Conference Agenda

19th NVP Dutch Society for Brain and Cognition Winter Conference

Session

Poster session 2

Time:
Friday, 15/Dec/2023:
2:00pm - 3:45pm

Location: **Zuiderduinzaal**

Poster format: A0 landscape

Take off your poster immediately after the session

Presentations

ID: 185 / **Poster session 2: 1**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Decision Making

The cerebellum in reversal learning: Preliminary findings

Eline S. Kruithof, Eva M. Drop, Jana Klaus, Dennis J.L.G. Schutter
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The documented involvement of the cerebellum in outcome prediction and error minimization suggests a potential contribution of the cerebellum to reversal learning. Here, we examined whether the transient disruption of cerebellar activity using continuous theta burst stimulation (cTBS) affected reversal learning. Sixty-two healthy adult volunteers participated in a single-blind randomized between-subjects study and received cTBS to either the medial posterior cerebellum, right posterolateral cerebellar hemisphere or lateral occipital cortex before engaging in a reversal learning task. The reversal learning task requires the adaptation of behavior in response to two reversals where reward-punishment contingencies change. During the task, heart rate variability (HRV) was recorded to examine cerebellar modulation of parasympathetic nervous system activity in reversal learning. Preliminary results showed that while reversal learning was observed across cTBS conditions, in the medial cerebellum cTBS condition participants did not incrementally learn after the second reversal of reward-punishment contingencies. Furthermore, in participants who received cTBS to the medial cerebellum, higher HRV was associated with worse reversal learning. The findings imply that decreasing cortical excitability of the medial cerebellum in healthy volunteers may induce risk avoidance and diminish the use of the most rewarding behavioral strategy after reversal learning.

ID: 183 / **Poster session 2: 2**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

The interplay of spontaneous pupil size fluctuations and alpha power in detection of near-threshold visual stimuli

Veera Helmi Sofia Ruuskanen[1], Nico Böhler[2], Sebastiaan Mathôt[1]
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Larger pupils are associated with improved performance in visual detection tasks, often attributed to changes in level of arousal as indexed by pupil size. However, changes in pupil size also affect the amount and focus of light on the retina, potentially influencing detection independently of arousal. The goal of our project was to gain a better understanding of how pupil size and neural activity (as measured with EEG) are related to each other and to performance in a visual detection task. This work is exploratory in nature, and thus, no specific hypotheses were formulated beforehand.

We collected EEG and pupil data from 15 participants while they performed a task consisting of detecting faint stimuli briefly flashed in peripheral vision. Stimulus parameters (contrast and spatial frequency) were adjusted with a staircase procedure to fix performance at 65% accuracy.

Preliminary results show that larger pupils are linked to better detection performance, as we have shown before. Further, pupil size is positively correlated with power in the alpha band in the pre-stimulus period. However, alpha power itself is not significantly correlated with performance. We plan to continue with a decoding analysis and structural equation modeling to account for arousal as a latent variable.

ID: 184 / **Poster session 2: 3**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Haptic and Auditory Enumeration of the Contents of a Container

Krista Overvliet[1], Olga Sagou[1], Ian Koopmans[1], Ilja Frissen[2]

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Everyday experiences suggest that containers, such as a box of chocolate sprinkles, can convey pertinent information about the nature of its content. Despite the familiarity of the experience, we do not know which sources of information people use to estimate the number of objects in a container and which enumeration processes (subitizing, counting, estimation) come into play. The current study explores the impact of auditory and haptic cues on enumeration as well as the transition points between the enumeration processes. In two experiments, we investigated exploration times and accuracy of enumeration of boxes containing 1-8 items under three conditions: auditory-only, haptic-only and combined haptic-auditory cues. In the first experiment, participants explored the boxes for 5 seconds. In the second experiment, participants were free to explore, and we recorded exploration times. The auditory-only condition yielded the highest accuracy, the haptic-only condition the lowest accuracy, while the haptic-auditory condition fell in the middle range, suggesting a weighted average of both sensory modalities. The subitizing range was ~3 items for auditory and haptic-auditory modalities and ~2 items for the haptic-only condition. Larger numbers were enumerated less accurately and yielded similar exploration times: we therefore conclude that larger numbers are estimated and not counted.

ID: 186 / **Poster session 2: 4**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

The effect of subtitles on audiovisual speech integration: An ERP study

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Behavioral and event-related potential (ERP) data show that auditory speech processing is facilitated by viewing a speaker's face. In ERP studies on audiovisual speech perception, multisensory integration effects are typically determined by comparing the auditory-only ERP to the difference between the audiovisual and visual-only ERPs (AV – V = A). Previous studies have reported subadditive amplitude reductions (AV – V < A) for the auditory N1 and P2 to congruent, synchronized audiovisual speech stimuli. In the current EEG experiment we investigated whether redundant information in the form of subtitles affects audiovisual speech integration. Twentynine Dutch participants watched videos of 90 different consonant-vowel syllables in A-only, V-only and AV conditions. Half of the V-only and AV trials were accompanied by subtitles matching the auditory and visual content. The text was positioned on a fixed location for every condition, which coincided with the chin of the actor in the video and started 500 ms before the onset of the video. Testing the difference between audiovisual integration with and without subtitles ([AVt – Vt – A] vs. [AV – V – A]) revealed an augmented amplitude reduction of the P2 when subtitles were added to the video, which suggests facilitation of AV speech integration at the phonetic level.

ID: 187 / **Poster session 2: 5**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Emotion and motivation

Exploring the inverted-U relationship between stress and conflict adaptation in a new Stroop-like stress task

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Introduction: The relationship between stress and cognitive functions is commonly believed to follow an inverted-U-shaped curve, although this idea has not been thoroughly examined within-subject. In this study, we developed a new Stroop-like stress task to investigate the transition from functional to dysfunctional effects of stress on adaptive cognitive control within an individual.

Method: Forty-one participants (25 female) completed our new stress task, which consisted of four blocks of increasing difficulty.

Results: Participants reported a gradual increase in subjective stress levels over the course of the four blocks. Analyses on the behavioral data showed that adaptive cognitive control as measured by the conflict adaptation effect did not reliably differ between the four blocks. However, regression analysis revealed that, across subjects, subjective stress positively predicted conflict adaptation only under the relatively mild stress condition (during the first two blocks only).

Conclusion: Consistent with the inverted-U account, our findings tentatively suggest that mild stress may facilitate conflict adaptation, although, we failed to demonstrate a robust curvilinear effect of stress on conflict adaptation directly. This study offers important insights for optimizing stress manipulation in future versions of the task. It also underscores the importance of including physiological stress measurements in follow-up studies.

ID: 189 / **Poster session 2: 6**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Language

Cortico-cortical and cortico-cerebellar connectivity during syntactic structure building in speaking and listening

Laura Giglio[1,2], Daniel Sharoh[1,2], Markus Ostarek[1], Peter Hagoort[1,2]
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The neural infrastructure for sentence production and comprehension has been found to be mostly shared. The same regions are engaged during speaking and listening, with some differences in their loading depending on modality (Giglio et al., 2022). In this fMRI study (n=40), we investigated whether modality affects the connectivity between inferior frontal and temporal regions, previously found to be involved in syntactic processing across modalities, and with the cerebellum, which has been historically linked with motor aspects of production. Participants produced or listened to word sequences of increasing constituent size. We found that constituent size reliably increased the connectivity between the inferior frontal gyrus and the posterior temporal lobe in both modalities. Preliminary cerebellar results suggest that different sub-regions presented different patterns of connectivity. Connectivity between Lobule VI and (pre)motor regions was increased during production relative to comprehension. Connectivity between Crus I/II and fronto-temporal regions was instead increased as a function of constituent size, and in particular during production. These results thus show that the connectivity between fronto-temporal regions is upregulated for syntactic structure building in both sentence production and comprehension, while cortico-cerebellar connectivity is enhanced both in response to syntactic processing and during production.

ID: 190 / **Poster session 2: 7**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Methods and modelling

Improving the generation of artificial EEG signals by GANs with cognitive models

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In principle, employing deep learning (DL) methods on the basis of electroencephalography (EEG) data holds significant promise for addressing clinical and cognitive questions. For example, it could be used to build a robust mind-wandering classifier or predict outcomes in patients with traumatic brain injury. However, it is difficult to collect sufficient between- and within-participant EEG data for DL methods to work properly. Therefore, synthesizing artificial EEG data at both individual and trial levels is necessary.

Generative AI is a promising method for such EEG data augmentation (DA). Generative Adversarial Networks (GANs) are among the most popular generative models but face challenges, such as the feasibility and diversity of signal quality. Integrating cognitive principles into GANs, for example, through the Adaptive Control of Thought-Rational (ACT-R) model might enhance their performance and validate the physiological plausibility of the generated EEG signals.

We will present our initial work in generating data with GANs and some basic principles that determine GANs performance. We found that the choice of hyperparameters was crucial for model stability and signal quality. We will also reflect on how principles of cognition may be incorporated in this data generation process.

ID: 191 / **Poster session 2: 8**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Development

Working in sync: Children and adults' cooperation and interpersonal liking during face-to-face interactions

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Previous research in adults has linked the synchrony of both facial expressions and physiological signals to increased cooperation and interpersonal liking. However, the extent to which synchrony influences children's cooperative behaviour and liking, and whether this differs from adults, is currently unclear. In this study, we investigated the effects of the synchrony of both smiles and skin conductance level on cooperation and liking. Dyads consisting of N = 240 children and N = 214 adults participated in a real-life Prisoner's dilemma game with an unfamiliar partner and completed a questionnaire on interpersonal liking. We found significantly above-chance smile and skin conductance level synchrony in adults but not children. Notably, neither synchrony in smiles nor skin conductance level predicted cooperation across both age groups, although the gender composition of the dyad emerged as a significant predictor of cooperative behaviour in children. Furthermore, in adults, but not in children, the synchrony of smiles predicted greater interpersonal liking. The results of this work suggest that the positive adaptive function of synchrony in real-life interactions may be more complex than previous lab-based studies suggest.

