$) in the pooled community-dwelling adults after adjusted for groups, age, sex, education levels, and body mass index. ***Discussion***: Our results show that the basal effect of this WB-IRT was able to increase BDNF, maintain IGF-1, and benefit with QoL. These are particularly alarming in the resistance exercise-induced regulation of plasma BDNF concentrations, thereby associating QoL in community-dwelling adults.

Poster: **A14** **Autumn Chall**

Awe And Positive Affect: The Role Of Self-Transcendence And Self-Focused Attention

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Introduction: The experience of awe is associated with positive emotion (Nelson-Coffey et al., 2019). The mechanisms through which awe leads to positive emotion are poorly understood. One way to induce awe is through writing about a prior awe-inducing experience (Bai et al., 2017). The purpose of this study was to use a writing task to (a) confirm the relationship between awe and positive affect (PA) and (b) investigate two theory-based mediators of that relationship—a reduction in self-focused attention and greater self-transcendence (e.g., Jiang & Sedikides, 2021). ***Methods***: College students (N = 241) completed this study online. This between-subjects design had participants complete a measure of PA (Watson et al., 1988) and then write about either a personal experience of awe or a neutral experience. Following this, participants filled out questionnaires assessing post-writing PA, subjective feeling of awe (Bai et al., 2017), self-focused attention (Woody, 1996), and self-transcendence (Jiang et al., 2018). ***Results:*** Participants in the awe condition reported significantly higher awe feelings than the control condition, $t(238) = 7.27$, $p < .001$. After controlling for pre-writing PA, participants in the awe condition reported higher post-writing PA than those in the control condition, $\Delta R2 = .01$, $F(1, 238) = 4.00$, $p = .047$. The relationship between writing condition and post-writing PA was not mediated by self-transcendence, indirect effect = .18 (95% C.I. = −.06, .49), nor self-focused attention, indirect effect = −.02 (95% C.I. = −.16, .06). Self-transcendence, however, was positively related to post-writing PA. ***Discussion***: This study provided additional evidence that writing about awe experiences has the potential to induce awe and increase momentary PA (see Bai et al., 2017). Still, the mechanism of awe's effect on emotion remains elusive. This research provides increased support of the effectiveness of writing about awe experiences as a method of inducing awe and PA.

Poster: **A15** **Kinga Mazurek**

Unveiling the Dynamics of Inattentional Blindness: Attention Processes during Magic Tricks with Edited Video Stimuli

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Introduction: Vast majority of recent studies on attention processes often unfold in controlled laboratory settings with non-social stimuli. Acknowledging the limitations of these controlled laboratory settings, our study explores how an easily-perceived magic trick influences attentional resources, particularly investigating inattentional blindness toward salient aspects of a human body—such as the magician's face and hands. By manipulating video stimuli with distinct levels of editing artifacts, we aim to reveal the subtle but crucial influence of unnatural editing occurrences on attention. ***Methods***: Two versions of the same magic trick video were created, each with unique editing artifacts. Participants, divided into groups, experienced different video conditions. In order to investigate participants' explicit and implicit perceptions of the artifacts we collected eye-tracking data. We also administered a questionnaire assessing inattentional blindness and the uncanny valley effect. We analyzed scanpaths, subtle eye movement patterns as well as questionnaire data. ***Results:*** The analysis focuses on comparing fixation patterns, attentional resource allocation, and inattentional blindness effects between the two video conditions. Questionnaire responses will provide insights into participants' conscious and unconscious perceptions of the editing artifacts, contributing to a comprehensive understanding of attention processes in response to socially relevant stimuli. ***Discussion***: Our hypothesis posits that magic tricks, as inherently attention-grabbing stimuli, induce a natural social situation, potentially leading to inattentional blindness to edited facial features. The study aims to discern the predominant factors influencing participants' perceptions—context, eeriness of editing, or grounding effects. We recognize that the eeriness of editing is a component of grounding, exploring how similar stimuli may merge into a singular perception. The use of eye-tracking technology and assessment questionnaires will provide nuanced insights into both conscious and unconscious perceptions of editing artifacts, contributing valuable findings to the study of attention processes in response to socially relevant stimuli.

Poster: **A16** **Mustafa Yavuz**

Social vigilance during perception

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Introduction: Our behavior and cognition are heavily influenced by the presence of others, usually in the backdrop of cooperative or competitive interactions. Here, we take a step back and ask whether our behavior and cognition are influenced simply because we realize that someone else is jointly perceiving the same object as us, irrespective of interactive context. ***Methods***: We examined the difference between privately vs. jointly perceiving the same stimulus while in both cases another human was present. Participants (N = 33) made a perceptual (Random Dot Motions) decision in the presence of a confederate. By strategically positioning a divider screen, the stimuli appeared either only visible to the subject (private perception) or visible to both the subject and to the confederate (co-perception). Choice, response time confidence ratings were collected. We also measured EEG signals, pupil size change and electrocardiography in the participants (but not the confederate). ***Results:*** No difference was found between the conditions at the behavioral level. EEG signals, pupil responses and cardiographic activity showed altered patterns with respect to private versus co-perception. ***Discussion***: This result points to a mode of social vigilance that takes place at a subconscious level and would translate into behavior if the social interaction requires it.

Poster: **A17** **Laura Marie Schmidt**

Post-COVID Syndrome and the Frontal Brain: A Temporal Dynamics Perspective

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Introduction: Post-COVID (PC) syndrome commonly manifests with neuropsychiatric symptoms such as fatigue and cognitive impairment, yet the underlying mechanisms remain poorly understood. This study utilized BOLD fMRI to explore neural correlates of PC fatigue and cognitive impairment during a reaction time task. ***Methods***: 24 patients with confirmed SARS-CoV-II infection and a diagnosis of PC syndrome and 24 demographically matched healthy controls (HC) were enrolled in the study. PC patients came from our memory clinic, suffering from subjective fatigue and memory problems. Sociodemographic background variables and neuropsychiatric symptoms were assessed using a set of nine questionnaires, including the FAS, ESS, BDI-II, SHAPS-D, and others. During an fMRI scan, task performance and behavioral reward answer were examined with the Monetary Incentive Delay Task. We analyzed task-related temporal dynamics of BOLD activity and functional connectivity. ***Results:*** PC participants exhibited chronic fatigue, anhedonia, sleep disturbances, and memory impairment. Despite intact behavioral reward circuit function, PC patients performed significantly slower on the task than HCs. The effect of rewarding cues increased over time for PC patients. This was associated with a temporal effect in brain activation, with delayed activation in the left frontal gyrus (lFG) and higher initial activity in task-positive network regions. Altered functional connectivity was also observed in these brain regions. ***Discussion***: BOLD fMRI revealed clear changes in frontal brain activity with increased temporal latency and additional activation of the task-positive network in PC patients. Moreover, PC fatigue was found to result in poorer task performance. The coincidence of delayed lFG activation and delayed improvement in task performance suggests the presence of compensatory neural mechanisms in PC patients. Post-COVID syndrome is discussed as a process of chronic neuroinflammation. Since inflammation affects reward processing in the brain, our results are the first to demonstrate this effect in PC syndrome.

Poster: **A18** **Hannah McDermott**

Expectation effects on neural sharpening and dampening during statistical learning.

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Introduction: Expectation Suppression (ES) and Repetition Suppression (RS), or the suppression of neural activity in response to expected or repeated stimuli respectively, are both seemingly explained by Predictive Coding. However, the mechanisms behind both are unclear and many early studies failed to acknowledge ES as a standalone phenomena independent of RS. Various models of the mechanisms supporting ES have been suggested with conflicting evidence. Sharpening models propose that expectations suppress neurons that are not tuned to the expected stimulus. In contrast, dampening models posit that expectations suppress neurons that are tuned to the expected stimuli. In this study I aim to shed light on the sharpening/dampening processes behind ES and how it relates to prediction formation and deployment. ***Methods***: Twenty-eight participants completed a statistical learning task consisting of paired scene categories whereby a "leading" image from one category is quickly followed by a "trailing" image from a different category. Multivariate EEG analyses focussed on decoding stimulus information related to the trailing image category. A decoder was trained on leading image categories, and tested on trailing image categories based on Mahalanobis distance of EEG amplitude values pooled over channels. Category decoding was quantified by comparing distance between expected and unexpected categories. Decoding accuracy was compared for expected vs unexpected images using paired t-tests. To quantify sharpening vs. dampening, Mahalanobis distance matrices were fitted with simple models of population tuning curves, with separate parameters coding for their width (sharpening) and gain (dampening). ***Results:*** Decoding analyses outline the presence of sharpening and dampening effects at different time points during the statistical learning process. ***Discussion***: These data address the inconsistency in the literature surrounding sharpening and dampening models of ES. Both sharpening and dampening are observed separately during the learning process, in line with Predictive Coding accounts of learning.

Poster: **A19** **Sein Jeung**

BIDS-Motion : Brain Imaging Data Structure for Reproducible Motion Research in Neuroscience

Jeung, S. [1,2,3], Cockx, H. [4,5], Appelhoff, S. [6], Berg, T. [1], Gramann, K. [1], Grothkopp, S. [1], Warmerdam, E. [7], Hansen, C. [8], Oostenveld, R. [5,9], BIDS Maintainers [10], & Welzel, J. [8]

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Introduction: We present an extension to the Brain Imaging Data Structure (BIDS) for motion data. Motion data is frequently recordedalongside human brain imaging and electrophysiological data. The goal of Motion-BIDS is to make motion data interoperable across different laboratories and with other data modalities in human brain and behavioral research. ***Methods***: Motion-BIDS standardizes the data format and metadata structure. It describes how to document experimental details, taking the diversity ofhardware and software systems for motion data into consideration. This promotes FAIR data sharing and Open Science inhuman motion research. ***Results:*** The contribution of Motion-BIDS to this end is threefold. (i) It provides a flexible way to define what is construed as a single motion tracking system, agnostic to the type of recording technology used. (ii) It requires users to share metadata that are the most central to interpretation of motion data. (iii) By embedding motion data in BIDS framework, it supports the growing junction between biomechanics and human neuro- and behavioral science. Concretely, it facilitates management of motion data together with other data modalities in a harmonized and time-synchronized manner. ***Discussion***: Prioritizing the ease of sharing and interpreting the data naturally results in a number of persisting challenges such as the lack of the means to share the precise sensor placement and more detailed definition of spatial axes within the BIDS framework. This reflects the lack of field consensus on whether and how the complexity of such spatial quantities can be made universally approachable. Motion-BIDS intends to consider potential solutions for these issues and stay compatible with efforts coevolving alongside BIDS.

Poster: **A20** **Aureen Aureen Dsouza & Ignacio Rebollo**

Bodily sensations and emotional fingerprints

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Introduction: Emotional processing involves bodily changes. However, whether one can map specific emotions to bodily changes depends on peoples' abilities to sense and correctly identify bodily sensations, i.e. interoception. Here, we investigate whether self-reported bodily sensations can act as emotional fingerprints and how this is related to interoceptive abilities. We hypothesize that subjective sensations of bodily changes can be used to distinguish one emotion from another. Furthermore, we hypothesize that the individual differences in interoception and self-reported bodily sensations can be used to identify personality traits. ***Methods***: We collected self-reported bodily sensations in the form of drawings from 300 participants tested online (150 females, 18-35 years old) after exposure to negative, positive, disgusting, appetizing or neutral video stimuli. In addition, we also collected psychological questionnaires of interoception, anxiety, disgust sensitivity, positive and negative affect, and personality traits. ***Results:*** Repeated measures ANOVA validated the emotion-inducing efficacy of the different video stimuli. Using Principal Component Analysis in combination with Linear Discriminant Analysis, we found above-chance discrimination between drawings from different emotional categories, successfully replicating previous findings. Moreover, we found significant associations between self-reported bodily sensations and questionnaire responses. ***Discussion***: These findings underscore the embodied nature of emotional experiences and suggest that certain emotional states may indeed have unique "fingerprints". The results pave the way for future studies employing neuroimaging methods, with potential implications for understanding emotional experiences in clinical populations and the development of therapeutic interventions.

Poster: **A21** **Felix Klotzsche**

Assessing and Comparing Eye Tracking Performance in Virtual-Reality Headsets: A Test Battery

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Introduction: An increasing number of virtual reality (VR) headsets provide integrated solutions for tracking eye positions. This offers new opportunities for research which includes the study of gaze patterns, especially in naturalistic settings and such that incorporate head and full-body movements. However, evaluating and comparing the tracking quality of these devices remains challenging. Quality metrics (e.g., spatial and temporal accurateness) are often only provided by the manufacturers and lack transparency and standardization, complicating objective assessment and cross-device comparison . Here, we present a new test battery for assessing the quality of VR eye tracking systems. ***Methods***: Using the Unity game engine, we implemented a series of test procedures which validate the accuracy and precision of the eye tracking data provided by current and widely used VR headsets. In conditions with and without head movements, human observers perform guided saccadic and fixational eye movements while their eye movement data is recorded. We then assess the sample-to-sample variation (i.e., precision) and compare the gaze direction estimates provided by the VR eye trackers against the actual location of the gaze targets in the virtual environment (i.e., accuracy). Additionally, we assess the delay between the movement and its registration in the VR or tracking software (i.e., sample latency). ***Results:*** The poster presents relevant features of the test battery as well as preliminary results from applying it to a selection of contemporary VR headsets (HTC Vive Focus 3, HTC Vive Pro Eye, Meta Quest Pro, PICO 4 Enterprise, Varjo Aero) in a sample of pilot participants. ***Discussion***: Our test battery provides the first comparison of multiple eye tracking quality measures across different VR headsets (including mobile standalone devices). It offers a tool for researchers to systematically determine the suitability of specific headsets for studies involving eye tracking in VR environments.

Poster: **A22** **Marta Gerosa & Aishvarya Aravindan Rajagopal**

Methodological Flexibility in the Heartbeat Counting Task: a Pre-Registered Meta-Methods Project

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Introduction: The Heartbeat Counting Task (HCT) is a well-known experimental paradigm intended to assess cardiac interoceptive accuracy, i.e., the ability to accurately detect heartbeats. The performance of specific groups in the HCT is frequently linked to various psychological outcomes and risk factors, such as eating disorders and anxiety. Nevertheless, there exists considerable variability in the implementation and evaluation of HCT. Common variations include, for example, the number and duration of trials, the instructions given to participants, and the quantification of HCT performance. Such methodological flexibility hampers the comparability across studies and the generalization of results, and prevents effective meta-analytic synthesis. These reasons amplify existing uncertainties about the construct validity of the HCT. A systematic investigation of the methodological flexibility in psychological and neuroscientific research using the HCT could mitigate these shortcomings. ***Methods***: The meta-methods analysis planned here aims to identify and quantify variability in the implementation and scoring of the HCT. Employing a pre-registered design, we will conduct a systematic synthesis of published empirical studies using the HCT, focusing on key procedural and analytical decisions. Specifically, our search will span multiple databases (e.g., PubMed, Scopus), targeting original research articles in English that employ the HCT. From the eligible articles, information extraction will cover details of the HCT design, including task format, instructions, number and duration of trials, trial randomization, as well as information about analytical decisions, such as the number and type of scoring strategies. ***Results:*** As a first step, we have piloted a preliminary version of the codebook and plan to proceed with a first round of data extraction. We shall present the comprehensive codebook and preliminary observations in the poster.

Poster Abstracts

Poster Session B

March 11, 2024 at 19:15-20:00 | Virtual March 13, 2024 at 10:20-10:55

Poster: **B01** **Marie Loescher**

Cardiac influences on multisensory integration: does self-relevance matter?

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Introduction: A unified first-person perspective, inherent to conscious experience, might correspond to the integration of information from exteroceptive senses with internal signals from bodily organs. For example, neural processing of heartbeats has been shown with the perception of external stimuli on the one hand, and with self-related cognition on the other hand. In this experiment, we link these two lines of research by investigating whether cardiac signals also modulate multisensory integration, and whether this is dependent on the self-relevance of the stimuli. We manipulate the self-relevance by placing the stimuli within or outside of the subject's peripersonal space (PPS). ***Methods***: Participants performed a speeded tactile detection task. Faint electrical stimuli to the right hand were presented alone or concurrently with a short tone. The tone could be presented either near or far from the stimulated hand, i.e., within or outside PPS. In addition to reaction times (RT), we recorded EEG and additional physiological signals, including cardiac activity via ECG. ***Results:*** As expected, tactile RT were faster in the audio-tactile compared to the tactile condition ("bimodal effect"); and even faster when the concurrent sound was near compared to far ("distance effect"). RTs were also shorter when the tactile stimulus was presented late in the cardiac cycle, i.e. during diastole, compared to systole. However, this effect did not interact with the bimodal nor the distance effect. Finally, we will test for an interaction between those effects and the amplitude of the neural heartbeat-evoked response, a common marker of cardiac processing. ***Discussion***: Our results so far confirm existing reports of cardiac influence on tactile perception. However, our findings suggest that cardiac cycle effects are independent of multisensory integration processes, and also independent of self-relevance of external stimuli.

Poster: **B02** **Angeliki Charalampaki**

The role of tactile information on metacognitive representations of agency

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Introduction: When we intentionally move our body, our brain compares the sensory predictions to the sensory consequences accompanying our actions. Only if these two match do we feel we are the agents of our actions. Empirical studies often investigate this sense of agency by manipulating primarily visual representations. While most experimental manipulations focus on the visual consequences of movement, tactile information can, and does, also guide our movements by encoding properties of the external world. To investigate the contributions of tactile information to representations of our movements, we compared the contributions of visuo-tactile and visuo-proprioceptive information. ***Methods***: Participants completed two tasks — one where we measured subjective ratings of agency and one where we measured their metacognition of agency when different aspects of the movement displayed (spatial, temporal, tactile) were manipulated. The basic motor task was the same: Participants reached with their right hand toward a textured surface. On the first task, participants acted once and then rated how much agency they felt they had. On the second task, participants acted twice, discriminated in which of the two intervals they felt more control over, and then rated their confidence in their own decision. ***Results:*** On the first task, we saw that the magnitude of the tactile discrepancy - similar to temporal and spatial discrepancies- was inversely related to agency ratings. On the second task, we found that tactile information informed participants' metacognitive representations of agency similar to temporal but to a lesser degree than spatial. ***Discussion***: Given the ubiquitous tactile sensation that results from our movements, this study sheds light on a crucial but neglected aspect of our interaction with the world while maintaining tight experimental control. It also complements the recent approach that we and other groups have developed, aiming to investigate agency in relation to, and using tools borrowed from metacognition research.

Poster: **B03** **Víctor Fernández Asunción**

Complexity Electroencephalographic markers for cognitive decline detection

Fernández, V. [1], Kompatsiaris, I. [2], Nikolopoulos, S. [2], Lazarou, I. [2], Georgiadis, K. [2], Oikonomou, V. [2], Tsolaki, A. [3], Tsolaki, M. [2], Kroupi, E. [1], Braboszcz, C. [1], & Soria-Frisch, A. [1].

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Introduction: This study aims to evaluate the efficacy of electroencephalographic (EEG) complexity markers, namely Higuchi Fractal Dimension (HFD), Waveform Complexity (Cw), Permutation Entropy (PE) and Lempel Ziv Welch (LZW), for cognitive decline detection in the CERTH-GAADRD High-Density EEG Database, which include subjects at different neurodegenerative stages (N=220). ***Methods***: The validation dataset includes distinct groups of individuals: healthy controls (HC), subjective cognitive decline (SCD), mild cognitive impairment (MCI), and Alzheimer's disease (AD) patients. First, EEG signals were averaged over various cerebral areas. Complexity markers were then computed on this averaged data and the outliers were eliminated using the Tukey method. Lastly, the discrimination capability of the complexity markers among the groups was statistically analyzed. ***Results:*** Statistical analysis of EEG complexity markers revealed significant findings in the occipital and parietal areas. Specifically, the HFD marker showed a statistically significant reduction in the AD group compared to other cognitive categories ($p<0.05$), corroborating literature that suggests these regions are affected in AD-related complexity loss. In contrast, Cw, LZW and PE did not demonstrate this pattern. Across all complexity markers, the SCD group exhibited a significant reduction in temporal region complexity ($p<0.05$), pointing to its potential vulnerability in early cognitive decline. ***Discussion***: HFD emerged as a promising marker for the detection of cognitive decline, with the capability to distinguish the AD group from other stages. This finding underscores the importance of HFD in the context of neurodegenerative research.

