9ᵗʰ MindBrainBody Symposium 2022

Poster Session A

Posters Nr. A1-A20 (Zoom Breakout Rooms)

Monday, March 16, 2022 at 18:30-19:15 (GMT+1)
Discussion Part 2 | Poster Session A & B | Tuesday, March 17, 2022 at 09:30-10:00 (GMT+1)

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A04_Hapsari	Fransisca Mira	Adaptive Sensorimotor Training for Amnestic Mild Cognitive Impairment Patient: A randomized and controlled study of a tablet-based sensorimotor home training
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A11_Miklashevsky	Alex	Emotions at our fingertips: Grip force signatures of emotional information processing *Poster Co-Presenters: Kulkova, Elena & Fischer, Martin H.*
A12_Fanghella	Martina	How humans and artificial classifiers decode grasping movements through kinematic information *Poster Co-Presenter: D'Asaro, Fabio Aurelio*
A13_Nasim	Ammara	Decoding the neural representations of digital humans' emotional faces in stereo- versus monoscopic viewing conditions - a study plan *Poster Co-Presenter: Klotzsche, Felix*
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A15_Bamberg	Christoph	A Meta-Analysis of the Effects of Temporary Calorie Restriction on Cognitive Performance
A16_Fourcade	Antonin	Linking emotional arousal to the heartbeat-evoked potential in immersive virtual reality
A17_Shaikh	Usman Jawed	Modulation of fronto-striatal connectivity by intermittent Theta Burst Stimulation (iTBS). A 18F-DesmethoxyFallypride Positron Emission Tomography (PET) study
A18_Hechler	André	Quantifying the Metabolic Cost of Prediction During Visual Processing
A19_Fernandez Larrosa	Pablo Nicolas	Complex decision-making could be facilitated by social modulation through priming
A20_Rodriguez Soriano	Javier	Cross-frequency dynamics of neural and cardiac rhythms in the context of effortful cognition and breath focus

Poster Abstracts

A01 **Poster Presenter:** **Candia-Rivera, Diego**

Neurocardiac dynamics initiate emotional processing through parasympathetic afferents

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Introduction: A century-long debate on bodily states and emotions persists. While the involvement of bodily activity in emotion physiology is widely recognized, the specificity or causative role of such activity has not yet been demonstrated. We hypothesize that the peripheral neural monitoring and control of cardiovascular activity prompts and sustains brain dynamics during an emotional experience **Methods:** We investigated the functional brain-heart interplay under emotion elicitation in publicly available data from 62 healthy participants. The estimation of the bidirectional brain-heart interplay was assessed with a computational model based on synthetic data generation of EEG and ECG signals. The output of the model are time-varying coupling coefficients, for either ascending or descending interplay, between EEG bands and heartbeat's spectral estimators of sympathovagal activity. **Results:** Our findings show that parasympathetic activity plays a leading and causal role in initiating the emotional response, in which ascending modulations precede the descending modulations in the bidirectional communication measurements. Furthermore, we found the existence of a bidirectional interplay between central and peripheral neural dynamics in emotional processing, and the average ascending interplay measured during the whole trial is correlated to the reported level of arousal. **Discussion:** The observed neural dynamics showed that the heart prompts emotions, supporting causation theories of physiological feelings. Our results demonstrate that the emotional experience raise from the mutual interplay between brain and body. The brain receives afferent autonomic information, triggering a cascade of cortical activations. In turn, the brain performs directed neural control onto the heart. The observed ascending pathway of parasympathetic activity towards cortical regions suggests that emotion processing is an integration of physiological inputs in the brain, rather than an interpretation of the physiological changes.

Finding landmarks – An investigation of viewing behavior during spatial navigation in VR using a graph-theoretical analysis approach

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Introduction: Vision provides the most important sensory information for spatial navigation. Recent technical advances allow new options to conduct more naturalistic experiments in virtual reality (VR) while additionally gather data of the viewing behavior with eye tracking investigations. Here, we propose a method that allows one to quantify characteristics of visual behavior by using graph-theoretical measures to abstract eye tracking data recorded in a 3D virtual urban environment. **Methods:** The analysis is based on eye tracking data of 20 participants, who freely explored the virtual city Seahaven for 90 minutes with an immersive VR headset with an inbuild eye tracker. To extract what participants looked at, we defined "gaze" events, from which we created gaze graphs. On these, we applied graph-theoretical measures to reveal the underlying structure of visual attention. **Results:** Applying graph partitioning, we found that our virtual environment could be treated as one coherent city. To investigate the importance of houses in the city, we applied the node degree centrality measure. Our results revealed that 10 houses had a node degree that exceeded consistently two-sigma distance from the mean node degree of all other houses. The importance of these houses was supported by the hierarchy index, which showed a clear hierarchical structure of the gaze graphs. As these high node degree houses fulfilled several characteristics of landmarks, we named them "gaze-graph-defined landmarks". Applying the rich club coefficient, we found that these gaze-graph-defined landmarks were preferentially connected to each other and that participants spend the majority of their experiment time in areas where at least two of those houses were visible. **Discussion:** Our findings do not only provide new experimental evidence for the development of spatial knowledge, but also establish a new methodology to identify and assess the function of landmarks in spatial navigation based on eye tracking data.

A03 **Poster Presenter:** **Carls-Diamante, Sidney**   **Co-Presenter:** **Laciny, Alice**

A predictive processing/active inference account of procrastination in the context of autism spectrum disorder (ASD)

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Introduction: A phenomenon often associated with autism spectrum disorder (ASD) is a deficit in executive function, manifestations of which include difficulty in initiating tasks. In some cases, this is accompanied by feelings of inertia and sensations that can be described as simultaneous restlessness and paralysis. Consequently, the difficulty in getting started on tasks can result in procrastination, either by simply postponing working on the task or by performing other unrelated tasks before engaging in the original one. Interestingly, however, it is also documented that once a task has been started, autistic persons may focus on it intensely and for prolonged periods of time (hyperfocus), especially when the task is interesting to them. **Methods:** This study uses the analytical methods of philosophy to develop a framework to account for the relationship between deficits in executive function, procrastination, and hyperfocus in ASD. The framework is based on the existing theories of predictive processing and active inference. **Results:** The relationship between executive function, procrastination, and hyperfocus in ASD is accounted for via a model that integrates the known and proposed causes of deficits in executive function, predictive processing/active inference theories of action selection and motor control, and the role played by interest in attention regulation and motivation. **Discussion:** The model proposes that procrastination is the outcome of inefficiency in prediction-error minimizing processes, such as differential weighting of sensory stimuli. Links to the proposed ASD model of weak central coherence (WCC), i.e., a tendency to focus on small details rather than the "big picture", as well as possible distinctions from similar phenomena known from attention deficit disorder (AD(H)D) or anxiety disorders are discussed.

Adaptive Sensorimotor Training for Amnestic Mild Cognitive Impairment Patient: A randomized and controlled study of a tablet-based sensorimotor home training

Bekrater-Bodmann, R. [1], Löffler, A. [1], Silvoni, S. [1], Frölich, L. [2], Hausner, L. [2], Desch, S. [1], Kleinböhl, D. [1], Flor, H. [1, 3], & Hapsari, F. [4]

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Introduction: One reliable early sign of dementia and Alzheimer's disease is the diagnosis of amnestic Mild Cognitive Impairment (aMCI), a stage in which preventive measures can make or break the prognosis of cognitive decline. To date, cognitive trainings demonstrated low generalization and maintenance, yielding limited positive effect to specific task which often disappears after the training is completed. **Methods:** This study presents a new approach for retaining cognitive performance in aMCI patients, that is more fundamental in nature. Our current study tested firstly whether there is a connection between sensory and memory functions. Secondly, whether a tablet-based sensorimotor training (tbSMT) was superior to control cognitive training, in terms of generalization to sensory and cognitive function improvements. As sensory cortices are less vulnerable to aging than the newer cortices, training basic sensorimotor functions might yield a more long-lasting and generalized improvement. The sensorimotor training was based on brain-plasticity and operant conditioning principles. Applying shaping, it provided reinforcement of successive approximations of desired sensorimotor outcomes. **Results:** Pearson correlations showed a strong relationship between sensory ability, as indicated by visual acuity and hearing threshold, and cognitive functions, as indicated by verbal and visual episodic memory. After 3-months of computerized training, no significant progress difference between tbSMT and control training groups was observed with factorial ANOVA. However, both groups showed sensory improvement which is largely limited to visual acuity perception. No clear-cut cognitive improvement was discovered, as only slight progress in verbal and visual episodic memory was found. **Discussion:** We provided another evidence for interconnection between sensory functions and cognitive functions in clinical population. This was one of the first studies examining multi-modality sensorimotor training to cognition. Thus, future research comparing the effectiveness of sensorimotor and cognitive training is needed, as well as integrating different approaches in training elderly with MCI.

Are Developmental Learning Disorders risk factors for Neurodegenerative Diseases?

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Introduction: Factors associated with early life educational performance can be related to neurodevelopment, cognitive functioning and, consequently, the risk for dementia, but have received less attention than adult biomarkers. **Methods**: A systematic review of the evidence available up to December 2021 in PubMed and Scopus was carried out. Original articles addressing both developmental LD and late-onset NDD were included. **Results:** A significant prevalence of LD was found in patients with atypical variants of Alzheimer's disease (AD). Furthermore, an association was found between primary progressive aphasia - logopenic variant and language-related LD, and also between posterior cortical atrophy and non-language-related LD. These results could be explained by the selective vulnerability hypothesis, which states that the vulnerability of a particular brain network or area could predispose both to developmental LD and late-onset NDD. **Discussion:** Developmental LDs can be considered as risk factors for late-onset NDD, especially for atypical AD variants. Given the scarcity of results and the limitations reported, a greater number of studies are required, with larger samples and, preferably, of longitudinal design in order to address this issue.

Are experimental approaches to study the Sense of Agency comparable?

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Introduction: The sense of agency (SoA) is the feeling of intentionally moving our body and, through it, affecting the environment. In line with this definition, studies aim to affect SoA by manipulating either a representation of a movement or the consequences of that movement on the environment. However, it is unclear whether the underlying assumption is valid, that these two kinds of manipulations equally affect the SoA. Using a novel experimental paradigm, we aim to address this question by systematically manipulating these two components: a representation of the movement itself vs its effects on the environment. Further, we employ as dependent measures estimates of metacognitive performance to compare different conditions devoid of response biases in subjective measures, which are often present in typical agency tasks. **Methods:** In a virtual game, participants throw a ball to hit a target twice on each trial. The visual feedback is congruent with what participants did in only one of the two movements and incongruent in the other: Either the movement or the outcome (ball flight trajectory) does not match what participants did. In each trial, participants select the interval in which they felt stronger SoA and rate their confidence in that decision. **Results:** We will estimate participants' metacognitive performance in each condition. We will also conduct exploratory event-related potentials (ERP) analyses to examine if the amplitude of specific ERPs (e.g. ERN and CRN) differs between conditions. **Discussion:** We hypothesize that SoA over the movement differs from SoA over the outcome both behaviourally and at the neural (EEG) level, which would suggest that these two approaches, while each valid on its own, should not be considered equivalent. Furthermore, by framing SoA within the broader framework of metacognitive monitoring, we aspire to lay some theoretical grounds and a more precise methodological approach to move forward the research on SoA.

A07 **Poster Presenter:** **Forster, Carina** **Poster Co-Presenter*:* Enk, Lioba**

Informative cue on stimulus frequency affects criterion in near-threshold detection

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Introduction: Sensory perception relies on stimulus properties and the context in which the stimuli are presented. Recently in the visual system, it has been shown that expectation of a weak stimulus altered the subjective threshold of reporting the stimulus (commonly known as criterion in signal detection theory). Moreover, interoceptive signals such as cardiac and respiratory rhythms influence human perception of near-threshold stimuli. However, it remains to be determined whether stimulus expectations interact with these interoceptive signals to influence sensory perception. **Methods:** Forty-two healthy adults received near-threshold electrical stimulation to their index finger whilst 62-channel EEG, ECG and respiration were recorded. In each trial, participants had to report stimulus presence and decision confidence. Stimulus expectation was manipulated in a within-subject design. Each of the 30 blocks per condition contained either three near-threshold trials (25%; low expectation) or nine near-threshold trials (75%; high expectation). Before each block of twelve trials a cue indicated whether there was a high or low chance for a stimulus. The cues (25%/75%) matched the actual probability of stimulus presence. **Results:** Participant's threshold to report a stimulus was higher in the low expectation condition while sensitivity did not differ significantly between conditions. Reaction times were shorter and confidence was higher in hits in blocks with a high stimulus probability compared to blocks with a low probability for a stimulus. Preliminary results indicate that participants are more sensitive in diastole but this effect is only present in the low expectation condition. **Discussion:** We show for the first time in the somatosensory system that informative cues of lower stimulus probability lead to an increase of subjective thresholds to report a weak stimulus. Interestingly, higher sensitivity for weak tactile stimuli can only be replicated in the low expectation condition.

Non-zero mean alpha oscillations are involved in P3b generation

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Introduction: The parietal P3b is by far the most widely investigated evoked response in EEG/MEG research and it is used to study general stimulus processing, attention and arousal, working memory, etc. However, the neurobiological mechanisms underlying the generation of P3b are rather poorly understood. Previous research demonstrated that P3b co-occurs with alpha-amplitude decrease triggered by a stimulus, therefore P3b origin may be due to the baseline-shift mechanism for evoked response generation (BSM). BSM posits that if neuronal oscillations have a non-zero mean, any modulation of oscillations' amplitude would result in the deflection in the frequency range of modulation. Therefore, modulation of the non-zero mean alpha oscillations co-occurs with a low-frequency wave, i.e., evoked response. In this study, we tested the BSM prerequisites for the generation of P3b. **Methods:** We analysed a large cohort of elderly individuals (N=2308, 60-82 y.o.) in a framework of assumptions relating to BSM. From the rest-state data, we extracted the baseline-shift index, a measure that determines how strong is the concordance between low-frequency time course (0.1-3 Hz) and the ongoing rhythm envelope (the alpha rhythm). From the stimulus-based data, we extracted P3b (using simple averaging) and alpha rhythm amplitude envelope (using the Hilbert transform). **Results:** We showed that predictions of BSM concurred with the P3b–alpha amplitude relation - (1) the sign of the baseline-shift index together with the direction of amplitude change determined the direction of P3b, (2) time courses of P3b and alpha envelope were correlated, (3) spatial distributions of P3b and alpha modulation were comparable. **Discussion:** Our results suggest that P3b, at least partially, is generated via BSM, and therefore is closely related to alpha oscillations. Furthermore, in a broader sense, it indicates that changes in P3b with respect to age or disease should also be interpreted in the context of oscillatory neuronal dynamics.