ID: 192 / **Poster session 2: 9**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

The role of predictive feedback versus feedforward noise training in robust visual perception

Maartje Koot[1], Lea-Maria Schmitt[1], Micha Heilbron[1,2], Floris de Lange[1]
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Recurrent processing is thought to be an important factor driving robust perception in biological visual systems. The predictive coding framework postulates that lower sensory input is reconstructed through generative predictive feedback from higher brain regions, which helps disambiguate

perception. Here, we studied how this generative predictive feedback affects the processing of noisy visual input. We added generative predictive feedback to a feedforward convolutional neural network (CNN) trained on noise-free MNIST digits. We then compared its performance on noisy digit classification to that of a purely feedforward, discriminative CNN trained on noisy MNIST digits. Our results showed that improved noise robustness can be achieved at intermediate noise levels by incorporating predictive dynamics into a network without training it on noisy data. Moreover, the network with generative predictive feedback showed enhanced denoising and reduced dimensionality in representations at layers receiving feedback, as compared to the noise-trained network. This suggests that generative predictive feedback handles noise differently than discriminative noisy data training, potentially by top-down connectivity pushing early visual representations toward a clean manifold.

ID: 195 / **Poster session 2: 10**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Sensitivity to auditory feedback and individual variability

Muge Ozker Sertel[1], Laura Giglio[1], Janniek Wester[1], Peter Hagoort[1,2]
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Monitoring auditory feedback is important for fluent speech production as it enables correction of vocalization errors. Influence of auditory feedback is best illustrated by manipulating it during speech production. A common temporal manipulation technique is delaying auditory feedback (DAF), which disrupts speech fluency, and a common spectral manipulation technique is perturbing the pitch of auditory feedback, which elicits vocal changes. We aimed to understand whether there is a correlation between sensitivity to temporal versus spectral manipulations of auditory feedback. We collected data from 40 participants. In the DAF task, participants repeated sentences, and auditory feedback was presented with 0 or 200ms delay. In the pitch perturbation task, participants phonated the vowel /a/ for 4 seconds and pitch of the auditory feedback was shifted by ±100 or ±200 cents.Voice recordings were analyzed using LME models to test the effects of feedback manipulations. We found that DAF significantly prolonged articulation duration and increased both voice pitch and intensity. Additionaly we found that large pitch shifts elicited less compensatory responses. There was a large individual variability in sensitivity to feedback manipulations for both tasks, however there was no correlation between the sensitivity profiles between tasks, suggesting that these features are processed differently.

ID: 196 / **Poster session 2: 11**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Consciousness

Exploring the role of valence in conscious perception: insights from similarity judgments and deep learning models

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Recent theories claim that valence plays an important role in conscious perception (Cleeremans & Tallon-Baudry, 2022, Barrett & Bar, 2009). Inspired by this, we tested how valence judgments are related to similarity judgments and whether they correlate with stages of processing in deep neural networks (DNNs).

Forty-seven participants provided similarity judgments for 120 images of everyday objects using the odd-one-out task. Using the birthday task (Lebrecht, 2012), we also collected affective judgments. For the same images, we extracted activations from the layers of DNNs trained to classify objects.

Leveraging representational similarity analysis, we first compared perceptual and affective dissimilarities between stimuli. We found that affective processing was correlated with similarity processing, indicating that valence contributes to similarity judgments.

DNN analysis showed that perceptual features contributed to both valence and similarity processing. Importantly, valence processing correlated with activations in the first DNN layers, indicating that low-level visual features take part in the computation of valence.

These results indicate that valence computation may happen already in early visual processing. They also show that valence is involved in similarity judgments, suggesting a link between affect and cognition, corroborating claims for the functional role of affective conscious experience (Cleeremans & Tallon-Baudry, 2022).

ID: 197 / **Poster session 2: 12**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Cognitive control and executive function

To go or not to go: controllability-dependent arbitration between Pavlovian-instrumental strategies for adaptive stress coping

Yanfang Xia[1,2], Egbert Hartstra[1,2], Roshan Cools[1,2]
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We are facing many stressors – some are controllable and can be avoided, while others are not. Adaptive stress coping hinges on a meta-level ability to select an appropriate behavioural control strategy at the right moment. We propose that this adaptability involves flexible arbitration between cognitively effortful instrumental and frugal Pavlovian control strategies based on dynamic estimates of stressor controllability.

Moreover, we hypothesize that recruitment of these distinct strategies implicates distinct sympathetic and parasympathetic neurophysiological stress responses. To test this, we are developing a Go/Nogo-to-avoid-Shock learning task which requires participants to learn both Pavlovian-congruent (i.e., Nogo-to-avoid-shock and Go-to-win-money) and Pavlovian-incongruent (i.e., Go-to-avoid-shock and Nogo-to-win-money) responses. This enables quantification of reliance on a Pavlovian versus an instrumental control strategy, evident as greater Pavlovian biases: greater tendency to NoGo-to-avoid than Go-to-avoid, and greater tendency to Go-to-win than Nogo-to-win. Outcome controllability is manipulated by fluctuating action-outcome contingency over time. We anticipate greater Pavlovian bias and reduced sympathetic stress responses in uncontrollable versus controllable task phases. The paradigm will also allow us to assess failures to adapt strategy selection to controllability changes, as implicated, for example, in learned helplessness.

ID: 198 / **Poster session 2: 13**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Enhanced temporal memory and diminished temporal bias after slow and fast theta tACS

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Theta oscillations (3-8 Hz) are vital for episodic memory, with slow (3 Hz) theta linked to short-term memory accuracy and fast (8 Hz) theta serving various cognitive functions. However, their role in temporal memory remains unknown. We used transcranial alternating current stimulation (tACS) to investigate theta involvement in temporal memory. Participants (N=24) completed three tACS sessions while encoding 72 pictures within frames that changed color every eight items (boundary), receiving 8 Hz, 3 Hz, or sham tACS over P3. After encoding, participants indicated item serial positions on a visual analog scale representing the sequence's timeline. We analyzed temporal accuracy (absolute temporal error) and temporal bias (signed temporal error; negative [positive] values indicating underestimation [overestimation]) for encoded items relative to boundaries for each tACS condition. Compared to sham, 3 Hz, but not 8 Hz, significantly enhanced temporal accuracy. For temporal bias, a temporal underestimation for items encoded away from boundaries after sham stimulation was diminished after 8 Hz, but not 3 Hz. Our study represents the first application of brain stimulation to test the contribution of theta stimulation on temporal memory, showing evidence for a functional dissociation of slow and fast theta, potentially influencing hippocampal function in temporal memory formation.

ID: 199 / **Poster session 2: 14**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Action

Neural states and state transitions accompanying smartphone behavior

Ruchella Kock, Arko Ghosh
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Real-world behavior is complex and composed of a broad range of activities constantly changing over time. This behavior can be captured based on spontaneous smartphone interactions composed of distinct temporal dynamics. In this study, we address whether neural states and state transitions are tuned to distinct temporal behavioral dynamics. For instance, while rapid consecutive interactions (common in typing) may require maintaining the same neural state, transitioning to slower interactions (browsing) may not. We capture the neural states in the form of EEG microstates - quasi-stable patterns of scalp topographies - that reflect periods of computational continuity in the brain. These microstates and microstate transitions are mapped onto a joint-interval distribution that summarizes the temporal smartphone dynamics. We next identify the EEG microstates that appear similar across the sampled population when engaged on the smartphone and critically address if they have similar putative behavioral roles. Our explorations aim to provide a comprehensive account of the functional structures of neural computations underlying real-world behavior.

ID: 200 / **Poster session 2: 15**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Consciousness

Towards a functional NeuroimagingDatabase ofAlteredStates of Consciousness

Xaver Funk[1], Violeta Cespedes[2], Michiel van Elk[1], Timo Torsten Schmidt[3]
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Within the past 20 years, several research groups have collected functional neuroimaging data on different altered states of consciousness (ASCs), using both pharmacological (e.g. psychedelics or stimulants), as well as non-pharmacological (e.g. sensory overload or deprivation) modes of induction. However, direct comparisons between ASCs are sparse and large parts of the published literature are based on a small number of datasets. In addition, there has been significant disagreements with regards to certain preprocessing decisions that highly impact results and inferences. The aim of this project is to build an open, FAIR (findable, accessible, interoperable, reusable) database of ASC fMRI data, allowing for insightful comparisons across ASCs and preprocessing techniques and validating previous analyses, originally based on small datasets. Here, we present the overall plan of the project, provide some preliminary insights that we gained from initial analyses, as well as perspectives for future developments.

ID: 201 / Poster session 2: 16
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

Effort in the presence of a smartphone

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Some studies have shown that the mere presence of a smartphone can lead to reduced performance on cognitive tasks. It is possible that, during a given task, a phone could represent a potentially rewarding alternative task, increasing the opportunity cost of the original task. This, in turn, may cause individuals to reduce their effort and potentially result in decreased performance. We investigated the impact of a smartphone's mere presence on performance in a working memory task. Smartphones were either placed face-down next to the computer screen or kept out of sight. Our preliminary HDDM findings suggest that participants accumulate evidence more slowly at the beginning of an n-back task when a phone is present, but faster towards the end of the n-back task compared to when the phone is absent. Furthermore, participants exhibit less caution in their responses over time, and they are generally less cautious when a phone is present as opposed to when it is not.

ID: 202 / Poster session 2: 17
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Emotion and motivation

Childhood adversity predicts striatal connectivity gradient changes after acute stress

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Background:

Childhood adversity (CA) leads to maladaptive behavioral and brain functional changes. Previous studies from acute stress and reward-processing identified the importance of striatum-centered network in the psychopathology of CA. To understand this better, it's necessary to examine the large-scale striatal connectivity under joint impacts of acute stress and CA.
Methods:
In the sample combining 150 psychiatric patients and 26 controls, we utilized 'connectopic gradients' to capture the functional topographic organizations of striatal connectivity during resting-state scans before and after the acute stress induction. Connectivity gradients were linked to the index of CA by Spearman correlation. Linear mixed models were built to clarify the role of symptom strengths in these correlations.
Results:
One type of CA -- emotional neglect negatively predicted post-stress-induction values, and the stress reactive changes in the anterior-posterior orientation of the first-order striatal gradient. Moderation models revealed the observed correlations were selectively present in individuals with high-comorbidity.
Conclusions:
People who experienced frequent emotional neglect displayed distinguished stress-induced alterations in the motivation-related connectivity modes. The anterior-posterior organization of striatal gradients could be a new biomarker for the symptomatology of people with frequent neglected history, by tracking stress-related brain changes in the general motivation and high-order cognition systems.