Poster: **B04** **Kevin Balßuweit**

Machine Learning of Cognitive Trajectories in Parkinson's Disease: Predicting STN-DBS Impact with Neuroimaging and Clinical Data

Balßuweit, K. [1,2,5], Gerner, K. [1,2,4], Barthel, A. [1,2,5], Schweinar, A. [1,2,4] Wagner, F. [1,2,3], Köhler, H. [1,2], Schmidt, A. [1,2], Gaser, C. [1,2], Klingner, C. [1,2] & Brodoehl, S. [1,2].

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Introduction: Parkinson's disease (PD), the second most common neurodegenerative disorder, presents with motor symptoms like bradykinesia, rigidity, and tremor. One of the most relevant non-motor symptoms is the development of dementia. Subthalamic nucleus stimulation (STN-DBS) is an effective therapy for advanced PD, but its impact on cognition remains unclear. ***Methods***: This study included 43 PD patients diagnosed by Movement Disorder Society criteria at the University Hospital's Neurology Department, with 23 undergoing STN-DBS. We gathered a comprehensive set of data, including neuroimaging and clinical assessment parameters. Neuroimaging data were acquired using high-resolution three-dimensional T1-weighted MRI scans. Cortical thickness measurements were derived from these images using surface-based morphometry (SBM) techniques implemented in the CAT-12 Toolbox. Clinical data encompassed the Unified Parkinson's Disease Rating Scale (MDS-UPDRS) Part III scores, Levodopa equivalent daily dose (LEDD), the time since initial diagnosis, demographic details, and specific PD questionnaires. We employed a predictive modeling approach using Support Vector Machine (SVM), a robust supervised learning algorithm suitable for classification tasks. The primary endpoint for predictive accuracy was the change in the Montreal Cognitive Assessment (MoCA) score, which was projected 6-12 months into the future to assess cognitive decline. ***Results:*** We use a large number of variables (250 per patient) in this study, which makes the use of the SVM particularly effective compared to other learning models. To evaluate our model, we use the accuracy, F1, ROC-AUC and precision-recall curve, among others. An initial data analysis shows that the SVM model provides good predictive quality. We want to further adapt the model to our data. ***Discussion***: Our research leverages innovative machine learning techniques to uncover cognitive impairment associated with PD and to forecast potential cognitive deficits in patients who may undergo DBS therapy. Integrating clinical evaluations and neuroimaging data enhances predictive accuracy for cognitive decline.

Poster: **B05** **Marina Baroni**

"Psycho-plasticity": the link between psychological dimensions and visual plasticity

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Introduction: According to the cognitive penetrability of perception, psychological dimensions such as personality and mental states can influence perceptual processes. Accordingly, psychological factors may also influence neuroplasticity. In the context of vision, after 2 hours of monocular deprivation, plasticity in V1 could be measured by observing the presence or absence of a change in ocular dominance in favour of the deprived eye using a binocular rivalry paradigm. Therefore, the aim of the present study was to observe the possible associations between psychological dimensions, and visual plasticity in V1. ***Methods***: 17 healthy subjects underwent a binocular paradigm at baseline and after 2 hours of monocular deprivation, which allowed the detection of both perceptual rivalry rates and the change in ocular dominance (deprivation index). Higher values of the deprivation index (close to 1) corresponded to a lower susceptibility to monocular deprivation. Psychological dimensions were assessed using three different standardised questionnaires (Big Five, STAI-Y, SCL-90-R) to evaluate personality traits and psychopathological conditions. Linear regression analyses were performed to observe the association between psychological dimensions and perceptual rivalry rates and change in ocular dominance. ***Results:*** After 2 hours of monocular deprivation, significant associations were found between the change in ocular dominance and psychological dimensions. It was observed that subjects with lower levels of anxiety were less susceptible to monocular deprivation (higher deprivation index). Notably, negative associations between the deprivation index and state-anxiety ($p=0.009$), trait-anxiety ($p=0.020$), and phobic anxiety ($p=0.036$) were found. Moreover, it was also observed that subjects less susceptible to monocular deprivation had higher scores in the personality domains of "Openness to culture" ($p=0.032$) and "Perseverance" ($p=0.027$). ***Discussion***: The results support the effects of psychological dimensions on both visual perceptual processes and visual plasticity in V1. The observed associations may depend on the activity and levels of GABA, serotonin, and norepinephrine neurotransmitter systems.

Poster: **B06** **Stefania Cionca**

Dressing the Mind: Shapewear Influences Mind-Body Connection, Altering Body Awareness and Dietary Preferences

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Introduction: Despite the popularity of shapewear, especially among young women, quantitative research examining their effects on our body and behavior is lacking. Previous research shows that clothing type, such as formal or informal attire, influences food choices, whereas the sensation of tightness around the stomach in an exposure exercise appears to enhance interoception. We hypothesize that wearing tight clothing provides a constant external tactile cue, which triggers cognitive and behavioral adjustments via interoceptive channels. In our pre-registered study, we aimed to investigate the effects of wearing shapewear on interoception, body image, impulsivity and dietary preference. ***Methods***: Forty-four healthy participants (mean=26.46 years, Std.=5.78, 28 women), with a normal Body Mass Index range of 20-25, were recruited for this study. On each of the two laboratory visits, they wore a tight shapewear or a loose shirt for a duration of four hours, in a counter-balanced design. During this, dietary preference was assessed through a task measuring hedonic ratings of high- and low-calorie foods, as well as willingness to pay. Body image was evaluated using body size estimations and questionnaires. Interoception was measured with the Heartbeat Discounting Task and a questionnaire, while impulsivity was assessed via the Go/No-Go task. ***Results:*** Wearing shapewear reduces the volume of water ingested to reach satiety and impacts aspects of interoceptive awareness, such as self-regulation, and attention given to and trust in bodily sensations. We also found effects of shapewear wearing on body size perception, with some size estimations becoming more accurate. Dietary preference and impulsivity are also impacted by shapewear. ***Discussion***: Our study contributes to the existing body of knowledge on the complex relationship between tactile sensations, interoception, body image, and decision-making in nutrition. The results open an important discussion about how our clothing can impact how we feel about our bodies and how this can further influence our eating behavior.

Poster: **B07** **Dirk Gütlin**

Neuromimetic Predictive Coding: Building Biologically Valid Models with Recurrent Neural Networks

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Introduction: Closing the gap between artificial neural learning and biological neural learning is essential for understanding the basic building blocks of cognition and evaluating popular theories such as predictive coding. Here, we present a systematic exploration into alternative implementations of predictive coding within standard machine learning frameworks, specifically leveraging recurrent neural networks. ***Methods***: Our general architecture, resembling a simple top-down Recurrent Neural Network, mimics the predictive coding framework's core dynamics, allowing for the formation of priors and the propagation of prediction errors. With the goal of reproducing certain landmark phenomenological characteristics of predictive coding in artificial neural networks (such as mismatch responses and gain control), we systematically varied training procedures, network architectures and regularization. We examined stimulus sequences with roving oddball sequences, stimulus omissions, and statistical learning, examining if these results generalize to diverse learning paradigms. ***Results:*** Training procedures, such as contrastive or autoregressive implementations of predictive coding, demonstrated significant differences from standard backpropagation-based learning. Notably, only the former two exhibited mismatch responses, shedding light on the learning behaviors induced by distinct algorithms. Network architectures enabling feedback connections were also necessary for generating mismatch responses, consistent with the pivotal role of top-down expectations. Connection strength regularization as well as activational regularization lead to attenuated gain control as it is observed in biological neural networks. ***Discussion***: Our preliminary findings not only position this modeling approach as a useful framework for simulating and probing canonical mechanisms, but also lay the groundwork for aligning our models with neurophysiological data. By closely mirroring the predictive coding framework, this neuroconnectionist approach allows for a nuanced exploration and systematic testing of the brain's learning and inference mechanisms. As a secondary application, these models offer a potential blueprint for future unsupervised machine learning paradigms, providing a flexible and biologically inspired foundation for artificial neural networks.

Poster: **B08** **Damla Çifçi**

How Artistic Expertise Shapes Individual Differences in Low-level Sensory Working Memory

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Introduction: Understanding how daily sensory experiences shape working memory abilities is crucial to comprehend the embodied nature of cognitive functions. To investigate examples of individuals with extraordinary daily sensory experiences, we recruited participants from two unique groups - musicians and visual artists - for whom precise perception and reproduction of low-level sensory stimuli are essential. We aimed to capture the modality-specific effects of these daily sensory experiences on working memory performance. ***Methods***: We conducted an online behavioral experiment with graduates of Fine Art and Music Bachelor's programs with extensive training in their respective fields, either in drawing or in ear training. Participants performed two different working memory tasks in which they were asked to either memorize a visual or an auditory stimulus and reproduce it as precisely as possible after a short delay. ***Results:*** Both groups exhibited selective benefits for the sensory modality corresponding to their professional expertise. Visual artists displayed less biased recall for the orientation of a memorized grating, while musicians demonstrated higher precision in recalling pure tones. These findings suggest that daily experiences and training influence working memory abilities in a modality-specific manner. ***Discussion***: The less biased recall in artists and increased precision in musicians may imply the existence of distinct neural mechanisms shaped by specialized training in the human brain. These results further highlight the reliance of working memory processes on sensory perceptual processes and allow us to ask what differential neural mechanism drives these differential abilities.

Poster: **B09** **Withdrawn**

Poster: **B10** **Verena Viktoria Auerswald**

Influence of the hypocretinergic System on the functioning of the human reward system – a comparative study at behavioral and neuronal level in people with and without hypocretin deficiency

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Introduction: : Hypocretin/orexin is a neuro peptide primarily known in connection with narcolepsy with cataplexy which is a result of hypocretin deficiency. However, there are increasing indications that hypocretinergic neurons also take part in regulating the reward system. The aim of our research is to gain more insight on the participation of hypocretinergic neurons in reward processes and it's behavioral correlatives. In order to achieve this, we are comparing neuronal connectivity and reward sensitivity during MID in healthy people, people with type I narcolepsy (hypocretin deficiency) and, to distinguish effects of hypocretin deficiency from sleepiness-related effects, people with type II narcolepsy. ***Methods***: Our goal is to include 20 healthy controls, 20 patients with type I narcolepsy and 20 patients with type II narcolepsy in total. We chose the monetary incentive delay task with 3 different incentives as reward triggering paradigm, capturing reaction times in each round as behavioral data and recording brain activity using magnetoencephalography. ***Results:*** A first analysis of reaction times in 5 patients with type I narcolepsy and healthy controls showed significant increases in reaction speed from neutral to low incentive and from low to high incentive in healthy controls, compared to no significant speed increase from low neutral to low incentive in patients with type I narcolepsy. Connectivity data hast yet to be analyzed. Data analysis will be completed by august of 2024. ***Discussion***: Based on our promising first analysis, we expect a decreased reward sensitivity and altered connectivity during reward processes in patients with type I narcolepsy in contrast to healthy controls and patients with type II narcolepsy. Furthermore, we expect a correlation between those alterations and symptoms like depression, fatigue and concentration difficulties in patients with type I narcolepsy, making it possible to trace those symptoms back to low hypocretin levels and not merely sleepiness.

Poster: **B11** **Marta Chrustowicz**

The Influence of Loneliness on the Neurocognitive Aspects of Cognitive Reappraisal in Young Adults

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Introduction: According to the Evolutionary Theory of Loneliness, a prolonged feeling of loneliness may increase bottom-up processes associated with orienting toward social stimuli (e.g. hypervigilance to social threats) while decreasing top-down processes necessary for producing adequate emotional response towards it (mentalizing and emotion regulation). The study aimed to examine the impact of loneliness on the ability to engage in cognitive reappraisal, in a group of participants from the general population. ***Methods***: A total of 151 young adults representing a whole range of loneliness levels participated in a study where they were instructed to either reappraise or passively observe brief negative animations featuring two point-light agents sourced from the Social Perception and Interaction Database. Concurrently, their electroencephalography (EEG), electrocardiography (ECG), and galvanic skin response (GSR) were recorded. ***Results:*** The study revealed that altercations, in comparison to neutral interactions, resulted in enhanced amplitudes of Late Positive Potential (LPP), and stronger heart deceleration. These altercations were also perceived as more arousing and negative, as indicated by behavioral scores. Intriguingly, no association was observed between levels of loneliness and the behavioral or neurophysiological indicators observed during the task. ***Discussion***: In summary, the findings indicate that participants were adept at understanding the negative scenarios depicted in point-light displays and effectively utilized cognitive reappraisal to diminish both their negative evaluations of the stimuli. Moreover, the participant's ability to engage in cognitive reappraisal was found to be unaffected by their level of loneliness. Nevertheless, the study had some limitations, such as the inability to include individuals with extremely high loneliness scores in a nonclinical sample, which could have influenced the observed effects. Nonetheless, the findings of this study hold significance for interventions aimed at assisting individuals in dealing with adverse social interactions.

Poster: **B12** **Diana-Eliza Gherman**

Exploring the Boundaries of Passive Brain-Computer Interfaces: Mobility, Virtual Reality, and Multimodality

Diana-Eliza Gherman [1], Dr. Laurens Krol [1], Dr. Marius Klug [1], & Thorsten O. Zander [1]
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Introduction: In recent years, a new, more natural way of human-machine communication has been enabled by passive brain-computer interfaces (pBCIs). Yet, despite promising results in their ability to implicitly decode mental states from electroencephalography (EEG) without a user's effort, this technology has not made its way outside of research laboratories. This is partly due to concerns related to the EEG signals' sensitivity to movement and noise characteristics in real-life scenarios. Most pBCIs today are assessed in conditions where users sit while performing a task on a computer. With this study, we wanted to go beyond such setups and explore the potential value of adding other physiological measures. We did this by comparing the performance of a pBCI across body posture (sit vs. stand), medium (desktop vs. VR-based), and sensors (EEG vs. multimodal). ***Methods***: A workload-inducing task was presented repeatedly in 4 conditions: sit-desktop, sit-VR, stand-desktop and stand-VR. Besides EEG, during the VR conditions, we recorded heart rate and pupillometry data. The EEG signal and classification ability were statistically compared across these conditions. The EEG data was then fused with the other measures and the classifier was trained again on multimodal data for both body posture conditions. The accuracies of the multimodal and unimodal classifiers were statistically compared. ***Results:*** The results yielded a robust workload pBCI classifier across contexts. Despite some signal alterations, the medium (desktop and VR) and posture did not produce a significant main effect in our ANOVA results. Also, the unimodal, EEG-based pBCI proved to be significantly better than the multimodal pBCI. ***Discussion***: Our results provide hope for the transferability of pBCI to more practical applications. The lack of added value of other psychophysiological measures for classification offers more trust to EEG-based pBCIs for mental state detection. More work is needed to investigate pBCI in additional, more dynamic conditions.

Poster: **B13** **Mirna Hajric**

Intrinsic causal network dynamics of emotion regulation capacity and tendency

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Introduction: Effective emotion regulation (ER) is a highly adaptive process driven jointly by one's tendency to choose specific regulatory strategies and one's capacity to implement the chosen strategies, with distinct neural networks underpinning these processes (Morawetz et al., 2020). Here, we explored the association between resting-state effective brain connectivity (EC), distraction/reappraisal capacity (DC and RC), and the tendency to reappraise (RT). ***Methods***: We analyzed resting-state fMRI data of 40 participants (mean age = 22.53 ± 3.76 years, 20 female) (3.0 Tesla MR scanner; 260 whole-brain images) using spectral dynamic causal modeling (spDCM) to make inferences about the causal interactions between brain regions of a coupled system. Outside the scanner, participants performed two emotion regulation tasks, in which they were asked to decrease their emotions in response to negative images by either using distraction or reappraisal. Based on these, the RC and DC were determined by subtracting the mean emotional state rating after regulation from the control condition (no regulation). RT was computed as a relational covariate (percentage of choices between distraction and reappraisal). ***Results:*** Comparing the intrinsic network architecture in relation to RC and DC revealed that across all networks, 50-70% of all connections were modulated by the capacity to regulate with both strategies, with distinct connections from parietal to frontal areas associated with RC, from caudate to temporal and frontal areas linked to DC, and from ventromedial prefrontal cortex to subcortical regions positively related to RC. The RT was related to a high degree of connectivity between frontal and parietal regions, between frontal and temporal regions, and within the limbic and subcortical regions. ***Discussion***: This is the first study to show how EC within four reappraisal-related networks at rest is linked to both regulation capacity and tendency.

Poster: **B14** **Tilman Stephani**

Excitability modulations of somatosensory perception do not depend on feedforward neuronal population spikes

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Introduction: Perception of even basic stimulus features, such as their intensity, is highly variable and depends on instantaneous states of the neural system. Recent work has argued that this variability both in neural responses and perceptual outcome is reflected in excitability levels, even during very early sensory processing in the cortex. However, the locus of modulation remains poorly understood – do these excitability dynamics reflect fluctuations in feedforward processing or feedback signals? ***Methods***: Re-examining an EEG dataset of a somatosensory intensity discrimination paradigm, we here tested the involvement of neuronal population spikes in moment-to-moment dynamics of neural excitability and their effects on perceived stimulus intensity. For this, we analyzed so-called high-frequency oscillations (HFO), stimulus-evoked oscillation-like responses in a frequency range around 700 Hz, which have previously been shown to reflect population spiking activity of the initial thalamocortical feedforward sweep of the somatosensory response cascade. Concurrently, changes of cortical excitability were inferred from the amplitude of pre-stimulus alpha oscillations and the N20 component of the somatosensory evoked potential. ***Results:*** Using Bayesian statistics, we found evidence against the involvement of HFO in moment-to-moment variability of perceived stimulus intensity, in contrast to the previously observed effects of pre-stimulus alpha power and N20 amplitudes. Thus, population spiking activity of the first feedforward excitatory input does not seem to be involved in state-dependent modulation of sensory processes. ***Discussion***: Following the notion that conventional stimulus-evoked potentials in lower frequencies – such as the N20 component – may reflect a backpropagation of membrane potentials towards the apical dendrites, we suggest that top-down feedback processes (e.g., related to alpha oscillations) may take place at distal sites of the involved pyramidal cells rather than a modulation of output firing at basal compartments.

Poster: **B15** **Jannis Friedrich**

Joining Grounded Cognition and Predictive Processing under Structuralism

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Introduction: This presentation aims to reconciliate two theories that both describe the format of mental representations. Grounded cognition is a position stemming from embodied cognition, which states that mental representations take the format of experiential aspects. Predictive processing suggests a unifying mechanism underlying perception, cognition, and action: predictions of sensory experience. The latter accounts for mental representations from the position of structuralism, which suggests that the cognitive architecture is a small-scale model of (perception and action in) our environment. This presentation assesses whether grounded cognition and predictive processing may be reconciled to produce a holistic position informed by the history of grounded cognition and breadth of predictive processing. ***Methods***: I compare and describe whether these theories can be reconciled to provide an account of mental representation, informed by the different approaches afforded by grounded cognition and predictive processing. ***Results:*** Grounded cognition, and especially the simulation theory proposed by Barsalou, is commensurable with predictive processing. We find that empirical findings in grounded cognition can be well-accounted for by predictive processing. ***Discussion***: Predictive processing, and its representational format structuralism, states that cognition takes the form of a simulation of possible actions in a small-scale model of the external world. Mental representations therefore take the format of (predictions of) possible actions or perceptions, a position is shared by both grounded cognition and predictive processing. These two theories may therefore be approaching the same feature of cognition (experience-based mental representations of concepts) from two different perspectives. Predictive processing would profit from the solid foundation and empirical history of grounded cognition. Grounded cognition, on the other hand, would be augmented by spreading its influence connecting to the grand unifying principle provided by predictive processing. The poster presents a unified account of both positions and an outlook for future theoretical and empirical work.