The Role of Mother-Infant Emotional Synchrony in Speech Processing in 9-month-old Infants

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Introduction: Interactions between mothers and their infants are characterized by regular and recurring cycles of behavior and affective expressions. These rhythmic patterns might elicit the temporal alignment of behavioral states (i.e., interpersonal synchrony), such as the matching of affective expressions. Similarly, language is rhythmic. Infants ability to perceive rhythm and their word segmentation ability predict later language outcomes. The present study aimed at investigating whether mother-infant emotional synchrony contributes to infant language development. We hypothesized that higher levels of emotional synchrony are linked to better word segmentation at 9 months of age. **Methods:** Data of twenty-six 9-month-old infants and their German-speaking mothers were included in this study. To measure emotional synchrony, we video-recorded 5 minutes of free play interactions between the mothers and their infants, which were then coded for positive, neutral and negative emotional expressions. To quantify the patterns of emotional synchrony we used Cross-Recurrence Quantification Analysis, particularly recurrence rate (i.e., RR, tendency of the dyadic system to repeat itself) and entropy (i.e., ENTR, degree of disorder characterizing the dyad). With an eye-tracking-based central fixation paradigm, we tested infants' word segmentation. During familiarization, infants heard text passages containing two target words (i.e., familiar trials). At test, infants heard familiar words and novel word trials, and infants' looking times while listening to trials were used as dependent measure. **Results:** Regression modelling revealed that ENTR, but not RR, interacted with trial type: the lower the entropy during interaction, the longer infants looked during presentation of novel compared to familiar words at test, indicating successful word segmentation performance. **Discussion:** These findings suggest that individual differences in word segmentation relate to the complexity and predictability of emotional expressions during mother-infant interactions. Our study highlights the relevance of examining the role of shared emotions in communication, specifically its dynamics, and language development.

Emotions at our fingertips: Grip force signatures of emotional information processing

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Introduction: The body-specificity hypothesis predicts an association between positive stimuli and the right hand and between negative stimuli and the left hand in right-handed participants. The magnitude account of emotion processing instead predicts the association of all arousing stimuli with the right hand and of neutral stimuli with the left hand. **Methods:** 26 right-handed participants were included in the study. We measured participants' initial emotional state and then presented them with happy, sad, and neutral faces. Participants' spontaneous grip force changes were bimanually recorded with millisecond resolution by using grip force sensors. Vocal responses were required only in go trials, while all trials of interest required no response at all (no-go trials). The task was to distinguish between faces vs. non-animate objects, i.e., emotional state was processed implicitly. **Results:** We found a complex interaction between participants' initial emotional state and their reactions to emotional stimuli presented during the experiment. Participants whose state before the experiment was calmer and more negative exhibited stronger grip force for emotional stimuli in both hands already at 140-180 ms after stimulus onset. At 630-760 ms, the same participants only demonstrated this effect in the left hand. Participants whose initial emotional state was positive showed stronger grip force for emotional stimuli in the right hand at 630-760 ms. **Discussion:** Our findings favor the magnitude account that predicts an association between force and arousal. We demonstrate the moderating impact of participant's initial emotional state on the processing of emotional stimuli. The body-specificity hypothesis received little support in our study. We hypothesize that horizontal valence-space associations might result from explicit lateralized responses used in previous studies.

A12 **Poster Presenter:** **Fanghella, Martina** **Poster Co-Presenter:** **D'Asaro, Fabio Aurelio**

How humans and artificial classifiers decode grasping movements through kinematic information

Martina Fanghella* [1], Fabio Aurelio D'Asaro* [2], Maria Teresa Pascarelli [1], Guido Barchiesi [1], & Corrado Sinigaglia [1]

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*equally contributed

Introduction: Recent models of action observation suggest that the brain relies on motor information to understand others' behaviour. However, less is known on the mechanisms underlying action recognition when motor information is ambiguous. By comparing human and algorithms performances in a grasping recognition task, this study aims to investigate the strategies underpinning movement classification when different amounts of motor information are available. **Methods:** 1.Human recognition of grasping movements 30 participants took part to an online study. They observed videos showing 10%, 20%, 30% or 40% of the kinematic, and guessed if the hand was grasping a large or a small object, by looking at the hand kinematics. 2.SVM classification on Kinematic Data We performed binary classification on kinematic data by training a Support Vector Machine (SVM). 3.Neural Network classification on Videos To perform classification on videos, we used a hybrid Machine Learning Neural Network model known as CNN-RNN. All classifications were performed on the same datasets. **Results:** Analysis of Precision and Recall in Humans and SVMs shows that recall for "small" objects is significantly greater than recall for "large" objects up to 30% of video for humans ($p < 0.005$). Then, the trend is inverted with recall for class "small" being reduced than recall for class "large" from 30% of the video onwards ($p < 0.001$). Similar results hold for precision. Conversely, we could not observe the same pattern for visual classification with Neural Network. **Discussion:** Our study shows that human performance is characterised by similar patterns compared to the classifier using only kinematic information, confirming that humans use motor information to understand others' actions, even when ambiguous. By contrast, machine learning algorithms using visual information exhibit different trends of performance, suggesting that visual analyses of the stimuli may impact only marginally on movement recognition.

Decoding the neural representations of digital humans' emotional faces in stereo- versus monoscopic viewing conditions - a study plan

Nasim, A. [1,2], Hofmann, S.M. [1,3], Nikulin, V. [1], Sommer, W. [4,5,6], Villringer, A. [1,4], Gaebler, M [1,4], Klotzsche, F. [1,4,5]

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Introduction: One of the core building blocks of social communication are emotional facial expressions. Faces are complex 3D structures that the human visual system captures via stereopsis. Yet, face perception has mostly been studied with setups that do not provide stereoscopic depth information. In our study, we compare the effect of stereoscopic and monoscopic presentations of digital humans' facial expressions on the elicited neurophysiological response by combining immersive Virtual Reality (VR) technology with EEG and eye tracking. **Methods:** Healthy, young participants (N=30) perform an emotion recognition task (720 trials) with stereoscopic and monoscopic renderings of three digital humans' faces showing different emotional expressions (neutral, happy, angry, surprise). The stimuli were generated based on the Facial Action Coding System (FACS) using "FACSHuman", a validated plugin for the open-source software "makehuman". The faces are presented in a VR headset while we record EEG and eye tracking data. We use multivariate decoding (temporally resolved logistic regression) to test the extent to which different facial expressions and identities can be distinguished based on EEG data. To assess the impact of stereoscopic information, we compare the classification performance and relevant neural features in the EEG for stereoscopically and monoscopically presented faces. **Results:** Data acquisition for this study is not yet completed. We will present the experimental design as well as preliminary results of this ongoing study, demonstrating the EEG decoding approach and challenges posed by eye movement artifacts. **Discussion:** We hypothesize that stereoscopically presented emotional facial expressions lead to enriched mental representations, which manifests in higher decoding performances. This study will contribute to understanding the relevance of stereopsis for the processing of digital humans' emotional faces by the brain.

A Meta-Analysis of the Effects of Temporary Calorie Restriction on Cognitive Performance

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Introduction: Does temporary calorie restriction, such as skipping breakfast or intermittent fasting, worsen cognitive performance? Previous research investigated this question by assessing a variety of fasting interventions and cognitive tests. Bringing together these different approaches, we assess whether calorie restriction effects are dose-dependent, and whether the effect differs across cognitive domains (e.g., attention, working memory capacity). **Methods:** We searched seven electronic databases, Google Scholar and previous reviews for relevant experimental studies (PROSPERO preregistration ID: CRD42021272822). We considered experiments with a zero-calorie fasting intervention and a standardised cognitive performance measure. In total, 17,465 studies were screened; 52 were entered into the meta analysis, with 157 effect sizes and a combined sample of N=2,185. The median fasting duration was 12 hours. A three-level random-effects model was fit to the standardised mean differences in cognitive performance between the fasted and satiated condition. **Results:** Cognitive performance in the satiated condition was higher than in the fasted condition (SMD = 0.078, SE = 0.035, 95%CI = [0.009, 0.147], p = 0.026). The heterogeneity in the model was $I2 = 34.08\%$. Adding fasting duration as a predictor, the difference in cognitive performance between the satiated and fasted condition increased for longer fasting periods (beta=0.003, SE=0.001, 95%CI=[0.001,0.005], p=0.004). Distinguishing the investigated cognitive domain in a subgroup analysis significantly reduced residual heterogeneity by 2.38% (Test of Moderators: QM(df = 7) = 14.89, p = 0.038). **Discussion:** Cognitive performance decreases in individuals who are fasted compared to when satiated. This effect is dose-dependent—it increases for longer periods of calorie restriction—and slightly differs between cognitive domains. The worse performance when fasted may be due to participants not being used to fasting. Future studies following participants over several fasting periods could help shed light on individual cognitive responses to calorie restriction.

Linking emotional arousal to the heartbeat-evoked potential in immersive virtual reality

Fourcade A. [1, 2, 3], Klotzsche, F. [1, 2], Hofmann, S. M. [1, 4], Mariola, A. [5, 6], Nikulin, V. V. [1], Villringer A. [1, 2, 3], & Gaebler M. [1, 2]

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Introduction: The heartbeat-evoked potential (HEP) is an event-related potential linked to the cortical processing of the heartbeat. It has previously been associated with emotional arousal, a fundamental dimension of affective processing: HEP amplitude over temporo-parietal electrodes has been found to be larger during high emotional arousal (HA) than during low emotional arousal (LA). In the present study we tested this association under naturalistic conditions using immersive virtual reality (VR). **Methods:** We analyzed HEPs in previously collected data: 37 young healthy participants completed a VR experience (HTC Vive), while EEG and ECG were recorded. Each participant completed the experience (two rollercoasters separated by a break) twice: once without and once with freely moving the head (randomized across participants). After each experience, subjective emotional arousal was continuously rated while viewing a 2D recording of the experience. LA and HA were defined as lower and upper tertile of the rating (1-s) bins, respectively. In a whole-head analysis, non-parametric cluster-based permutation t-tests were used to compare HEP amplitudes between HA and LA, by pooling the data from both head movement conditions. **Results:** We did not find evidence for higher HEP amplitudes during HA compared to LA over right temporo-parietal electrodes. A cluster over left frontal electrodes showed a significantly lower HEP amplitude for HA than for LA. In control analyses, we found significant effects of arousal, head movement, and their interaction on heart rate variability (HRV) but not on heart rate. In particular, HRV was higher for LA than for HA. **Discussion:** The topography of the frontal cluster might reflect the anterior pole of a dipole that also (reversely) projects to parietal electrodes. The difference in HEP amplitude could also be related to the difference in HRV. Frontal cortices have been associated with changes in heart rate, HRV, and the regulation of emotional arousal.

Modulation of fronto-striatal connectivity by intermittent Theta Burst Stimulation (iTBS). A 18F-DesmethoxyFallypride Positron Emission Tomography (PET) study

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Introduction: Frontostriatal networks are neural pathways that connects frontal regions and the striatum and is involved in motor, cognitive, and behavioural processes. It has been shown that Transcranial Magnetic Stimulation (TMS) can modulate connectivity in the human brain. TMS with long stimulation protocols to the Pre Frontal Cortex (PFC) is widely used for clinical purposes such as depression treatments. The combined measurement of PET and TMS technique would help to understand better the dopaminergic activity in the fronto-striatal area. The aim of the study is to investigate the fronto-striatal connectivity by measuring the release of dopamine in the striatum in response to an excitatory intermittent theta burst stimulation (iTBS) of the Left-Dorsolateral Prefrontal Cortex (L-DLPFC). A PET measurement was performed by using the 18F-DesmethoxyFallypride (DMFP) radioligand, that is a high affinity receptor-antagonist which competes with endogenous Dopamine neurotransmitters for D2/D3 receptor binding. **Methods:** The study was conducted on 23 healthy participants, who underwent iTBS sham (control) and verum (active) stimulations on separate days. The PET scan lasted 120 mins, consisting of 4 iTBS stimulations delivered to the left-DLPFC at 30 mins interval in both sham and verum condition. Mean Binding Potential values in the sub-regions of the striatum (Nucleus Caudate and Putamen) were determined and compared between the sham and verum stimulation using analysis of variance (ANOVA). **Results:** Mean Binding Potentials shows a significant difference between sham and verum stimulations. The Sham stimulation shows the expected, baseline increasing pattern for the Binding Potentials. The verum stimulation shows reduction in Binding Potentials as the iTBS has increased the Dopamine release in the striatum. **Discussion:** Results suggest that the minimal stimulation time iTBS protocol can effectively increase Fronto-striatal connectivity. This stimulation protocol can be used as a therapeutic therapy for treating major Depression patients by presenting it in the repeated blocks of short intervals.

Quantifying the Metabolic Cost of Prediction During Visual Processing

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Introduction: Mathematical models informed by the free energy principle suggest that information processing in the human brain leads to metabolic efficiency. An underlying mechanism might be the minimization of uncertainty about sensory input via a feedback loop between internal models of the world and actual input. This is supported by MR studies showing decreased activity for sensory stimuli that validate participants' predictions. However, whether predictions themselves incur significant metabolic cost over naïve perception is still unclear. **Methods:** The traditionally used BOLD signal is only a proxy for energy consumption, providing relative measurements mainly driven by hemodynamic activity. Here, we have been acquiring data from 21 healthy subjects using novel multiparametric quantitative BOLD methods. We separately measured blood deoxygenation, cerebral blood flow and cerebral blood volume to calculate the cerebral metabolic rate of oxygen (CMRO2) on a voxel level. During a three-day training phase, participants viewed temporal object sequences while performing a cover task to ensure attention. Objects either always appeared in the same order (predictable condition) or always in a random order (unpredictable condition). We tracked the learning progress with a sequence completion test after each session. In the following MR session, we presented the experimental conditions using a block design. **Results:** After the training, participants averaged >80% correct completions of predictable sequences. To estimate the cost of prediction, we contrasted CMRO2 values of predictable versus unpredictable blocks both brain-wide and within the object selective cortex. Results show a significant increase in the predictable condition of 4.3% and 1.94% respectively (all $p<.05$). These findings are consistent across functional brain networks (Schaefer parcellation) with the smallest changes in the visual network and largest in fronto-parietal regions. **Discussion:** The quantitative evidence for a brain-wide increase in energy consumption suggests that predictive processing and metabolic efficiency are at least partly at odds.

Complex decision-making could be facilitated by social modulation through priming

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Introduction: Some decision-making (DM) processes require quick answers, while more complex decisions demand greater cognitive engagement. Under the hypothesis that frequent exposure to a stimulus (repetition priming) or its association with an emotional valence (emotional priming) could drive DM, online experiments were conducted. **Methods:** Cognitive experiments involved a computer task where participants had to choose a face from 4 options, each of them was associated with different frequencies (EXP#1) or with positive, negative, neutral, or mixed sentences (EXP#2). Two experimental groups were assessed: the 1st group was asked to choose a face without any specification (NST); and the 2nd one for an important task (IT). To compare results in a more ecological situation (Social Study), online social surveys were conducted during the 2019 Argentine Presidential Elections, as well as written media news were scraped to assess each candidate's mention frequency and sentiment analysis. **Results:** Results show: 1. The most repeated face was significantly more chosen in the NST group, involving significantly greater response time; 2. The faces with a positive association were significantly more chosen than others, in both groups; and 3. The effect persisted at least for 24hs.   In the case of the Social Study, Familiarity(F), Trust(T), and Voting Probability(VP) were estimated for each candidate from the surveys, as well as the main means used by the participants to inform themselves about the candidates. T and F mostly explain the VP variance; in a cross-analysis between variables and for different candidates, T was found to correlate better (than F) with VP but both were significant in most analyses. Besides, F, T, and VP for each candidate correlate significantly with the frequency of mentions, the positive association, and election results. **Discussion:** These results support our hypothesis and suggest that complex decision-making susceptibility to repetition or emotional priming could depend on the relevance of the involved task.