ID: 203 / Poster session 2: 18
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Neural activation in relation to sensory processing sensitivity during movie-watching

Christienne G. Damatac[1], Elisa van der Plas[2], Laurens Landeweerd[3], Tessel E. Galesloot[4], Judith R. Homberg[1], Linda Geerligs[5], Corina U. Greven[1,6]
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Sensory processing sensitivity (SPS) is a heritable, evolutionarily conserved trait describing inter-individual differences in perceiving and processing environmental information. SPS has been linked to health outcomes, yet its neural mechanisms remain largely unknown. We investigated how SPS affects neural activity in an ecologically valid setting (while movie-watching). We were interested in whether people with different SPS scores processed the movies in a different way.

We obtained Sensory Processing Sensitivity Questionnaire and movie-fMRI (including neutral and threat aural framings) data from a general population sample from the Healthy Brain Study (N=238,age_{mean}=33.84years). We performed inter-subject synchrony and representation similarity analyses on SPS versus neural activation.

Throughout all movie conditions, participants with more similar SPS scores had more similar neural activation in limbic, dorsal attention, visual, salience, executive, and default mode networks. During neutral movie condition, participants had lower synchrony in dorsal attention and salience networks in association with higher SPS scores. During threat condition, participants had higher synchrony in executive and dorsal attention networks in association with higher SPS. However, no effects survived multiple testing correction.

These initial analyses revealed no evidence of associations between SPS and neural activation similarity. Further analyses comparing threat versus neutral conditions may clarify SPS-related activation differences.

ID: 204 / **Poster session 2: 19**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Decision Making

Assessing the effectiveness of procedures regarding cavitation inception on naval vessels

Julian Steinke
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In modern naval warfare, the submarine poses one of the largest threats to surface ships, naval or civilian. With advancements in concealments, stealth technologies, and silent operating modes, it has become increasingly difficult to locate and engage submarines – also because submarines are often aware of the presence of a surface ship before vice versa. Sound created by cavitation at the ship's propeller is one of the easiest ways to locate a ship and a challenge for anti-submarine warfare. This study aims to map the processes during an anti-submarine mission on the bridge of a warship seen as a joint cognitive system. A mission protecting a high-value asset by locating and engaging an enemy submarine in a simulator environment has been observed to perform a FRAM. The mission profile has then been used for exercises on an active frigate of the Royal Netherlands Navy which has been observed as well to refine the model. The study is expected to deliver a model of the system in this high-risk environment. This assessment will reveal possibilities for the development of a cavitation-prevention interface and how to integrate such a system in the overall structure onboard without increasing the workload of the crew.

ID: 205 / **Poster session 2: 20**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Action

Hippocampal involvement in motor control and learning: Insights from the Alzheimer's disease spectrum

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Despite indications of hippocampal involvement in motor control and learning, its role in different aspects of motor proficiency remains relatively unknown. Using experimental, neuroscientific, and machine learning approaches, we examined whether hippocampal degeneration affects motor control and learning. We had 47 healthy controls (HC), 27 individuals with mild cognitive impairment (MCI), and 26 individuals with Alzheimer's disease (AD) perform manual motor tasks. Our battery included measures of finger tapping, sequence learning, grip strength, psychomotor speed, and spiral tracing. Additionally, hippocampal volume was obtained via structural MRI scanning. For finger tapping, individuals with AD performed poorer in dominant, non-dominant, and dual tapping conditions, whereas this was restricted to non-dominant hand tapping in those with MCI. Tapping speed and variability were related to hippocampal volume, and machine learning could discriminate HC and AD subjects based on performance (accuracy=70%). Sequence learning did not significantly differ among the three groups. We also did not observe an association between the rate of learning and hippocampal volume. Finally, a composite machine learning model with seven performance measures resulting from the various tasks (after recursive feature elimination) revealed that classification accuracy was ~60%. Overall, our findings suggest that hippocampal degeneration selectively affects motor abilities.

ID: 206 / **Poster session 2: 21**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

PRYME study - mindfulness based early intervention for help-seeking youth: Self-referential processing bias, associated neural activity and resting state network activity in youth with internalising problems.

Maud Schepers[1,2], Paul Lagerweij[1,2], Anne Speckens[2], Roshan Cools[1], Guusje Collin[1,2]
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Internalising problems, including anxiety and mood disturbances, are increasingly common in youth and may constitute an early stage of mental illness development[1,2,3]. Negativity biases in self-referential processing and memory are believed to contribute to the development of internalising problems[4,5]. In our Promoting Resilience in Youth through Mindfulness mEditation (PRYME) study[6], we will investigate the efficacy of a mindfulness-based intervention in reducing internalising symptoms in help-seeking youth. As part of this study, we will assess self-referential processing and associated neural activity before and after mindfulness training as a putative mechanism underlying (changes in) internalising problems. Several studies have linked self-referential negativity biases to (subclinical) depression in youth[7,8]. Neural correlates of self-referential processing are found in cortical midline structures that are part of the default-mode network (DMN)[9,10]. Neuroimaging studies in patients with depression have shown increased DMN activity and connectivity during self-referential processing[11,12]. We measure self-referential processing

using a Self-Referent Encoding Task[13], performed during fMRI-scanning. In addition to task fMRI data on self-referential processing, we will assess resting state network activity before and after mindfulness training, focussing on DMN, salience network (SN) and Executive Control Network (ECN). I will present our study rationale and elaborate on our neural and behavioural hypotheses.

ID: 207 / **Poster session 2: 22**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Decision Making

The road not taken: Biased sampling and persisting inaccurate impressions

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In a recent study, we investigated how reinforcement learning might perpetuate biased impressions through selective outcome feedback and endogenous sampling. Participants executed a two-armed bandit task with two identical options, where initial evidence led them to perceive one option as superior. We hypothesized that frequent reinforcement would sustain this bias, fostering the notion that the oft-chosen option was more beneficial. In contrast, infrequent reinforcement was expected to encourage exploration and correction of the bias. The study was conducted entirely online and comprised two experiments: (i) a reward-based experiment (n = 300) where financial gains served as a reinforcer, and (ii) an aversive experiment (n = 301) where choices were reinforced through the omission of an anticipated financial loss. In both experiments, participants were randomly assigned to either a frequent or infrequent reinforcement condition. Notably, while the expected results were not observed in a rewarding context, participants in the aversive setting did demonstrate the expected bias when anticipated losses were frequently omitted. These results highlight how irrational aversive beliefs might be inadvertently reinforced through an interaction between expectations and choice behavior, underscoring the importance of safety behaviors in ambiguous contexts as a mechanism underlying the persistence of disproportionate fear and avoidance.

ID: 208 / **Poster session 2: 23**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Methods and modelling

Cognitive fatigue can be reliably induced using a short individualised computer task without causing boredom, sleepiness and loss of motivation

Margit Midtgaard Bach, Kerstin Weissinger, Peter Jan Beek
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Cognitive fatigue can lead to mistakes which is a challenge in an ever-demanding world where making mistakes can result in devastating outcomes. The aim of this methodological study was to determine which tasks can be used best to induce cognitive fatigue but not boredom, sleepiness, and loss of motivation.

Thirty adults were recruited in a within-subject study protocol and exposed to three different cognitively fatiguing tasks (the individualized 16-minute TloadDBack task, the individualized 32-minute TloadDback task, and a standard 32-minute letter N-back task, where N=2) and a control task (watching a documentary of choice). Each participant also attended a familiarization session to determine their individual level of the TloadDback task and familiarize themselves with the protocol.

Cognitive fatigue, motivation, boredom (VAS), sleepiness (Stanford Sleepiness Scale), and reaction time (3-minute PC-PVT) were all assess pre-and post-task. The RSME and NASA-TLX were administered post-task during each session.

We found that the 16-minute TloadDback induced a similar amount of cognitive fatigue as the other tasks but not the same levels of sleepiness, loss of motivation, and boredom as the other tasks. Thus, an individualized task such as the 16-minute TloadDback task is more efficient at inducing cognitive fatigue than longer or standardized tests.

ID: 209 / **Poster session 2: 24**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

Individual differences in the effects of salience and reward on impulse control and action selection

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Adequate action selection and the ability to control impulses may be crucial but significant individual variations in these abilities exist. We addressed the following questions: (1) Can we pinpoint electrophysiological markers for individual differences in impulse control? (2) Can impulsive tendencies and action selection be influenced by manipulations regarding the salience of external cues and reward, respectively? (3) Is the effectiveness of these manipulations associated with (baseline) individual differences? Specifically, we examined whether high pre-stimulus EEG alpha power is associated with weak impulse control, as assessed by a stop-signal task, and whether increasing stop-signal salience has more impact on stopping competence in individuals with high compared to low-EEG alpha power. We further asked whether monetary reward improves Go/Nogo performance, mostly so in individuals with low baseline EEG theta/beta ratio, a putative index of task-

induced motivation. Results show that impulse control is enhanced by increasing salience, but independently so of baseline alpha level, as was baseline stopping itself. Rewards enhanced overall task performance, and more so in individuals with lower theta/beta ratio. In conclusion, salience and reward may enhance impulse control and action selection, respectively, with only reward effects being dependent on individual characteristics.

ID: 210 / **Poster session 2: 25**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Two-pathway model revisited: Insights from lesion overlap analysis of colour, orientation, and motion processing in stroke patients.