Poster: **B16** **Zsuzsanna Nemecz**

Resolving memory interference between non-meaningful stimuli depends on the parahippocampal and perirhinal cortex, not the hippocampus

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Introduction: Resolving interference between similar inputs is a critical feature of adaptive memory systems. Computational theories of the medial temporal lobe posit that the Dentate Gyrus and Cornu Ammonis 3 (DG-CA3) subfields of the Hippocampus are ideally suited to reduce interference via a process called pattern separation. There is evidence that some cortical areas upstream of the Hippocampus contribute to interference reduction in a content-specific manner (e.g. reducing spatial or object-related interference), but the DG-CA3 is hypothesized to be a domain general pattern separator. Previous research in humans is almost solely based on mnemonic discrimination tasks involving everyday items, potentially confounding semantic and retrieval processes with pattern separation. ***Methods***: Here we strived to study the pattern separation of objects and spatial locations in a more "process-pure" manner, utilizing non-meaningful fractal images. We acquired full-brain high-resolution functional MRI data of human participants (n=39) while they studied fractals with varying degrees of interference in either their spatial locations or object features. Building upon the idea that the repetition of a stimulus results in a diminished BOLD response in areas involved in the processing of that stimulus (repetition suppression), we expected that regions engaged in the pattern separation of objects or spatial locations would decrease their response to repetitions, but not to highly similar (interference-inducing) items. ***Results:*** Accordingly, we found that the parahippocampal cortex contributes to interference reduction in the spatial domain, while the perirhinal cortex contributes to interference reduction in the object domain. While the CA3-DG region showed strong repetition suppression effects, indicating memory for the repetitions, it did not show the expected maintenance of BOLD signal-strength to similar stimuli in either the object or the spatial interference conditions. ***Discussion***: Altogether, these results are in line with content-specific cortical interference reduction, however, they challenge the view of DG-CA3 as a universal pattern separator.

Poster: **B17** **Aleksandra Piejka & Szymon Mąka**

Loneliness is associated with decreased propensity for altruistic behavior but only for distant others

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Introduction: Although there exists evidence that loneliness impacts decision making, the question of how it is linked to a propensity for altruistic behavior remains underinvestigated. Theoretical frameworks have highlighted the fact that loneliness can be related to two opposing processes. While loneliness may increase the motivation to approach people and help them in order to create new relationships, it can also arouse a negative bias towards others, increasing the tendency for an individual to fend for herself. It is plausible that loneliness may have a different association with altruistic behavior depending on different social distances (e.g., close others vs strangers). Thus, this study aimed to investigate the relationship between loneliness and social distance discounting. ***Methods***: 165 participants completed a set of questionnaires, including measures of social cognitive bias, and the Social Distance Discounting Task. During the task, participants selected options characterized by selfishness or generosity, resulting in either a substantial reward exclusively for them or smaller rewards shared between the participant and another individual at a specific social distance. Then, a hyperbolic social discount function was modeled, illustrating how rapidly the perceived value of money obtained by another person decreased with social distance through a hierarchical Bayesian model. The obtained discount rates and generosity scores were then correlated with levels of perceived social isolation. ***Results:*** While the association between general generosity and loneliness was not significant, higher discount rates were positively correlated with higher loneliness levels. Moreover, exploratory analyses revealed that this association was fully mediated by social cognitive bias measures. ***Discussion***: The study provided evidence that, while more lonely individuals might not be less altruistic in general, their propensity for altruistic behavior towards more socially distant people decreases significantly more than in less lonely individuals. This effect could potentially be linked to a tendency to perceive others and their intentions more negatively.

Poster: **B18** **Withdrawn**

Poster: **B19** **Daniel Janko & Carlotta Isabella Zona**

Exploring the behavioral correlates of hexagonal-grid representations of conceptual spaces

Poster: **B20** **Anindita Bhattacharjee**

Neuroimaging-based Drug Repurposing for Clearance of Amyloid-beta in Alzheimer's Disease

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Introduction: Our paradigm formulates two interconnected pathways by which amyloid-beta is transported across the enterohepatic and hepato-biliary circulations in Alzheimer's disease (AD). ***Methods***: We undertook pharmacological molecular dynamics analysis and drug-receptor interaction evaluation of some repurposable drugs (rifampicin, metformin, cilostazol) which can target our proposed receptors to enhance amyloid-beta's fecal clearance, reduce amyloid-beta formation, and prevent the reuptake of amyloid-beta from intestinal feces. Network pharmacology and synergism analysis were utilized to validate our hypothesis and identify the drug combinations, respectively. We have performed tractography analysis and investigated diffusion MRI scans of 30 subjects (15 healthy controls and 15 AD patients). We also performed clinical trial analysis and neuroimaging assessment from three AD clinical trials with the aforesaid three hepatomodulatory amyloid-beta clearance drugs. ***Results:*** The system analysis reveals that activating the pregnane-X-receptor (PXR) by rifampicin can enhance the removal of amyloid-beta by upregulating the expression of genes: ATP-Binding-Cassette-Superfamily-G-member-2 (ABCG2) and multidrug-resistance protein-1 (MDR1). Similarly, increasing the expression of bile-salt export pump-encoding gene ABCB11 by metformin, and ATP-binding-cassette-transporter (ABCA1) gene by cilostazol in liver can improve the efflux of amyloid beta. Furthermore, through MRI-tractographic analysis, we have formulated a three-segmental basis of brain amyloid-beta spread: Fronto-thalamic region (segment-1), Temporo-occipital region (segment-2), and Dorso-cingulate region (segment-3). These three segmental patterns are corroborated histopathologically by Braak's stages A, B and C respectively. MRI-tractographic analysis showed a significant reduction in neuronal integrity in the three aforementioned regions in untreated AD compared to controls. However, these drugs increased neural activation in AD patients in the corresponding three segments by upregulating genes ABCB11, ABCA1, and MDR1, which were downregulated in the anatomical segments 1, 2, and 3 of AD. ***Discussion***: This approach offers a complementary therapeutic strategy for Alzheimer's Disease, focusing on hepato-metabolic dysfunction along with potential preventive intervention in AD.

Poster: **B21** **Simon Hofmann**

Sampling from the cognitive face space under 3D viewing conditions

Hofmann, S.M. [1,2], Ciston, A. [1], Koushik, A. [1,3], Klotzsche, F. [1,4,5], Scherf, N. [2], Villringer [1,4,6,7], Nikulin, V. [1], Gaebler, M. [1,4]

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Introduction: The concept of "face space" describes perceptual ordering of facial features in a cognitive-computational space, where the similarity of faces is represented as distance. Previous research on face similarity has been mainly done in 2D, yet in the real-world humans primarily view faces in 3D. We conducted an online study juxtaposing judgement of face similarity in 2D and 3D. ***Methods***: We 3D-reconstructed 100 faces (50 female) from the standardized Chicago-Face-Database. To sample empirical estimates of distances in face space, we used a triplet-odd-one-out task. In the 2D-condition, 3D-reconstructed faces are seen from a static frontal view. In the 3D-condition, faces are rotated (7 1/4°) on the orthogonal plane providing various perspectives. In the UXF2.0-based online experiment, n2D=1,346 and n3D=1,259 participants, recruited via Prolific, completed the study covering 161,700 face combinations. Human judgments were converted to behavioral similarity matrices (BSM). We contrasted (Spearman's rho, R) BSMs with similarity matrices gained from (1) 44 physical face attributes (PFA) and (2) computational face embeddings (CFE) obtained by (2A) Variational Interpretable Concept Embeddings (VICE) and (2B) deep-learning models (VGG-face). ***Results:*** 2D and 3D BSMs were highly correlated ($R_{2D\sim3D}=0.93$; $p<0.001$). 2D-based PFAs partially explained BSMs ($R_{2D}=0.26$, $p<0.001$; $R_{3D}=0.25$, $p<0.001$). VICE predicted human judgments well (accuracy_2D=89.32%, accuracy_3D=86.01%, corrected for human variance levels). The most predictive VICE dimensions were related to gender, chin, cheeks, nose and eye-shapes. Similarity matrices based on our human-choice-aligned VGG-face models correlated highly with the corresponding BSMs ($R_{2D}=R_{3D}=0.88$; both $p<0.001$). ***Discussion***: Both computational models (CFEs) accurately fit human behavior and extracted relevant face features. However, we found only small differences in the face space between 2D and 3D, speaking for a perceptual invariance w.r.t. volumetric information during similarity judgements. That suggests that humans mainly rely on features that reside in 2D. To gain more insights, our approach could be extended to stereoscopic viewing conditions using virtual reality.

Poster: **B22** **Asli Akdeniz**

Effects of Prior Stimulation on Tactile Evoked Epidural Field Potentials in Rat S1 Cortex

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Introduction: Tactile exploration and mammalian navigation involve sequential limb movements which are accompanied by a continuous stream of somatosensory inputs. In the tactile modality, temporal relationship between those inputs may produce psychophysical masking or summation depending on various stimulus parameters. ***Methods***: This work investigates the neural effects of a vibrotactile stimulus (duration: 1 s) presented prior to the vibrotactile test stimulus (duration: 0.5 s) with a temporal gap (0.1 or 0.3 s). The stimuli were applied on the hind paw glabrous skin (plastic probe diameter: 1.9 mm) of anesthetized rats at various combinations of vibrotactile frequencies (5, 40, 250 Hz) and amplitudes (zero-to-peak 210-480 mm of sinusoidal displacements). Contralateral epidural field potentials (EFPs) were recorded from the rat S1 cortex by using platinum 16-channel mECoG electrodes (each active site diameter: 200 mm) and ×1000 amplification (bandwidth: 0.7-300 Hz). The EFPs were digitized, further band- pass filtered (2nd order, zero-phase Butterworth, 4-150 Hz), and time-averaged across 10 trials to study evoked activity of the test stimulus for each experimental condition. ***Results:*** The vibrotactile stimuli produced robust EFPs at stimulus onset and ended within 0.15 s. The presentation of the prior stimulus suppressed the EFPs for the test stimulus, such that their amplitudes decreased and latencies increased compared to those in trials with only the test stimulus. This suppression decreased as the temporal gap increased, and there were also significant main and interaction effects of prior/test stimulus amplitudes and frequencies. For example, higher prior stimulus levels produced higher suppression; and the greatest suppression occurred when the prior and test vibrotactile frequencies were 250 and 5 Hz, respectively. ***Discussion***: These results may be considered as the neural correlate of vibrotactile forward masking (albeit not at threshold level) and highlight the interaction between the effects of sequential vibrotactile inputs. This work can help improve the design and implementation of somatosensory neuroprostheses and brain-machine interfaces.

Poster: **B23** **Jellina Prinsen**

Progesterone-induced changes in heart rate across the menstrual cycle and its effect on cardiac interoception – rationale and study design

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Introduction: The brain-body connection holds substantial relevance for mental health and overall wellbeing. This connection partially relies on interoceptive competency, or the ability to accurately perceive signals arising from the own body. Notably, female participants perform significantly worse on cardiac interoceptive tests, suggesting that less accurate heartbeat perception may contribute to the heightened female-specific vulnerability for common psychopathological symptoms, such as anxiety symptoms and low mood. Despite the recent recognition that periods of hormonal change are a specific risk factor for female mental health, the role of hormonal factors in poor female cardiac interoception remains undetermined. Here, we propose that cyclical variation in the female resting heart rate across the menstrual cycle, coinciding with fluctuating levels of the ovarian hormone progesterone, underpins suboptimal female cardiac interoception. Given the stability of beliefs about one's average heart rate, it is expected that, particularly during the high-progesterone mid-luteal cycle phase when the resting heart rate is significantly elevated, a mismatch between these beliefs and the veridical heart rate occurs, resulting in somatic prediction errors. These errors, in turn, may contribute to the well-documented increase of psychopathological symptoms in the luteal cycle phase. ***Methods***: To investigate this proposed (in)sensitivity to cyclical changes in resting heart rate, thirty adult female participants (18-35 years) with a natural and regular menstrual cycle will undergo cardiac interoceptive testing twice during their menstrual cycle: once during the mid-follicular cycle phase (low progesterone, low resting heart rate), and once during the mid-luteal cycle phase (peaking progesterone, elevated resting heart rate). The adopted heartbeat detection task will be combined with simultaneous EEG-ECG recordings to examine the heartbeat-evoked potential (HEP) as an indicator of neural-attentional mechanisms during these different hormonal phases. The anticipated findings will provide first insights in the complex interplay between ovarian hormonal fluctuations, cardiac interoception and associated mental health vulnerabilities during the regular menstrual cycle.

Poster: **B24** **Agata Patyczek & Elias Reinwarth**

Mapping the Brain's Stress Response: Changes in Functional Cortical Gradients

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Introduction: The stress response facilitates adaptation to challenges, such as physical threats or psychological strains. The acute stress response is crucial for maintaining a healthy brain-body state. Chronic stress, however, can impair mental and physical health. Prior research indicates stress-induced alterations in functional connectivity within distinct cortical regions and brain networks, such as the Default Mode Network (DMN), Salience Network (SN), and Frontoparietal Network (FPN). Our study explores macroscale patterns, identifying large-scale connectivity changes linked to both acute and chronic stress. ***Methods:*** Acute stress was analysed in healthy young males who completed 3T rsfMRI before and after the Trier Social Stress Test (n=34) or a control intervention (n=33). Chronic stress was analysed in healthy young adults (n=142, 43 females), who completed the Trier Inventory of Chronic Stress (TICS) questionnaire. We used functional connectivity gradients to detect stress-related cortical changes. We focused on eccentricity (400 parcels, 3 gradients) and dispersion within and between networks (DMN, SN, FPN). ***Results:*** Acute stress-related changes in cortical gradients were found in the left insula, part of the SN, which shifted towards a connectivity profile more akin to somatomotor processing. The right ventral prefrontal cortex (vPFC), linked with the DMN, exhibited a more pronounced DMN-like connectivity profile. We show a significant disconnection of the DMN from the SN and FPN. We did not find evidence for the hypothesised association between chronic stress and cortical gradients. ***Discussion***: Our findings show an acute stress-induced shift towards externally-driven information processing. This is highlighted by the left insula's connectivity shift towards somatomotor processing, coupled with the dissociation of the DMN from other networks. The inconclusive findings for chronic stress may stem from the difficulties in defining and assessing chronic stress across individuals.

Poster Abstracts

Poster Session C

March 12, 2024 at 15:25-16:10 | Virtual March 13, 2024 at 13:15-13:50

Poster: **C01** **Lorena Cecilia López Steinmetz & Margarita Sison**

Machine Learning Models Identify Trajectories into Depression for Argentinean College Students during Periods of COVID-19 Quarantine: A longitudinal survey study

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Introduction: The COVID-19 pandemic has exacerbated mental health challenges, particularly depression among college students. Early detection of at-risk students is crucial but remains challenging, especially in developing countries. The use of data-driven predictive models offers a viable solution for addressing this need. This study aims to 1) develop, compare, and assess machine learning (ML) models for predicting depression presence in Argentinean students during the pandemic; 2) identify the key features driving depression prediction. ***Methods***: A longitudinal dataset (N = 1492 college students) captured T1 and T2 measurements during the Argentinean COVID-19 quarantine. ML models, including linear logistic regression classifier (LogReg), random forest classifier, and support vector machine (SVM), are assessed to predict depression presence using psychological inventories, clinical information, quarantine sub-period information, and demographics as features. Benchmarking against dummy models (uniform random baseline, most frequent baseline, and stratified random baseline) provides baseline references. Models performance on test data is assessed using five metrics: AUPRC, AUROC, Balanced Accuracy, F1 score, and Brier loss. Feature importance analyses are conducted to assess the predictive strength of each individual feature with respect to the target variable. All previously employed ML algorithms are applied to single features. The performance of multi- vs univariate models is compared using the mean AUPRC score. ***Results:*** The SVM and LogReg models demonstrate the highest performance (e.g., AUPRC: 0.76, 95% CI: 0.69, 0.81). Univariate classifiers, in particular

LogReg and SVM using depression at T1 (0.72, 95% CI: 0.64, 0.79) or anxiety scores (0.71, 95% CI: 0.64, 0.78) show performance levels close to those of the multivariate models including all features. ***Discussion***: These findings underscore the relevance of depression and anxiety in predicting depression during quarantine, emphasizing their comorbidity. ML models, particularly SVM and LogReg, show potential in timely detection of at-risk students, enabling preventive measures for improved mental health outcomes.

Poster: **C02** **Qiaoyue Ren**

Listen to your heart: Attentional trade-off between cardiac and visual domains

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Introduction: Internal bodily signals, such as heartbeats, can influence conscious perception of external sensory information. Spontaneous shifts of attention between interoception and exteroception have been proposed as the underlying mechanism, but direct evidence is lacking. ***Methods***: We used steady-state visual evoked potential (SSVEP) frequency tagging to independently measure the neural processing of visual stimuli that were concurrently presented but varied in heartbeat coupling. ***Results:*** Although heartbeat coupling was irrelevant to participants' task of detecting brief color changes, we found decreased SSVEP power for systole-coupled stimuli and increased SSVEP phase synchronization for diastole-coupled stimuli, compared to noncoupled stimuli. Furthermore, the coupling of visual stimuli to the systole led to a larger heartbeat evoked potential (HEP) but a smaller N2 component evoked by the color change. The increase in HEP amplitude was related to the decrease in N2 amplitude. ***Discussion***: These findings suggest that cardiac arousal automatically redirects attention from external to internal domains. Our study highlights the dynamic reallocation of limited processing resources between interoception and exteroception across the cardiac cycle.

Poster: **C03** **Corinna Kühnapfel**

Art as Intervention On the Effects of a Street-level Gallery Exhibition on Neighbourhood Connectedness, Satisfaction and Psychological Wellbeing

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Introduction: Publically visible art can stop us in our tracks. It offers us affordances to emotionally engage, to reflect or reorientate. This holds for public monuments, murals, but also for publicly available street-level gallery art. ***Methods***: In our study we assessed whether an open, street-level exhibition in Gallery Wedding, Berlin altered visitors' Connection to, and Satisfaction with the Neighborhood, and subjective Wellbeing. The exhibition aimed at a re-mediation of the relation to a neighborhood ("Job Center. Psychic Places," artist: Emily Hunt, curator: Solvej H. Ovesen). We stopped by-passers to engage with the exhibition and assessed their attitudes pre-post the experience. They also had to aesthetically evaluate the exhibition. ***Results:*** Preliminary results show that after engaging the exhibition, participants (N = 64) felt significantly more Connected to the Neighborhood and had improved subjective Wellbeing. We also assessed the curator's and artist's intended emotions. Here we found that when visitors felt the artists' intended emotions more, they exhibited higher subjective Wellbeing and Neighbourhood Connectedness after the exhibition. For our presentation, we will focus also on the subjective aesthetic evaluation of the art (as good, meaningful, etc.) and how it relates to the above changes. ***Discussion***: We will relate this to previous research and discuss both our method and the results with respect to the transformative potential of urban art.