Cross-frequency dynamics of neural and cardiac rhythms in the context of effortful cognition and breath focus

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Introduction: Pairs of neural oscillators can only phase-synchronize when their peak frequencies arrange harmonically (e.g., alpha = 10 Hz; theta= 5 Hz; ratio alpha:theta = 2:1). Transient shifts in peak frequencies of different neural oscillators seem to form the principal mechanism by which cross-frequency coupling (i.e., facilitating information integration and communication) takes place. Previous work shows that alpha and theta peak frequencies undergo shifts upon conditions of cognitive effort, breath focus and rest. Considering the growing evidence that an interplay between neural and other physiological oscillatory activity (e.g., cardiac, respiratory and gastric rhythms) also occurs in a state-dependent manner, a similar mechanism of cross-frequency relationships has been proposed to characterize brain-body interactions. **Methods** Following a systemic approach to study human oscillatory physiology, we explored cross-frequency relationships between neural and cardiac (i.e., alpha and heart rate; HR) oscillators. Electroencephalography and electrocardiography were recorded from 18 adults (mean age 23.56 ; 11 women) during three 5-min conditions of (i) rest, (ii) breath focus and (iii) a cognitively demanding arithmetic task. Then, transient frequency changes and the ratio between frequencies of the oscillator pair were computed. **Results:** The transient incidence of alpha-HR cross-frequency relationships at or around the harmonic (8:1 for alpha-HR) was significantly higher during the arithmetic task compared to rest and breath focus. On the contrary, the incidence of approximately non-harmonic relationships (harmonic ratio of 8:1 multiplied by the irrational number golden mean, 1.618; i.e., ratio of 12.94:1) was shown to be higher during breath focus compared to both rest and arithmetic task. **Discussion:** These findings, considering the dynamical interaction of body subsystems, inform of the physiological underpinnings of cognition. Specifically, the cross-frequency relationships predominant in each condition suggest that during effortful cognition there is a greater degree of coupling between neural and cardiac oscillators. Conversely, breath focus seems to be characterized by decoupling between these oscillators.

9th MindBrainBody Symposium 2022

Poster Session B

Posters Nr. B1-B20 (Zoom Breakout Rooms)

Monday, March 16, 2022 at 19:15-20:00 (GMT+1)
Discussion Part 2 | Poster Session A & B | Tuesday, March 17, 2022 at 09:30-10:00 (GMT+1)

Poster Nr. & Family Name	First Name	Title
B01_Quian	Maria del Rosario	Evaluating The Hemispheric Asymmetry Model Of Encoding And Retrieval Through Music. *Poster Co-Presenters: Bertoli, Juan Ignacio & Andreau, Jorge Mario*
B02_Caramés	Maria Ayelen	Frequency and Emotional Priming Could Modulate Complex Decision-making Processes Depending on Task Relevance
B03_Panagoulas	Eleni	Grey matter volume in patients with Central Poststroke Pain
B04_Tawil	Nour	Is curvature preferred over angularity? Exploring psychological responses to indoor environments presented in Virtual Reality
B05_Bachman	Shelby	Isometric handgrip exercise speeds working memory responses in younger and older adults
B06_Ramírez	Verónica Adriana	Role of Gender in Autonomic Reactivity: Analysis of Heart Rate of Preschool Children During Videos with Different Emotional Content
B07_Jeglinski-Mende	Melinda A.	Shaping Negation – Spatial-Numerical Associations in Negative Numbers
B08_Kim	SuHyeong	The adult rats after alcohol exposure in a third – trimester model of FASD showed impairment in spatial working memory dependent delayed alternation task.
B09_Constant	Marika	The Weighting of Prior Information in Confidence
B10_Beccherle	Maddalena	Virtual social touch on embodied avatars in patients with Fibromyalgia
B11_Herman	Aleksandra	Delay and Effort-Based Discounting, and the Role of Bodily Awareness, In People Experiencing Long-Term Pain: A Cross-Sectional Study
B12_Morgenroth	Elenor	Movie-induced emotion experiences modulate dynamically-occurring amygdala-CAPs
B13_Aydin	Tuba	Investigation of marriage and life satisfaction of multiple sclerosis patients in terms of demographic variables *Poster Co-Presenter: Önger, Mehmet Emin*
B14_Al	Esra	Cardiac Signals Influence Cortical Motor Excitability and Muscle Activity
B15_Chinchella	Nicola	Addiction, cure or care?
B16_Stephani	Tilman	Cortical excitability shapes somatosensory perception with spatiotemporally structured dynamics
B17_Recart	Emilio	Sentiment analysis in news media headlines in 2019 Presidential Elections: Exploratory Reliability Study Analysis
B18_Poster Withdrawn		
B19_Sonkusare	Saurabh	Neural interactions between anterior insula and anterior cingulate cortices link perceptual and physiological processes
B20_Shapouri	Soheil	Emotional Reactions to Natural and Technological Disasters; A Possible Case for Evolutionary Mismatch
B21_Pimpini	Leonardo	Mindset matters: Attentional focus – not body-weight – determines the level of food-related brain activity

Poster Abstracts

B01 **Poster Presenter:** **Quian, Maria del Rosario** **Poster Co-Presenters:** **Bertoli, Juan Ignacio & Andreau, Jorge Mario**

Evaluating The Hemispheric Asymmetry Model Of Encoding And Retrieval Through Music.

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Introduction: The hemispheric encoding/retrieval asymmetry (HERA) model proposes a differential lateralization in the memory encoding and retrieval processes, with encoding having a preferential activity in the left hemisphere and retrieval having a preferential activity in the right hemisphere. On the other hand, several studies reported that the perception of music also activates the brain in a lateralized way, with the right hemisphere having a greater preponderance. **Methods:** In order to analyze the HERA model through music, our experimental subjects had to recall a list of words by listening to music in the background in encoding or retrieving verbal information. **Results:** Our results will provide new data to better understand hemispheric specialization and the factors associated with it. **Discussion:** This project would allow the development of a novel and inexpensive methodology to test the HERA model.

Frequency and Emotional Priming Could Modulate Complex Decision-Making Processes Depending on Task Relevance

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Introduction: Complex decision-making processes (CDM) differ from simple ones because they require greater cognitive commitment, in which the precision of the response predominates over the reaction time (RT). **Methods:** Through online cognitive experiments, it was studied if CDM can be modulated by two different conditions: repetition and emotional priming. Faces were sequentially presented with different frequencies (1, 6 or 12 times in 20 repetitions) or with the same frequency (5 times each face) associated to one emotional content phrase (positive, negative or neutral). Subjects were aleatory separated into two analysis groups by asking them to choose one face among four faces to realize an important task (IT) or a non-specified task (NST). Results indicated that: 1. RT in IT is significantly longer than in NST; 2. Face with frequency 12 was significantly more chosen in NST; 3. Faces with positive phrases associated were significantly more chosen in both groups. These experiments raise the role of the task´s nature in a possible top-down mechanism modulating CDM. In this essay a third analysis group was evaluated by choosing faces to realize a not important task (NIT) replicating the same online experiments, comparing with a new NST group. **Results:** Results show that: 1. Face with frequency 12 was significantly more chosen in NST than in NIT; 2. RT in NIT is significantly longer than NST; 3. In NIT the faces significantly more chosen were associated with negative or neutral phrases. **Discussion:** These results support the hypothesis that priming modulation could be affected by the task´s relevance, with a top down mechanism.

Grey matter volume in patients with Central Poststroke Pain

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Introduction: Central post-stroke pain (CPSP) is a chronic neuropathic pain condition that arises following a cerebrovascular accident affecting the central somatosensory pathway. CPSP develops in at least 8-20% of patients with somatosensory stroke. Once established, it is often refractory to treatment, causing a significant negative impact on patients' quality of life. The aim of this study was to investigate grey matter volume (GMV) changes over time in patients with CPSP and compare them with non-pain sensory stroke (NPSS) patients. **Methods:** A longitudinal and cross-sectional voxel-based morphometry analysis of T1 weighted images was conducted using SPM and the CAT12 toolbox. GMV of CPSP patients was compared to NPSS patients in the acute (days 2-10) and the chronic setting (> 6 months). **Results:** This study reports the first ever longitudinal voxel-based morphometry results of patients with central post stroke pain. In total 51 NPSS patients and 26 (33.8%) CPSP patients were analysed. CPSP patients showed an increase in GMV in the contralesional middle and superior temporal gyrus when comparing GMV before and after pain development. In the acute setting patients that went on to develop pain, showed lower GMV in bilateral superior and middle temporal gyrus as well as in bilateral caudate nuclei, contralesional precentral and middle frontal gyrus compared to NPSS patients. Chronic CPSP patients showed lower GMV in the contralesional insula, ipsilesional cingulate gyrus as well as the contralesional cerebellum relative to NPSS. **Discussion:** These findings are in accordance with previous VBM studies in CPSP patients and offer a unique insight into the profound effect that stroke and CPSP have on brain morphology. Furthermore, it appears that patients already in the acute setting show structural features that might predispose them to develop pain. This supports the argument for early identification and initiation of treatment in this patient group.

Is curvature preferred over angularity? Exploring psychological responses to indoor environments presented in Virtual Reality

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Introduction: There has been a recent interest in understanding how architectural features affect human brain and behavior. For instance, some studies have proposed that humans prefer curved, as opposed to angular or edgy interiors, with the latter inducing more positive emotions. Whereas the evidence for this hypothesis in the context of abstract shapes and lines seems robust, it does not appear to be as strong in architectural settings, with the scarce available research primarily depending on static, unmatched, or unrealistic stimuli. **Methods:** In a within-subject study, we aimed to systematically examine the curvature preference hypothesis in indoor photorealistic environments, while including style as an explorative second level variable. 42 participants were exposed to four well-matched virtual living rooms representing contrast in contour (angular vs. curved) and style (modern vs. classic). Subjects freely explored the simulated rooms inside which they performed a repeated mental arithmetic task and rated their mood and spatial experience. **Results:** Out of the 33 outcome variables measured, and after correcting for false discoveries, only two eventually confirmed differences in the contours analysis, in favor of angular rooms. Analysis of style primarily validated the contrast of our stimulus set, and showed significance in one other dependent variable. Results of additional analysis using the Bayesian framework were in line with those of the frequentist approach. **Discussion:** The present results provide evidence against the curvature preference hypothesis, suggesting that the psychological response to contour in dynamic architectural settings is more complex. This study, therefore, helps to communicate a more complete scientific view on the experience of interior spaces and highlights the necessity of further investigations by providing directions for future research.

Isometric handgrip exercise speeds working memory responses in younger and older adults

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Introduction: Working memory performance is modulated by stress and emotion, but it is unclear how changes in physiological arousal affect working memory. The locus coeruleus (LC), a small brainstem nucleus, is an arousal hub region in the brain. Higher tonic levels of LC activity are associated with poorer task performance. Isometric handgrip exercise modulates arousal and LC activity, with arousal and tonic LC activity elevated during handgrip and reduced immediately after handgrip. In this study, we investigated how changes in physiological arousal - induced through short bursts of isometric handgrip exercise - affected subsequent working memory performance. **Methods:** A sample of 57 younger (ages 18-29) and 56 older (ages 65-85) participants performed blocks of isometric handgrip exercise in which they periodically squeezed a therapy ball, alternating with blocks of an auditory working memory task. Electrocardiogram, respiration, and continuous blood pressure signals were acquired throughout the experiment to assess arousal. **Results:** Compared with those who completed a control task, participants who performed isometric handgrip had faster reaction times on the working memory task. Handgrip-speeded responses were observed for both younger and older adults, across working memory loads. Multimodal physiological responses (heart rate, pupil diameter, and sympathetic tone) indicated that physiological arousal increased during handgrip and subsequently decreased after handgrip. Furthermore, participants with greater increases in physiological arousal during handgrip had faster reaction times on the working memory task. Finally, there was a trend toward lower post-handgrip tonic pupil diameter in the handgrip relative to the control group. **Discussion:** These results suggest that physiological arousal induced through isometric handgrip improves working memory performance. Further, our findings implicate the LC in handgrip's effects on working memory. The potential for acute isometric exercise to temporarily improve processing speed may be of particular relevance for older adults who show declines in processing speed and working memory.

Role of Gender in Autonomic Reactivity: Analysis of Heart Rate of Preschool Children During Videos with Different Emotional Content

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Introduction: Emotions are complex phenomena that include changes at different levels of organization. Within these levels, the different autonomous measures have proven their usefulness in recent years to show the fluctuations resulting from emotional processes. Heart rate and its variation are particularly robust measures for evaluating these processes. The greater heart rate variation (range) implies greater emotional processing and reactivity. In the preschool years, both emotional processing and autonomic reactivity are in development, so it is of primary interest to study these phenomena at this stage. Several investigations established the importance of gender modulation of emotional processes, due to the different cultural treatment given to emotions in both genders. One of the most widely used methodologies today for the evaluation of emotional processes in children is emotion modulation through the viewing of short videos. For that, this paper aims to compare heart rate variation (range) between girls and boys after viewing short videos with different emotional content. **Methods:** A sample of 43 5-years-old children was formed. Participants were randomly assigned to one of two possible conditions (positive video or neutral video) and their heart rate was registered previously (baseline) and during the video watching. The interest variable was the heart rate range registered during the task. A 2x2 ANOVA was performed in order to examine the interaction between gender and video emotional content. Baseline heart rate was introduced as a covariable. **Results:** Results showed a greater heart rate range in positive condition than in neutral one. Also, girls presented a wider range than boys. However, no interaction was found between the two variables. **Discussion:** These results are consistent with the literature and illustrate the importance of including gender in studies about emotional processing. In addition, the viewing of videos is an emotional modulation paradigm that allows showing differences in the autonomous level.

Shaping Negation – Spatial-Numerical Associations in Negative Numbers

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Introduction: Recent research has shown spatial associations for positive and negative numbers to horizontally aligned real-word objects. In addition, associations have also been found in vertically aligned symbols and positive numbers. The aim of our study is to extend these findings by using negative numbers. Hereby, we address the question whether negative numbers are aligned on a extended mental number line. **Methods**: Negative (-9, -8, -7, -6, -4, -3, -2, -1) and positive (+1, +2, +3, +4, +6, +7, +8, +9) numbers were presented subsequently together with vertically aligned arrows or rectangles in varying size in a go-nogo task. Participants (n=100) were asked to compare negative numbers to the reference minus -5 (positive numbers to +5). Repeated-measures ANOVA was used to test the effect of congruency, i.e., small positive and negative numbers congruent with downward-pointing arrows or small rectangles, large numbers with upward-pointing arrows and large rectangles. **Results:** We found the expected congruency effect in all positive conditions. There was no overall congruency effect in negative numbers, only in one condition, where negative numbers were presented mixed with positive counterparts and with down-facing arrows. Nevertheless, when presented together with positive numbers and small rectangles, large negative numbers were perceived as small. **Discussion:** Our research shows that different objects elicit different associations in positive and negative numbers: All positive numbers are spatially aligned as expected. In negative numbers, depending on the stimuli-set and context, we found both evidence for alignment on a mental number line that extends the mental number line of positive numbers and for processing by numerical value as if negative numbers were positive numbers. Taken together, spatial-numerical associations in negative numbers are situated in the context while associations for positive numbers are mentally grounded.

The adult rats after alcohol exposure in a third – trimester model of FASD showed impairment in spatial working memory dependent delayed alternation task.