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Despite decades of research, there is still a lack of consensus on how the brain processes basic visual features. To address this gap, we investigated whether associations between colour, orientation, and motion perception align better with the two-pathway model or the patchwork model of the visual brain. We employed multivariate and atlas-based lesion-symptom mapping (LSM) to identify unique and shared lesion locations contributing to performance on colour, orientation, and motion tasks in an unselected group of 307 ischemic stroke patients assessed with a new diagnostic set-up. Surprisingly, multivariate LSM analyses did not identify any brain regions associated with the processing of these visual features, while atlas-based LSM revealed significant associations for colour and motion, but not for orientation. These results challenge the traditional localizationist view of colour, orientation, and motion processing. Instead, they suggest a distributed mode of processing, aligning more closely with the patchwork model. Our findings hold a significant clinical impact, as understanding the effect of lesion locations on neurological outcomes is fundamental to our understanding of pathogenesis and recovery. Broadly, this research contributes to both cognitive neuroscience and clinical practice by shedding light on the neural mechanisms underlying visual feature processing.

ID: 211 / **Poster session 2: 26**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Methods and modelling

Predicting long-term outcome of older mild Traumatic Brain Injury (mTBI) patients using machine learning

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Mild traumatic brain injury (mTBI) is a global public health concern. mTBI patients often completely recover (CR) from mTBI, but a subgroup of patients may experience persistent complaints for months to years, leading to incomplete recovery (IC), with a higher incidence among older individuals (van der Naalt et al., 2017). While various studies identified factors like post-traumatic complaints, demographics, and psychological states as predictors of IC, a comprehensive model incorporating these factors is lacking.

In this study, our objective is to develop a classification model for mTBI outcomes (CR or IR) at 6-months post-injury. We use psychological factors and demographics as predictive features, employing a machine learning approach. This study included 191 mTBI patients aged 60+ and 42 healthy controls. Initial results demonstrate strong performance within the training dataset. However, the number of predictors must be limited to prevent overfitting. We here present results for knowledge-based and data-driven approaches to achieving this.

Overall, our research aims to enhance the prognostic capabilities for mTBI outcome, contributing to a better understanding of how various factors influence the recovery process. We hope that our findings will have significant implications for improving patient care and optimizing recovery strategies in the context of mTBI.

ID: 212 / **Poster session 2: 27**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Attention

Examining whether vulnerability to depression increases self-referential mind-wandering

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Since individuals with depression are known to suffer from exaggerated self-referential thinking, and since self-referential thinking is known to impair task performance, we hypothesized that individuals with higher vulnerability to depression would exhibit poorer task performance under self-referential conditions. We further explored whether this self-related performance decline is driven by an increase in off-task thinking. Participants' vulnerability to depression was assessed through questionnaires, while a spatial Complex Working Memory (CWM) task embedded with thought probe questions was employed to assess task performance and characterize spontaneous thoughts. Our findings demonstrated compared to the control condition, that individuals exhibiting greater vulnerability to depression showed significantly lower average recall

accuracy. In the high depression-vulnerability group, the increase in off-task thinking during self-referential processing significantly predicted the decline in memory accuracy. In conclusion, our results suggest that the self-referential processing can lead individuals with a high vulnerability to depression to engage in more task-irrelevant spontaneous thinking, which in turn impairs task performance.

ID: 213 / **Poster session 2: 28**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Pressing a mental stop button (but not a physical one) inhibits retrieval of unwanted memories

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Suppressing retrieval of unwanted memories can cause forgetting, an outcome often ascribed to inhibitory control. This suppression-induced forgetting (SIF) generalizes to new cues used to test the suppressed content (cue-independence), a property taken as consistent with inhibition. But does cue-independent forgetting necessarily imply that a memory has been inhibited? Tomlinson et al. (2009) reported a surprising finding that pressing a button also led to cue-independent forgetting, which was taken as support for an alternative interference account. We therefore investigated the role of inhibition in forgetting due to retrieval suppression and pressing buttons in the Think/No-Think (TNT) paradigm. We modified Tomlinson et al.'s procedure to examine an unusual feature they introduced that may have caused inhibition effects in their study: the omission of explicit task-cues. When tasks were uncued, we replicated the button-press forgetting effect (exp1); but when cued, pressing buttons caused no forgetting (exp2). In contrast, SIF occurred despite procedural changes. These findings indicate that simply pressing a button in the TNT paradigm does not induce forgetting, on its own, without confounding factors that introduce inhibition into the task and that inhibition likely underlies SIF

ID: 215 / **Poster session 2: 29**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Consciousness

When AI Agents are in charge: Sense of agency during AI guided actions

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The omnipresence of Artificial Intelligence (AI) systems in modern life frequently influences our choices in various contexts, ranging from navigation, to planning, to entertainment. This raises more fundamental psychological questions : how much autonomy should be granted to AI systems? And does this compromise the human sense of control, often referred to as sense of agency? While existing literature demonstrates that involuntary actions lead to a decreased sense of agency, few studies have investigated the sense of agency in the context of AI-guided actions. Our study examines the sense of agency in a controlled experiment using an intentional binding paradigm. Participants (n = 75) executed both free and forced key presses upon receiving instructions. Subsequently, participants were asked to estimate the time interval between their action and its outcome for 144 trials. The findings revealed no significant difference between the free and forced conditions. Additionally, the distinctions between human and AI agent-directed actions were not significant in terms of sense of agency. These results have implications for our understanding of sense of agency in the context of Human-AI interactions.

ID: 216 / **Poster session 2: 30**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Decision Making

Age-related changes in neural variability in a decision-making task

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Aging is characterized by impairments in decision-making, memory, and learning. Classical theories suggest that the cognitive decline may be caused by increased neural variability, reducing the signal-to-noise ratio of information processing in the central nervous system. To explicitly test this hypothesis, we investigate behavior and brain activity in young and old mice performing a visual decision-making task. Old animals show relatively worse performance (a shallower psychometric curve and slower reaction times). We then used extracellular neural recordings to quantify single-neuron variability (using Fano Factors) in the cortex, hippocampus, and thalamus. Preliminary analyses of the neural data indicate that, in line with those classical theories, old animals show higher trial-to-trial firing rate variability of neurons from the dentate gyrus of hippocampus and thalamus. Old animals also exhibit smaller variability 'quenching' (variability decrease on stimulus onset) than the young animals in the hippocampus and thalamus. These aging effects vary across the different brain regions we examined. This work will help us understand alterations of neural function that may contribute to age-related cognitive decline.

ID: 220 / Poster session 2: 31
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Cognitive control and executive function

Vulnerability of learnt action to Pavlovian biases depends on working memory load during learning

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Prior evidence from overtraining work with animals indicates that habits are more vulnerable to Pavlovian biasing than goal-directed actions. This observation has direct relevance for understanding addiction. Here we leverage the recent innovation to enhance reliance on a habitual reinforcement learning (RL) versus a goal-directed working memory (WM) strategy by increasing WM load during instrumental training. We adapted a well-established Pavlovian-to-instrumental transfer (PIT) paradigm, manipulating set size during instrumental training (N=40). We hypothesise that Pavlovian biases of learnt actions depend on the reliance on RL versus WM strategies during learning. Specifically, we predict that greater biasing of actions acquired under high WM load would indicate greater vulnerability of RL-based habits.

Using mixed-effects logistic regressions, we first replicated the PIT effect (main effect of valence χ^2=5.14, p=.023), showing participants' actions are indeed vulnerable to the Pavlovian biases. However, WM load during instrumental training did not significantly affect the valence-specific PIT effect (χ^2=.1, p>0.1). Surprisingly, we observed a higher go bias (χ^2=5.70, p=.017) during the PIT phase to cues learnt under high versus low WM load. This finding may suggest that actions acquired using RL strategies are more vulnerable to failures of impulse control than actions acquired using WM strategies.

ID: 222 / Poster session 2: 32
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Attention

Broadening of Attention Dilates the Pupil

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Inconclusive evidence suggests that the pupil is more dilated when the breadth of attention is broad compared to narrow. To further investigate this relationship, we recorded pupil size from healthy volunteers while inducing trial-wise changes in breadth of attention using a shape discrimination task where participants had to remember the location of a gap in a small or a large circle. A visual search task with targets presented at different distances from the centre of the screen was used to behaviourally assess the success of the manipulation of breadth of attention. Data were analysed using a generalized additive mixed model to test the experimental effects on pupil size after controlling for the effects of gaze location and eye vergence. The results showed that the pupil was more dilated in the broad-breadth-of-attention condition compared to the narrow-breadth-of-attention condition. However, the effect of attentional breadth on visual search performance was not mediated by pupil size, suggesting that more research is needed to understand the functional role of pupil dilation in relation to breadth of attention.

ID: 223 / Poster session 2: 33
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Development

Characterising development in the ventral visual stream in young infants with neuroimaging and deep neural networks

Cliona O'Doherty[1], Aine T. Dineen[1], Graham King[1], Anna Truzzi[1], Chiara Caldinelli[1], Lorijn Zaadnoordijk[1], Enna-Louise D'Arcy[1], Jessica White[1], Anna Kravchenko[1], Claire Ambre[1], Anisha Wadhwa[1], Maebh Healy[1], Amy Burke[1], Sojo Joseph[1], Adrienne Foran[3,4], Ailbhe Tarrant[3,4], Angela Byrne[2,5], Eleanor Molloy[1,2], Rhodri Cusack[1]
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Behavioural studies using looking time procedures have suggested that visual representation undergoes a developmental transition. More specifically, these representations in 3- to 4-month-old infants rely on readily available perceptual features. In contrast, 10-month-olds employ conceptual knowledge of category relations to form these representations. However, behavioural studies are limited, in that young infants could in principle have conceptual representations but not act on them due to a lack of anatomical connectivity. Alternatively, infants may simply choose not to respond to this aspect of the stimulus. Neuroimaging, which does not rely upon a behavioural response can therefore provide a complementary window onto the development of representations in the ventral visual stream. In the foundations of cognition (FOUNDCOG) project, we have acquired the largest awake fMRI dataset in 2-months-old infants (N=134), with longitudinal follow-up at 9-months-old (N=90). Using this dataset, we explore three key hypotheses concerning the transition of perceptual and conceptual representations within the infant ventral visual stream. We use deep neural networks, which in adults have been proven effective models of ventral visual representations, as a model of the infant system.