Poster: **C04** **Alexander J. Hess**

Causality in the Allostatic Self-Efficacy Theory of Fatigue and Depression

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Introduction: The 'allostatic self-efficacy' theory (ASE), proposes that the subjective experience of fatigue arises when, in a situation of persistent dyshomeostasis, the brain arrives at the metacognitive diagnosis that its control over bodily states is failing; a condition also referred to as low allostatic self-efficacy. Once a generalisation of low self-efficacy beliefs beyond interoception has taken place, i.e., a general sense of helplessness and perceived lack of control, this is postulated to trigger the onset of depression. ***Methods***: In this work, we formalized the causal structure implied by the ASE theory in the language of causal inference, more precisely, in the form of a structural causal model (SCM) under assumptions of linearity and normality. In a pre-registered analysis (https://doi.org/10.5281/zenodo.10559656), we used data from a study on interoception of breathing to search for contradictions to the structure of the induced directed acyclic graph (DAG). Additionally, we estimated two causal effects that are of central interest to the ASE theory, using three different methods of estimation (linear regression, the 'propensity score' method, and double machine learning). ***Results:*** The data set contradicted the proposed DAG in two aspects. Moreover, across all three methods of estimation, we found a predicted and significant negative average causal effect from metacognition of allostatic control (M; i.e., the feeling of being in control over one's own bodily states) to fatigue (F). ***Discussion***: Our findings provide new insights regarding the causal structure of the ASE theory. The finding of a negative effect from M to F was predicted and confirms recently published results in the literature. Overall, our analysis represents a first empirical test of the causal structure implied by the ASE theory and identifies concrete directions for future research.

Poster: **C05** **Dina von Werder**

Perceptual and behavioral response to increased CO2 inhalation in patients with post-COVID

von Werder, D. [1, 2, 3], Aubele, M. [3], Tebbe, E. [3], Biersack, K. [3], Adorjan, K. [4], Stubbe, H. [5], Jörres, R. [6, 7], Nowak, D. [6, 7], Van den Bergh, O. [8], Glasauer, S. [1], & Lehnen, N. [3]

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Introduction: Persistent symptoms after COVID-19 are common and severely impact patients' quality of life. Currently, a comprehensive understanding of possible underlying mechanisms is lacking, preventing adequate treatm ent of patients. In this study, we investigated characteristic markers of breathing behavior and breathlessness perception during different breathing conditions regarding their potential to indicate dysfunctional processing of respiratory signals along the brain-body axis in patients with post-COVID. ***Methods***: We recruited 34 patients with post-COVID and 36 age- and gender-matched healthy control participants. During the experiment, individuals breathed either room air (baseline and recovery condition) or rebreathed CO2 enriched air (rebreathing condition, starting at 5% CO2). Breath-by-breath measures of breathing behavior and exhaled CO2 concentration were assessed, and individuals rated their current breathlessness on a scale from 0 to 100 every 10s. Group differences in breathing behavior and breathlessness were evaluated using Bayesian repeated-measures ANOVA (H1: model with factor group, H0: null model). ***Results:*** There was weak evidence (all Bayes Factors (BF) between $0.30 < BF10 < 0.73$) for equal breathing behavior and exhaled CO2 concentration in both groups for every breathing condition. There was moderate evidence ($BF10 = 4.37$) in the baseline and strong evidence in the rebreathing ($BF10 = 2088.71$) and recovery condition ($BF10 = 64.51$) for a group difference in breathlessness. ***Discussion***: Patients with post-COVID reported stronger breathlessness than healthy control participants in all tested breathing conditions, but at least on a group level this was not reflected in differences of breathing behavior or exhaled CO2 concentration. In other words, respiration-related sensory input, e.g., from stretch receptors in the lung and chemoreceptors, did not determine the experimentally observed differences in breathlessness. This points towards the involvement of top-down processes in symptom emergence.

Poster: **C06** **Wen Wen**

Control over self and others' face: Exploitation and exploration

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Introduction: The sense of agency, defined as the subjective experience of controlling one's actions and their consequences, is a fundamental aspect of human cognition. This study introduces a dual-mode theory that posits two underlying modes: Exploitation and exploration. Exploitation aligns with the comparator model, relying on prediction errors and a strong sense of self-agency, whereas exploration involves accounting for others' potential influence and a more flexible self-model. ***Methods***: We employed a face-motion mixing paradigm using a deep generative model to test our theory, manipulating the belief in control by having participants interact with their own face or someone else's face, with full or partial control. ***Results:*** The results supported our hypothesis, showing that controlling one's own face, linked to stronger control beliefs, was associated with less movement diversity and sharper drop in agency rating when small discrepancies were presented, compared to controlling someone else's face, which engaged exploratory behavior and yielded higher agency ratings and more varied movements. ***Discussion***: These findings contribute to understanding how beliefs in control influence action policies and perceptual sensitivities. The proposed dual-mode theory offers a comprehensive understanding of the dynamic interplay between exploitation and exploration modes of agency, providing a useful framework to predict and interpret the nuanced ways in which individuals experience and exert control in varying contexts.

Poster: **C07** **Cecilia Roselli**

How intentionality of actions affects individual and vicarious Sense of Agency towards humanoid robots

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Introduction: Sense of Agency (SoA) is the feeling of being in control over one's actions and their outcomes. However, people can experience a "vicarious" SoA towards another agent, being another human, or an artificial agent such as a robot. One of the most common measures of implicit SoA is the Intentional Binding (IB) effect, which is thought to be stronger when the causing action is intentional. However, it is still unclear whether the same occurs also for vicarious SoA towards robots. ***Methods***: In two experiments, participants performed an IB task both alone and with the humanoid robot iCub. In both experiments, the nature of the causing actions remained the same, i.e., physical actions producing a tone sensory outcome. However, in the Voluntary Condition both self- and iCub-generated actions were intentionally performed, whereas in the Involuntary Condition they were both unintentional passive movements externally triggered by a mechanical lever. The two experiments were identical, except for the critical event of interest: in Experiment 1, participants judged the occurrence of actions (Action IB), whereas in Experiment 2 they judged the occurrence of tone outcomes (Tone IB). ***Results:*** Results of Experiment 1 showed that participants experienced SoA over self-generated actions only when they were intentional; however, SoA over iCub's actions always occurred, despite the nature of the causing action (intentional vs. unintentional). In Experiment 2, results showed that participants always experienced SoA over tone outcomes, at both individual and vicarious levels. ***Discussion***: Taken together, our findings show that the intentionality of actions plays a role in the emergence of SoA, despite differently between self- and robot-generated events. Furthermore, they highlight a dissociation in implicit SoA (in the form of the IB effect) according to the critical event of interest, thus showing that Action and Tone IB might be driven, at least in part, by different mechanisms.

Poster: **C08** **Daniel Kluger**

Respiration-locked excitability changes in health and disease

Daniel Kluger
[1] University of Münster

Introduction: An ever-increasing body of work continues to highlight the role of respiration in neural processing. Respiration-locked changes in cortical excitability constitute one candidate mechanism by which the breathing rhythm is thought to modulate brain activity. ***Methods***: I present M/EEG and respiratory data from a series of studies in healthy participants as well as a case study of a focal epilepsy patient. ***Results:*** Our results suggest that respiration actively aligns sensory information sampling with transient periods of heightened excitability to facilitate perception. At rest, fluctuations of aperiodic brain activity (1/f slope) are phase-locked to the respiratory cycle, which suggests that spontaneous state shifts of excitation-inhibition (E:I) balance are at least partly influenced by bodily signals. Differential temporal dynamics in their coupling to non-oscillatory and oscillatory activity raise the possibility of a functional distinction in the way each component is related to respiration. In a clinical application, we show that i) respiration differentially modulates E:I balance in focal epilepsy (compared to controls) and ii) the timing of interictal epileptiform discharges (IEDs) depends on both excitability and respiratory states. ***Discussion***: These findings overall suggest an intricate interplay of respiration phase-locked changes in cortical excitability which in turn influence perceptual processes in healthy participants. In the case study of a focal epilepsy patients, breathing-related variation in excitability states appears to contribute to the consequential susceptibility for IED generation.

Poster: **C09** **Lina Skora**

Pupillary markers of noradrenergic activity under brief and long pulses of transcutaneous auricular Vagus Nerve Stimulation.

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Introduction: Transcutaneous auricular Vagus Nerve Stimulation (taVNS) is a non-invasive technique increasingly applied as a tool in clinical, psychophysiological, and behavioural research. Yet, the mechanism of action remains unclear, and the effects on neuromodulatory systems are poorly understood, largely due to differences in stimulation parameters across studies. Recently, it was proposed that vagal stimulation leads to changes in putative physiological markers of noradrenergic activity including pupil dilation, salivary alpha amylase, P300, and alpha oscillations. ***Methods***: In this pre-registered study, we compare pupil dilation under phasic (1s) and tonic (30s) taVNS, in a task-free, single-blind, sham-controlled, within-subject crossover design. ***Results:*** Pupil dilation significantly and rapidly increased under active phasic taVNS stimulation compared to sham, and rapidly declined after stimulation offset. Surprisingly, tonic taVNS induced a similarly rapid (and larger than sham) increase in pupil size, returning to baseline within 5 s, despite ongoing stimulation. As such, we show that both active and sham tonic modes closely resembled the phasic effect, without any sustained effects of stimulation on tonic pupil size. ***Discussion***: This result suggests that brief taVNS pulses under standard parameters may be better suited for noradrenergic manipulation in behavioural tasks than longer stimulation trains, and sheds light on the temporal profiles of brief and long stimulation patterns, with implications for their applicability in further research.

Poster: **C10** **Lioba Enk**

The effect of cardiac phase on distractor suppression and motor inhibition in a stop-signal task

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Introduction: It has been suggested that perception and action are affected by the interplay of exteroceptive and interoceptive processing. In the motor domain, studies have evidenced links between systolic baroreceptor firing and inhibition efficiency as well as deliberate execution. Yet, to perform in such paradigms exteroceptive relevant cues, for instance, stop-cues, need to be selected from irrelevant distracting information to perform efficiently. Interestingly, previous work in the field of perception hints to cardiac phase dependent fluctuations in sensitivity favouring diastole. Integrating that, we investigated how the temporal alignment of distracting visual information to different cardiac phases (systole vs. diastole) impacts upon motor inhibitory performance. We hypothesized that distractor signals moving at cardiac diastole would be cancelled out less efficiently with downstream effects on task performance. ***Methods***: Forty young, non-clincial adults participated in a stop-signal task in which they were to press a button after go-cue onset but to inhibit their response once a stop-signal followed the go-cue. Simultaneously, we presented several task-irrelevant dots on screen that were timed to move either at cardiac systole or diastole; as control, no distracting dots were shown in a third condition. EEG and ECG were recorded. ***Results:*** Behaviourally, participants were better at inhibiting their motor response in systole relative to diastole distractor trials. Electrophysiological evidence indicated that systole bound distractors were suppressed more effectively than diastole bound distractors. This led to elevated N2 amplitudes in response to the stop-signal as well as enhanced P2 amplitudes in response to error feedback on stop trials. ***Discussion***: We highlight cardiac timing related fluctuations in selection efficiency of visual distracting information with subsequent detrimental effects on motor and feedback processing. Our findings hereby suggest that the relevance of a sensory input for given contextual affordances determines whether its temporal alignment with afferent cardiac feedback turns out to be beneficial or not.

Poster: **C11** **Ulrich Stoof**

Integration of multi-modal datasets to relate clinical symptomatology to (neuro)biological foundations in neurological disorders: A case study for intracranial EEG and neuroreceptor densities

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Introduction: Understanding links between clinical measures of brain function and their underlying molecular, synaptic constraints is essential for developing and utilizing personalised interventions. We developed an approach to integrate electrophysiological data, such as iEEG recordings, and microscale synaptic data, such as neuroreceptor density maps, and derived a normative map of effective synaptic parameters across the cortical surface. ***Methods***: We first asked if a canonical microcircuit model can replicate iEEG spectra. Using a parametric empirical Bayesian hierarchical model, we then tested if receptor density variance across the cortical surface can be predicted by iEEG signals, and if regional receptor compositions ('fingerprints') can explain regional variation in iEEG spectra and model parameters. In addition, to illustrate the wider applicability of our findings, we used mismatch negativity as a case study to show improved predictions with our informed connectivity parameters' priors. ***Results:*** First, our DCM model replicated ongoing awake cross spectral densities of iEEG signals (1770 data series) highly accurately; with 40 exceptions (≅ 2.3% of the total number) DCM was able to generate key components of regional cortical signal variability. Secondly, using principal component analysis we captured regional receptor composition variability and showed that the derived principal components explain regional variation of iEEG spectra. Third, we showed that our normative parameter priors, which include receptor density information, are informative for modelling mismatch negativity and lead to significantly higher model evidence and fit, and improved parameter posteriors. ***Discussion***: In summary, we show how tissue characteristics (i.e., receptor density) can be incorporated to improve biophysically grounded models and explain regional variations in electrophysiology. This principled, hierarchical approach is data agnostic and can be used to test hypotheses related to cognitive and medical questions.

Poster: **C12** **Katharina Kühne**

No Evidence of the Red-Attraction Effect in Human-Robot interaction

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Introduction: The red-attraction effect is a psychological phenomenon where the color red, specifically in clothing or picture backgrounds, is associated with an increased perception of attractiveness in human interactions. Despite the common assumption that robots are treated as social actors akin to humans, little is known about the applicability of the red-attraction effect in the context of human-robot interaction. ***Methods***: In an online experiment, 78 participants evaluated six social robots with different human-likeness across dimensions of attractiveness, trust, likeability, and willingness to spend money on the robot. Two groups were exposed to images of these robots on either a red or white background. ***Results:*** The background color exhibited no impact on attractiveness ratings or participants' willingness to invest in the robots. Ratings for trust and likeability also remained consistent across both groups. Importantly, a consistent and statistically significant effect emerged concerning human-likeness, wherein robots with moderate human-like features garnered the highest ratings across attractiveness, trust, likeability, and willingness to spend money. ***Discussion***: These findings are consistent with the principles of the uncanny valley hypothesis. They are also in accordance with recent research advocating for a moderate level of human-likeness in robots to enhance interaction effectiveness. Our study underscores the importance of leveling human-like attributes in social robot design and contributes crucial insights for shaping human-robot interaction dynamics.

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

The power of motivation: Motivational mindsets facilitate early but not late inhibition towards unhealthy food

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Introduction: Understanding unhealthy eating patterns is crucial to developing interventions and policies that prevent the detrimental effects on people's health such as obesity and various other diseases. It is therefore important to understand what causes people to inhibit responses towards unhealthy food. Existing research has focused on the impact of limited inhibitory control capacity. In contrast, the present study aimed to investigate the impact of motivation on food-specific inhibitory control, bringing a novel approach to self-control failure. We, therefore, tested whether a motivational mindset to eat healthily (versus to enjoy tasty food) facilitates inhibition towards unhealthy food at early and later stages of inhibition initiation. ***Methods***: 36 university students completed both a Go/No-Go Task and a Stop Signal Task with food and neutral pictures. We selected food items in the inhibition tasks based on an initial survey. In a within design, we induced motivation mindsets to eat healthily versus to enjoy tasty food in a secondary task (Go/No-Go Task) or as part of the task (Stop Signal Task). ***Results:*** A healthy motivational mindset facilitated inhibition performance towards unhealthy food items in the Go/No-Go task compared to the indulgence mindset condition ($p<.05$). However, we found no evidence of the impact of motivation on inhibition when inhibitory control capacity was measured by the Stop Signal Task, reflecting that these two cognitive tasks might be targeting different mechanisms involved in food-specific inhibition. ***Discussion***: Our study provides evidence that motivation influences food-specific inhibitory control capacity but only if measuring early initiated inhibition. We aim to extend this by experimentally manipulating different brain areas associated with inhibitory control and motivation with non-invasive brain stimulation techniques.

Poster: **C14** **Gina-Isabelle Henze**

Testing the Triple Network Hypothesis in a Largescale Biopsychological Sample: Neural Responses to Psychosocial Stress

Henze, G.-I. [1,2], Bärtl, C. [3], Giglberger, M. [3], Peter, H.L. [3], Konzok, J. [4], Kreuzpointner, L. [3], Speicher, N. [3], Streit, F. [5], Veer, I. [1,6], Erk, S. [1], Kirsch, P. [7], Kudielka, B.M. [3], Nichols, T.E. [2,8], Wüst, S. [3], & Walter,

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Introduction: Over the past decades, many attempts have been made to determine neural response patterns to acute stress exposure. The initial focus was thereby on incorporating established and reliable laboratory stressors into the scanner environment. Based on the most widely used laboratory stress induction paradigm in the world, the Trier Social Stress Test (TSST), ScanSTRESS was developed and has been implemented in numerous functional magnetic resonance imaging (fMRI) studies. ***Methods***: In general, psychosocial stressors all have the systematic manipulation of three key stress-eliciting components in common, namely social-evaluative threat, negative feedback, and forced failure. Recently, it has been suggested that precisely these psychosocial stress components trigger responses in different structures of the human brain and that these structures can be subdivided into three well-defined networks that are both functionally and structurally distinct. Following this so-called triple network hypothesis of neural stress processing it is assumed that psychosocial stress in particular recruits only two of the three included networks. In addition to the salience network (SN), comprising the amygdala, insula, and anterior cingulate cortex, the default mode network (DMN), involving the medial prefrontal cortex, posterior cingulate cortex, and more broadly the hippocampus, appear to be specifically engaged in psychosocial stress processing. Remarkably, the stress inducing component of negative feedback, however, appears to ultimately render the third stress network, the central executive network (CEN), less responsive. ***Results:*** The aim of our study is therefore to test this hypothesis on the basis of a large-scale biopsychological sample exposed to the ScanSTRESS paradigm. Based on data from approximately 500 female and male subjects, we will investigate whether psychosocial stress components lead to responses in the SN and DMN at the expense of the CEN. ***Discussion***: Results on task-based activation and deactivation patterns as well as psychophysiological interactions (PPI) will be presented at the conference.

Poster: **C15** **Tahnée Engelen**

In search of interoceptive profiles: do the heart, lungs, and stomach influence the motor cortex the same way?

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Introduction: The rhythms of the heart, lungs, and stomach interact with cognition, exteroception, and action, as well being coupled to a widespread network of brain areas. While many similarities between these organs exist (shared afferent pathways, general function of keeping the organism alive), they also show many specificities (rhythms at distinct frequencies, dedicated pathways, and respective functions). Despite this, interoception is typically defined in a holistic manner, and the extent of organ specificity in brain-body interactions rarely empirically tested. We here aim to bridge this gap by assessing whether the cardiac, respiratory, and gastric rhythm are coupled to the excitability of primary motor cortex, and whether this coupling occurs in an organ-specific or organ-general manner. ***Methods***: We combined continuous physiological recordings with single pulse Transcranial Magnetic Stimulation (TMS) to probe phase-amplitude coupling between the phase of the cardiac, respiratory, and gastric rhythm and the amplitude of Motor Evoked Potentials (MEP). ***Results:*** The phase of both cardiac and respiratory rhythms was coupled to MEP amplitude, with increased excitability in the early phase of the cardiac cycle, and in the transition phase from expiration to inspiration in the respiratory cycle. There was no gastric-MEP coupling. Participants showing high cardiac-motor coupling did not necessarily display high respiratory-motor coupling. ***Discussion***: We find that cardiac and respiratory, but not gastric, phase is coupled to motor cortex excitability. Cardiac and respiratory contributions to motor excitability are only partially independent, ongoing analyses will further probe whether heart rate mediates part of their joint influence. We will also test whether interoceptive influences on MEPs co-vary with cardiac, respiratory and gastric conscious interoception evaluated with questionnaires.