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Introduction: Alcohol exposure (AE) during the brain growth spurt (BGS) results in damage to regions critical for WM: medial prefrontal cortex (mPFC), hippocampus (HC), and thalamic nucleus reuniens (RE). We have shown that AE during the BGS damages the RE and that RE inactivation disrupts mPFC – HC oscillatory synchrony and spatial WM (SWM). From these two separate findings, we hypothesized that AE during the BGS would result in SWM deficits. We compared choice accuracy between AE and sham intubated (SI) groups on a SWM-dependent delayed alternation (DA) task in male and female rats. **Methods**: The AE group was given 5.25 g/kg/day ethanol in milk formula via intragastric intubations on postnatal days (PD) 4-9. The SI group received the same intubation procedure as the AE group without any liquid administered. Adult rats underwent 6 days of DA sessions, consisting of interleaved 10 second (s), 30s, and 60s delay trials. **Results:** A three-way ANOVA was conducted to compare the effect of alcohol on DA choice accuracy between the AE and SI groups in 10 s, 30 s, and 60 s conditions and across 6 sessions. There was a significant 3-way interaction ($F_{(10,370)}=1.94$, p=.039). Posthoc analysis showed a significant postnatal-treatment x session interaction for the 30 s delay ($F_{(5,195)}=2.70$, p = .02), only a significant main effect of session ($F_{(5,195)}=7.93$, p < .001) for the 10 s delay, and no significant main effects and no interaction for the 60 s delay. **Discussion:** These results suggest that the AE and SI groups perform uniformly poorly on the 60 s delay and uniformly well on the 10 s delay. However, for the 30 s delay, the AE group, unlike the SI group, failed to show consistent improvement across days. These findings support the hypothesis that AE during the BGS produces long-term SWM deficits.

The Weighting of Prior Information in Confidence

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Introduction: Literature on Bayesian inference assumes our perception to depend on integrating prior expectations ("priors") and incoming information ("likelihood") to form the posterior belief or percept. Standard Bayesian models of confidence build off of this and consider confidence to be based on the perceived posterior probability that a decision is correct, given the internal evidence and the decision. This assumes confidence computations to optimally integrate priors and likelihoods. However, it remains unclear whether this is true, and how confidence judgments weigh information from priors. Here, we aimed at assessing whether priors are optimally weighted in confidence computations. **Methods:** In a gamified dual-decision task, we varied the precision of priors and likelihoods such that for each posterior precision level, there were two conditions, one in which the prior was more precise and one in which the likelihood was more precise. This allowed us to analyze whether accuracy or confidence would differ between these two conditions, despite equal posterior precisions, which would indicate either over- or underweighting of the priors. **Results:** We found that decision accuracy did depend on condition, indicating suboptimal weighting of priors relative to likelihoods. However, we did not find confidence to depend on the condition. Further, by fitting a Bayesian confidence model with a weighting parameter for the prior information, we could investigate quantitatively how the prior was weighted at both the decision level and confidence level. **Discussion:** These findings suggest that information from priors might be weighted to a different extent at the level of decisions and at the level of confidence. This provides important insight into how priors are integrated in decisions and confidence, which is critical for making quantitative predictions about confidence across different situations.

Virtual social touch on embodied avatars in patients with Fibromyalgia

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Introduction: Fibromyalgia (FM) is a syndrome characterized by chronic widespread pain. Among all the aspects of quality of life impaired by FM, social functioning is one of the most affected. Considering that social touch represents one of the preferred channels to establish and maintain personal relationships, we investigated how 'vicarious' social touch is perceived in FM, using Virtual Reality (VR), combined with physiological recordings. **Methods:** Two groups of women were recruited (FM and age-matched healthy controls). Participants were lying on a deckchair and were presented with a VR scenario showing a female avatar in underwear matching their real position. 24 virtual pleasant touches (3cm/sec) were delivered by another female avatar on 6 different body parts, categorized in previous studies as neutral (knee and foot), social (head and hands), and intimate (breast and pelvis). Participants were asked to rate the perceived appropriateness, pleasantness, erogeneity, and ownership for the touched body part evoked by each virtual stimulus, using 0-100 Visual Analogue Scales (VAS). Skin Conductance Response and Heart Rate were recorded during teach trial. **Results:** The analysis showed that the virtual touch on the intimate area was perceived as less appropriate, less pleasant but more erogenous as compared to the social and neutral ones in both groups. Furthermore, FM reported higher ratings of appropriateness, pleasantness, and erogeneity as compared to HC. No differences emerged between the groups in ownership ratings, mood, and affective dimensions. **Discussion:** Our results seem to suggest that although the qualitative evaluation of touch and the ownership over the virtual body parts did not vary between the groups, FM patients' ratings were higher than controls. A generalized increased response to touch is suggested, while the hypothesis of anhedonia to gentle touch is not confirmed, at least for virtual touches. These results might be relevant when considering touch as a therapeutic practice for FM.

Delay and Effort-Based Discounting, and the Role of Bodily Awareness, In People Experiencing Long-Term Pain: A Cross-Sectional Study

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Introduction: Pain interventions typically include effortful exercise and long-term treatment – ie, short-term costs (effort) with delayed benefit (improved pain and/or function). Thus, understanding if long-term pain influences decision-making in context of delays and effort is essential given clear relevance to treatment uptake and/or adherence. **Methods:** We evaluated delay and effort attitudes in those experiencing chronic pain (n = 391) and in pain-free controls (n = 263). Additionally, we investigated the role of bodily sensation awareness and/or interpretation as potential contributing factors to altered decision-making. Volunteers completed three discounting questionnaires, assessing the influence of temporal delays (gains, losses) and effort on devaluation of monetary outcomes. **Results:** Individuals with chronic pain showed more short-sighted decisions for monetary gains, but not losses, and decreased willingness to undertake effort for monetary gains than the No Pain group. The Pain group had higher bodily sensation awareness and while this related to higher impulsivity, delay and effort discounting, neither awareness nor interpretation of bodily sensations interacted with pain levels or explained group differences in discounting behavior. **Discussion:** These findings suggest that impaired delay and effort-based discounting is present in people with chronic pain, and that this may be driven by pain-induced changes, but not pain-induced enhancements in bodily sensation awareness and/or interpretation. Exploring the utility of interventions targeting discounting behavior is warranted.

Movie-induced emotion experiences modulate dynamically-occurring amygdala-CAPs

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Introduction: Researching the neural basis of emotion experience is a challenge. Facilitated by recent developments in technology and methods, new approaches to investigate dynamic functional connectivity using film as stimuli have gained increasing attention. We investigated films as a means to elicit a rich variety of emotions and to probe brain dynamics and their relationship with experienced emotions. **Methods:** We put together fMRI of 30 participants watching short films with continuous annotations of 13 discrete emotions to unravel dynamic brain states associated with emotion experience during movie watching. A general linear model (GLM) was used to reveal brain areas associated with specific discrete emotions by contrast with the other emotions. We further computed ten amygdala-seeded Coactivation Patterns (CAPs) separately for each short film and matched the resulting CAPs across runs using the Hungarian algorithm. The matched CAP time courses were then used as regressors in ANOVAs to predict their contribution to emotion experience. **Results:** Results from GLM revealed distinct activation maps for each but one emotion, overlapping with well-known functional networks. Further, amygdala-CAPs highlighted several networks coactivated with the amygdalae. Occupancy of all CAPs varied between 6.87-11.43%, demonstrating versatile brain states over time. ANOVAs showed most CAPs to be associated with time courses of experienced emotions. Notably, all emotions were significantly predicted by a linear combination of CAPs. **Discussion:** While many studies in affective neuroscience are limited to few emotion categories, we demonstrate distinct activation patterns for twelve discrete emotions. Amygdala-CAPs incorporate large-scale functional networks and we observe strong relationships between them and time courses of emotion experience in our data, which provides deeper insight into the functional networks and dynamics driving emotion experience beyond the results of GLM. This supports the validity of employing short films as a means for emotion elicitation and for studying dynamic brain changes underlying emotion experience.

Investigation of marriage and life satisfaction of multiple sclerosis patients in terms of demographic variables

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Introduction: Multiple Sclerosis (MS) is one of the neuro-degenerative disorders. It affects negatively to life satisfaction of its patients. In current literature, it is known that there is a positive correlation between life satisfaction and marriage satisfaction. In this study, we aimed to examine life and marriage satisfaction of patients with MS (pwMS) in terms of demographic variables. **Methods:** This study was conducted between May-June 2019 in Ondokuz Mayıs University, Faculty of Medicine. In data collection Demographic Information Form, Marriage Life Scale (MLS), and Life Satisfaction Scale (LSS) were used. Data were analysed with IBM SPSS V28 software program. The significance level was taken as $p < 0.05$. **Results:** Marriage satisfaction of pwMS did not change according to patient's education level, partner's education level, income level, marriage duration, marriage age, child number, disease duration and total attack number, significantly. Their marriage satisfaction significantly changed according to dating period before marriage in marriage satisfaction. Patients who have 6 or more years dating period before marriage have higher marriage satisfaction than less than one year. In addition, their life satisfaction significantly did not change according to patients' education status, patients' income level, disease duration and total attack number. There was a significant positive correlation between marriage satisfaction and life satisfaction of pwMS. **Discussion:** As in healthy individuals, marriage satisfaction plays important roles in life satisfaction in pwMS. Demographic factors that is related to MS does not affect marriage and life satisfaction as other demographic factors. In a result, by finding out the factors affecting the marital and life satisfaction of pwMS, new strategies can be developed to increase the quality of life of pwMS.

Cardiac Signals Influence Cortical Motor Excitability and Muscle Activity

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Introduction: Internal bodily signals such as heartbeats can influence human perception and action. For example, somatosensory perception is impaired both during the systolic phase of the cardiac cycle and following stronger cortical responses to heartbeats. Here, we investigate whether these cardiac effects are associated with general changes in cortical excitability. **Methods:** Cortical and corticospinal excitability was assessed using electroencephalographic and electromyographic responses to transcranial magnetic stimulation (TMS) while monitoring cardiac activity using electrocardiography in thirty-six participants. Single pulses of TMS were applied over the right primary motor cortex of the participants. The experiment included 832 trials divided into four blocks of real and sham TMS conditions. At the end of the TMS experiment, subjects also performed a motor task, in which they squeezed a pinch gauge for three seconds and then relaxed their fingers for three seconds. In this order, subjects performed thirty trials. **Results:** Our results demonstrated that cortical and corticospinal excitability was maximal during systole as compared to diastole. In line with this finding, in the motor task, muscle activity and desynchronization of sensorimotor oscillations (8-25 Hz) were observed to be stronger following muscle contractions during systole. Complementing these results, we also observed that TMS led to heart-rate decreases specifically in systole but not in diastole. In addition to the cardiac cycle effects, increases in cortical responses to heartbeats, as measured by heartbeat-evoked potentials, predicted stronger corticospinal excitability. **Discussion:** These findings show that systolic cardiac signals are associated with a facilitatory effect on motor excitability. This is in contrast to the cardiac-related sensory attenuation previously reported for somatosensory perception. Altogether these findings thus suggest that action and perception have distinct windows in the cardiac cycle for optimal information processing.

Addiction, cure or care?

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Introduction: Addiction has been historically conceived and widely researched as a brain disease. While there has been much criticism on brain-centred approaches to addiction, this paper aims to reject such approaches by applying insights from phenomenology of psychiatry. We claim that when considering addiction as a brain disorder, research fails to account for the psychological feel and the rumination as direct or indirect prediction of addiction experience, and thus fails to provide suitable treatments for those subjects. **Methods:** Applying Merlau-Ponty's insightful distinction between the biological and the lived body we introduce respectively the concept of disease and illness and claim that since the lived body is not reducible to the biological body, illness is not reducible to disease. To support this claim, we leverage the example of schizophrenia which is taken to be a clear instance of this irreducibility, and which provides key features of illness to be tested against addiction. **Results:** Testing the instances of illness derived from schizophrenia against addiction we found that the latter shares important lived body disruptions with the former. Thus, using the same argument for the irreducibility in schizophrenia, we claim that also in addiction the lived body dimension cannot be simply reduced to its biological underpinnings. **Discussion:** The irreducibility of illness to disease unveils the difference between cure-oriented and care-oriented treatments which are directed respectively to the biological and the lived body. We then conclude that, any model which does not encompass both dimensions will fail in providing efficient treatment for addiction.

Cortical excitability shapes somatosensory perception with spatiotemporally structured dynamics

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Introduction: Brain responses vary considerably from moment to moment, even to identical sensory stimuli. This has been attributed to changes in instantaneous neuronal states reflecting the system's excitability. However, the spatiotemporal organization of these dynamics and their influence on the perception of external stimuli remain poorly understood. **Methods:** In a series of three somatosensory stimulation paradigms in humans, we examined the interplay of two markers of cortical excitability, pre-stimulus oscillatory activity in the alpha band (8-13 Hz) and thalamo-cortical excitatory post-synaptic potentials (EPSP) inferred from short-latency somatosensory evoked potentials (SEP) in the EEG, as well as their association with the perceived stimulus intensity. Furthermore, we characterized the temporal structure and the spatial specificity of these dynamics on a single-trial level using scaling analysis and source reconstruction of hand- and foot-related SEPs, while controlling for variability in peripheral nerve activity. **Results:** Pre-stimulus alpha oscillations influenced initial cortical SEPs, which were in turn associated with changes of the perceived stimulus intensity – yet unrelated to variability of subcortical or peripheral nerve activity. Furthermore, these fluctuations of cortical excitability consistently followed a temporal power law, thus indicating the existence of long-range temporal dependencies. Moreover, comparing these dynamics between spatially distinct somatosensory regions (i.e., foot and hand areas), we observed a somatotopic organization of the relation between instantaneous neuronal states and stimulus-evoked responses. **Discussion:** Our findings demonstrate that already at initial cortical processing neural excitability modulates how intense a stimulus is perceived. Despite these cortical dynamics representing topologically confined effects, they also seem to be embedded in global system activity that is organized in a scale-free manner, as indicated by the observed long-range temporal dependencies. This may reflect a delicate balance between robustness and flexibility of neural responses to sensory stimuli, enabling the brain to adaptively change the neural encoding of even low-level features, such as the stimulus´ intensity.

Sentiment analysis in news media headlines in 2019 Presidential Elections: Exploratory Reliability Study Analysis

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Introduction: In recent years, social networks offer the facility to access political headnews instantly. Despite the growing information, there has been a spread of fake news generating a biased perception to the politics. According to this, new computational models have been developed to identify and predict subjective perception towards social politic content. Reliability has been a widely used tool in measuring agreements that different people arrive at the presentation of the same stimulus. By the other hand, sentimental analysis is a useful tool for analyzing electoral behavior. **Methods:** The purpose of this study was to evaluate the subjective perception of individuals for each presidential formula/force of principal Argentina´s newspapers during 2019 elections using reliability coefficient agreement. For this, 3 participants were recruited to classify 2257 headlines of the principal country's newspapers as positive, neutral, or negative according to their perception. To minimize ideological bias, each formula/force was replaced by a "Target". **Results:** Krippendorf nominal reliability alpha metric yielded adequate inter agreements between the participants. With this tool, we found that Alberto Fernandez (the winning candidate) was mentioned with positive connotation in 387,66 headlines (negative: 239,66), while Mauricio Macri (the outgoing president and the second candidate) in 320,66 ones (negative: 430,66). Other candidates did not exceed 140 positive mentions (negative: <16,66). **Discussion:** According to this, using these metrics could be a useful tool for future studies for classifying the valence of the headlines.