ID: 224 / Poster session 2: 34
Abstract Submission for Poster / Talk

I prefer to present a poster.
Select best fitting topic: Social Cognition

Neural Correlates of Self- and Other-related Processing in Adults with and without Autism

Annabel D. Nijhof, Jan R. Wiersema
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Humans show enhanced (neural) responses to self-related stimuli, such as their own face or name. These enhanced responses are thought to be crucial for social functioning, and have been found to be diminished in individuals with autism. However, neural responses to self-related stimuli have rarely been investigated across different stimulus types. Further, it is still being debated precisely which aspects of self-related processing are altered in autism. Therefore, the aim of this study was to investigate the neural processes underlying own and other face and name processing in adults with and without autism.

25 adults with autism, and 24 without autism, passively viewed six runs of face images, and six of names, in three categories (Self, Close Other, Stranger), in a 3T MRI scanner. As a first step, exploratory whole-brain analyses revealed stronger activation for familiar faces and names than for a stranger's face/name in a number of visual areas, but also in the intraparietal sulcus and precuneus, areas associated with self-related processing. However, no self-specific enhancement was found, nor any group differences. In a next step, we will perform representational similarity analyses to investigate group differences in activation patterns for self- and other-related stimuli, within and across stimulus type.

ID: 225 / Poster session 2: 35
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Consciousness

Training novel color qualia

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One of the most intriguing philosophical questions in neuroscience concerns the neural basis of conscious experience. Recent studies suggest that training novel qualia offers an opportunity for neuroscientists to trace the formation of first-person experience in neurobiological terms. In line with this, fMRI revealed that visual and parietal brain activation was found to be predictive of reported color experience after extensive letter-color training (e.g., 'a' is red). However, behaviorally, in the same studies, neither the amount of training nor the reported vividness of visual mental imagery could predict the novel color qualia reported. It remains unclear why some people are susceptible to forming such novel color qualia while others are not. The primary goal of the current study was to corroborate previous findings that (color) qualia can be acquired by means of extensive training in a larger sample of participants. In addition, the study addresses whether novel qualia affect early visual memory. We investigate the relationship between reported color qualia and early visual memory after participants read specially prepared colored books in a pre- versus post-training experiment. Our findings will provide insights into how newly formed representations are integrated in the brain, underscoring the experience-dependent nature of unique conscious experience.

ID: 228 / Poster session 2: 36
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Stimulus certainty modulates similarity-induced memory bias

Nursima Unver Aydingul[1,2], Rosanne Rademaker[1], Keisuke Fukuda[2,3]
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People often report an item in visual working memory (VWM) as biased towards novel visual input shown during the delay, especially when the two are judged as similar. We investigated whether the magnitude of this similarity-induced memory bias (SIMB) is influenced by stimulus certainty of the VWM item and/or the novel visual input. Across two experiments, participants (N=61) remembered the direction of a dot motion stimulus (target) over a 2.5-second delay, subsequently reporting this direction and their confidence. On 80% of trials, a second dot motion stimulus (probe) appeared during the delay, and participants judged its similarity to the target. Stimulus certainty was manipulated by changing the motion coherence of the target and probe. As target coherence decreased, both precision and confidence of the target report decreased, indexing a decline in objective and subjective stimulus certainty. Critically, the SIMB was amplified when the target had low coherence and the probe had high coherence. We discovered that this amplification reflected two dissociable VWM memory errors: bias towards the probe, and replacement of the target by the probe. This implies that VWM items can be biased or replaced by new input depending on the stimulus certainty.

ID: 229 / Poster session 2: 37
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Decision Making

Pharmacological elevation of catecholamine levels improves perceptual decisions, but not metacognitive insight

Stijn Nuiten[1,2], **Jan Willem de Gee**[2], **Jasper Zantvoord**[3], **Johannes Fahrenfort**[4], **Simon van Gaal**[2]
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Perceptual decisions are often accompanied by feelings of decision confidence. Whereas parietal cortex is known for its role in shaping perceptual decisions, metacognitive evaluations are additionally associated with (pre-)frontal cortex. Theories of cortical functioning further propose that increased arousal –controlled by neuromodulatory systems– may relatively enhance bottom-up processing (driving perceptual decisions) over top-down processing (crucial for introspection of task-performance). Here, we tested this hypothesis, by investigating the causal effect of two neuromodulatory systems on behavioral and neural measures of perceptual and metacognitive decision-making. To do so, we pharmacologically elevated levels of catecholamines (atomoxetine) and acetylcholine (donepezil) in humans performing a visual discrimination task in which we gauged decision confidence, while measuring electro-encephalography (EEG). Whereas cholinergic effects were not robust, catecholaminergic enhancement improved perceptual sensitivity, while at the same time leaving metacognitive sensitivity unaffected. Neurally, catecholaminergic elevation did not affect sensory representations of task-relevant visual features, but did enhance well-known decision signals measured over centroparietal cortex, reflecting the accumulation of sensory evidence over time. Crucially, catecholaminergic enhancement concurrently impoverished neural markers measured over frontal cortex tightly linked to the formation of metacognitive evaluations. Enhanced catecholaminergic neuromodulation thus improves perceptual, but not metacognitive decision-making, possibly by divergently shaping bottom-up and top-down signaling.

ID: 230 / **Poster session 2: 38**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Attention

Asymmetrical switches between external and internal attention: Electrophysiological evidence for anticipatory reconfiguration

Sam Verschooren, **Luc Vermeylen**, **Sam Boeve**, **Gilles Pourtois**
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We often switch attention between external and internal sources of information, i.e., prioritizing the processing of current sensory input versus stored mnemonic representations. Recent research has shown that these switches are associated with an asymmetrical switch cost: participants show a larger cost when switching attention from external to internal information than vice versa (e.g., Verschooren et al., 2019). To better understand this asymmetry and dissociate potential causes, it is important to determine how it unfolds over time. We here collected EEG measures while 36 participants switched on a trial-by-trial basis between external and internal attention. Behaviorally, we robustly replicated the switch cost asymmetry. EEG results further showed that the asymmetry is most outspoken for early visual ERPs during the cue-target interval, suggesting that the asymmetry stems from a preparatory reconfiguration of attentional settings. During target processing, we found evidence for a perceptual decoupling process on internal trials that was similar when remaining in an internal focus and when switching towards one, further suggesting that the actual attentional reconfiguration occurs before – and is independent of – stimulus processing. These findings have implications for understanding attentional flexibility and the balance between external and internal attention.

ID: 231 / **Poster session 2: 39**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Relying on the external world: uncovering individual strategies in dynamic visual working memory usage

Sanne Böing[1], **Beleke de Zwart**[1], **Teuni F. ten Brink**[1], **Tanja C.W. Nijboer**[1,2], **Stefan Van der Stigchel**[1]
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People tend to make little use of their full visual working memory capacity. Instead, they rely on the external world and (re)inspect information based upon current needs. Only when this 'sampling' is impeded, people shift to relying on memorization. Opting for either a sampling or memorization strategy, therefore, seems largely based on situational demands. Here, we characterized individual differences in strategy use, and investigated whether and how these changed in a copy task with changing task demands. Participants (n=43) rebuilt an example puzzle as fast and accurately as possible in a condition in which they could directly sample information versus a condition with a gaze-contingent waiting time. When information was directly accessible, 39.5% was identified as checker (i.e., inspecting the example >1 per item) and 60.5% as non-checker (i.e., memorizing ≥1 item per inspection). Checkers and non-checkers did not differ in performance. Having to wait for access let checkers become non-checkers. Interestingly, former checkers performed worse than those that already were non-checkers. This implies that individuals naturally adopt a visual working memory strategy that works best for them; although being able to dynamically switch between strategy types in response to situational demands, this might come at a cost of performance.

ID: 232 / **Poster session 2: 40**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Sensory input matching visual working memory drives internal prioritization

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Adaptive behavior necessitates the prioritization of the most relevant information in the environment (external) and in memory (internal). Internal prioritization and sensory processing are thought to be tightly coupled since visual working memory (VWM) content drives external attention. Here we addressed if sensory input matching VWM content in turn guides internal prioritization. Participants memorized three orientations. Crucially some, but not all, objects held in VWM were made available again. These reappearing objects were task-irrelevant and could be forgotten. Experiment 1 showed that the reappearance of all but one object held in VWM (opposed to one or no reappearing objects) benefited accuracy and speed as much as a traditional spatial retrocue. This shows that memory-matching, yet task-irrelevant sensory information facilitates internal prioritization. But which aspects of the sensory content drive this effect? Experiment 2 demonstrated that prioritization was facilitated most if reappearing objects matched VWM content in terms of both location and orientation – even though these objects were now task-irrelevant. Internally held representations prepare sensory processing, and conversely, sensory processing guides the prioritization of relevant internal representations. We therefore propose that predictive and feedback signals jointly optimize internal prioritization to subserve adaptive behavior.

ID: 233 / **Poster session 2: 41**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Attention

Attentional blur and blink: Effects of adaptive attentional scaling on visual awareness

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Attentional scaling allows flexible attention allocation across the visual field. While its role in visual processing is established, its effect on visual awareness remains unclear. This study investigates the adaptive control of attentional scaling and its influence on visual awareness in an attentional blink paradigm. Participants were required to attend to the first target's location, which was manipulated either session-wise, trial-wise, or such that it could be learned across a block of trials. We hypothesized discrete awareness for a narrow attentional scale and gradual awareness for a broad attentional scale. We used mixture modeling to assess second target awareness. Results revealed that the attentional scale could be adaptively controlled across stable sessions, and through statistical learning in blocks of successive trials. This produced gradual perceptual awareness when the participants adopted a broad attentional scale, causing an attentional "blur". However, trial-wise cues prevented attentional scaling, resulting in more discrete target perception overall, and an attentional "blink". We conclude that the attentional scale is to some extent under adaptive control during the attentional blink/blur, where it can produce qualitatively different modes of perceptual awareness. Subsequent EEG experiments will explore the neural mechanisms underlying the observed attentional scaling effects on visual awareness.