Poster: **C16** **Einav Gozansky**

Assessment of Pain Sensitivity in Healthy Females Using Multimodal Approach

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Introduction: Various cognitive and emotional processes influence pain perception via the descending pain modulatory system. Although pain regulation via the descending pain pathway was studied intensively, between-person variability in pain sensitivity and regulation remains poorly understood. Thus, this study aimed to comprehensively examine the cognitive and emotional correlates of pain, and to specifically test the inhibitory role of the vagal tone. ***Methods***: Eighty-six healthy females completed a battery of questionnaires measuring anxiety, mood, and conceptions about pain, and performed two tasks measuring attention bias towards pain (i.e. pain perceptual load task (PL) and pain dot-probe). Afterward, they underwent a baseline pain assessment using quantitative sensory testing (QST) simultaneously with electrocardiogram recording. QST is a multimodality pain assessment approach that includes ratings of suprathreshold heat pain stimuli and conditioned pain modulation (CPM), as well as evaluation of cold-water pain threshold and tolerance using the cold pressor test (CPT). ***Results:*** Higher distraction from pain-related pictures in the PL task correlated with higher pain ratings of suprathreshold heat pain stimuli [r=.22, p=.044]. Moreover, higher interference from pain-related words in the dot-probe task correlated with higher fear of pain [r=.264, p=.015] and with heightened HR during CPM recovery [r=.394, p<.001]. In addition, the root mean square of successive differences between normal heartbeats (rMSSD) before the CPT was correlated with both lower pain threshold [r=.241, p=.019] and lower pain tolerance [r=.283, p=.009]. ***Discussion***: Our preliminary results suggest that attention bias to pain-related information is related to lower pain regulation abilities, as manifested by heightened sensitivity to pain as well as by difficulties in recovering from pain. Additionally, higher vagal activation before the experience of pain predicts both decreased pain sensitivity and enhanced pain regulation. Thus, our results emphasize the importance of multimodality pain assessment for understanding the various aspects of pain sensitivity.

Poster: **C17** **Elias Mansour**

Continuous Monitoring of Psychosocial Stress by Non-Invasive Volatilomics

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Introduction: Stress is becoming increasingly commonplace in modern times, making it important to have accurate and effective detection methods. Currently, detection methods such as self-evaluation and clinical questionnaires are subjective and unsuitable for long-term monitoring. There have been significant studies into biomarkers such as Heart Rate Variability (HRV), cortisol, electrocardiography and blood biomarkers, but the use of multiple electrodes for electrocardiography or blood tests are impractical for real-time stress monitoring. To this end, there is a need for non-invasive sensors to monitor stress in real-time. This study looks at the possibility of using breath and skin Volatile Organic Compounds (VOCs) fingerprinting as stress biomarkers. ***Methods***: The Trier Social Stress Test (TSST) was used to induce acute stress and HRV, cortisol and anxiety levels were measured before, during and after the test. Gas Chromatography – Mass Spectrometry (GC-MS) and sensors array were used to collect and measure VOCs. ***Results:*** A prediction model found eight different stress-related VOCs with an accuracy of up to 78%, and a molecularly capped gold nanoparticles-based sensor revealed a significant difference in breath VOCs fingerprint between the two groups. ***Discussion***: These stress-related VOCs either changed or returned to baseline after the stress induction suggesting different metabolic pathways at different times. A correlation analysis revealed an association between VOCs and cortisol levels, and a weak correlation with either HRV or anxiety levels, suggesting that VOCs may include complementary information in stress detection. This study shows the potential of VOCs as stress biomarkers, paving the way into developing a real-time, objective, non-invasive stress detection tool for wellbeing and early detection of stress-related diseases.

Poster: **C18** **Moritz Gerster**

Levodopa-induced spectral modulation of STN-LFPs in Parkinson's disease patients - a multi-center comparison

Gerster, M. [1, 2], Waterstraat, G. [3], Radzinski, L. [3], Binns, T. [2, 4], Koehler, R. [2, 4], Vanhoecke, J. [2, 4], Krause, P. [4], Faust, K. [5], Schneider, G-H. [5], Kühn, A. A. [4], Sure, M. [6], Todorov, D. [6], Hirschmann, J. [6], Florin, E. [6]

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Introduction: Parkinson's disease (PD) can be effectively treated with subthalamic nucleus (STN) deep brain stimulation (DBS). Many studies have investigated the pathophysiology of PD using DBS-STN recordings after withdrawal and administration of dopaminergic medication. While this field of research has been rapidly growing, it faces three major challenges: 1) the considerable inter-subject variability along with small sample sizes, 2) differences in practices among DBS centers, and 3) heterogeneity in data analysis methods. ***Methods***: To tackle 1) and 2), we have aggregated data from 170 STNs across five DBS centers. We assess the variability across centers and examine how levodopa therapy influences STN activity in a within-subject comparison. Regarding 3), we enhance the reliability of our conclusions by applying a range of analysis techniques previously used in the field, assessing the robustness of our findings. ***Results:*** We confirm levodopa-induced low- and high beta power reductions ($p<1e-5$). Further, we reproduce dopamine-induced increases of Theta, Finely Tuned Gamma (FTG), and High-frequency oscillations (HFO). In contrast to earlier studies, we avoided spectral normalization, which can cause spurious band power changes. Robustness is confirmed using different definitions of spectral power. Further, the specific channels picked for analysis have little impact on the results of frequency bands below 50 Hz. However, channel selection appears crucial to studying FTGs and HFOs as they are highly focal. ***Discussion***: Leveraging the growing number of STN recordings across centers will pave the way to more generalizable research.

Poster: **C19** **Franziska Wagner**

Stroke survivors exhibit initial decreased reward sensitivity, potentially guiding rehabilitation.

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Introduction: Stroke stands as major contributor to acquired disability, underscoring the need for immediate and extensive neurological rehabilitation. The rehabilitation phase often encounters obstacles, notably in learning new skills or relearning those that were lost, which is a critical component of recovery. Rewards play an integral role in the learning process, particularly in reinforcing positive behavior and enhancing learning outcomes. Therefore, a deeper comprehension of the reward system's impact on stroke rehabilitation could yield valuable insights into improving rehabilitation strategies. Neuroplasticity is a hallmark of successful behavioral rehabilitation, as it underpins the recovery of motor function. From previous research (Wagner et al., 2023), we hypothesize that reward system functionality is fundamentally linked to motor learning abilities after stroke. We propose that these systems recover simultaneously, yet there is an apparent gap in understanding how their recovery timelines interact. ***Methods***: In this longitudinal cohort study are assessed at the onset of stroke and subsequently at 3, 6, and 12 months post-stroke. Motor learning is evaluated using the Sequential Reaction Time Task (SRTT), while the Monetary Incentive Delay Task (MID) measures reward system activity. Magnetoencephalography (MEG) and electroencephalography (EEG) are employed to assess the functional connectivity of these systems. ***Results:*** Initial results indicate that stroke patients have diminished reward sensitivity and require greater incentives for performance enhancement. Concurrent learning deficits and a decrease in neural connectivity within frontal and temporoparietal regions suggest a disruption of the reward system by acute stroke, affecting behavioral outcomes. Notably, the degree of learning impairment correlates with the extent of reward sensitivity reduction, emphasizing the impact of reward processing on rehabilitation potential. ***Discussion***: Initial results indicate that stroke patients have diminished reward sensitivity and require greater incentives for performance enhancement. Concurrent learning deficits and a decrease in neural connectivity within frontal and temporoparietal regions suggest a disruption of the reward system by acute stroke, affecting behavioral outcomes. Notably, the degree of learning impairment correlates with the extent of reward sensitivity reduction, emphasizing the impact of reward processing on rehabilitation potential.

Poster: **C20** **David Haslacher**

Frontal delta oscillations mediate heartbeat perception

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Introduction: The ability to accurately perceive one's own bodily signals, such as the heartbeat, plays a vital role in physical and mental health. However, the neurophysiological mechanisms underlying this ability, termed interoception, are not fully understood. Previous work has demonstrated that rhythmic fluctuations of visual and somatosensory perception are linked to the heartbeat, but the neuronal substrate of this link remains unclear. ***Methods***: Participants (N = 24) performed a heartbeat detection task while electroencephalography (EEG) was recorded. We used amplitude-modulated transcranial alternating current stimulation (AM-tACS) synchronized with the hearbeat to enhance and suppress frontal delta oscillations in a phase-specific manner. We applied stimulation artifact source separation (SASS) to EEG data recorded in the presence of AM-tACS to assess frontal delta oscillations. ***Results:*** In absence of AM-tACS, we found that frontal delta synchrony was anticorrelated with the heartbeat-evoked potential ($r = -0.604$, $p = 0.0018$) and higher during incorrectly than during correctly detected heartbeats ($t(23) = 1.61$, $p = 0.044$). In the presence of AM-tACS, we found that the change in delta synchrony predicted the change in heartbeat detection accuracy ($r = -0.411$, $p = 0.0231$). ***Discussion***: These findings suggest that frontal delta oscillations play an important causal role in heartbeat perception. As theories of emotions differ in the role they attribute to the perception of bodily signals, the methodological approach presented here could be used to test such theories. Finally, neuromodulation of frontal delta oscillations should be explored in a clinical setting for the treatment of psychiatric disorders featuring alterations of interoception.

Poster: **C21** **Magdalena Gippert**

Motor Imagery influences performance beyond the imagined action: Imagery of prior movements enhances motor adaptation

Gippert, M. [1], Shih, P.-C. [2], Heed, T. [3], Howard, I. S. [4], Jamshidi, M. [1,5,6], Villringer, A. [1,7], Sehm, B. [1,8,*], Nikulin, V. V. [1,∗]

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Introduction: Most movements in daily life do not occur in isolation but are embedded within a sequence. Linked movements like this have been shown to influence the execution of prior and following motor actions and can even facilitate adaptation during reaches through opposing force-fields. We investigated whether the facilitative effect of linked movements could also be achieved with kinesthetic motor imagery of prior movements. Additionally, we aimed to identify neuronal correlates of motor imagery predicting such motor learning. ***Methods***: Movement kinematics (exoskeleton robot, Kinarm Lab) and EEG (64 electrodes) of 60 participants were recorded to investigate direction-specific adaptation during a reach of the right arm in an interference force-field paradigm. We compared performance of three experimental groups: 1) no prior movement (visual static cue) 2) active prior movement, 3) motor imagined prior movement. ***Results:*** In line with previous research, we showed that active prior movements facilitate adaptation to opposing force-fields, while visual static cues do not. Moreover, we found that motor imagery of prior movements can induce motor adaptation as well. In addition, our results indicate that post-imagery event related synchronization of alpha and beta oscillations can serve as an indicator of successful motor adaptation. ***Discussion***: Altogether our results go beyond a simple demonstration that motor imagery resembles performance of an actual movement in the brain. We show that the neuronal processes, underlying motor imagery of parts of a motor sequence, can be related to motor adaptation. This suggests that imagining a linked movement can be used to enhance motor performance of real movements.

Poster: **C22** **Ana Böke**

Can illusory percepts be affected by sensory interhemispheric inhibition? A somatosensory EEG study based on the cutaneous rabbit effect.

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Introduction: Sensory detection is characterized by remarkable variability: While some illusory stimuli are perceived as real, some veridical stimuli are not perceived at all. The well-established cutaneous rabbit effect (CRE) is an example of this. The CRE can be described as a mislocalization of tactile stimuli, often presented on the arm, in which a stimulus is felt on a spot that is not stimulated. According to Dendritic Integration Theory (DIT), feedforward sensory information, arriving at basal dendrites of cortical pyramidal cells, interacts with feedback signals at the apical dendrites, which together determine the perceptual outcome. Yet, this mechanism is still without empirical evidence in humans. The CRE may allow to directly test the dependence of somatosensory perception on feedback signals in apical dendritic activity, given that the induced illusion should correspond to a percept without feedforward input from the perceived bodily location. ***Methods***: To study these mechanisms in humans non-invasively, we combine the CRE with sensory interhemispheric inhibition (IHI), which has been shown to specifically target apical dendrites, and record electroencephalography (EEG). To increase the detectability of EEG responses, stimuli are presented across the fingers, instead of the typical forearm design. ***Results:*** First behavioral pilots confirmed that it is possible to evoke the CRE in fingers (in about one third of trials) albeit with a smaller perceptual counterpart; compared to the forearm illusory stimuli they were perceived as weaker, therefore making them easier to distinguish from veridical stimuli. ***Discussion***: To achieve a more robust illusion, we will present stimuli at different intensities. We expect IHI to lead to an attenuation of the CRE and mechanistically to an attenuation of feedback processes thus providing evidence for DIT. In EEG recordings, this could be seen as a reduction of evoked responses, where bigger effects may also correlate with stronger attenuation of the sensory illusion.

Poster: **C23** **Rosa Großmann**

Investigating Recurrent Processing in Visual Conscious Perception - Methodological Considerations

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Introduction: Recurrent processing is thought to be the neural substrate of consciousness. Manipulating the strength of feedback projections by using NMDA receptor antagonist memantine allows testing its role in perceiving ambiguous visual stimuli, and is a promising way to crystallize the causal relationship between recurrent processing and conscious perception. However, the experiment needs to be carefully designed and tested for perceptual learning effects and realistic control conditions. Furthermore, it is unclear whether memantine influences eye movements, response capabilities or mental state of participants. Ensuring this is crucial as any observed results can be directly attributed to the manipulation of recurrent processing. ***Methods***: This study consists of a proof-of-concept study and a main study. The main study is a double-blind placebo-controlled within-subject study with three sessions, each including two bistable perception experiments and the figure ground segregation task. Memantine was administered in either the second or the third session. Before that, we ran the proof-of-concept study without the administration of memantine, to test the quality of the paradigm. ***Results:*** The average percept duration in the ambiguous paradigms was 8 seconds in the rotating sphere and 4 seconds in the binocular rivalry experiment. Average percept durations varied individually and the variance was high. Percept durations did not change significantly across experimental blocks or sessions. In the figure-ground experiment, participants' fixation and response times were not influenced by memantine. Mood scales in placebo sessions were not significantly different from the scales in memantine sessions. ***Discussion***: Visual percepts and behavioral responses over three experimental sessions were stable and showed no perceptual learning effect. Percept durations of the unambiguous control stimuli should be adapted and individually set for each participant. Memantine did not affect mood, visual fixation ability, or response times. Overall our project shows that the experimental design and the administration of memantine is a suitable method to manipulate feedback processing.

Poster: **C24** **Maria Azanova**

Heart rate scales with prediction error

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Introduction: Recent conceptualizations of cardiac deceleration in adaptive environments suggest that heart slowing improves the precision of perception by reducing the frequency of noisy events associated with heartbeats. Prediction error, the difference between an expectation and an outcome, is key to the learning process and signals a need to integrate new evidence. However, it is unclear how heart rate scales with various prediction errors and how such heart rate dynamics relate to the neural reaction to feedback. ***Methods***: To investigate this, we combined EEG and ECG recordings during a probabilistic learning task in 37 participants. We used computational modeling (Q-learning) to extract prediction errors and Bayesian mixed linear models to examine their interaction with cardiac and neural responses. To study cardiac responses, we assessed the change in the inter-beat interval (IBI) of the first heartbeat after feedback. To study neural responses, we computed average amplitudes of feedback-related negativity (FRN) and P300. ***Results:*** We found that heart rate slowed more with larger prediction errors. Furthermore, only when feedback appeared earlier in the heart cycle phase (i.e., systole) was heart slowing positively associated with P300 but not with FRN. ***Discussion***: Therefore, we show it is possible to detect instant IBI scaling with prediction error. Our findings provide insight into the cardio-behavioral states involved in learning and highlight the critical role of heart slowing. This has further implications for understanding how cognitive processes are affected by disturbances in heart-brain interactions, e.g., for learning in anxiety.

Poster Abstracts

Poster Session D

March 12, 2024 at 16:10-16:55 | Virtual March 13, 2024 at 13:50-14:25

Poster: **D01** **Simon M. Hofmann**

scilaunch your research project

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Introduction: Driven by pressing search for discoveries, as researchers we tend to neglect keeping our digital drawer tidy, quickly ending up in a jungle of project files and folders, which ultimately slow down our process. Finding a well-attuned project structure can take months of experience or several project iterations. The (re-)organization of projects can turn out to be a critical time-sink for scientists and their supervisors or (future) collaborators. Here, we introduce scilaunch, a single command-line tool that helps researchers to kick-start their projects. scilaunch initializes a canonical project structure and includes a pre-configured setup for a code environment, version control, and example files and folders, which aim to nudge the users to remain on a reproducible path, while their project grows. ***Methods***: Installing scilaunch requires Python (v.3.8 or higher) and can be easily archived by running pip install scilaunch in the terminal (Linux, macOS, Windows). Now, a new project can be launched by typing scilaunch in the terminal. scilaunch offers to set up a conda environment, in which research code is pre-installed as Python package, which eases code development. Moreover, the structure can be populated with other programming languages as well. For more information see https://shescher.github.io/scilaunch/. ***Results:*** - ***Discussion***: With scilaunch we provide a tool, which aims to be simple to use and offers a quick start into new projects. Also existing projects can be quickly transferred into the canonical structure provided by scilaunch, that can help research groups and collaborators to operate from a familiar base.

Poster: D02 **Paula Guiomar Alarcón de Antón**

Study on metacognition of affective states

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Introduction: Research in metacognition (the capacity to reflect on, monitor and control first-order cognitive processes) has traditionally focused on memory and perceptual processes, yet the metacognitive aspect of emotional processes remains unexplored. Being inspired by Garfinkel's three-dimensional model of interoceptive processes, this project aims to quantify and potentially establish the construct "metacognition of emotion", i.e. to what extent we are able to correctly recognize the affective states we experience at a given moment. ***Methods***: For that purpose, we are developing an affective picture viewing task with confidence ratings, plus EEG, and pupillometry measurements, to evaluate the correspondence between participant's neurobiological correlates of emotion with subjective reports of emotion and their confidence in such evaluations. We will assess these metacognitive abilities in a normative sample of healthy individuals. Study participants will also complete a battery of psychological assessments and other behavioural tasks (interoceptive, emotion recognition task, memory…) ***Results:*** We predict metacognitive evaluations of emotional experiences to originate only above a certain intensity threshold. We also expect to find correlations between metacognitive performance in the emotion introspection, emotion recognition, and interoceptive tasks, but not with a memory task. We also predict to find positive correlations between the behavioural measure of metacognition of emotion and questionnaire scores of psychological assessments of alexithymia, emotion regulation skills, mindfulness; and negative correlations with symptoms of psychopathology or neurological conditions such as anxiety, depression, or autistic traits. ***Discussion***: The contributions of this study are twofold. First, it will give insight for the first time, whether we meta-represent our emotional experiences, and what psychological factors, like certain personality traits or symptoms of psychopathology, are related to this skill. This may have implications for the understanding of mental health disorders and potential mechanisms mediating well-being interventions. Second, this study will contribute to the current debate of domain-generality vs domain-specificity theories of metacognition.

Poster: D03 **Piotr Bekier**

Why cognitive sicence should take over the topic of social fasilitation? - transition from behavioral to cognitive perspective

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Introduction: Social facilitation is a social phenomenon in which individuals perform a task (e.g. pursuit rotor task, finger maze learning) better or worse in the presence of others than when they perform the same task alone. The drive theory was the first to propose an explanation of why results improved in some tasks in a social situation and deteriorated in others, drawing on Hull-Spence behavior theory. For the most part, this perspective dominated the view of social facilitation, with the discussion shifting towards attempting to explain the social factors that may trigger the mechanism described by the theory. ***Methods***: My work aims to demonstrate that despite the development of cognitive psychology and cognitive science, social facilitation can still be perceived fundamentally as a behaviorist doctrine. I will show why this way of thinking is inappropriate and inhibitory for the advancement of research on social facilitation, presenting research results that contradict the drive theory. ***Results:*** I will use the method of comparative analysis and case studies to show that attention and cognitive control are key factors determining the positive or negative impact of social facilitation. I will present socio-cognitive factors that may mediate changes in attentional processes and cognitive control, aiming to show that these factors and changes in processes have common elements with theory of mind. ***Discussion***: Thus, I want to open a discussion on whether the phenomenon of social facilitation is simply a by-product of our socio-cognitive processes essential for functioning in society and responding in a social environment.I will argue that research on social facilitation can contribute something new to the issue of social brain – i.e., whether we should view the brain as an organ with separate subsystems for responding in social and non-social conditions.