Neural interactions between anterior insula and anterior cingulate cortices link perceptual and physiological processes

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Introduction: The dynamic integration of sensory and bodily signals is central to optimally guiding adaptive behaviour. Although the anterior cingulate cortex (ACC) and the anterior insular cortex (AIC) play key roles in this process, their context-driven dynamic functional interactions are unclear. **Methods:** Here, we studied the functional interplay between these two brain regions using intracranial EEG measures of high-frequency activity (HFA) and dynamic effective connectivity acquired while three participants viewed a dramatic film. The rich perceptual and emotional content of the movie allowed us to link exteroceptive (visual and audio) and body physiological (heart rate) features with neural activity and patterns of connectivity within the AIC-ACC circuit. **Results:** We found that HFA of AIC and ACC were strongly correlated. Furthermore, exteroceptive features were related to ACC effective connectivity parameters, suggesting a crucial role of this region in processing extrinsic sensory information. Conversely, AIC parameters were linked to both exteroceptive (audio) and heart rate features, highlighting a core role of AIC connectivity in dynamically linking sensory and physiological information. **Discussion:** These findings provide new evidence for complementary, yet dissociable, roles of neural dynamics between the ACC and the AIC underlying the brain-body responses during an ecologically valid perceptual experience.

Emotional Reactions to Natural and Technological Disasters; A Possible Case for Evolutionary Mismatch

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Introduction: Introduction: Evolutionary mismatch refers to the situation where evolved characteristics or traits of an organism are no longer advantageous due to the rapid changes in the environment which the organisms cannot keep up with. This concept has been used to explain a wide range of observations from human mating to addiction but whether and how it can be applied to the study of threats like natural and technological disasters has not been addressed. We hypothesized that humans experience more negative emotions in response to technological disasters than natural disasters after controlling for severity of these threats. **Methods:** Methods: In the first part of this study, we investigated EM-DAT dataset, an international disaster database, to see which type of disaster, natural or technological, causes more fatalities and injuries. In the second part, we will examine the valence and arousal ratings of visual stimuli depicting natural and technological disasters from affective databases to measure the intensity of negative emotions experienced in response to these threats. **Results:** Results: Our investigation of EM-DAT data shows that natural disasters are more frequent and significantly kill more people and cause more injuries. The results of the second part will be presented at the conference. **Discussion:** Discussion: If our hypothesis is supported by the data, it can open up a whole world of new research possibilities for evolutionary neuroscience.

Mindset matters: Attentional focus – not body-weight – determines the level of food-related brain activity

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Introduction: A dominant view in the literature is that viewing high-caloric foods leads to increased brain activity in the reward circuitry of overweight people. However, the empirical literature is inconsistent. This may be due to the double-sided nature of high-caloric foods: high in the hedonic, low in the health value. People's attentional focus may frequently switch from a hedonic to a health focus while viewing foods, complicating the interpretation of results in studies where attentional focus is not controlled (e.g., passive view). **Methods:** We hypothesize that food-related brain responses are moderated by attentional focus. In this study, attentional focus (hedonic, health, neutral) was manipulated, using a one-back task with food stimuli, while participants (32 healthy-weight, and 29 obese) were in the fMRI. **Results:** Univariate analysis showed no difference in brain activity for palatable vs. unpalatable foods or for high vs. low-caloric foods. Instead, brain activity was higher in the hedonic than in the health and neutral attentional focus. Multi-Voxel-Pattern-Analysis showed that foods' palatability and calorie content can be decoded in the mesocorticolimbic system (Frontal Gyrus, Anterior Cingulated, Insula), with results not moderated by BMI. **Discussion:** So, the level of brain activity is neither proportionate to the reward value of foods, nor moderated by BMI. Instead, the level of brain activity reflects attentional focus, with food palatability and caloric content represented as patterns of brain activity.

9th MindBrainBody Symposium 2022

Poster Session C

Posters Nr. C1-C20 (Zoom Breakout Rooms)

Wednesday, March 18, 2022 at 11:00-11:45 (GMT+1)

Discussion Part 2 | Poster Session C & D | Wednesday, March 18, 2022 at 19:00-20:00 (GMT+1)

C01_Folz	Julia	Facial mimicry and metacognitive judgments in emotion recognition – modulated by social anxiety and autistic traits?
C02_Darbinyan	Lilit	Functional, Behavioral and Morphological Changes in a Rat Model of Parkinson's Disease: Protective Effect of Curcumin
C03_Baghdasaryan	Ella	Generalized anxiety disorder: Review of neuroimaging methods.
C04_ Reyes	Cristian	The effect of tDCS on the rSTS on reading speed of social sentences is modulated by personality traits
C05_Ho	Jasmine	Not my body, not my pain? Pain perception and placebo analgesia in individuals with body integrity dysphoria
C06_Danielyan	Margarita	The Effect of Armenian Viper Venom on Globus Pallidus Neurons in a Rotenon Model of Parkinson's Disease
C07_Poster Withdrawn		
C08_Ajith	Susan	Attention Related Experimental Paradigms in Meditation Research ***Poster Co-Presenters:*** *Pandey, Pankaj & Miyapuram, Krishna*
C09_Gupta	Pragati	Reliable EEG Neuromarker to discriminate Meditative states across practitioners
C10_GHanimi	Khatereh	Transmission of mind sound without mechanical waves "Natural or metaphysics"
C11_Tekgün	Ege	Projected Self-Location and Perspective in Dreams
C12_Lapomarda	Gaia	Theta and Delta changes in resting-state EEG activity after regulating emotions
C13_Simonyan	Karen	Effects of stevia on synaptic plasticity and NADPH oxidase level of CNS in conditions of metabolic disorders caused by fructose
C14_Pandey	Pankaj	Predicting Neural Resonance in Naturalistic Scenarios: A Computational Framework to Establish Neural Marker to Observe Internal and External Entrainment
C15_Koushik	Abhay	Testing the effect of depth on the perception of faces in an online study ***Poster Co-Presenter:*** *Hofmann, Simon M*
C16_Poster Withdrawn		
C17_Satpathy	Jyotirmaya	Cognito - Tectonics in Stress Induced Emotional Behaviour ***Poster Co-Presenters:*** *Satpathy, Madhubrata & Sahoo, Kalpana*
C18_Satpathy	Jyoitrmaya	Cognito Fluctuations in Decision Making ***Poster Co-Presenter:*** *Satpathy, Madhubrata*
C19_Puri	Shivam	Contingent capture: Solved?
C20_Saeed Modaghegh	Mohammad Ali	Study of relationship between second stroke and localization of multi-point stimuli ***Poster Co-Presenter:*** *Rostami, Mohammad*

Poster Abstracts

C01 **Poster Presenter:** **Folz, Julia**

Facial mimicry and metacognitive judgments in emotion recognition – modulated by social anxiety and autistic traits?

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Introduction: Both individuals with social anxiety disorder and individuals with autism spectrum disorder show alterations in the perception of others' emotional facial expressions. Additionally, mimicry of an observed expression as well as the assessment of one's own performance, i.e. metacognition, may be altered in these individuals. **Methods:** Using a non-clinical sample (N=57), we examined whether emotion recognition is linked to facial mimicry and confidence in one's performance, as well as potential alterations in this link associated with social anxiety and autistic traits. While participants were presented with videos of spontaneous emotional facial expressions, we measured their facial muscle activity, and asked them to label the expressions and indicate their confidence levels in accurately labelling the expressions. **Results:** Our results showed that confidence in emotion recognition was lower with higher social anxiety trait levels even though actual recognition was not related to social anxiety trait levels. Higher autistic trait levels, in contrast, were associated with worse recognition as well as a weakened link between performance and facial mimicry. **Discussion:** Consequently, social anxiety might not affect emotion recognition itself but the top-down evaluation in an emotion recognition context, whereas individuals with autism may integrate information promoting emotion recognition, i.e. sensorimotor simulations, to a lesser degree.

Functional, Behavioral and Morphological Changes in a Rat Model of Parkinson's Disease: Protective Effect of Curcumin

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Introduction: Parkinson's disease (PD) is a progressive neurodegenerative disorder that affects nerve cells, or neurons, in the part of the brain that controls movement. A hallmark feature of PD is the degeneration of the dopamine neurons in the substantia nigra (SN) pars compacta and the consequent striatal dopamine deficiency. Yet, the pathogenesis of PD remains unclear.The lack of dopamine causes the primary symptoms of Parkinson's disease - tremor, slowness of movement, muscle stiffness and balance problems. In vivo animal models have simulated most, although not all, of the hallmarks of PD and are useful for testing new neuroprotective approaches. Research is devoted to the study of systemic compensatory reactions of the rat's brain developing in response to rotenone-induced animal model of PD under the conditions of neuroprotective intervention of Curcumin. This has raising expectations for the development of new neuroprotective therapies for the prevention of PD. **Methods:** Male albino rats were treated with rotenone injections (2.5 mg/ml intraperitoneally) for 21 days. We examined the effects of neuroprotector curcumin (200 mg/kg) on behavior and the electrical activity of hippocampus neurons measured in response to high frequency stimulation (HFS) of entorhinal cortex (EC). In the hippocampus, the excitatory and inhibitory synapses between EC and CA3 pyramidal cells expresses robust forms of short-term plasticity, such as frequency facilitation (post-tetanic potentiation-PTP) and depression (post-tetanic depression- PTD). Motor activity was assessed by cylinder test. **Results:** The results showed that Rotenone causes significant reduction of neuronal activity, whereas curcumin can improve the motor impairments and electrophysiological parameters and may be beneficial in the treatment of PD. **Discussion:** Curcumin significantly prevented rotenone-induced impairment of hippocampal synaptic plasticity, which is likely mediated via dysfunction of mitochondrial complex I. It alleviated the deficits behavior in rats as the rearing frequencies of animals were enhanced.

Generalized anxiety disorder: Review of neuroimaging methods.

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Introduction: Generalized anxiety disorder (GAD) is a common mental illness that is characterized by fear, worry and sorrows. Patients are aware of their fears being not realistic and sorrows being exaggerated. The exact mechanism of GAD is not entirely known. Understanding the pathophysiological basis of GAD is a challenging task and different neuroimaging methods are being used to solve this problem. **Methods:** Here, we review the existing literature about neuroimaging methods that have been used to image the function of the GAD patients' brain. **Results:** Lee et al. used single photon emission computed tomography and supposed that the striatal dopamine transporter level could have a role in GAD mechanisms. Kalk et al. found increased MFG blood flow using 99mTc-hexamethylpropyleneamine oxime single-photon emission computed tomography. Jing et al. used F-FDGPet-CT imaging, which showed differences of uptake in prefrontal cortex, lateral striatum, left thalamus in GAD patients compared to healthy group. Moon et al. used proton magnetic resonance spectroscopy and found choline/N-acetyl aspartate metabolic changes in the dorsolateral prefrontal cortex in GAD patients. Xie et al. used f-MRI and ReHo approach and found significantly decreased values in the right orbital MFG, left ACC, right MFG and bilateral supplementary motor area in patients with GAD. Increased ReHo values were found in the left MTG, left STG and right SOG. Authors suggest that the decreased values show destruction of local synchronization of spontaneous low-frequency fluctuations dependent on blood oxygenation levels. **Discussion:** To conclude, we can say that there is change of function of special brain areas in GAD patients. We propose that future studies will be needed to find the best neuroimaging method to diagnose GAD.

The effect of tDCS on the rSTS on reading speed of social sentences is modulated by personality traits

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Introduction: Mathematical models informed by the free energy principle suggest that information processing in the human brain leads to metabolic efficiency. An underlying mechanism might be the minimization of uncertainty about sensory input via a feedback loop between internal models of the world and actual input. This is supported by MR studies showing decreased activity for sensory stimuli that validate participants' predictions. However, whether predictions themselves incur significant metabolic cost over naïve perception is still unclear. **Methods**: The traditionally used BOLD signal is only a proxy for energy consumption, providing relative measurements mainly driven by hemodynamic activity. Here, we have been acquiring data from 21 healthy subjects using novel multiparametric quantitative BOLD methods. We separately measured blood deoxygenation, cerebral blood flow and cerebral blood volume to calculate the cerebral metabolic rate of oxygen (CMRO2) on a voxel level. During a three-day training phase, participants viewed temporal object sequences while performing a cover task to ensure attention. Objects either always appeared in the same order (predictable condition) or always in a random order (unpredictable condition). We tracked the learning progress with a sequence completion test after each session. In the following MR session, we presented the experimental conditions using a block design. **Results:** After the training, participants averaged >80% correct completions of predictable sequences. To estimate the cost of prediction, we contrasted CMRO2 values of predictable versus unpredictable blocks both brain-wide and within the object selective cortex. Results show a significant increase in the predictable condition of 4.3% and 1.94% respectively (all p<.05). These findings are consistent across functional brain networks (Schaefer parcellation) with the smallest changes in the visual network and largest in fronto-parietal regions. **Discussion:** The quantitative evidence for a brain-wide increase in energy consumption suggests that predictive processing and metabolic efficiency are at least partly at odds.

Not my body, not my pain? Pain perception and placebo analgesia in individuals with body integrity dysphoria

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Introduction: Mathematical models informed by the free energy principle suggest that information processing in the human brain leads to metabolic efficiency. An underlying mechanism might be the minimization of uncertainty about sensory input via a feedback loop between internal models of the world and actual input. This is supported by MR studies showing decreased activity for sensory stimuli that validate participants' predictions. However, whether predictions themselves incur significant metabolic cost over naïve perception is still unclear. **Methods**: The traditionally used BOLD signal is only a proxy for energy consumption, providing relative measurements mainly driven by hemodynamic activity. Here, we have been acquiring data from 21 healthy subjects using novel multiparametric quantitative BOLD methods. We separately measured blood deoxygenation, cerebral blood flow and cerebral blood volume to calculate the cerebral metabolic rate of oxygen (CMRO2) on a voxel level. During a three-day training phase, participants viewed temporal object sequences while performing a cover task to ensure attention. Objects either always appeared in the same order (predictable condition) or always in a random order (unpredictable condition). We tracked the learning progress with a sequence completion test after each session. In the following MR session, we presented the experimental conditions using a block design. **Results:** After the training, participants averaged >80% correct completions of predictable sequences. To estimate the cost of prediction, we contrasted CMRO2 values of predictable versus unpredictable blocks both brain-wide and within the object selective cortex. Results show a significant increase in the predictable condition of 4.3% and 1.94% respectively (all p<.05). These findings are consistent across functional brain networks (Schaefer parcellation) with the smallest changes in the visual network and largest in fronto-parietal regions. **Discussion:** The quantitative evidence for a brain-wide increase in energy consumption suggests that predictive processing and metabolic efficiency are at least partly at odds.

C06 **Poster Presenter:** **Danielyan, Margarita**

The Effect of Armenian Viper Venom on Globus Pallidus Neurons in a Rotenon Model of Parkinson's Disease

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Introduction: Parkinson's disease is a chronic progressive brain disease characterized by nigrostriatal degeneration and impairment of basal ganglia functions, particularly the globus pallidus. Parkinson's disease is associated with the degeneration of dopamine neurons in the globus pallidus, responsible for body movement. **Methods:** The aim of the present study was to identify effects of venom of the Armenian viper Montivipera raddei on morphofunctional state of globus pallidus neurons in a rotenone model of Parkinson's disease. For morphological and histochemical study, the method of detecting the activity of $Ca2+$ - dependent acid phosphatase was used. **Results:** Data analysis revealed that nerve cell lesions in the globus pallidus are abiotrophic in nature. Neuronal damage is accompanied by a decrease in phosphatase activity in the cytoplasm and chromatophilic substance lysis. Long processes react in such neurons, but their phosphatase activity is reduced, and their lead phosphate precipitate is dusty or fine-grained. Various types of cell atrophy are revealed against a background of normal cells. Thus, rotenone intoxication causes abrupt morphological and metabolic changes in intracellular structures, as well as in the globus pallidus. This is a reversible condition. When compared to a Parkinson's disease model, small doses of venom caused positive changes in the structural properties of neurons in the globus pallidus. The morphology is normal; long processes with high acid phosphatase activity react in most cells. In comparison to the rotenone rat model, glial reaction slows down and phosphatase activity in the cytoplasm of cells increases, indicating an increase in metabolism, which was impaired in rotenone-intoxicated rats. **Discussion:** The findings suggest that small doses of venom of the Armenian viper Montivipera raddei act as a neuroprotective agent, but more research is needed to further clarify the mechanisms of action and potential treatments for Parkinson's disease.