ID: 234 / **Poster session 2: 42**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Development

Effects of COVID-19 pandemic on structural brain development in early adolescence

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The COVID-19 pandemic caused a global health crisis with large behavioral effects and serious stress and social consequences. Particularly, teenagers suffered pandemic-related social restrictions including school closures. This study examined whether and how structural brain development was influenced by the COVID-19 pandemic and whether pandemic length was associated with accumulating or resilience effects of brain development. We investigated structural changes in social brain regions (medial prefrontal cortex: mPFC; temporoparietal junction: TPJ) as well as the stress-related hippocampus and amygdala, using a longitudinal design of 2 MRI waves. We selected two longitudinal age-matched subgroups (9-13 years old) of which one was tested *before* (n=114) and the other *during* (peri-pandemic group, n=204) the COVID-19 pandemic. Results indicated that teenagers in the *peri*-pandemic group showed accelerated development in the mPFC and hippocampus compared to the *before*-pandemic group. Furthermore, TPJ growth showed immediate effects followed by possibly subsequent recovery effects that returned to a typical developmental pattern. No pandemic effects were observed for the amygdala. These findings suggest that experiencing the COVID-19 pandemic measures had accelerated effects on hippocampus and mPFC development but the TPJ showed resilience to negative effects. Follow-up MRI assessments are needed to test acceleration and recovery effects over longer periods.

ID: 235 / **Poster session 2: 43**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

The interactive effects of surprise and plausibility on memory

Amy de Bruïne[1], Myrthe Vel Tromp[1], Arnout Koornneef[1], Garvin Brod[2], Dietsje Jolles[1]
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It has been demonstrated that surprising information often leads to better recall. Yet, this might not apply to information that is considered to be

implausible. The current study examines how surprise and plausibility judgments relate to participants' recall and updating of their mental representation. Numerical statements (e.g., X out of 10 animals are insects) were presented and participants made an estimation of X, saw an answer, and indicated their surprise and plausibility. An unexpected memory test was presented to examine the effects of surprise and plausibility on recall. Finally, 24-48 hours later, participants provided new estimations for the numerical statements. A U-shaped relation between surprise and memory recall was found with unsurprising and highly surprising items being remembered better than moderately surprising items, but only for plausible items. Next, results showed that on day 2 plausible and unsurprising answers were reported back more often than implausible and moderately or highly surprising answers. For updating the mental representation more surprise led to more updating, but only for plausible items. So, surprise enhances memory, but metacognitive judgments of plausibility and time can interfere with this effect. Moreover, enhanced recall does not necessarily mean that information is fully incorporated into the mental representation.

ID: 237 / **Poster session 2: 44**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

How learning and forgetting curves change shape through mere averaging over individuals

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In 2011, Murre and Chessa showed that averaging over exponential functions tends to give a power function. I shall summarize some recent findings (without including the math): (1) Averaging over individual learning (or forgetting or other) curves tends to change their shape. (2) Averaging over exponential functions tends to give power functions. (3) Averaging over power functions tends to give log power functions. (4) Averaging over logarithmic functions retains their shape. (5) The results hold for a wide variety of learning rate distributions. (6) For exponential and power functions, geometric averaging retains the shape. (7) Geometric averaging over logarithmic functions does not retain that shape.

ID: 238 / **Poster session 2: 45**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

Default-executive coupling in aging in a verb generation task

Wouter De Baene[1], Geert-Jan M. Rutten[2], Margriet M. Sitskoorn[1]
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Recent research suggests a shift in cognitive mode with aging, characterized by a decline in executive control abilities and an increasing reliance on semantic knowledge. This shift is thought to rely on a higher reliance on the default mode network ('DMN', thought to support prior knowledge) while executive networks like the fronto-parietal network ('FPN') become less engaged with age. In this exploratory study, we tested these predictions using a verb generation task in 282 glioma patients (122 low grade gliomas, 160 high grade gliomas) aged 18 to 76. Using multivariate GLM analyses, we investigated the effect of age on task-related activation and functional connectivity within and between the FPN and DMN. As predicted, activation in FPN and DMN showed opposite patterns with age: activation in the FPN decreased with age while DMN activation showed an increasing trend. Furthermore, within-network connectivity decreased with age. Contrary to the predictions, however, network connectivity between the FPN and DMN also decreased with age. Notably, these age-related effects did not interact with tumor grade (low grade vs high grade glioma). These findings support the idea that, as people age, they tend to engage DMN more and FPN less during a semantic task.

ID: 239 / **Poster session 2: 46**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Decision Making

Time is money: time as an incentive to improve performance

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Extensive research has demonstrated that investing mental effort is costly: people avoid difficult tasks or perform worse unless (larger) rewards are prospected (i.e., cost-benefit analysis). Among others, one account theorizes that the perceived costs of mental effort derive from an opportunity cost, defined as the next-best use to which our limited resources can be put. For example, a student may perceive a difficult task as more burdensome when there's a more appealing alternative (e.g., taking a break before the next lesson). In a pre-registered experiment, 60 students performed an arithmetic task. On each trial, a cue predicted the difficulty of the task and whether a fast and correct response to that trial would reduce the duration of the experiment (potentially up to 20 minutes out of 1 hour experiment) or not. Given the lenient response deadline (2s) participants were more accurate, but also slower in response to time-rewarded trials. This suggests that participants are willing to invest (some) time in order to gain time, and more generally that time is considered a reward as predicted by the opportunity cost account.

ID: 240 / **Poster session 2: 47**

Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Learning & Memory

The role of refreshing mechanisms in the maintenance of working memory

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Working memory (WM), a crucial system for the temporary storage of information, has been related to neuronal oscillations within the alpha band (8-12 Hz). Recent research by Barbosa et al. reanalyzed electroencephalographic (EEG) data from a prior study and found that there is ongoing neural activity in alpha power during WM maintenance. This might constitute a "refreshing" signal, strengthening previously established patterns of functional connectivity. Here, we aim to investigate refreshing during WM maintenance. 30 human participants engaged in a visual WM task with two items, one of which was retro-cued, while EEG was recorded. The task featured two conditions: either there was a long delay interval of 3 seconds or a short delay interval of 1 second. We used impulse perturbation to access WM representations during the delay interval. Consistent with previous studies, our dynamic activity analysis revealed significant decoding clusters for memory items. We also observed that only cued memories could be robustly decoded during both delays, while uncued memories could not. Depending on the delay condition, we furthermore expect to see evidence of differential refreshing during this period, with more refreshing activity in the 3-second delay than in the 1-second delay.

ID: 241 / Poster session 2: 48
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Consciousness

Control over conscious perception through meditation?

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Our brains continuously infer and rapidly conceptualize sensory input based on past experiences as demonstrated by Binocular Rivalry (BR). BR is a phenomenon triggered by presenting distinct visual stimuli to the eyes so they appear to overlap spatio-temporally, resulting in perceptual alternation between the two stimuli rather than a veridical continuous mixed percept. In this ongoing study, we examined whether volitional control over this process of perceptual inference is possible through meditation-induced attention modulation. Expert meditators were exposed to BR stimuli in three conditions: no-meditation, Focused Attention (FA) meditation, and Open monitoring (OM) meditation, in both self-report and no-report blocks, while their brain activity was recorded with EEG. We hypothesized that FA – by upweighting attention to the perceived stimulus – would increase perceptual dominance duration (PDD), and OM – by equally distributing attention to all aspects of experience – would decrease PDD. Preliminary results from nine expert meditators suggest longer PDD during both meditation conditions. First results further show that we can successfully classify the reported percept using EEG data and a localizer task-trained classifier, enabling rivalry-tracking during deep-meditative no-report conditions. Further results from a larger sample will be presented to illuminate the extent to which control over conscious perception is possible.

ID: 243 / Poster session 2: 49
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Social Cognition

The effect of expected and actual reciprocity on cooperative trust in algorithms

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While algorithms have taken a central place in daily life, a general distrust toward them persists, resulting in reluctance to cooperate with an algorithm. The present study investigates the mental processes underlying differences in (dis)trust in algorithms and humans, using iterated trust games. We tested whether differences in trust granted to human and algorithm-coplayers relate to the expected reciprocity of a coplayer (at the start of the game) or the actual reciprocity of a coplayer (experienced during a game). In a series of three experiments (n= 750), we manipulated the expected reciprocity by providing cues at the onset of a game (e.g., the upcoming coplayer will reciprocate on 70% or 30% of trials in the next game), as well as the actual reciprocity rate of the coplayers. Our findings suggest that when playing against an algorithm, these cues had an effect on the proportion of trust granting. In contrast, when participants believed they were playing against a human coplayer, the reciprocity cues had no impact. The effect of the actual reciprocity was similar for both types of coplayers. We conclude that differences in trust towards algorithms and humans are mainly based on expected reciprocity.

ID: 244 / Poster session 2: 50
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Decision Making

When models matter: How we learn to arbitrate between model-based and model-free control

Leslie Held[1], Elise Lesage[1], Wouter Kool[2], Senne Braem[1]

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In reinforcement learning models, a common distinction is made between model-based and model-free control, capturing how much people rely on the specific actions that led to previous rewards vs. simulations from an internal model of the environment. In three experiments, we aimed to test whether people can learn to regulate these respective strategies based on environmental demand, operationalized as alternating vs. repeating first stage states in Kool, Gershman and Cushman's (2017) two-step task. In Experiment 1 (N=140), we tested and found that participants exposed to more first stage alternations (80%) in a training phase were more model-based in a subsequent test phase (50% first stage alternations) than participants exposed to more first stage repetitions. In Experiment 2 (N=140), we tested if amplification of rewards in 80% following first stage alternations (50%), leads to more model-based behaviour. While we observed a quantitative trend in this direction, our results revealed no significant differences between the two amplification conditions. In Experiment 3, we will therefore increase the amplification probability per respective sequence. Overall, our initial findings suggest that changes in environmental demand can drive different reinforcement learning strategies, but whether we can learn these same changes through selective reinforcement remains inconclusive.