Poster: D04 **Fabian Kiepe**

Sensory attenuation of self-initiated tactile feedback is modulated by stimulus strength and temporal delay in a virtual reality environment

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Introduction: Despite extensive research across different modalities, the precise mechanisms of sensory attenuation (SA) remain debated. Our study investigated the underlying mechanisms of SA in the tactile modality, specifically examining self-initiation and temporal predictions within a virtual reality (VR) environment. The VR setup allowed for precise control over sensory feedback in response to movement. ***Methods***: Participants (N = 31) engaged in an active condition, moving their hands to elicit a touch. Importantly, visual perception was modified in VR, so that participants touched their rendered – but not physical – hands. The virtual touch triggered a test vibration (intensity: 0.2, 0.35, 0.5, 0.65, 0.8, in a.u.) on the Meta Quest 2 touch controllers. Participants compared the test vibration to a standard stimulus (intensity: 0.5). In the passive condition, vibrations were presented without movement and were preceded by a visual cue. Further, test and standard vibrations appeared either immediately or after a variable onset delay (700 - 800ms). ***Results:*** Our results revealed a shift in the point of subjective equality (PSE) – the point at which the test stimulus is perceived as equivalent in intensity to the standard stimulus – depending on whether the stimuli were self-initiated or externally generated. This attenuation effect was most pronounced when self-initiated vibrations were of higher intensity 0.65, 0.8) and occurred immediately after the movement. ***Discussion***: Our findings highlight the importance of self-initiation on sensory attenuation. Further, the results suggest adaptiveness in the perceived intensity of self-initiated sensory input, with attenuation effects modulated by contextual factors such as signal strength and temporality.

Poster: D05 **Shira Baror**

Neural mechanisms determining the duration of task-free, self-paced visual perception

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Introduction: Humans spend hours each day spontaneously engaging with visual content, free from specific tasks and at their own pace. Yet, what determines the duration of our spontaneous engagement with the perceptual environment? In most lab-based experiments perceptual behavior is constrained by task-demands, and its timing and duration predetermined by experimental design. Therefore, the brain mechanisms determining the duration of self-paced perceptual behavior remain largely unknown. ***Methods***: Here, we aim to bridge this gap by setting an experiment in which participants viewed naturalistic images under task-free settings, and self-paced each image's viewing duration while undergoing EEG and pupillometry recording. Top-down and bottom-up predictive cues of image category were implemented as well. ***Results:*** Across two independent datasets, we observed large inter- and intra-individual variability in viewing duration. However, beyond an image's presentation order and category, specific image content had no consistent effects on spontaneous viewing duration across participants. Overall, longer viewing durations were associated with sustained enhanced posterior positivity and anterior negativity in the event-related potentials (ERPs) compared with shorter viewing durations. Individual-specific variations in the spontaneous viewing duration were consistently correlated with evoked EEG activity amplitudes shortly after image onset, and with pupil-size changes. By contrast, presentation order was selectively correlated with baseline alpha power and baseline pupil size. Critically, spontaneous viewing duration was strongly predicted by the temporal stability in neural activity patterns starting as early as 350 ms after image onset, suggesting that early neural stability is key for sustained perceptual engagement. Interestingly, neither bottom-up nor top-down predictions about image category influenced spontaneous viewing duration. ***Discussion***: Overall, these results suggest that individual-specific contextual factors (e.g., memory and spontaneous neural activity) can influence perceptual processing at a surprisingly early time point and influence the multifaceted ebb and flow of spontaneous human perceptual behavior in naturalistic settings.

Poster: D06 **Wiebke Nörenberg**

Motion masking at saccadic speed is largely invariant to motion amplitude

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Introduction: The rapid retinal image shifts imposed by saccadic eye movements routinely escape conscious perception—a phenomenon called saccadic omission. A potential cause of saccadic omission is motion masking, a notable reduction in perceived motion amplitude resulting from brief stationary presentation (for a certain masking duration) of an image before and after its motion. While previous studies have explored the contribution of masking duration and image content, we investigated the impact of the kinematics of the motion itself. ***Methods***: In a simulated saccade paradigm, observers fixated the center of a gray screen, when a pink-noise background (same average luminance) appeared, rapidly shifted across the screen, and disappeared again, remaining stationary for the masking duration before and after the shift. Each noise image was repetitive such that it was identical before and after its motion, removing any static cues to the amplitude of the movement. Masking duration varied between 0 and 320 ms. Observers adjusted an on-screen arrow to indicate perceived amplitude and direction of the image shift. We manipulated the motion profile (constant vs. saccade-like), amplitude (6, 12, and 18 dva) and duration (33, 44, or 55 ms, corresponding to the expected durations of the test saccade amplitudes). ***Results:*** Observers reported shorter perceived amplitudes for saccade-like compared to constant motion profiles. Interestingly, reported motion amplitudes remained largely consistent across the wide range of motion amplitudes and durations we tested, even when motion was unmasked. While perception of motion amplitude was remarkably poor, discrimination of motion direction remained intact. Even though unmasked motion led to larger reported motion amplitudes, motion direction discrimination was poorest in this condition. ***Discussion***: This study provides compelling evidence that motion masking systematically reduces the perceived amplitude of a movement, even for large amplitudes. Furthermore, saccadic velocity profiles seem to enhance the effect possibly contributing to the phenomenon of saccadic omission.

Poster: D07 **Melis İnce**

Object correspondence across movements at saccadic speed

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Introduction: Saccadic eye movements impose rapid motion on the retinal image, raising the question of how object correspondence is established from one fixation to the next. Here, we investigated if the rapid motion itself — by providing spatiotemporal continuity — plays a role in achieving object correspondence. ***Methods***: To isolate the contribution of high-speed motion, we simulated saccadic motion using a high-temporal-resolution projector (updating the display every 0.69 ms) while observers fixated their gaze throughout the experiments. We first investigated the contribution of motion at saccadic speed to object correspondence using a two-frame quartet-motion display. We positioned identical Gabor patches as objects at opposing corners within an imaginary rectangle. One object then moved continuously — along a curved trajectory (inward or outward) — to one of the neighboring corners, while the other jumped to the opposite side, completing the quartet. On each trial, participants first reported quartet rotations (clockwise or counterclockwise), indicating perceived object correspondence, and then traced the perceived continuous motion trajectory using a mouse, indicating motion visibility (location and curvature). ***Results:*** We found that motion visibility declined as speed increased, eventually reaching chance levels for location and curvature reports. At the same time, continuous motion biased the quartet rotation perception even at the highest (saccade-like) speeds. ***Discussion***: These results suggest that high-speed motion informs object correspondence, even if that motion is effectively invisible. We are currently following up on this finding in a second study, in which we combine a version of our quartet motion display with the go/no-go reviewing paradigm (Sasi et al., 2023). We investigate if object files are maintained through motion at saccadic speed. By combining objective measures of stimulus visibility, the perception of object correspondence, and the maintenance of object files over time, we aim to shed light on the fundamental mechanisms behind object continuity at saccadic speeds.

Poster: D08 **Lara Puhlmann**

Investigating resilience dynamics in the longitudinal resilience assessment (LORA) study.

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Introduction: Resilience has been defined as the maintenance or quick recovery of mental wellbeing after exposure to adversity. Increasingly, resilience is conceptualized the outcome of dynamic processes of adaptation to stressor exposure. Here, we investigate whether psychosocial factors that support resilience, such as emotion regulation capacity, tend to be stable in their relationship with outcome-based resilience, or whether the relationship develops dynamically over time. ***Methods***: In the context of the LOngitudinal Resilience Assessment (LORA) study, N= 738 adults were monitored for current stressor exposure and mental health symptoms every 3 months over 3 years. Resilience was operationalized as low stressor reactivity, meaning comparatively few mental health problems relative to individual stressor exposure, and quantified at each of the n=12 monitoring timepoints. Fifty-eight potential risk and resilience factors, including coping styles and personality traits, were assessed via self-report questionnaires at study baseline and 1.5 and 3 years later. ***Results:*** Almost all risk and resilience factors showed prospective association with stressor reactivity over 3 years of continuous monitoring. Of these, two-thirds showed time-invariant associations with stressor reactivity and one-third showed progressively weaker associations. Updating questionnaire scores through reassessment improved prediction of subsequent stressor reactivity for half of the factors. Within subjects, strengthening of resilience factors was associated with reduced stressor reactivity, and strengthening of risk factors with increased stressor reactivity. ***Discussion***: We conclude that a significant proportion of psychosocial risk and resilience factors appear to have a time-varying relationship with outcome-based resilience. We provide evidence for dynamic resilience processes, in which changes in risk and resilience factors over 3 years are associated with corresponding increases or decreases in stressor reactivity.

Poster: D09 **Hannah Am Ende**

Mismatch learning in virtual reality (VR) technology in older adults – a pilot-study

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Introduction: VR technology offers a promising way to simulate and promote motor training. To evaluate such a motor training paradigm, we exposed subjects with decreasing individual potential for plasticity (age-related) to an artificially induced mismatch (AIM) training in a virtual environment, compared with a younger control group. The objective is to validate the existing theoretical model concerning sensorimotor mismatch effects in older adults. Our hypothesis is, that AIM training could enhance the motor learning potential of older individuals by destabilizing an existing motor program. ***Methods***: The study involved 30 younger (18-40 years) and 30 older adults (55-85 years) in an one-hour motor training program over five consecutive days, with equal gender representation. The training encompassed a virtual reality training with three possible conditions, a serial reaction time task (SRTT) and a throwing exercise. After a minimum six-week interval, a second five-day training session with modified VR playing conditions was conducted. Evaluation included analyzing the motor learning tasks and assessing neuronal connectivity through magnetoencephalography (MEG) and electroencephalography (EEG) recordings during training. ***Results:*** Analyzed by using paired t-test and repeated measurement ANOVA, various VR conditions (error-free, error-based, mismatch) show different effects on motor learning in older adults. Particularly, mismatch learning stands out for its effects on motor learning. Connectivity change analyses are ongoing. ***Discussion***: Overall, we see increased decay parameter in the mismatch group compared to the groups based on error-free and error-based learning. These findings hold potential implications for designing innovative therapeutic approaches for motor rehabilitation, especially in the context of post-stroke patients.

Poster: D10 **Anastasia Malyshevskaya**

Where is Monday? Continuous mouse tracking study reveals horizontal space-time association

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Introduction: Embodied cognition theories posit that attention, perception, and sensorimotor systems are integral to the development of conceptual knowledge. For example, processing past/future related words leads to corresponding attentional biases, manifesting in faster responses with the left/right hand, respectively. Such biases also accompany access to words denoting different time units, e.g., hours, days, and months. However, most existing studies focus on overt and delayed response-related measures, e.g. key-press reaction times. It therefore remains unclear whether space-time association signatures are already present at earlier processing stages. ***Methods***: We used words denoting hours, days, and months with presumed left (e.g. Monday) and right (e.g. Sunday) biases in a line-bisection study. Participants (N=57) listened to time words and then used a mouse cursor to indicate the center of a horizontal line. We measured cursor movement trajectories, initial line intersection coordinates, and final bisection coordinates to detect hypothesized lateral spatial-conceptual biases. ***Results:*** First, we found early divergence in movement trajectories for hours and days. Second, predicted spatial biases were registered in the initial intersection coordinates for months and in the final bisection responses for hours. ***Discussion***: Our results (1) suggest that time-related spatial biases emerge at early processing stages and (2) provide further support to the idea of embodied and grounded representations of temporal concepts.

Poster: **D11** **Jairo Perez-Osorio**

High-order cognitive mechanisms modulate the deployment of gaze-guided attention in collaborative scenarios with artificial agents

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Introduction: Understanding nonverbal cues is pivotal for social interaction, enabling the inference of other's mental states. Studies that investigated these nonverbal cues showed that reflexive gaze-guided attentional orienting can be modulated by contextual factors like action expectations; however, the cognitive mechanisms underlying the processing of incongruent gaze shifts remain unclear. ***Methods***: We propose that cognitive control modulates the impact of irrelevant gaze shifts during task execution. In this context, we measured the effects of task-related expectations on the processing of the agent's signals in performance (RTs, error rates, and eye movements) and EEG correlates (N2 component and theta activity) of cognitive conflict. We expected (1) top-down modulation of the attentional orienting according to task goals, (2) higher performance cost to incongruent social signals reflected in cognitive conflict correlates. ***Results:*** Results showed that participants followed the agent's gaze, revealed by faster response times to targets congruent with head/gaze direction relative to incongruent locations (in all Experiments). Additionally, incongruent (relative to congruent) head/gaze shifts elicited higher error rates (Experiments 2-4), larger curvatures in eye-tracking trajectories (Experiment 3), larger N2 amplitudes and higher Event-Related Spectral Perturbation (ERSP) amplitudes (Experiment 4). ***Discussion***: Participants followed the agent's gaze/head shifts, but goal-oriented expectations modulated attentional orienting to task-relevant locations independent of gaze direction. This shows that cognitive control modulates the impact of irrelevant social signals, as reflected by performance and EEG cognitive conflict markers. Our findings suggest that humans process irrelevant signals from artificial agents, which impacts complex collaborative settings, either improving or hindering performance.

Poster: D12 **Jens Madsen**

Bidirectional brain-body interactions during natural story listening

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Introduction: Narratives have been shown to synchronize neural and physiological signals between individuals. In this study, we investigated the directionality of effects between cognition, behavioral and autonomic function. We hypothesized that cognition influences arousal while autonomic physiology modulates cognitive processes. ***Methods***: Participants listened to auditory narratives in an attentive or distracted state controlling for top-down effects of cognition. We synchronously recorded EEG, heart rate, respiration, pupil size, eye movements, and electrodermal activity. To control for bottom-up effects subjects carried out controlled interventions. They were asked to breathe rhythmically (bottom-up effects of respiration), saccade in a rhythmic fashion (ocular effects on peripheral signals) or were exposed to varying luminance (pupil effects on peripheral signals). ***Results:*** We find that auditory narratives entrained gaze variation, saccade initiation, pupil size, and heart rate, consistent with the hypothesized top-down effect. Controlled breathing influenced pupil size, and saccades entrained heart rate, providing evidence for a bottom-up effect of peripheral signals on the brain. Gaze variation, pupil size, and heart rate were associated with anterior-central brain signals, indicating a convergence of peripheral autonomic function and central arousal circuits. ***Discussion***: This study contributes to the understanding of the bidirectional causal effects between cognitive processing of auditory narratives, peripheral autonomic function, and central brain circuits controlling arousal. The results highlight the dynamic interplay between cognition and physiology and suggest arousal as a common factor.

Poster: D13 **Shivendra Singh**

Is Consciousness Local or Global? Searching for Old Answers in a Newer Context

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Introduction: Consciousness, defined as subjective awareness or Phenomenal Consciousness, is always about something, i.e., it is intentional. The question of where this Consciousness is located has been perplexing the physicalist mind for quite a long time. With the development of neurosciences and imaging techniques, spatial and temporal, the question was supposed to dissolve. However, even with these advancements in scientific tools, the question remains and has turned even more perturbing. The current terminology that the debate uses is local and global. Hence the question, 'Is consciousness Local or Global?' In the following paper, the scholar has tried to put forward a brief sketch of the issues involved in answering the above question. Next, the attempt looks for empirical evidence that still holds the problem. Lastly, the paper will delve briefly into the perspective of the Advaita Vedanta school of philosophy and try to look for some potential answers. ***Methods***: QUALITATIVE RESEARCH ***Results:*** CONSCIOUSNESS DOES NOT RESIDE IN THE BODY. ***Discussion***:

Poster: D14 **Luianta Verra**

Dissociating perceptual and value-based generalisation in anxiety and intolerance of uncertainty

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Introduction: A characteristic marker across anxiety disorders is inflated affective responses to stimuli that are in fact safe. Such generalisation of affective responses can arise from two sources: the failure to discriminate between stimuli (i.e. perceptual mechanisms) and the active process of transferring learned values to similar, but discriminable stimuli (i.e., value-based mechanisms). We ask how these mechanisms differentially shape threat generalisation and how they are impacted by individual differences in anxiety (STICSA) and intolerance of uncertainty (IUS). ***Methods***: In a Pavlovian aversive learning paradigm, participants first learned to probabilistically associate flower-like shapes with aversive screams. Next, affective ratings to stimuli varying in similarity to the original shapes were collected as a measure of generalisation. We systematically varied perceptual and outcome uncertainty to test the respective contributions of perceptual and value-based components to generalisation. Perceptual uncertainty was manipulated using personalised stimuli at different discrimination difficulties and value by varying reinforcement rates during threat acquisition. We next related these individual processes to trait anxiety and intolerance of uncertainty in a healthy population sample (n=107). ***Results:*** We found an effect of both perceptual uncertainty and value on threat generalisation, that varied depending on the distance from the conditioned stimulus. This effect was consistent even though participants solved the task using different generalisation rules i.e., based on similarity or linear. We further found that trait anxiety and intolerance of uncertainty were associated with elevated generalisation further from the conditioned stimulus, but only for participants following a similarity-based generalisation rule. ***Discussion***: The results provide evidence for differential effects of perceptual and value-based mechanisms in fear generalisation. We show that these effects are independent of the generalisation rule chosen to solve the task. On the other hand we find that anxiety effects of overgeneralization are only found for similarity-based generalisers.

Poster: D15 **Deniz Yilmaz**

The Effects of Physical Exercise on Interoceptive Abilities of Patients with Schizophrenia

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Introduction: Current antipsychotic treatments for schizophrenia (SZ) often inadequately address chronic negative and cognitive symptoms, contributing to a global disease burden. Physical exercise, beneficial for some, targets challenging symptoms and counters disembodiment observed in SZ, potentially restoring the altered mind-body relationship. Research investigating the bodily self in SZ has predominantly focused on the external body, neglecting interoception. Furthermore, although studies consistently show bivariate links between exercise, interoception, and mental health, no study thus far investigated these in a single experimental design. ***Methods***: Baseline analysis involves N = 50 SZ patients compared to healthy controls' existing data. For the within-subjects longitudinal analysis, N = 156 SZ patients will undergo baseline and 12-week post-exercise intervention testing, measuring fitness, symptoms, cognitive and global functioning. Longitudinal assessment of interoception includes self-report, interoceptive accuracy, and neuroimaging. Measures utilize validated tools, including MAIA-2, BPQ-SF, CDS, and Heartbeat Counting Task. Neuroimaging at both time points involves EEG, ECG, and fMRI data to examine Heartbeat-Evoked Potentials and insular neuroplasticity. ***Results:*** We predict baseline interoceptive deficits in individuals with SZ, evident in self-reports, behavioral measures (Heartbeat Counting Task), and neural indicators. These deficits are expected to correlate with symptom severity and fitness. Following a 12-week exercise intervention, improvements are anticipated, and the study aims to identify neural mechanisms distinguishing responders from non-responders. ***Discussion***: Our comprehensive study on schizophrenia explores the impact of exercise on interoception, combining self-report measures, behavioral assessments, and advanced neuroimaging. While providing valuable treatment insights, the longitudinal design limits making causal inferences. The research aligns with precision psychiatry, aiming to enhance personalized treatment strategies for individuals with schizophrenia.