C08 **Poster Presenter:** Ajith, Susan   *Poster Co-Presenters:* Pandey, Pankaj & Miyapuram, Krishna

Attention Related Experimental Paradigms in Meditation Research

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Introduction: The neuroscientific study of meditation has shown enormous growth in the last two decades due to its effects on multidimensional attributes, including neurophysiology, phenomenology, and cognitive functioning. Studies have reported evidence that regular meditation results in long-term attentional and structural and functional brain changes. Interestingly, despite its wide reach, the field struggles from poor methodological quality. Factors such as cross-sectional studies precluding causal attribution, sampling bias and poor control limits interpretations. As a result, our investigation narrows down to attention-related experimental design paradigms in mediation research, as meditation is an intentional deployment and management of attention. Various designs in meditation research, with their results, as well as their relevance and future scope based on training and techniques, are discussed. **Methods:** Attentional studies conducted on meditators have utilized behavioral paradigms based on reaction time and accuracy as parameters to assess improvements in attention. Attentional network test and other measures specific to the type of attention such as Flanker test, attentional blink task, stroop task, oddball paradigm and multiple object tracking task among various meditators in comparison with novice as well as experienced meditators are implemented. **Results:** Overall, most studies show significant improvement in sustained attention, allocation of attentional resources, executive attention, smaller attentional blink, less interference and improved distractor inhibition. **Discussion:** Future research needs to use actively controlled, longitudinal, randomized designs with larger sample size that compares data at several time points and studies its development from novice to experienced stages of meditation. Essentially, longitudinal studies can direct research towards providing a theoretical basis for meditation. Our understanding will remain nascent unless we understand how the structural and functional brain changes are related to improvement in cognition. Such studies hold high value in decomposing the outcomes of meditation into cognitively measurable parameters, thereby offering a promising treatment of clinical disorders and general well being.

Reliable EEG Neuromarker to discriminate Meditative states across practitioners

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Introduction: In this study, we examined EEG analysis techniques across a variety of meditation traditions in order to identify reliable metrics that could be applied in meditation research, revealing how each tradition interprets eeg signals distinctly. The study's potential is in its future neurotechnological innovations, to increase usage of meditation (by enriching one's internal environment for better equilibration) among users. EEG's high temporal resolution may result in misinterpretation or erroneous correlation if the analyzing technique is unreliable and weak. Overall, investigation of this may provide insight into the complex nature of meditative practice and its impact on the brain. **Methods:** Neuroscientific studies demonstrate several methods from simple to complex, including spectral power, entropy (sample, lempel-ziv), and fractal dimensions (higuchi) etc. Distinguishing expert and naive practitioners involve large-scale dynamics of distinct cognitive and resource allocation across different meditation types. Meditation research includes a comparison of expert meditators with controls, Intervariability across meditation practitioners (Himalayan yoga, Vipassana, etc) with controls. There have been several studies conducted on the effects of mind-wandering on brain rhythms and meditation practice among expert meditators and controls, using thought probes, instructed mind-wandering conditions. **Results:** Meditation-related EEG studies have shown power increases in theta and alpha bands and overall frequency slowing, with the occasional increase in gamma power. Large scale decrease in entropy (Lempel Ziv-Complexity) during meditation states was observed. Contrary to this finding, a study by Vivot et al., 2020 observed increased alpha and gamma power sample entropy across vipassana meditators. Decreased number of transient alpha-theta 2:1 harmonic ratio during meditation conditions among 43 experienced meditators, was revealed. In one study, after Integrated Body-Mind Training (IBMT) of 24 participants, functional connectivity measures were performed. The IBMT group exhibited a larger clustering coefficient, global and local efficiency, and shorter average path length at midline electrodes when compared to controls. **Discussion:** The generation of a neurophysiological marker that is reliable when a person is progressing from one level of meditation to another is still in its infancy. Depending on how different meditation styles are studied and analyzed there might be both similarities and differences in the results, but rigorous scrutiny (preprocessing, experimental design, meditation type, feature extraction, etc.) will provide a better insight into generalizations.

Transmission of mind sound without mechanical waves "Natural or metaphysics"

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Introduction: Abstract The preset work deals with transmission of the mind sound in absence of a physical environment and mechanical waves. By "transmission", we refer to what happens for sound waves in physical environment. By the "sound of mind" we intend something other than what has been examined by many psychologists over the past few years. They utilize the concept with its applied meaning in "inner dialogue" disease. Therefore, the sound wave generated by the brain/mind is intended in this study, which is like the sound generated by one's larynx and can be heard by others. Keywords: Brain, mind, sound, transmission, physical environment, sound of mind, brain waves **Methods:** Methodology The study is a wide and multidisciplinary work that covers theoretical and experimental fields of science. Thus, the methods used in these two groups might be required including: •Descriptive methods; •Experimental methods; and •Historical methods. It is clear that we cannot determine which method will be used in what stage. This question will be answered throughout the study depending on the needs. **Results:** Conclusion Given the above, the following points are notable: -The mind sound in the proposed study is beyond the inner dialogue. -Generated waves by the mind/brain will be transmitted from different distances and received by the brain/mind of the receiver. -The idea is to transmit sound (generated waves and vibrations) from one brain/mind to anther. -The study will also determine if the mind organizes its activity independent from the brain and interacts with it (immaterial and material things) or they are the same and identical. In conclusion, if the nature of mind/brain sound and the environment that the transmission takes place is determined, several new topics and questions will be found each leading to a new world. Sciences like neuroscience, artificial intelligence, virtual economy, virtual world and the like along with philosophy and physics will be measured through a complicated and interwoven relationship. **Discussion:** Take typist A that is trying to establish a virtual connection with typist B from a long distance (say 50km). While typing, the 'mental voice" generated by typist A's brain/mind is transmitted to the brain/mind of typist B and heard/imagined by him (mind and brain interaction). This example is to elaborate on the point that if the transmission of sound from one mind/brain to another is presumably feasible in long distances, how it can be explained in absence of mechanical waves and vibration of brain/mind and the physical environment in which such waves can travel? The point is that previous studies have only managed to record the brain waves using electrodes at the moment of imaging the reception of musical notes. So that these studies have not addressed the transmission of waves from one mind to another. Rather than indirect transmission through recording brain waves and the imagined voice by electors and translating the data, the proposed study will address the direct transmission of waves emitted by one brain/mind to another.

Projected Self-Location and Perspective in Dreams

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Introduction: A wide range of neuroscientific studies suggest that, if we can dream about various preposterous dream characters, our hierarchical generative self-modeling capacity should have already accepted them. Regarding this, all of the dream characters that our dream body encounters with, should be based on the potential to embody other-selves at a certain spatial distance in dreams. Given the role perspective on ownership, we investigated the relationship between projected self distance and perspective in dreams. **Methods:** A total of 379 people were recruited online from Izmir University of Economics students and their relatives. We asked the participants whether they saw their dreams from a first-person (1PP) or a third-person perspective (3PP). We also asked the participants how often they see other dream characters to the specified distances on a picture. **Results:** A 2 (1PP, 3PP) x 3 ([0-90cm], [90-180cm], [180-270cm]) mixed ANOVA revealed that people are more likely to see other dream characters between 0-90 cm distance interval. However, we did not find a significant main effect of perspective and interaction effect. **Discussion:** Our study provided a new perspective to understand the phenomenology of projected dream location and bodily self-consciousness in dreams. Although further research is needed, we suggest that boundaries between self-other overlap within peripersonal space during dream states emphasizing the embodied nature of dreams.

Theta and Delta changes in resting-state EEG activity after regulating emotions

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Introduction: Emotions are powerful determinants of our everyday life, and the ability to regulate them is essential for our well-being. Several studies focused on the neurophysiological mechanisms associated with emotion regulation. Changes in theta and delta frequencies have been associated to the deployment of emotion regulation strategies, as well as a sense of increased wellness and relaxation. One intriguing question is whether regulating emotions can leave a trace in the brain by affecting its oscillatory activity at rest. **Methods:** Thirty-three adults participated in the experiment. 5 minutes resting-state EEG (RS-EEG) was recorded, to provide a baseline measure of brain activity. After that, participants completed an Emotion Regulation task consisting of two randomized sessions, each one followed by 5 minutes RS-EEG. In one session, participants attended to the stimuli and experience the emotions elicited. In the other one, they regulated the elicited emotions by applying distancing, that consists in assuming a detached perspective from an emotional situation. To elicit emotions, 160 picture stimuli (80 neutral, 80 negative) were taken from the International Affective Picture System. Participants rated their emotions on both the valence and arousal dimensions using the Self-Assessment Manikin procedure. **Results:** A nonparametric cluster-based permutation approach was used. This is a data-driven approach that provides appropriate control for multiple comparisons. The analysis indicated an increased RS-EEG activity after regulating emotions, corresponding to two positive clusters at the level of delta (3.6 to 4 Hz, p = .033) and theta (6 Hz, p = .040) frequencies. **Discussion:** Demonstrating that the application of regulation strategies can alter brain activity at rest may shed light on the influence of affective processes on brain functioning. Furthermore, it can represent a first evidence of the potential effect that psychotherapy can have on the patients' daily life.

Effects of stevia on synaptic plasticity and NADPH oxidase level of CNS in conditions of metabolic disorders caused by fructose

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Introduction: Excess dietary fructose intake associated with metabolic syndrome and insulin resistance and increased risk of developing type 2 diabetes. Previous animal studies have reported that diabetic animals have significantly impaired behavioural and cognitive functions, pathological synaptic function and impaired expression of glutamate receptors. **Methods:** By in vivo extracellular studies induced spike activity of hippocampal neurons during high frequency stimulation of entorhinal cortex, as well as neurons of basolateral amygdala to high-frequency stimulation of the hippocampus effects of Stevia rebaudiana Bertoni plant evaluated in synaptic activity in the brain of fructose-enriched diet rats. **Results:** In this study, the characteristic features of the metabolic effects of dietary fructose on synaptic plasticity in hippocampal neurons and basolateral amygdala and the state of the NADPH oxidase (NOX) oxidative system of these brain formations are revealed, as well as the prospects for development of multitarget and polyfunctional phytopreparations (with adaptogenic, antioxidant, antidiabetic, nootropic activity) from native raw material of Stevia rebaudiana. **Discussion:** Stevia exhibits an antistress, membrane-stabilizing role reducing the level of total fractions of NOX isoforms from central nervous system tissues and regulates NADPH-dependent O_2^- -producing activity.

Predicting Neural Resonance in Naturalistic Scenarios: A Computational Framework to Establish Neural Marker to Observe Internal and External Entrainment

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Introduction: Resonance can be distinguished as a metaphor and physical mechanism. Neural resonance is a physical phenomenon that refers to the synchronization and amplification of brain oscillations to features of internal/external oscillators. Entrainment is a type of resonance, which can be further defined as external and internal. External entrainment involves brain waves correlated to musical rhythms, amplifying/dampening human rhythms while watching/listening to movies/music, brain to brain synchronization between trainer and practitioner during guided meditation. Internal entrainment discusses the breathing style or speed that tunes with natural body frequency, ideas/thoughts that primarily induce pleasantness, positivity, and relaxation. We discuss several measures to establish the neural marker for these effects and future perspectives to develop the computational toolbox incorporating machine and deep learning techniques. **Methods:** We discuss a few important components to compute the resonance effect. Stimulus-Response correlation (SRC) computes the time-varying features of stimulus with brain responses and the commonly used measure is Canonical Correlation Analysis. Frequency tagging and the harmonics discuss the responses frequency-locked to the rhythms at beat and meter frequencies employing steady-state evoked potentials. Inter-Subject Correlation computes the similarity between two brain responses and the time domain can be measured using cross-correlation and coordination in the frequency domain by computing spectral using Fourier or wavelet transform. The synchrony of instantaneous phases of two neural responses at frequency f can be quantified using phase locking value and coherence. The change in brain complexity (entropy) during resonance at a particular frequency may also provide insights. **Results:** Previous studies have observed frequencies related to the musical beat, and discussed entrainment while listening to familiar music as compared to scrambled version. The recent result accompanies graph theory and machine learning measures to observe the differences between high and low enjoyment. **Discussion:** We encompass the different components (temporal, spectral, and spatial) that serve as the framework to develop the computational toolbox to predict neural markers for neural resonance. We discuss incorporating machine and deep learning techniques to investigate this mechanism.

C15 **Poster Presenter:** Koushik, Abhay   *Poster Co-Presenters:* Hofmann, Simon M

Testing the effect of depth on the perception of faces in an online study

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Introduction: Faces are socially relevant stimuli, which can be distinguished by 3D spatial arrangements of their features. The perceptual system orders these features in a cognitive "face space", in which distance represents face similarity. In the past, this space has been mostly probed in 2D experiments. We plan an online behavioral study to investigate the effect of 2D vs 3D presentations on face perception, aiming to bridge the gap to naturalistic viewing. **Methods:** We randomly sampled neutral faces (n_female=n_male=50) from the standardized 2D Chicago-Face-Database (CFD) and used DECA - a deep learning-based pipeline that 3D-reconstructed them retaining facial geometry. We implemented an odd-one-out similarity task to acquire pairwise similarity matrices. Two participant groups (n_2D=n_3D=500) are currently tested online with static 2D-images and with rotating 3D-reconstructions on 2D-screens. Representational similarity analysis will be applied on behavioral similarity matrices of human judgements to quantify the difference between viewing conditions. We then feed a shallow neural network with attribute measurements (e.g., face-width) and fit it to the behavioral judgements to extract the most relevant face features for each condition, which serves as a computational model of the cognitive face space. **Results:** To follow (study in progress). **Discussion:** We aim to extract facial dimensions that define similarity judgments, and hypothesize that their order of relevance differs between 2D and 3D representations as spatially defined features are more important for the latter. Differences between 2D and 3D would have implications on previous 2D research and would encourage future studies on face perception with more naturalistic experimental designs. Moreover, our pipeline can be used for different stimulus sets or samples, for example, with different ethnical groups or clinical populations, and for psychophysiological studies.