ID: 245 / **Poster session 2: 51**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

The role of counterfactual visibility in perceptual decisions

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Perceptual decisions are driven not only by incoming sensory input, but also by our beliefs regarding the likelihood of input given competing hypotheses about the world. This role of probabilistic reasoning in perception is especially pertinent when deciding that a stimulus is absent. In decisions about absence, sensory input is missing and decisions are based not on the visibility of a presented stimulus, but on counterfactual visibility: the degree to which a stimulus would have been visible, if present. To test the effects of beliefs about counterfactual visibility on perceptual decisions, we had participants perform a near-threshold detection task under different levels of partial stimulus occlusion. Across three pre-registered experiments we find that, at the group level, occlusion slowed down decisions about presence but had virtually no effect on the timing of decisions about stimulus absence, consistent with an effect of visibility, but not counterfactual visibility, on detection decision times. Critically, further analysis revealed that this null group-level effect for target-absence responses is driven by stable variability among participants, with some slowing down and others speeding up when more of the display was occluded. We present a rational analysis account of these opposite effects of counterfactual visibility on perceptual decisions.

ID: 248 / **Poster session 2: 52**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Cognitive control and executive function

Pupil-linked arousal tracks adaptive control over the stability-flexibility trade-off

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Cognitive control has notorious limitations. Why, for example, do we sometimes have difficulty reading scientific articles in a noisy environment even though we've already committed to that task? Recent research suggests such limitations are not a bug but a feature of neural processing systems in response to the computational dilemmas these systems must navigate.

Limiting the intensity of control we allocate to the current task might reflect a solution to the stability-flexibility trade-off. This trade-off refers to the tension between maximizing control in the current task (minimizing distraction and optimizing performance) and the ability to quickly and flexibly reconfigure our cognitive system when task demands change. A limitation on control intensity prevents the system from getting "stuck" in a task, and dynamically regulating the intensity allows the system to adapt to different demands for flexibility. This hypothesis has gained traction through computational models that make normative predictions in the task-switching paradigm and empirical work showing that people behaviourally conform to these predictions.

Here, we tested the hypothesis that brainstem-arousal systems provide a neurophysiological mechanism for dynamically regulating the intensity of control. Indeed, we demonstrate that pupil size, a proxy for arousal, tracked participants' behavioural adaptation to different demands for flexibility.

ID: 249 / **Poster session 2: 53**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Social Cognition

Structural cortico-subcortical connectivity and its relation to social self-regulation across development

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Growing up, children encounter various social challenges, including social rejection. While some may experience ongoing mental health issues

like depression or aggression as a result, others seem to handle social rejection without much harm to their well-being. Previous studies have shown that late childhood could be a sensitive period for the regulation of aggression following social rejection. Not only has variability in social self-regulation been associated with individual differences in neural activation in the dorsolateral prefrontal cortex (PFC), variations in the development of structural connections between the PFC and ventral striatum have been linked to individual differences in self-regulation as well. The current preregistered study will therefore examine the fractional anisotropy (FA) in the cortico-subcortical pathways to find out whether changes are related to variations in social self-regulation. Using random-intercept crossed lagged panel models (RI-CLPM) in a large (N>500) 4-wave longitudinal design, it will be investigated whether there are specific periods in 7-to-14-year-olds in which changes in structural connectivity can predict social self-regulation or vice versa. The data collection finished on October 1st and we are currently running data analyses. During the 19th NVP winter conference we can present the preliminary results.

ID: 253 / **Poster session 2: 54**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Decision Making

When and where to exert cognitive control: Uncovering a role for environmental controllability and traveling waves of striatal activity

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Surviving in an everchanging environment demands that humans can adapt their behaviour adequately by exerting control over the environment. This ability to exert cognitive control is computationally expensive. Given our limited resources, we need to recruit such an expensive control strategy only when it is needed, for example, when the current instrumental context requires actions (e.g., nogo-to-win) that are in direct conflict with our hardwired Pavlovian biases (e.g., go-to-win). How do we decide when to recruit cognitive control? We posit a crucial role for our ability to estimate the controllability of the environment. We will present pilot results of a fast fMRI study that builds on the recent discovery that wave-like dopamine release patterns in the rodent dorsal striatum depend on outcome controllability (Hamid et al., 2021), thus suggesting a key role for striatal dopamine in deciding whether to recruit cognitive control. We aim to uncover analogous waves of striatal activity during the performance of a go/nogo-to-win/avoid learning paradigm, depending on fluctuations of outcome controllability. We predict that higher controllability estimates are associated with greater dorsal-to-ventral striatal waves as well as greater cognitive control of maladaptive behavioural Pavlovian biases.

ID: 254 / **Poster session 2: 55**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Perceptual expectations of presence and content in (atypical) visual perception

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Hallucinations have been proposed to result from overweighted predictions leading to maladaptive Bayesian inference. Elsewhere, it has been suggested that several types of predictions exist within a hierarchy, those of higher-level stimulus presence and those of lower-level stimulus content. Here, we attempt to link these two theories together by investigating, 1) how expectations about presence and content distinctly affect perceptual decisions and 2) which of these types of expectations correlates with hallucination proneness. Across separate discovery and replications studies, participants were asked to judge both the presence and content (orientation) of noisy gratings. Crucially, preceding compound cues simultaneously and orthogonally predicted both whether a grating was likely to appear as well as its possible orientation. In a normative sample, we show that predictions of presence and content influence detection and discrimination decisions in distinct but interacting ways. We explain how these effect profiles are accounted for by hierarchical models of perception. Further, we show subtle but inconclusive evidence for specifically presence predictions, but not content predictions, underlying the Bayesian explanation of hallucinations. However, important caveats to this conclusion remain, some of which apply to the larger field of hallucination research, which are discussed.

ID: 255 / **Poster session 2: 56**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Language

Does syntactic category constrain semantic interference effects during sentence production? A replication of Momma et al (2020)

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The semantic interference effect in picture naming entails longer naming latencies for pictures presented with semantically related versus unrelated distractors. One factor suggested to influence the effect is word category. However, results have been inconclusive. Momma et al.

(2020) used a sentence-picture interference paradigm where the sentence context ("her singing" or "she's singing") disambiguated the word category (noun or verb, respectively) of distractor and target, manipulating their word category match/mismatch. Semantic interference was only found when distractor and target belonged to the same word category, suggesting that syntactic category constrains lexical competition during sentence production. Considering this important theoretical conclusion, we conducted a preregistered replication study with Dutch participants, mirroring the design of the original study. In each of 2 experiments, 60 native speakers read sentences containing sentence-final distractor words that had to be interpreted as nouns or verbs, depending on the sentence context. Subsequently, they named target action pictures as either verbs (experiment 1) or nouns (experiment 2). Results of Experiment 1 showed a main effect of relatedness, suggesting a semantic interference effect regardless of word category. We discuss differences between the original and current study results with cross-linguistic differences in (de)compositional processing and frequency of distractor forms.

ID: 256 / **Poster session 2: 57**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Emotion and motivation

Dynamic causal modeling to index effective connectivity changes when dealing with criticism in adolescents

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Sensitivity to criticism is considered a risk factor for the development of psychiatry disorders in adolescents, who may be more vulnerable to negative social evaluation and exhibit inadequate emotion regulation such as rumination. The neural network involved in dealing with criticism in adolescents may serve as a biomarker for vulnerability to depression.

In this study, 64 healthy adolescents (aged 14 to 17 years) were asked to listen to a series of self-referential auditory segments, which included criticism, praise, and neutral conditions, during fMRI scanning. Dynamic Causal Modeling (DCM) was performed to quantified the modulatory effects of exposure to criticism and praise on the effective connectivity between three brain regions: the left pregenual anterior cingulate cortex (pgACC), the left dorsolateral prefrontal cortex (DLPFC), and the right precuneus (preCUN).

We found that adolescents who are more sensitive to criticism showed less inhibition of the preCUN-to-DLPFC connectivity when being criticized, indicating that they required more engagement of the DLPFC to sufficiently disengage from negative self-referential processing. Furthermore, the inhibitory connectivity from the DLPFC to the pgACC was strengthened by exposure to praise as well as criticism, suggesting a recruitment of cognitive control over emotional responses when dealing with positive and negative evaluative feedback.

ID: 257 / **Poster session 2: 58**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Age-related differences in the use of chunking strategies during reinforcement learning

Irene van de Vijver
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Reinforcement learning (RL) is supported by both dopaminergic prediction-error signals and working memory (WM). To decrease the WM load, participants report 'chunking' stimuli that are mapped to the same response based on similarities between them. We examined how age-related changes in the ability to discover and use such chunking-based strategies contribute to RL success. In three phases of a RL task, 28 younger and 28 older adults (1) invented their own strategies while there were no inherent similarities between stimuli mapped to the same response, (2) could discover and use similarities that were inherent in the stimulus mapping, and (3) were given explicit hints about these similarities. To explore the role of verbal WM, we also compared learning between concrete and abstract pictures. We confirmed that RL accuracy was generally lower in older adults, and that they used chunking-based strategies less often. However, the age-related difference in RL accuracy decreased with increasing assistance in finding the optimal strategy. Moreover, with specific hints about the similarities, in combination with nameable stimuli, the age difference disappeared. Thus, age-related differences in RL performance seem to depend on changes in the learning process itself and in the ability to use strategies to optimize performance.

ID: 258 / **Poster session 2: 59**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Probing the effects of object category learning on the macaque inferior temporal cortex

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Primates are proficient at learning object categories. Prior work shows that individual neurons in the inferior temporal (IT) cortex, critical for visual object recognition, modestly increase their selectivity to objects from learned categories. How do these neural changes translate into behavioral

performance gains ("learning")? Here, we address this by comparing the IT responses of macaques only trained to fixate passively on images (naïve) with those that also learned to categorize objects (trained). We observed that IT responses indeed moderately changed due to category training: trained IT sites were more category-selective, yielding improved linear decoding accuracies for learned object categories and more categorical representational geometries at the population level. Critically, these changes led to greater IT-decode consistency with the monkeys' behavioral patterns. How do these concurrent changes in IT and behavior arise? We provide a systems-level perspective on this by simulating category training in various task-optimized artificial neural networks (with different architectures, pre-training objectives, and learning strategies). Interestingly, trained models performing on par with the trained macaques showed IT-like increases in category information and an increased predictivity of behavioral patterns. Together, these results indicate that category training produces modest, yet behaviorally relevant changes in the IT cortex collectively enhancing category readout.