Poster: D16 **Emma Bailey**

Task-evoked high frequency oscillations in cortex and spinal cord

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Introduction: High frequency oscillations (HFOs) in response to somatosensory stimulation were first observed in the 1970s in human EEG recordings as small notches on the earliest cortical somatosensory evoked potential (SEP). Recent concurrent EEG and single-unit recordings in primates suggest HFOs may be a non-invasive marker for cortical population spiking. Here, we examined whether HFOs can be non-invasively recorded not only in cortex, but also the spinal cord, potentially providing a novel window into neuronal activity across the central nervous system. ***Methods***: The data was acquired during an experiment in which 36 participants received electrical stimulation of the upper and lower limb. Electrospinography was recorded from 40 electrodes arranged in two patches over the cervical and lumbar spine, while EEG was simultaneously recorded from 64 scalp channels. To extract HFOs from these surface recordings, canonical correlation analysis (CCA) was applied to find spatial filters that maximise the correlation between single-trial data and the trial-averaged signal. ***Results:*** First, we replicated previous findings concerning cortical HFOs evoked by upper and lower limb stimulation, revealing clearly visible HFOs in our dataset with the somatotopy corresponding to the stimulated nerves. Next, we tested for the existence of HFOs in the cervical and lumbar spinal cord and detected HFOs in most participants (cervical cord: ~90%, lumbar cord: ~50%). Group-level results in the spinal cord and cortex were then assessed by averaging across the HFO amplitude envelope of single-participant responses. Using this procedure, we obtained evidence for group-level HFOs across both cortex and spinal cord. ***Discussion***: Overall, our results demonstrate that HFOs to both upper and lower limb stimulation can be observed in both cortex and spinal cord at the level of the single participant, as well as robust group-level HFOs.

Poster: **D17** **Alexandros Kastrinogiannis**

Increasing eyewitness identification accuracy in lineups using 3D interactive virtual reality (3DIL)

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Introduction: Accurate witness identification (ID) is a cornerstone of police inquiries and national security investigations. Yet, the technology used to display lineups has not fundamentally changed over the past century. Worldwide, police present witnesses with static 2D photographic lineups. Eyewitnesses frequently err in identification tests, with analyses of real-world police line-ups showing that witnesses often mistakenly identify innocent individuals as perpetrators. Recent evidence suggests that active exploration in 2D lineups increases discrimination accuracy and we hypothesize that this effect is further increased in stereoscopic 3D using a virtual reality (VR) setup. ***Methods***: In an international consortium from the UK (University of Birmingham, University of Stirling), Canada (University of Victoria), and Germany (the Max Planck Institute for Human Cognitive and Brain Sciences, and Humboldt-Universität zu Berlin), this project implements recent advances in 3D image technology and stimulus presentation to increase witness ID accuracy. ***Results:*** In particular, we aim to develop techniques for creating and editing 3D facial representations in VR. We will also investigate the benefits of interactive 3D VR lineups over traditional 2D lineups and explore the impact of retrieval cues on lineup accuracy. With the multi-site acquisition, we will examine individual differences in face processing abilities and their relationship to lineup performance. ***Discussion***: Overall, 3DIL is expected to yield valuable insights into facial processing mechanisms within both 2D and 3D paradigms, thereby contributing to the enhancement of lineup procedures in practical forensic contexts.

Poster: D18 **Serap Özlü**

Neural Correlates of Anosognosia in Neurocognitive Disorders

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Introduction: Dementia, also known as a major neurocognitive disorder, is a comprehensive term used to describe the loss of cognitive abilities, changes in memory, language functions and alterations in behavior. Major neurocognitive disorders have significant impacts on patients, their families, the economy, and healthcare systems. Within the complex landscape of dementia, a prevalent and clinically significant phenomenon known as anosognosia, or "without knowledge of the disease," has gathered attention. Understanding anosognosia is pivotal to investigating the complex nature of dementia and may even serve as a diagnostic criterion for specific subtypes of the disease. ***Methods***: In this study, we conducted a systematic review and a meta-analysis of neuroimaging studies to investigate the neural underpinnings of anosognosia in dementia. Later, the results of meta-analysis were used in behavioral domain analysis. ***Results:*** A comprehensive search identified 16 relevant studies that met the eligibility criteria for meta-analysis. Next, the meta-analysis of these studies, encompassing a diverse range of dementia subtypes, cognitive assessments, and neuroimaging modalities, yielded compelling results. A distinct neuroanatomical pattern emerged, revealing two prominent clusters of brain regions consistently associated with anosognosia in dementia: the medial frontal gyrus and the cingulate gyrus. The results of behavioral domain analysis showed associations between clusters and paradigm classes from the BrainMap database related to social cognition, emotion processing and executive function. ***Discussion***: These findings suggest that dysfunction within these specific regions might play a significant role in the manifestation of anosognosia across various dementia subtypes. This systematic review and meta-analysis provide valuable insights into the neural correlates of anosognosia in dementia, shedding light on potential targets for future research and interventions aimed at improving the quality of life for individuals living with dementia and their caregivers. Understanding the neurobiological basis of anosognosia is a crucial step toward developing effective strategies to address this challenging aspect of dementia care.

Poster: D19 **Volker Reisner & Leonard König**

Re-enactment of encoding-related body movements supports idiothetic path estimation

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Introduction: From an embodiment perspective, the body plays an important role in shaping memory and behaviour through sensorimotor simulation. Previous research suggests that perceptual and motor information (e.g. body postures, eye movements) registered during the encoding of an event can be reactivated when the event is retrieved, thus enhancing memory performance. Here, we explore behavioural correlates of sensorimotor simulation (i.e. the re-enactment of body movements) in a fundamental aspect of human spatial navigation: The estimation of path length based on body-related ('idiothetic') signals. ***Methods***: In an ongoing study, we developed a novel path estimation task combining motion tracking with Virtual Reality (VR) technology. In this task, participants first learn to associate target locations of different length from a fixed start location with a unique irregular step pattern along a 1-D linear track ('encoding'). Subsequently, we ask participants to return to the target locations in complete darkness by 1) walking freely without explicit instructions to perform specific body movements ('free retrieval'), 2) reproducing encoding-congruent body movements ('congruent retrieval'), and 3) walking encoding-incongruent regular steps ('incongruent retrieval'). ***Results:*** Performance in our incomplete sample (N=24) was significantly above chance level, indicating that participants were able to estimate paths of different lengths in complete darkness. Furthermore, we find that the more participants intuitively tended to mimic the step patterns associated with encoding, the better their path estimation performance was - regardless of the retrieval condition. Consistently, path estimation was significantly more accurate during congruent retrieval than during incongruent retrieval. ***Discussion***: Our preliminary results are consistent with the hypothesis that the re-enactment of body movements relevant to encoding supports memory retrieval during idiothetic path estimation, possibly involving sensorimotor simulation. Future work aims to validate our findings in the final sample and will incorporate a computational model to explain the encoding congruency effect.

Poster: D20 **Withdrawn**

Poster: D21 **Ondrej Zika**

Contextual inference under uncertainty in anxiety

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Introduction: Updating beliefs in changing environments can be driven by gradually adapting expectations or by relying on inferred hidden states (i.e. contexts), and changes therein. Previous work suggests that increased reliance on context could underly fear relapse phenomena that hinder clinical treatment of anxiety disorders. ***Methods***: We test whether trait anxiety variations in a healthy population influence how much individuals rely on hidden-state inference. In a Pavlovian learning task, participants observed cues that predicted an upcoming electrical shock with repeatedly changing probability, and were asked to provide expectancy ratings on every trial. ***Results:*** We show that trait anxiety is associated with steeper expectation switches after contingency reversals and reduced oddball learning. Furthermore, trait anxiety is related to better fit of a state inference, compared to a gradual learning, model when contingency changes are large. ***Discussion***: Our findings support previous work suggesting hidden-state inference as a mechanism behind anxiety-related to fear relapse phenomena.

Poster: D22 **Eva-Madeleine Schmidt**

AI-Mediated Communication, Empathy, Prosocial behavior, Facial expressions, Emotions, Responsible AI

Eva-Madeleine Schmidt [1]

[1] MPIB CHM

Introduction: Facial expressions of emotions are an essential part in human interactions. When we observe these expressions in others, they are crucial signals for empathy. Current advancements in machine learning make it possible to visually manipulate the emotions in facial expressions. While we can already manipulate our own facial expressions, the prospect of altering the facial expressions of interaction partners raises profound societal concerns associated with Artificial Intelligence (AI). This necessitates a concerted effort towards responsible development and regulation. ***Methods***: This project addresses ethical concerns related to AI-mediated communication (AI-MC), focusing on the deployment of AI-based face altering technologies on interaction partners and evaluating their impact on empathy and prosocial behavior. Through a series of experiments, we address three key research questions: (1) To what extent does the utilization of facial AI filters on interaction partners influence empathic responses? (2) Does the use of facial AI filters influence prosocial behavior? (3) Do individuals strategically use facial AI filters to behave antisocially? The study aims to contribute valuable insights into the societal implications of AI-MC and inform responsible AI development. ***Results:*** The study aims to contribute valuable insights into the societal implications of AI-MC and inform responsible AI development. ***Discussion***: The research aims to integrate behavioral and neurophysiological measures to comprehensively understand the cognitive and affective processes involved in AI-MC.

Poster Abstracts

Poster Session V

March 12, 2024 at 13:00-13:40 | ONLY VIRTUAL

Poster: **V01** **Pınar Demir**

Comparison of Affordance and Spatial Compatibility Effects in Human and Object Interactions

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Introduction: Everyday social interactions, such as shaking hands, or goal-directed interactions with objects, such as holding a cup, require facilitation of action plans appropriate to their specific affordances. The spatial compatibility of a stimulus and a response might interfere with the activation of these affordance-compatible action plans. In the present study, we examined how framing of interactions affects the interaction between affordance and spatial compatibility effects towards humans and objects in two separate experiments. ***Methods***: In a motor priming task designed to simultaneously assess affordance and spatial compatibility effects, participants were presented with human interactive hand gestures and everyday objects with a single handle. Participants responded either with their left or right hand according to the color mask of the stimulus, regardless of the spatial position or the affordance-related orientation of the stimulus. In Experiment 1, the responses were given by keypresses and in Experiment 2, participants responded with key releases followed by performing a "holding" gesture. ***Results:*** When responding with simple keypresses, we found independent and strong affordance and spatial compatibility effects towards objects. Surprisingly, interactive hand gesture stimuli induced a reversed affordance effect, that is, mirror-compatible responses, while the effect of spatial compatibility was preserved. Changing the framing from a simple keypress task to an interactive one drastically altered these findings, resulting in enhancement of affordance and complete elimination of spatial compatibility effects for both human and object interactions. ***Discussion***: These findings indicate that affordance-related responses for social signals are strongly facilitated by contextual framing of interactions, rather than fixed action representations. These results pave the way for further exploration of neural processes underlying motor representations of mirror and complementary actions, especially in social interaction contexts.

Poster: **V02** **Angelika Bracher**

The parental brain in action: an emotional facial expressions task

Bracher, A. J. [1,2], Preckel, K. [1], Puhlmann, L. [1,7], von Polier, G. [2,3,4], White, L. O. [2,5], Vrticka, P. [1,6]

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Introduction: The parent-child relationship is pivotal for children's emotional development, relying on parents' ability to respond effectively to children's needs, often communicated through facial expressions. Child faces constitute a unique category of highly salient stimuli ('Kindchenschema') that trigger nurturing behaviors and activate parental brain correlates. Previous research, primarily with mothers of infants, highlights regions within the reward, saliency, and Theory of Mind (ToM) networks as central to the parental brain. Yet, limited knowledge exists regarding neural activation of fathers and mothers in response to older children. ***Methods***: In this pre-registered fMRI study, we sought a more comprehensive understanding of the parental brain's response to emotional facial cues, particularly in primary school-aged children, rather than infants. Our investigation included 89 parents, with a larger proportion of fathers than mothers, and equal proportions of daughters and sons. We examined effects of facial identity, emotion, gender, and parental sensitivity on parental neural activity. ***Results:*** Our whole-brain analyses revealed greater neural activity, specifically within the saliency and ToM networks, for viewing images of one's own, as compared to an unknown child, as previous studies have found with infant stimuli. No neural differences emerged between mothers and fathers, but our ROI analyses, which took child gender and caregiving behaviors into account, revealed a distinct father-daughter interaction. Fathers of daughters exhibited with increasing sensitivity, less ventromedial prefrontal cortex (vmPFC) recruitment. ***Discussion***: Our study suggests that parental neural activity extends beyond highly salient 'Kindchenschema' stimuli. Additionally, as previously indicated by the literature, parental brain activity appears comparable across mothers and fathers. Distinctions between parents only arose, when considering parental sensitivity as an additional factor. It may be, that with increasing sensitivity fathers require fewer neural resources during the affective processing of child faces as mothers do for daughters, but more research is needed to clarify such hypotheses.

Poster: **V03** **Nurfaizatul Aisyah Ab Aziz**

Profiling functional connectivity of cortical network from theta brainwave synchronization in response to passive listening of three different Arabic rhythms

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Introduction: Introduction: Neuronal oscillations, prevalent across species, play a crucial role in coordinating temporal and spatial signals that facilitate neural networks in managing neural processes, including perceptions and high cognitive functions. Theta brainwaves, believed to be involved in cognitive functions such as attentional control, are the focus of this study. ***Methods***: Method: This study examines theta brainwave synchronization in response to three Arabic rhythms: Quranic recitation, Arabic poem, and Arabic news. Twenty-nine (29) non-native Arabic speakers, from multicultural and multireligious backgrounds, were randomly recruited. Simultaneous magnetoencephalography (MEG) and electroencephalography (EEG) recordings captured brainwave responses during receptive listening to these rhythms. Average source estimation and whole-brain source-level functional connectivity of MEG data was quantified using Phase Locking Value (PLV) and subjected to a non-parametric permutation test. ***Results:*** Results: There is increased functional connectivity between the left angular – right middle frontal gyrus (MFG) during listening to the Quranic recitation. In contrast, for the Arabic poem, the MEG data established functional connectivity between the right Heschl's gyrus – left fusiform. As for Arabic news, there is increased functional connectivity at the right lingual and left cerebellar vermis brain regions. ***Discussion***: Discussion: The finding suggested the right MFG acted as the circuit-breaker to interrupt the dorsal network's ongoing attentional process and reorient attention to an exogenous stimulus, i.e., mediating the reorientation of attention between mind wandering to processing the Quranic recitation. Meanwhile, connectivity between the brain regions during listening to the Arabic poem and news appears prominent for perceiving and analysing sounds, and support language perception and visual mental imagery. The findings contribute to a deeper understanding of how different linguistic and rhythmic stimuli engage cortical regions, shedding light on the neural underpinnings of diverse auditory experiences in the Arabic language.

Poster: **V04** **Harald Murck**

Somatic symptoms of depression overlap with symptoms of normal pressure hydrocephalus - (NPH) effect of inhibition of 11beta HSD2 with glycyrrhizin

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Introduction: Treatment resistance in depression is associated with increased ventricular and choroid plexus volume, which are influenced by body mass index and aldosterone/cortisol ratio as well as inflammatory mechanisms. Somatic symptoms of depression show an overlap with those of normal pressure hydrocephalus (NPH), i.e. gait disturbances and bladder control issues in addition to cognitive symptoms and are correlated with depression severity. A common biological causality between these symptoms in depression and NPH may therefore exist. Glycyrrhizin (GL) acts antiinflammatory via TLR4 antagonism and reduces aldosterone secretion by inhibition of the 11-beta-hydroxysteroiddehydrogenase type 2 (11betaHSD2). ***Methods***: We hypothesized that this may specifically act on symptoms related to NPH either by directly acting at the choroid plexus or alternatively via changes in autonomic regulation. 12 inpatients with a major depressive episode (MDE) were treated with a GL containing extract adjunct to standard antidepressant therapy (TAU) and compared to 10 subjects treated as usual. Change from baseline to day 14 and day 42 regarding depression severity, NPH symptoms and gait parameters where captured. ***Results:*** As a high number of subjects treated with GL were released only change to day 14 are reported here in order to avoid bias. A significantly larger reduction in the Hamilton depression rating scale (HAMD) score ($p < 0.05$) and NPH scale ($p < 0.01$) with GL vs. TAU was observed. Interestingly, NPH symptoms worsened in the TAU group, but improved in the GL group, pointing to a specificity of the effect. Furthermore, a reduction in heart rate and sleep duration correlated with clinical response of depression. ***Discussion***: Symptoms of NPH occur in major depression and respond to the TLR4/11betaHSD2 inhibitor glycyrrhizin. This is in line with the notion of autonomic/neuroendocrine/inflammatory alterations in patients with MDE, which respond to GL.

Poster: **V05** **Mazira Mohamad Ghazali**

Unravelling the Relationship between Knee Osteoarthritis Pain and Cognitive Function

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Introduction: The cognitive effects of osteoarthritis (OA) pain remain poorly understood despite the known association between chronic pain and cognitive function impairment, including memory and cognitive flexibility. Thus, this study investigated the cognitive functions in primary knee OA patients and evaluated the association of each domain with age, gender, radiological Kellgren & Lawrence (KL) grade, and SF-MPQ2 and NRS scores. ***Methods***: . This study involved primary knee OA patients attending the Orthopedic Clinic at a suburban tertiary referral facility on the East Coast of Peninsular Malaysia (treatment group) and healthy subjects (control group) who fulfilled the inclusion and exclusion criteria. Participants were required to complete the SF-MPQ2 questionnaire, NRS score, and cognitive assessment using the Wechsler Adult Intelligence Scale (WAIS-IV). The WAIS-IV included three index scales: perceptual reasoning (PRI), working memory (WMI), and processing speed (PSI). Finally, the independent t-test was performed to compare the outcomes between knee OA and healthy groups with cognitive functions. ***Results:*** A total of 62 participants aged between 50 to 64 years were recruited, comprising 50.0% healthy subjects (Grade 0) and 50.0% (n = 31) knee OA patients with varying severity: Grade I (22.6%), Grade II (12.9%), and Grade III (14.5%). The groups had no significant differences in PRI, WMI, and PSI. Furthermore, both groups demonstrated strong positive correlations between NRS (r = 0.660) and SF-MPQ2 (r = 0.705) scores with KL grade, indicating increased pain with higher OA severity. Meanwhile, a weak positive correlation was evident between gender with WMI (r = 0.281) and PSI (0.312) in both groups, suggesting sex differences in cognitive functions. ***Discussion***: . In summary, the study findings indicated that knee OA pain was not the sole contributor to cognitive impairment. Other elements, such as age, education, pain medication, and socioeconomic factors, can interact with and lead to cognitive impairment.

Poster: **V06** **Gayatri Nerpagar**

Navarasa (nine emotions in Indian school of aesthetics) Perception Through Core Body Movements

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Introduction: One of the integral aspects of social cognition is recognizing and perceiving emotions. To understand how these expressed emotions are perceived through non-verbal communication mediums, the primary focus is on facial expressions. This has successfully shown how emotions are derived from facial expressions. However, studies have shown that people can perceive emotions from body movements. All these studies are done with Western emotion classification systems such as Ekman's basic six emotions and valances of positive and negative. This study uses the Navarasa (nine emotions) defined in the Indian school of aesthetics. Sage Bharat Muni, in his Natyashastra (Indian treatise on performing arts) has defined Navarasa with detail of facial expressions, body movements etc. These are Adbhuta (Wonder), Bhayanaka (Fear), Bibhatsya (Disgust), Hasya (Joy), Karuna (Sad), Raudra (Anger), Shanta (Peace), Shringara (Love), and Veera (Courage). ***Methods***: These Navarasa were used in these studies to understand the emotion perception from core body movement. Four trained Indian classical dancers were recruited to perform the Navarasa and a neutral action, their movements recorded using a Vicon motion capture system with thirty-nine markers on the body. The resulting marker data utilized to generate stick-figure animations that served as stimuli in an eye-tracking study, where observers identified emotions through the forced-choice paradigm. ***Results:*** Observers could recognize Navarasa above the chance level, with Veera (Heroic) emotion being the most accurately identified and Adbhuta (Surprise) being the least. The eye-tracking study revealed that observers focus on the arms and torso area when recognizing the rasa. ***Discussion***: This research emphasizes the importance of upper body regions in emotion recognition, and statistical tests further confirm that different Rasas elicit varied motion cues, underscoring the unique characteristics of each emotional expression.