Cognito - Tectonics In Stress Induced Emotional Behaviour

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Introduction: The success of an institution is mainly dependent on its effective human capital and in execution of strategic sustainable HR functions. Currently, human resources are under colossal pressure to ascertain its value, facing severe demands to create an innovative, result-oriented workforce. Ecological - connect practices save money through awareness and communication while reducing environmental predicaments. Personal or professional engagement of individuals will have a long-lasting effect on the environment. Innovation coupled with business processes can change the mindsets of people and businesses and reduce incremental costs. The hallmark of ecological - connect is that it brings about enduring stress - induced thinking competence. One of the prime doctrines of ecological - connect is maximization of positive benefits of an institution for all stakeholders and specifically it should commence with its domestic human resources. **Methods:** Recent research on psychological well-being has identified the psychosocial dynamics of human contentment. The advancement in the area of positive psychology has greatly facilitated this research. Drawing on these contemporary developments, it is asserted that engagement-seeking and contentment need not be viewed as separated, often incompatible (Devoutness) processes. **Results:** The explication of empirical research attests to the assertion that engagement seeking and contentment constitute a unitary (Devoutness) process. **Discussion:** The positive psychological concepts such self-efficacy, optimism, resilience, emotional intelligence and growth mind-set are well-incorporated in contentment. These positive attributes are also needed for successful engagement seeking emotional behaviour. The self-efficacy offers the confidence of executing a function competently. Optimism provides the supportive cognitive style to pursue both the engagement and contentment. Resilience builds capacity to deal with adversity. Emotional intelligence furnishes the human factors of empathy and compassion. The growth mind-set leverages the abundance of energy. An integrative approach to blend engagement seeking with contentment fulfills the objective of innovation and flourishing

Cognito Fluctuations in Decision Making

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Introduction: We would like to present the Cognito Fluctuations in Decision Making that a rational person experiences during stress. **Methods:** We used the Stress Measurement and ECG methodology **Results:** We observed peculiar cardio fluctuations when a person experiences exposed to stress and how basic neural circuits involved in decision making . **Discussion:** Stress and decision making are intricately connected, not only on the behavioural level, but also on the neural level, i.e., the brain regions that underlie intact decision making are regions that are sensitive to stress-induced changes. Anxiety can cause executive function (your high-level thinking and decision-making) to weaken or shut down. If it does, you make no decision, or you unknowingly base your decision on habit.

Contingent capture: Solved?

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Introduction: Two experiments conducted to examine if abrupt-onset cues capture attention in a contingent way even when the cue is unconscious and how this capture differs from the capture by a conscious abrupt-onset cue. **Methods:** Abrupt-onset cues of conscious (100 ms) and unconscious (16.66 ms) cue duration cued the location of colour targets (experiment 1) and abrupt-onset targets (experiment 2) in a spatial-cueing task. The participant was to look for the target letter (E or H) and report its identity. Reaction-time and accuracy were recorded. This was followed by a visibility test consisting of two parts - a forced-choice cue location identification task (objective measure) and a Perceptual Awareness Scale (subjective measure) to obtain robust measure of cue visibility. **Results:** Spatial cueing task - Significant cue validity effects observed in both the experiments, suggesting that attention capture by abrupt-onset cues may proceed in a stimulus-driven manner. And capture by unconscious cues found to be significantly less than that by conscious cues. Visibility task - Converging evidence obtained via objective and subjective test that cues behaved as expected. Interestingly, valid cues were rated significantly higher than the invalid cues on the PAS scale in experiment 1 whereas the complete opposite was observed in experiment 2 which implies there is a definite relation between the subjective visibility and the cue-target match/mismatch condition. **Discussion:** REPRESENTATION CROSS Model of attention capture is proposed. It states that the cue strength (visibility) is dependent on the interaction of cue type with target/distractor type. The representation of the cue gets strengthened if the target type is not the same as the cue, and it gets weakened if the target type is the same as the cue. This model is based on vector (cross) multiplication and explains the mechanism of attention capture for both stimulus-driven and contingent capture.

C20 **Poster Presenter: Saeed Modaghegh, Mohammad Ali   Poster Co-Presenter: Rostami, Mohammad**

Study of relationship between second stroke and localization of multi-point stimuli

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Introduction: In physical stimuli, the closer the stimulus points are to each other, the more difficult it is to distinguish the location of the skin stimulation sites. This localization also depends on the location of the stimulus and age. The number of tactile receptors on the shoulder blade and back of the human body is less than the rest of the body, and the fingertips have the largest number of tactile receptors, therefore, the number of stimuli on the fingertips is more likely to be detected than on the shoulder blade and back. Also, with advanced age stimuli detection encounters more mistakes. In this study, the number of separable tactile stimuli in localization that a person can count correctly was measured and recorded, and its relationship with second stroke was studied. **Methods:** Simultaneous multi-point stimulations with standard recognizable distance were conducted in 36 patients for 5 years. These stimuli were applied to the thigh, palm, arm, shoulder blade, and back of the subjects without them watching the place of the stimuli. Then they were asked about the number of stimuli. Patients are examined annually. **Results:** This work demonstrates the relationship between the ability to detect the number and location of stimuli in simultaneous multi-point stimulations and second stroke probability. Subjects with fewer correct responses (in detecting the number of simultaneous stimuli) are more likely to have a second stroke. **Discussion:** Our findings provide evidence that depending on the age of the person and the location of the stimulus, subjects with more mistakes in detecting simultaneous multi-point stimulations are more likely to have a second stroke.

9th MindBrainBody Symposium 2022

Poster Session D

Posters Nr. D1-D18 (Zoom Breakout Rooms)

Wednesday, March 18, 2022 at 11:45-12:30 (GMT+1)

Discussion Part 2 | Poster Session C & D | Wednesday, March 18, 2022 at 19:00-20:00 (GMT+1)

D01_Arbuzova	Polina	No evidence of impaired visual and tactile metacognition in adults with Tourette disorder
D02_Werwach	Annika	Speech perception slopes across the first year of life: Maturation of consonant perception, but not vowel perception, predicts lexical skills at 12 months
D03_Naraindas	Akansha	Body-based mental imagery and its relationship to body image disturbance and interoception from adolescence to late adulthood
D04_Myga	Kasia	Changing tactile amplitude and frequency perception via autosuggestion
D05_Kobylinska	Dorota	How is HRV and strengths of negative emotion connected to effectiveness of emotion regulation strategies (self-report and EMG data)
D06_Olszewska	Alicja	When Ears Deceive You. Processing of Auditory Incongruence in Musicians - preliminary results.
D07_Schulz	Corinna	Hyperaligning brainstem connectivity during vagus nerve stimulation
D08_Kühne	Katharina	Shaking hands in the face of danger? Interpersonal distance, peripersonal space, pro- and anti-social consequences of face masks during the COVID-19 pandemic
D09_Karjalainen	Suvi	Coactivation of autonomic and central nervous systems during processing of socially relevant information in autism spectrum disorder: a systematic review
D10_Shirali	Sahar	A Cognitive Evaluation of Lexical Access in Sequential Spanish-English Trilinguals
D11_Poster Withdrawn		
D12_Saleh	Ebtesam	Attitudes, Beliefs, and Experiences of Substance Use: A Systematic Review of Qualitative Research among Refugees and Practitioners
D13_Twarkowski	Hannah	Dentate gyrus inhibitory microcircuit promotes network mechanisms underlying memory consolidation
D14_Kiepe	Fabian	Probing Sensory Attenuation for Self-Initiated Actions using Virtual Reality
D15_Catrambone	Vincenzo	An overview on functional Brain-Heart Interplay measurements
D16_Demetriou	Andreas	Noetron: the central meaning-making unit in the mind and the brain
D17_Kraus	Nils	The Role of Affective States and Traits in Binocular Rivalry of Neutral Stimuli
D18_Livermore	James	A Single Administration of Citalopram Increases Interoceptive Insight in Healthy Volunteers

Poster Abstracts

D01 **Poster Presenter: Arbuzova, Polina**

No evidence of impaired visual and tactile metacognition in adults with Tourette disorder

Arbuzova, P. [1,2], Guo, S. [3], Koß, C. [2,4], Kurvits, L. [3], Faivre, N. [6], A. Kühn, A.A. [3], Filevich, E. [1,2], & Ganos, C. [3]

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Introduction: Premonitory urges in Tourette disorder are often linked to altered somatosensory processing, which might include deficits in metacognition. We explored tactile and visual metacognitive ability in people with Tourette disorder and healthy control participants. **Methods:** Patients with Tourrete disorder and healthy control participants completed a tactile and a visual metacognitive task. On each trial, participants did a forced choice discrimination and then rated their confidence in their decision. To quantify metacognitive ability, we used m-ratio — a bias-free measure that allows for comparisons across modalities. Correlations between severity of tics and premonitory urges with tactile metacognitive sensitivity were also performed. **Results:** Metacognitive ability in both tactile and visual domains was comparable between adults with Tourette disorder and healthy controls. We also found no evidence for correlations between tactile metacognitive ability and severity of premonitory urges or tic severity. **Discussion:** Tactile and visual metacognition is not impaired in adults with Tourette disorder. These results question the role of altered tactile metacognition in pathophysiology of tic disorders.

Speech perception slopes across the first year of life: Maturation of consonant perception, but not vowel perception, predicts lexical skills at 12 months

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Introduction: Consonants and vowels differentially contribute to lexical acquisition across the first year of life, with a preferential role of consonants from around 8 months. Infants' differential reliance on consonants versus vowels in word recognition has been shown to predict later lexical outcome. This predictive value, however, has not been evaluated for infants' longitudinal trajectories of consonant and vowel perception. We here aimed to study brain markers that can capture perceptual changes before infants show vowel or consonant preferences in word recognition behaviorally. **Methods:** We examined longitudinally (at ages 2, 6, and 10 months) whether infants' (n= 59) maturation trajectories of vowel and consonant discrimination differentially predict their later lexicon. At each age, we measured infants' discrimination abilities in a multi-feature paradigm by means of electrophysiological mismatch responses (MMR) to consonant and vowel deviants. At 12 months, we assessed infants' lexical skills via the German version of the CDI (parental questionnaire). Using second-order latent growth models, we tested the maturation slopes of vowel and consonant MMRs as predictors of word production and perception at 12 months, controlling for the effect of individual MMRs at each assessment. **Results:** The consonant MMR slope significantly correlated with word perception and production, whereas there were no effects for the vowel MMR slope. Note that only for consonants at 2 months, the single-time point MMR predicted later lexicon, while the MMR slope from 2 to 10 months had an additive predictive value. **Discussion:** These results confirm a prominent role of consonant, but not vowel discrimination for word learning from early on. Given that a behavioral preference for consonants in word recognition only evolves towards the end of the first year, our study points to a much earlier predictive value of consonant perception and to a particular role of the longitudinal maturation of this perceptual skill in lexical acquisition.

Body-based mental imagery and its relationship to body image disturbance and interoception from adolescence to late adulthood

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Introduction: Body image disturbance (BID) is the distortion of perception, behaviour, or cognition related to weight or shape. Body surveillance behaviours cause individuals to engage in 3rd person viewpoints of the self; leading to a prioritization of external signals at the cost of internal signals, causing a deficit in the ability to update allocentric body memory with inputs from perception (Riva, 2012). There is significant variation in body image satisfaction and BID; with limited understanding of how body image evolves over time and the role that self-body imagery plays in this development. This study aims to link how the body is imagined from different perspectives (egocentric and allocentric) to BID and tracks the developmental trajectory of self-body-imagery from early adulthood to older age. **Methods:** This was a within-subjects cross sectional study hosted online and preregistered on the Open Science Framework (OSF) . 1000 female participants with 250 subjects per 4 target age groups (Young Adults, Adults, Middle Adults, Older Adults) were recruited. The study used a modified Own Body Transformation (OBT) task (Blanke, 2005) to measure own-body imagery through visual perspective manipulations and linked this to interoceptive awareness and cognitive- attitudinal components (Self-Surveillance, Body dissatisfaction and Body shame) measured by questionnaires. **Results:** All the data have been collected and main analyses will be conducted prior to the conference. Pilot data revealed that the OBT task is successful in measuring the difference in time taken between egocentric and allocentric mental transformations **Discussion:** These results can tell us about the coherence of stored sensory information about the body and whether individual differences such as age and BID can affect this. As well as provide diagnostic insights for the manifestations of BIDs amongst the varied age groups, especially within older populations which are understudied in the context of eating disorder research.

Changing tactile amplitude and frequency perception via autosuggestion

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Introduction: Autosuggestion is an instantiation and reiteration of ideas or concepts by oneself aiming to actively influence one's own perceptual, brain or interoceptive states. Despite its potential beneficial clinical effects, for example in reducing chronic pain, autosuggestion has gained little scientific attention so far. Here, we tested the effects of autosuggestion on tactile amplitude perception using implicit measurements. **Methods:** In the experimental design, we made use of a known interaction effect between tactile amplitude and tactile frequency perception. We asked participants to manipulate their tactile amplitude perception via autosuggestion, but we measured their tactile frequency perception (implicit measure). Participants received two touches, first on their left (reference) and second on their right (test) index finger. The main task was to indicate if the touch on the test finger was higher or lower in frequency than the touch on the reference (baseline condition). In the autosuggestion condition, participants were asked to perceive the touches on the reference finger as very strong (Exp 1) or very weak (Exp 2), which we expected to influence frequency judgments. **Results:** Experiment 1 showed a significant difference ($p = .040$) in that frequency perception was lower at the test finger in the autosuggestion compared to the baseline condition, as expected. In Experiment 2, where participants were asked to perceive the touch as weaker, frequency perception was significantly higher ($p = .015$) at the test finger, as expected. An unexpected finding was that a significant difference ($p = .031$) in the direction opposite to predicted was found for those participants who show a reverse coupling between amplitude and frequency. **Discussion:** Our results indicate that the autosuggestion condition was effective in altering participants frequency perception, most likely via their internal change in amplitude perception. More research is needed to explain the effects in participants with reversed response trends.

How is HRV and strengths of negative emotion connected to effectiveness of emotion regulation strategies (self-report and EMG data)

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Introduction: We investigated how emotion regulation (ER) effectiveness -- operationalized via self-report and emotional expression (corrugator supercilii muscle activity) – is influenced by characteristics of the situation (strong vs weak negative material), strategy used (reappraisal, distraction, suppression, no regulation control condition) and individual dispositions (resting state Heart Rate Variability). **Methods:** The sample consisted of 69 adult females. In laboratory experiment, emotion regulation strategies were instructed before watching 8 blocks of negative IAPS photos. EMG and HRV were measured. **Results:** The results revealed that, all the included factors significantly influenced both corrugator activity and evaluation of pictures' negativity (in specific experimental conditions). For example, for high HRV participants (1) distraction, suppression and reappraisal significantly decreased corrugator activity compared to control condition, (2) distraction and reappraisal decreased appraised picture negativity for highly stimulating photos. For low HRV participants distraction and suppression were most effective in decreasing corrugator responses, while suppression was more effective than reappraisal in decreasing perceived picture negativity in low stimulation condition. Subjectively reported effort and success in applying ER strategies were also dependent on manipulated as well as dispositional factors. **Discussion:** Overall, our results support most of the hypotheses and lend support to flexible emotion regulation framework, showing that emotion regulation effectiveness relies on situational context as well as individual dispositions and their interaction.

When Ears Deceive You. Processing of Auditory Incongruence in Musicians - preliminary results.

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Introduction: Musicians use auditory feedback, e.g. sound pitch, to monitor their performance for errors and facilitate learning. The aim of this project is to investigate the processing of errors, understood as a mismatch between the expected and perceived auditory feedback, in musicians. **Methods:** Fifteen musicians (female, 19-26 yo) played various musical scales with their right hand while in an MRI scanner on a highly ecological, MRI-compatible keyboard instrument developed for this purpose. The musicians could not look at their hands while playing. In half of the trials, errors were simulated by replacing the auditory feedback of a single key with a sound corresponding to a neighbouring key. The keypresses were recorded, and the performance correctness was compared to a perfect performance using Levenshtein's ratio. Statistical comparison between auditory feedback conditions (altered vs correct) was conducted using one-way repeated-measures analysis of variance. Neuroimaging data were preprocessed and statistically analysed using SPM12 software. In the feedback condition, we directly compared altered and correct auditory feedback trials using one-sample t-tests. A voxel-wise height threshold of $p < 0.001$ (uncorrected) combined with a cluster-level extent threshold of $p < 0.05$ (FWE corrected) was applied. **Results:** At the behavioural level, the scales were played nearly perfectly for both conditions, with no statistical difference. Neuroimaging data analyses showed increased activation bilaterally in the visual cortex, the left supramarginal gyrus, the left supplementary motor cortex, and the left inferior frontal gyrus. **Discussion:** Taken together, despite no differences in behaviour, we observed the activation of structures involved in error monitoring and processing when musicians played with altered auditory feedback.

Hyperaligning brainstem connectivity during vagus nerve stimulation

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Introduction: The brainstem is a central relay station for afferent signaling and offers potential for large-scale modulatory input, for example, via non-invasive transcutaneous vagus nerve stimulation (tVNS). However, due to the brainstem's anatomical characteristics, human fMRI has been used sparingly to better understand modulatory effects on the functional connectivity of the brainstem . Therefore, additional methods may be required to yield robust results at the group and individual level as well as generalization to independent samples. **Methods:** We extended connectivity hyperalignment (CHA) to the brainstem combined with tVNS (vs. sham) during resting-state functional magnetic resonance imaging (rs-fMRI) in 41 participants. Specifically, we calculated connectivity between voxels of the nucleus of the solitary tract (NTS), the first entry point of the vagus nerve, and 395 cortical and subcortical regions. First, we validated CHA using training and test sets of data. Second, we investigated tVNS-induced effects on hyperaligned vs. anatomically-aligned functional connectivity. **Results:** CHA doubled inter-subject correlations of functional connectivity across phases (i.e., on the same day), but not across sessions. Moreover, CHA across phases revealed robust tVNS-induced changes in functional connectivity that survived correction for multiple comparisons, which anatomical alignment did not. Specifically, connectivity increased between the NTS and left prefrontal areas and the right insular granular cortex and decreased between the NTS and the ventral temporal gyrus. **Discussion:** In line with the goal to provide improvements in the robustness of stimulation-induced changes, we demonstrate the potential of CHA for improving alignment between participants in the NTS across phases. We discuss how future research might improve the generalizability of CHA across days. Ultimately, CHA could provide an promising method for other anatomically challenging targets in the brain which may facilitate future clinical applications beyond the NTS.

Shaking hands in the face of danger? Interpersonal distance, peripersonal space, pro- and anti-social consequences of face masks during the COVID-19 pandemic

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Introduction: Peripersonal space is the space surrounding our body, where multisensory integration of stimuli and action execution take place. The size of peripersonal space is flexible and subject to change by various personal and situational factors. The dynamic representation of our peripersonal space modulates our spatial behaviors towards other individuals. During the COVID-19 pandemic, this spatial behavior was modified by two further factors: social distancing and wearing a face mask. Evidence from offline and online studies on the impact of a face mask on pro-social behavior is mixed. **Methods:** In an attempt to clarify the role of face masks as pro-social or anti-social signals, 235 observers participated in the present online study. They watched pictures of two models standing at three different distances from each other (50, 90 and 150 cm), who were either wearing a face mask or not and were either interacting by initiating a hand shake or just standing still. The observers' task was to classify the model by gender. **Results:** Our results show that observers react fastest, and therefore show least avoidance, for the shortest distances (50 and 90 cm) but only when models wear a face mask and do not interact. **Discussion:** Thus, our results document both pro- and anti-social consequences of face masks as a result of the complex interplay between social distancing and interactive behavior. Practical implications of these findings are discussed.

Coactivation of autonomic and central nervous systems during processing of socially relevant information in autism spectrum disorder: a systematic review

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Introduction: Body-brain interaction provides a novel approach to understand neuropsychiatric and neurodevelopmental conditions, such as autism spectrum disorder (ASD), more comprehensively. In this systematic review, we analysed the empirical evidence regarding coexisting differences in autonomic and central nervous system (ANS and CNS, respectively) responses to social stimuli between individuals with ASD and typically developing individuals. We also reviewed the evidence of deviations in body-brain interaction during processing of social information in ASD. **Methods:** We conducted systematic literature searches in PubMed, Medline, PsychInfo, PsychArticles and Cinahl databases. The systematic literature searches identified 623 studies. After screening the titles and abstracts for initial inclusion criteria, irrelevant studies were excluded and duplicates were removed. Thus, 29 full-text articles were further examined in detail to assess for eligibility. Finally, six studies met the eligibility criteria and were included in the synthesis. **Results:** The results indicated context-dependent ANS and CNS functional atypicalities in ASD. Furthermore, there were indications of altered contribution of ANS on CNS, interpreted as atypical body-brain interaction, among individuals with ASD during processing of socially relevant information. **Discussion:** Although the evidence was limited, the results demonstrated alterations in ANS activity among individuals with ASD that may contribute to social functioning by influencing the processing of socially relevant stimuli in the brain. This study emphasizes the need for establishing our knowledge of the body-brain interaction and its role in social functioning among individuals with ASD. Therefore, we proposed developments for future studies examining ANS and CNS interaction in social contexts.

A Cognitive Evaluation of Lexical Access in Sequential Spanish-English Trilinguals

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Introduction: This study investigates whether Spanish-English cognates' cross-language overlap has any negative effect on sequential trilinguals' working memory. **Methods:** The participants of this research that was carried out in Iran, were 36 females whose first language was Persian and had educational exposure to English (L2) and Spanish (L3) respectively. A timed picture-naming task was applied to test the participants' English and Spanish lexical access and their cognitive development regarding resistance to inter-linguistic interference through low- (blocked) and high-competition (mixed) conditions. Forty-three colored pictures including cognate and non-cognate common nouns of Spanish and English were used in three conditions, at first two blocked ones and then, a mixed one. The number of correct answers in each block and also the response times were the variables of this research. **Results:** According to the results gained by the Kruskal-Wallis test and compared mean scores, a discrepancy was visible between the performances in single blocks and the mixed one, and also within the mixed block; between cognates and non-cognates. The results showed less accurate responses, more inter-linguistic interferences, and longer response times in the mixed condition than in the blocked ones. The scores in the mixed block and especially in cognates were the lowest among all three blocks, i.e., the participants' working memory functioned better in the single blocks. Also, they were more accurate and faster in the English block than in the Spanish one. **Discussion:** Based on the distributed memory representation model, the representation of cognates is associated with both lexical (form) and conceptual (meaning) levels; whereas, non-cognates relate only to the conceptual level. Thus, access to the exact lexical label for cognates takes longer. Besides, the results can be interpreted in terms of the participants' lower proficiency in L3 (Spanish) relative to their L2 (English). According to Cummin's Threshold Hypothesis, having reached the first critical threshold in both languages' proficiency, the learner is then able to overcome the negative effects of bilingualism, and the second threshold to get access to its benefits.

Attitudes, Beliefs, and Experiences of Substance Use: A Systematic Review of Qualitative Research among Refugees and Practitioners

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Introduction: Background and Aims While a range of growing research work is conducted among refugees; few studies conducted qualitative methods to investigate the problem of substance use. This systematic review explores the extent and type of evidence provided by qualitative research on substance use (SU) and substance use disorders (SUDs) among refugees. **Methods:** A systematic literature search identified 203 studies via six medical, allied health, and social sciences databases (EBSCO, PubMed, ScienceDirect, Web of Science, Scholar, and the Cochrane Library) in January - April 2021. Twenty-six studies were found to meet the inclusion criteria and were assessed for quality of evidence, findings were extracted and synthesized via the Database of Systematic Reviews and Implementation Reports according to PRISMA (2018). **Results:** Twenty-six studies were included, in which eight studies focused only on alcohol consumption, and eighteen studies investigated the use of all substances. Qualitative methods were applied by twenty-three studies, and mixed methods were applied by three studies. Four main themes emerged from the synthesis of evidence from the included studies: (1) Refugees are susceptible to SU and SUDs, (2) harmful consequences of SU complicated by social and organizational factors, (3) high barriers for refugees to access health facilities for SU treatment, and (4) there is a need to provide effective access to treatment, intervention, and prevention. **Discussion:** Understanding the problem of substance use among refugees remains limited; there is a need to conduct more qualitative and explorative methods to better understand refugees from different cultural backgrounds. Findings suggest a need to incorporate substance use preventive approaches and treatment into health and counseling services. Efforts are needed to overcome linguistic and organizational barriers in accessing health facilities to effectively provide substance use treatment among refugees.

Dentate gyrus inhibitory microcircuit promotes network mechanisms underlying memory consolidation

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Introduction: The hippocampal dentate gyrus (DG) to CA3 pathway plays a key role in encoding new experiences that are ultimately consolidated in the anterior cingulate cortex (ACC). Experience-dependent changes among excitatory neurons in the DG – CA3 circuit have been intensely studied. However, DG cell axons innervate not only CA3 pyramidal neurons but also inhibitory, parvalbumin positive interneurons (PV IN) to provide strong feed-forward inhibition (FFI) onto CA3 pyramidal neurons. Following learning, FFI onto CA3 is temporarily increased which may be a key element for consolidation and long-term memory storage in hippocampal – cortical networks1; 2. Computationally, feed-forward inhibition has been suggested to support spike-timing fidelity and regulate bursting activity. However, the underlying mechanisms through which this inhibitory microcircuit mediates memory consolidation in hippocampal – cortical networks are not well understood. **Methods:** Here, we harnessed a molecular tool2 to investigate how increased FFI in this microcircuit affects downstream neuronal ensembles and network oscillations during memory consolidation. We performed longitudinal in vivo calcium imaging in CA1 and ACC during contextual fear learning in mice with virally enhanced FFI in the DG – CA3 circuit. **Results:** We found that selectively increasing FFI onto CA3 facilitated formation and maintenance of neuronal representation, in form of context-associated neuronal ensembles, in both brain regions as it prevented a time-dependent decay of neuronal representations. Furthermore, the specificity of neuronal ensembles was increased in a time-dependent manner in ACC. Simultaneous recordings of local field potentials (LFPs) in CA1 and ACC revealed that virally enhanced FFI in DG – CA3 increased coupling of CA1 sharp-wave ripples and ACC spindles, a mechanism for hippocampal – cortical communication during memory consolidation3. **Discussion:** This study links a defined synaptic mechanism in a DG – CA3 inhibitory microcircuit with ensemble dynamics and network oscillations and provides direct evidence for its role in memory consolidation.

Probing Sensory Attenuation for Self-Initiated Actions using Virtual Reality

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Introduction: Self-generated outcome is perceived as less intense than the same sensory input generated externally. This phenomenon, called Sensory Attenuation (SA), is often explained by motor-based forward models. Recent developments in the research of SA, however, challenge these models. **Methods:** Using Virtual Reality in an adapted study design (Vasser et al., 2019), we aimed to examine the abilities of motor-based forward models and predictive processing in explaining SA. Participants decided about the intensity of Gabor contrasts, which either appeared behind participants' virtually invisible moving hand or not. Further, we examined the influence of temporal predictability and identity prediction by externally manipulating stimulus onset time and the initiation of motor behavior. Stimuli either appeared immediately after motor-behavior, with a varying delay or independent of the participants' actions. **Results:** We assessed differences in contrast perception by analyzing variations of the point of subjective equality (PSE) depending on the different conditions. **Discussion:** Preliminary data analysis shows that our results partly reproduce and extend the findings reported by Vasser et al. (2019), favoring predictive processing over motor-based forward models to explain the collected results.

An overview on functional Brain-Heart Interplay measurements

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Introduction: Several functional Brain-Heart Interplay (BHI) estimation methodologies have been recently developed. **Methods:** Most of these BHI methods target biomedical signals and related characteristics including non-stationarity, nonlinearity, complexity, multiscaling, and a-specificity. Non-stationarity refers to the system statistics changing in time, and nonlinearity refers to the non-applicability of the super-imposition principle. Complexity in physiological systems, especially in the cardiovascular system, arises from the combination of nonlinearity and multiple biofeedback and regulation loops, and the multiscale nature of the system dynamics may be referred to a spatial (e.g., for the brain, at a whole brain, or cortical, or neuron levels) or temporal (e.g., multifractality) dimensions. A-specificity of system dynamics implies that the changes that can be observed in healthy conditions (e.g., during postural changes) may also be observed in case of disease (e.g., congestive heart failure). **Results:** We propose a taxonomy for functional BHI estimation methods and define categories according to specificity in brain-heart activity modeling, directionality (i.e., functionally from heart to brain or vice versa), capability of estimating linear and/or nonlinear BHI, time-varying estimates, and physiological plausibility. **Discussion:** For each category, we describe exemplary methods that have been successfully used in a BHI study, critically highlighting pros and cons of specific applications.

Poster Presenter: **Demetriou, Andreas**

Noetron: the central meaning-making unit in the mind and the brain

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Introduction: The central core of intelligence is first specified. The brain equivalent is also discussed. **Methods:** Several studies are summarised, presenting structural equation models for behavioral data and reviews relevant brain research gearing on general intelligence. **Results:** Basic processes are search and alignment, abstraction and cognizance. These are served by process-specific modules and connector modules in several brain areas. **Discussion:** Implications for the psychology of intelligence, brain science, and artificial intelligence are discussed.

The Role of Affective States and Traits in Binocular Rivalry of Neutral Stimuli

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Introduction: Whether any mental process that is not perceptual in nature (e.g., personality traits or emotions) could in principle change the contents of our perception was widely debated throughout the last two decades (cognitive penetrability debate). Predictive coding tells us, that what we see is defined by how much we rely on prior assumptions and sensory evidence respectively. It further implies, that this balance could potentially be influenced by our affective status. This makes emotional states and traits a major variable of interest in studying potential effects of cognitive penetrability in vision. **Methods:** We are currently conducting a preregistered study (n=50) in which participants are asked to report their conscious percept in a binocular rivalry task in either a neutral, positive or negative mood. In a control condition, perception will alternate proportionally between the two presented stimuli (leftwards or rightwards tilted gabor). In a second condition (upright vs. tilted face) perception will be biased towards the more familiar stimulus (regular face). **Results:** We expect that negative affective traits (depressiveness, trait anxiety) as well as negative induced affect will lead to slower alternation rates in both stimuli. We further expect that during more-prior based perception, negative affect will lead to amplification of those biases (upright face is perceived longer on average) whereas positive affect will lead to attenuated biases. **Discussion:** If we find the described effects, this will strongly support the notion of cognitive penetrability of vision through affect. It will further broaden our understanding of how affect is functionally integrated into perceptual processing.

A Single Administration of Citalopram Increases Interoceptive Insight in Healthy Volunteers

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Introduction: Interoception is the signalling, perception, and interpretation of internal physiological states. Much of the psychopharmacology of interoception is still undiscovered. However, mental disorders associated with changes of interoception, including depressive and anxiety disorders are often treated with a selective serotonin reuptake inhibitor (SSRI). The aim of this current study was to causally test the effect of acute changes of serotonin transmission on interoceptive cognition. **Methods:** Using a within-participant, crossover, placebo-controlled design, forty-seven healthy human volunteers (31 female, 16 male) were tested both on and off a 20mg oral dose of the commonly prescribed SSRI, citalopram. For each randomly ordered session, participants made judgments on the synchrony of their heartbeat to auditory tones and expressed confidence in each of these judgments. **Results:** Citalopram enhanced insight into the likelihood that an interoceptive judgment had been correct, driven primarily by enhanced confidence for correct responses. This effect was independent of measured cardiac and subjective effects. **Discussion:** This novel result is evidence that acute serotonin changes can alter metacognitive insight into the reliability of inferences based on interoceptive information, which is a foundation for considering effects of serotonin on cognition and emotion in terms of effective top-down regulation of interoceptive influence on mental states.