Poster: **V07** **Mohammad Rostami & Nasim Haghi**

The effect of intelligent Tumor Treating Fields on reducing the size of glioblastoma brain tumor

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Introduction: Glioblastoma is a highly aggressive brain tumor with limited treatment options. Due to the limited advances in the treatment results of glioblastoma patients using common treatment methods, there is a fundamental need for new treatments methods to address this disease and increase life expectancy. Transcranial alternating current stimulation, like intelligent Tumor Treating Fields (iTTFs), disrupts biological processes in cancer cells, results in reducing tumor size. One of the key advantages of iTTFs therapy lies in its ability to intelligently activate and deactivate electrodes, thereby optimizing its impact on cancer cells undergoing division parallel to the electric field. ***Methods***: In this study, 6 patients with recurrent glioblastoma tumor were tested. Before transcranial stimulation, the tumor size was obtained using MRI. For a period of 5 weeks, patients received daily iTTFs treatment for 16 hours, with a frequency of 200 kHz. After completing the treatment, tumors size was reassessed using MRI. ***Results:*** The brain tumor size of patients decreased significantly after receiving this new treatment method, as evidenced by MRI measurements comparing the size of the tumor before and after iTTFs. Following the reduction in glioblastoma brain tumor size, the life expectancy of each patient receiving iTTFs has increased compared to that of patients receiving other common treatment methods. ***Discussion***: Despite the availability of treatment methods such as surgery, chemotherapy, and radiation therapy, glioblastoma patients have short life expectancy, and glioblastoma brain tumors size tends to increase day by day. iTTFs, as a new treatment method, disrupts some biological processes at the cell level. It initially stops tumor growth, then reduces its size. In this study, we used iTTFs on 6 recurrent glioblastoma patients, and observed tumor size reduction in all 6 patients following the use of this new treatment method but due to the small number of samples, more research is needed.

Poster: **V08** **Soner Yucetepe**

Exploring the Temporal Dynamics of Judgment of Learning Using Categoric Choises

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Introduction: It is an ongoing debate questions whether the Judgment of Learning (JOL) is an outcome of an inferential or recollective experience. To address this question through a neuroscientific perspective, we aimed to investigate the temporal dynamics of JOL adopting ERP methodology. ***Methods***: 72 young adults (49 female) aged between 18-27 (M=21.64; S.D.= 2.09) participated in the study. All were right-handed with normal or corrected-to-normal vision. None of them had any psychiatric or neurological conditions. A list of word-pairs (cue-target) was used in the study. At first, participants were asked to encode the word pairs. In the following phase (the JOL phase), the cue of each word pair was presented, and they were asked to indicate whether they remembered the target word by choosing one of the three options: "Definitely able to remember", "Uncertain" or "Definitely not able to remember". Participants' recognition memory performance was also assessed using a multiple-choice test. In this presentation, however, only JOL phase results were analysed. Recording, storage and analysis were performed using 64-channel EEG-EP systems, Curry 8.12 and NeuroScan 4.51. ***Results:*** ERPs were averaged for different JOL responses at the frontal, fronto-central, central and parietal sites. The analyses showed that JOL processes are observable within early time window after stimulus presentation. The P100, N100, P200, N200, and P300 components were found to be elicited for all responses, but only N100 did vary in amplitude among them. Moreover, a negative ERP component with a latency of 330-500 ms was evident for all responses, showing no amplitude differences among them. ***Discussion***: Our results provide support for the hypotheses suggesting that JOL is influenced by both familiarity and the degree of access to information.

Poster: **V09** **Vijaykumar Nandvadekar**

Mind In Ayurveda

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Introduction: According to Ayurveda, health is a whole, holistic state of energy that permeates all aspect of our life, not only the absence of disease. Because of this, the Ayurvedic approach to addressing any particular area of our health starts with considering our body, mind, and spirit as a whole.In a similar vein, the Ayurvedic tradition acknowledges that any one of these three elements of self—body, mind, or spirit—can contribute to or detract from our total state of health, making the mind one of three equally important factors. According to Ayurveda, even small mental disruptions can have a significant impact on our quality of life and lead to a variety of physical and non-physical illnesses. ***Methods***: Manas has no rupa in him. Nirvikara is what it is. Since it is an athindriya, lakshanas could be used to understand swaroopa. Only through manas is man exposed to vedanas such as sukha, dukha, vichara, krodha, kama, etc.According to Charaka, coordination between the manas, soul, sensory organs, and subjects is necessary for learning. ***Results:*** Mana's four functions—Uhya (hypothesis), Svasyanigraha (self restraint), Indriabhigraha (regulation of sensory organs), and Vidhara (consideration)—represent the mental processes. ***Discussion***: Manas influences both the body and the soul since it is the thread that binds them together. Manas are involved in both the development of disease and maintaining a state of health. The two doshas of Manas that are most important in producing psychological and physical illnesses are Rajas and Tamas.

Poster: **V10** **Farida Zeynalli**

The Fair and the Furious: The Role of the Moral Justifications of Emotions in Resource Distribution Context

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Introduction: Fair decisions are inherently shaped by social interactions. Therefore, the emotional mood of the interaction partner can influence decision-making in the context of resource allocations. Based on this, present (pilot) study aimed to investigate whether the reasons for the anger felt by the interaction partner would influence the actors' decisions in various resource distribution contexts. Furthermore, we examined the relationships between the tendency for analytical thinking and the amount of allocated resources across experimental conditions. We compared the amounts of money allocated by participants in both the Dictator and Ultimatum Games under conditions where the reasons for the partner's anger were either known (related to fairness or not) or unknown. ***Methods***: The study was announced on LinkedIn. Participants (N=92) were interviewed via the Zoom platform (Mage = 23.87, SD = 3.04), randomly assigned to one of three experimental conditions. All participants took part in both the Dictator Game and Ultimatum Game. They were asked to allocate 20 Turkish Lira (TL) in both games (40 TL in total). ***Results:*** One-way MANOVA results demonstrated that participants allocated higher amounts of money when the anger of the partner was caused by a fairness-related issue in the Dictator Game, $F(2, 89) = 4.30$, $p = .017$, partial $\eta 2 = .09$. However, there was no significant difference in terms of resource allocation between experimental conditions in the Ultimatum Game, $p>.05$. Participants allocated significantly more money in the Ultimatum Game ($M = 10.35$, $SD = 3.21$) compared to the Dictator Game ($M = 9.62$, $SD = 4.23$), $t(91) = 2.04$, $p = .04$. There was no significant relationship between analytical thinking tendency and money allocated, $p > .05$. ***Discussion***: In summary, the results suggest that decisions to be fair are influenced more by the moral context of the anger felt rather than the anger felt by the interaction partner itself.

Poster: **V11** **Maria Lojowska**

Threat-induced prosocial behavior: Enhanced exogenous attention to protect others from harm.

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Introduction: As social animals, humans tend to voluntarily engage in pro-social behavior to prevent harm to others. However, to what extent prosocial behavior can be reflected at the level of less voluntary cognitive processes remains unclear. Here, we examined how threat to others modulates exogenous attention. ***Methods***: Fifty-four participants performed an exogenous spatial cueing task where the participant's performance determined whether electric shocks would be delivered either to themselves or to their anonymous co-participant. ***Results:*** Threat of shock to the co-participant elicited orienting and reorienting responses that were faster than in the safe condition and did not differ from performance when participants avoided shocks to themselves. This attentional improvement was not due to speed-accuracy trade off and was associated with arousal, i.e., increased pupil dilation in both threat conditions. ***Discussion***: Together, these findings suggest that pro-social behavior triggers automatic attentional processes which may be relevant for providing immediate help without relying on reflexive processes.

Poster: **V12** **Siti Atiyah Ali**

Exploring a Bibliometric Analysis of Neuroimaging researches in Dementia: Alzheimer's Disease and Frontotemporal Dementia

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Introduction: Dementia, an umbrella term referring to the neurodegenerative loss symptoms of cognitive functioning that is commonly caused by Alzheimer's disease (AD) and frontotemporal dementia (FTD), affects millions globally. This bibliometric analysis explores the landscape of neuroimaging research in the two main causes of dementia, focusing on the trends, hotspots, and gaps in knowledge acquisition. ***Methods***: Literature searches related to AD and FTD in the range of years from 2000 to 2023 were conducted through the Scopus database. The bibliometric visualisation was generated by VOSviewer, and the most cited literature was generated by Harzing's Publish and Perish programme. ***Results:*** In total, only 635 works of literature were published in the field. According to the trend analysis, the number of studies was steadily increasing over the course of 23 years of duration. The Journal of Alzheimer's Disease was the 1st-ranked journal with the highest number of articles, followed by Neuroimage Clinical and Neurology as the 2nd and 3rd-ranked. The application of MRI in AD and FTD in exploring potential neural biomarkers for clinical diagnosis purposes has been determined as the research hotspot, as it yielded the highest number of citations compared to other areas of the research field and neuroimaging modalities like fNIRS, EEG, and ERP. Future research directions could venture into functional neuroimaging to understand how the neural system works in the brains of individuals with AD and FTD. ***Discussion***: Focused research mainly utilised the MRI method, possibly due to the reliable structural localization information provided by MRI, which is not provided by other neuroimaging tools. Altogether, this bibliometric analysis provides a reference for the researchers to widen the research on AD and FTD with other neuroimaging tools that are scientifically proven to provide temporal accuracy findings that can help in the recognition of potential biomarkers.

Poster: **V13** **Jyotirmaya Satpathy & Ankasha Arif**

OPERATIONAL RESEARCH FOUNDATIONS IN OPHTHALMIC - BASED DECISIONS

Satpathy, J. [1] & Arif, A. [2]
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Introduction: Explorations in operational research based decision making have extended from complex behaviourist approach to cognitive approach with focus on operational research based decision processes that ensue prior to response. In neural computational simulations, each operational research based decision is represented by node of neural activity. Operational research based decision related neural activity has components of intensification of activity and inception for neural activity to overcome complex operational research based decisions. One way to investigate is to scan positioning of eye movements linked to optical consideration. Investigating eye movements is expedient in providing evidence of orientation of operational research based decision behaviour replicating computational operational research based decision. Role of eye movements, intentional or reflex, help in gaining, possessing and tracing visual inducements, during operational research based decision formation. Current proof suggests that orientation of eye movement itself may not be an essential constituent. Rather, it can be as a result of intensification in contact to incitement as an e influential factor in operational research based decision formation. An important question is how manager makes complex operational research based decisions. Specifically, researchers are interested in assumptions, beliefs, habits, and tactics. Research suggests that eye considers various sources of information before making a operational research based decision. However, how does it do this? Deciphering eye - environment transactions requires mechanistic understandings of neurobiological processes that implement value-dependent complex operational research based decision-making. There is a crucial difference between 'thinking about thinking' and actually enhancing eye and mental processes by developing latent potential of each individual There is a need to attend as to how neuroscience can, and already has, benefited from Neuro - ophthalmic' unitary perspective and how neuroscience has been enriched by taking account multiple specialized neural systems with potential research directions. The issues, because modern models ignore influence of emotions on neuro - ophthalmic operational research based decision making, that crop up is; • What computational mechanisms allow eye to adapt to changing circumstances and remain fault-tolerant and robust? • Under what circumstances do these various systems cooperate ***Methods***: Methodology proposes to incorporate operational research model of Kowler (Rutgers University, USA) which states that eye movements are integral part of interactions with visual world. Tasks, inspecting contents of visual scene, require that operational research based decision makers bring eye swiftly and precisely to weighty and expedient positions. Eye movements accomplish this with virtually no overt effort or awareness. Model

involves eye movements and connections between eye movements, perception and cognition. Model is devoted to understanding how eye movements are planned, how they are carried out, how to maintain percept of clear, stable and coherent world despite continual changes in visual array that eye movements produce. One major effort understands relationship between eye movements and attention, question of how attention is involved in eye movement control and how to attend to visual environment independently of movements of eye. Model emphasizes active integration of eye movement planning with ongoing visual and cognitive processes. The model incorporates components of visual (attention), eye movements, eye movements and their role in visual and cognitive process, (attention) during active visual tasks, oculomotor control, visual memory, and allocation of visual (attention), accuracy and precision of visual and cognitive processes in new directions for operational research based decision research. ***Results:*** The study of operational research based decision-making and problem solving has attracted attention. Expanded research proposal requires (model - based empirical) study of behaviour and provide setting for basic research proposal on how ill-structured problems are, and can be, solved. Clinician neuro - operational research based decision-making, which is much less well understood than individual operational research based decision- making and problem solving, can be studied with great profit using already established methods of inquiry, especially through intensive studies. Neuro - ophthalmic management offers solution through series of measurements of eye activity at the time of complex operational research based decision. It provides conceptual and philosophical framework for understanding and conducting research at ophthalmic science, management and psychology spectrum. Neuro - ophthalmic management theory proposes to build eye-based models capable of predicting observed behaviour. Neuro - ophthalmic management will shed light on causes of behaviour (and neuro - ophthalmic anomalies) and help build theories capable of explaining and predicting complex operational research based decision. Measurement of eye activity provides information about underlying mechanisms eye during operational research based decision processes. Neuro - ophthalmic operational research based decision modelling would help when new information is inconsistent with goals. Combining the above disciplines gives interdisciplinary insight to define fundamentals of neuro - ophthalmic operational research based decision making. • Neuro - ophthalmic offers a solution through an additional set of data obtained via a series of measurements of eye activity at the time of complex operational research based decisions, • Provides conceptual and philosophical framework for understanding and conducting neuro - ophthalmic research at the intersection of neuroscience, ophthalmic and psychology, • Describes the first standard model for the choice process that links and spans neurobiological, psychological, and ophthalmic levels of analysis, • Applies neuroscience to both neuro ophthalmic and neoclassical ophthalmic, and ties both fields to biological constraints in how we judge relative value and make choices, • An important resource for researchers in disciplines ranging from ophthalmic to neuroscience, as well as to scholars of the theory of science and the development of interdisciplinary rese ***Discussion***: What are the operational research mechanisms that keep gaze stable with either stationary or moving targets? How does motion of cognitive image on retina affect vision? Where do (operational research based decision makers) look - and why - when performing complex task? How can the world appear clear and stable despite continual movements of eyes? Cognitive processes driving eye movements during operational research based decision-making are not in any consequential way different from those in similar tasks. Eye movements in operational

research based decision making are partially driven by task demands. Eye movements in operational research based decision-making are partially driven by stimulus properties that bias information uptake in favor of visually salient stimuli. Eye movements do not have causal effect on preference formation. However, through properties inherent to visual system, such as stimulus-driven attention, eye movements do lead to down-stream effects on operational research based decision-making. Operational research based decision makers optimize eye movements to reduce demand on memory and reduce number of fixations and length of saccades needed to complete operational research based decision task. Drivers of eye movements in operational research based decision making change dynamically within tasks (Orquin and Loose; 2013). Attention should be paid for performing experimental procedures in order to evaluate usability, accuracy and reliability of eye tracking systems. Any (complex operational research based decision) model that aims to describe operational research based decision making must reflect that visual information play central role in operational research based decision dynamics.

Poster: **V14** **Gaia Lapomarda**

The bodily-emotional experience of time: temporal interval perception is modulated by anxiety

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Introduction: Time perception is a crucial aspect of life, and many non-temporal factors such as emotions can modulate it. The ability to interpret subtle bodily changes (interoception) influences individuals' emotional experiences, and the insula plays a key role in this integrative process. However, the neural representation of the relationship between time, emotions, and body remains unclear. Here, we investigated the effect of anxiety on time perception, considering individual variations in interoception. We hypothesized that better interoceptive abilities would predict more intense emotional experiences, which in turn would disrupt the perception of time. This would be mirrored in a modulatory effect of the amygdala on the integrative function of the insula. ***Methods***: To test this, participants (N=30, 15 females, mean age = 21.75±4.28 years) performed an auditory temporal reproduction task while undergoing fMRI. In half of the blocks, they were at risk of hearing random screams throughout the task (threat condition), whereas in the other half, they were ensured that no screams would be presented (safe condition). In addition, the interoceptive accuracy was assessed outside the scanner using the Heartbeat Tracking Task. ***Results:*** Behavioral data were analyzed with linear mixed models in R. Our paradigm successfully induced emotional changes, with higher anxiety perceived in the threat blocks (SE=1.62, t=6.13, p<.001). Increased interoceptive accuracy was related to increased experience of anxiety (SE=0.55, t=4.82, p<.001). Higher anxiety predicted greater underestimation of long durations (Accuracy Reproduction: SE=0.01, t =-3.98, p<.001). To determine the interaction effect of emotions and temporal experience at a neural level, we plan to look at the functional interplay between the amygdala and insula. ***Discussion***: These first results suggest a disruptive effect of anxiety on temporal perception. Further exploring the neural underpinning of this process can inform our understanding of how the brain-body interaction powerfully modulates affective and cognitive processes.

Poster: **V15** **Jessica Hazelton**

Altered spatiotemporal dynamics of interoception in neurodegenerative diseases

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Introduction: Emerging evidence suggests that allostatic-interoception, the processing of signals from within the body, is dysfunctional in some neurodegenerative diseases. Allostatic-interoceptive dysfunctions may be accompanied by altered intrinsic neural timescales, which represent delayed signal processing of interoceptive information. Currently, no study has investigated the intrinsic neural timescales of interoception in neurodegenerative diseases. Therefore, we aimed to address this gap in the literature. ***Methods***: Eighteen behavioural-variant Frontotemporal dementia (bvFTD), 24 Alzheimer's Disease (AD), 18 Parkinson's Disease (PD), 46 Controls completed an interoception or exteroception task, while high density-EEG was simultaneously recorded. Intrinsic neural timescales were measured via autocorrelation windows (ACW), which represent the correlation of the EEG signal for each heartbeat with a time-lagged version of itself in 3-second epochs. Here, a shorter ACW represented more efficient processing of the heartbeat. ***Results:*** During interoception, bvFTD patients had a longer ACW than controls (p=.019) and PD (p=.017) across the whole brain. Moreover, bvFTD patients had a longer ACW than controls (p=.040) in frontal interoception-related EEG channels, with trend-level differences observed between patient groups during interoception (bvFTD vs. PD, p=.06; bvFTD vs. AD p=.08). During exteroception, bvFTD patients had a longer ACW than PD only (p=.024) across the whole brain, with no other significant differences observed. ***Discussion***: Here, we provide the first evidence for altered intrinsic neural timescales in bvFTD, particularly during interoception. This finding supports recent theoretical frameworks of dysfunctional allostatic-interoceptive processing in bvFTD. Moreover, intrinsic neural timescales may represent a potential biomarker of disease, which may inform future clinical trials.

Poster: **V16** **Nima Norbu Sherpa**

Effects of oral creatine monohydrate augmentation to cognitive- behavioural therapy in depression: an 8-week pilot, double-blind, randomised, placebo-controlled trial.

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Introduction: Preclinical and clinical studies hypothesise that creatine, an inexpensive nutraceutical, can be an effective add-on to conventional antidepressant pharmacotherapy. In this pilot study, we investigate the effects of creatine in addition to cognitive-behavioural therapy (CBT) on depression. ***Methods***: We conducted an 8-week randomised controlled trial in which creatine monohydrate plus CBT was compared to a placebo (starch) plus CBT. We employed mixed-model repeated measures analysis of covariance to assess changes in Patient Health Questionnaire-9 (PHQ-9) depression score at study endpoint, computed as adjusted mean difference (aMD) with 95% confidence interval (95%CI). ***Results:*** 100 participants (mean PHQ-9= 17.6 6.3) were randomly assigned to either creatine+CBT (N= 50, mean age = 30.5 7.0) or placebo+CBT (N= 50, mean age= 30.3 7.8)). After 8 weeks, 40 participants dropped out from the study. We observed a decrease in PHQ-9 ratings in both study arms, but more so in creatine+CBT group (aMD= -5.12, 95%CI= -7.20 to -3.52). ***Discussion***: This proof-of-concept, double-blind randomised controlled trial warrants further clinical investigations into the potentially augmenting effects of creatine on antidepressant strategies, including psychological treatment.