ID: 259 / **Poster session 2: 60**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Layer dependent fMRI and biophysical modeling reveal the distinct roles of cortical laminae in processing unpredictable and mispredicted sounds

Lonike K Faes[1], Isma Zulfiqar[1], Luca Vizioli[2], Zidan Yu[3], Yuan-Hao Wu[4], Jiyun Shin[4], Ryszard Auksztulewicz[5], Lucia Melloni[6,7], Kamil Uludag[8], Essa Yacoub[2], Federico De Martino[1,2]

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Predictive coding postulates that our brains build an internal representation of the sensory world through the comparison of predictions casted by an internal model and the sensory input. Such a process takes place throughout the (sub-) cortical hierarchy. A specific role is attributed to the different cortical layers in the information flow between top-down predictions and bottom-up sensory evidence. While ultra-high field fMRI (7 Tesla) can be used to observe cortical depth dependent brain activity non-invasively in humans, the effect of draining veins renders laminar gradient-echo BOLD activity tainted, making it difficult to disentangle neuronal from vascular dynamics. To investigate the role of cortical layers in response to tones that either respect or deviate from contextual cues using BOLD fMRI, we use a previously developed biophysical model that combines neuronal dynamics and laminar vascular physiology within a dynamic causal modeling (DCM) framework. Using this approach we account for draining effects and reveal the laminar distribution of responses to unpredictable and mispredicted tones (compared to predictable ones) across the bilateral auditory cortex. In accordance with the predictive coding hypothesis our results indicate a distinct role of deep and superficial cortical layers in the contextual processing of auditory stimuli.

ID: 260 / **Poster session 2: 61**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Action

Exploring the perception-action representation of human grasping in EEG, EMG and kinematic signals

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It is well-known that human neural representations of grasping movement observation and execution share similarities. However, it remains unclear how neural patterns of perception (movement observation) relate with behavioral covariates of action (movement execution), such as muscle or kinematic activity, or with categorical models of hand posture or object properties. To address this, I simultaneously recorded EEG, EMG and kinematic data while 31 subjects observed and performed multiple repetitions of 33 distinct grasping movements. Moreover, I categorized the grasps based on the shape and size of the object, thumb's position w.r.t the palm, and grasp type. Using representational similarity analysis, I explored the relation among EEG neural representation of movement observation, categorical models and behavioral covariates in three phases of the movement: hand pre-shaping, reach-to-grasp, and holding. I found that the EEG representation of the movement observation was correlated with the muscle representation most strongly in the holding phase. Furthermore, I found similarities during the observation and hand-preshaping phase between the EEG patterns and the categorical model of the object shape and size. With these findings we gain a joint understanding of the relation between grasping movement perception and action and a means to facilitate an intuitive neuroprosthetic control.

ID: 261 / **Poster session 2: 62**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Attention

Eye movements track prioritized auditory features in selective attention to natural speech

Quirin Gehmacher

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Over the last decades, cognitive neuroscience has identified a distributed set of brain regions that are critical for attention - one of the key principles of adaptive behavior. A strong anatomical overlap with brain regions critical for oculomotor processes suggests a joint network for attention and eye movements. However, the role of this shared network in complex, naturalistic environments remains understudied. Here, we investigated eye movements in relation to (un)attended sentences of natural speech in simultaneously recorded eye tracking and magnetoencephalographic (MEG) data. Using temporal response functions (TRF), we show that eye gaze tracks acoustic features (envelope and acoustic onsets) of attended speech, a phenomenon we termed *ocular speech tracking*. Moreover, we provide evidence for its contribution to neural differences in speech processing, emphasizing the necessity to consider oculomotor activity in future research and in the interpretation of neural differences in auditory cognition. Our results extend previous findings of a joint network of attention and eye movement control as well as motor theories of speech. They provide valuable new directions for research into the neurobiological mechanisms of the phenomenon, its dependence on learning and plasticity, and its functional implications in social communication.

ID: 262 / **Poster session 2: 63**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Language

Dynamic behavioral and neural correlates of learning progress during a letter-speech sound learning task

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A difficulty in forming letter-speech sound (LS) associations may form a crucial hurdle for individuals with dyslexia. So far, most research on LS learning has focused on outcome measures, whereas little is known about the learning processes themselves. In this EEG study, we investigated behavioral and brain changes while Dutch native speakers (18–27 years) learnt to map 6 novel letter symbols to 6 Dutch speech syllables that were either phonologically similar (/ba/, /da/, /pa/) or dissimilar (/fa/, /ka/, /la/), across four 8-minute blocks. Presented symbol-sound pairs where either congruent (50%) or incongruent (50%, random mappings). Our preliminary results show significant behavioral learning across blocks, paralleled by gradual response changes for matching pairs at temporal, ventral visual and centroparietal electrodes. We observed that LS learning for phonologically similar pairs was slower and led to a faster ascent to peak amplitude and a slower decline of left frontotemporal activity, relative to phonologically dissimilar pairs. This suggests that processing similar sounds engages intensified cognitive activity for initial discrimination and prolonged evaluative processes during LS learning. Next planned steps are to collect data of dyslexic readers, and relate individual participants' behavioral to ERP learning trajectories for phonologically similar and dissimilar pairs.

ID: 263 / **Poster session 2: 64**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Dissociating Contributions of Prediction and Trial-Level Adaptation Using High-Field fMRI and MEG.

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To make sense of the intricate, but congested soundscape of our dynamic surroundings, listeners continuously use contextual information to form predictions about future states whilst adapting to past sensations. While research supports the relevance of both prediction and trial-level adaptation to aid neural processing of sounds, differentiating between the two remains challenging. Prediction and adaptation are often correlated, making events that elicit surprise also –due to alterations in their low-level attributes– trigger a release from adaptation. Here we test the relative contributions of prediction and adaptation by presenting tones stochastically sampled from Gaussian distributions. We employ ultra-high-field functional magnetic resonance imaging for sub-millimeter resolution to examine layer-dependent effects of prediction and adaptation. We outline a voxel-specific (tuning dependent) modeling approach, encompassing: 1) low-level activation –using pRF modelling; 2) prediction –quantifying surprise with computational modelling; 3) trial-level adaptation –accounting for long-term effects. This investigation aims to pinpoint where (and in what layer) prediction and adaptation integrate within the auditory cortex. Complimentary, we use the same paradigm employing magnetoencephalography to supplement our fMRI findings, relying on time-resolved regressions to discern the temporal dynamics of the adaptation-prediction interplay. Preliminary results indicate the validity of our approach in disentangling the prediction and adaptation dynamics.

ID: 264 / **Poster session 2: 65**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Persistent sampling from the external world rather than from memory despite twenty-five repetitions of the same trial

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We commonly load visual working memory minimally when external information remains available. In visual search, this is characterised by both encoding novel (externally available) templates during search and revisiting previously encoded templates. When all templates have been encoded and rehearsed often, sampling templates could potentially become redundant once these templates are sufficiently stored in memory. To test whether sampling behaviour indeed decreases over trials, participants (n=15) performed a visual search task for 1, 2, and 4 search templates which remained available throughout trials. Critically, each template set was repeated 25 trials consecutively. When presented with a novel template set, participants inspected the template area approximately once per template, and thus primarily encoded and searched templates one-by-one. Although the number of inspections and inspection durations initially decreased significantly when a template set was repeated, behaviour largely stabilised between the tenth and last repetition; even in the last repetition participants still frequently sampled templates. Furthermore, a long-term memory test after the experiment indicated that participants could not successfully recognize all of the template sets they encountered. These findings demonstrate that participants persistently sample from the external world rather than from memory – not only from working memory but also long-term memory.

ID: 265 / **Poster session 2: 66**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Social Cognition

A Longitudinal Study on the Development of Mental Health Problems in Adolescents

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Young people encounter many societal challenges while growing up. The Growing Up Together in Society (GUTS) project is a longitudinal study of seven universities in the Netherlands spanning over 10 years. The GUTS project will investigate how neurobiological and social-cognitive factors interact with social and societal opportunities in becoming a contributing member of society. The present study design, as part of the GUTS project, will investigate why some adolescents develop mental health problems while others do not. Electrophysiological activity will be recorded while participants perform the social flanker task, the go/no-go task, and a social reward task, all measuring processes related to self-regulation, such as error processing, inhibition, and reward processing. The error-related negativity (ERN) has been associated with error processing and inhibition and appears to change in magnitude across development. The ERN has shown to be increased in internalizing disorders (e.g. anxiety disorders) and decreased in externalizing disorders (e.g. substance use disorder). Therefore, the ERN might be a useful marker of risk to predict longitudinal increases in several mental health problems. The goal of this poster is to receive feedback on the current study design and inspire collaborations.

ID: 266 / **Poster session 2: 67**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Social Cognition

A social plasticity model of substance use and addiction: does age matter?

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One of the most significant predictors of substance use during adolescence is the proportion of substance using peers, implying that social context is a risk factor. However, we also hypothesize social context to serve as a protective factor during (early) adulthood. To study this social plasticity model of substance use and addiction, we developed a two-year longitudinal neuroimaging project that focuses on the role of age in risk and resilience to substance use and addiction. In our design, we include three experimental groups of heavy cannabis users, heavy drinkers, and controls (16 – 35). To study social context in relation to substance use, participants complete questionnaires that measure social attunement (degree to which someone adapts to social environment) and vulnerability to social reward. Furthermore, we use a social-cue exposure task to assess how the brain responds to social cues. We hypothesize that, an age-related increase in social reward sensitivity, social cue reactivity, and substance use during adolescence, is followed by a decrease in early adulthood, due to increased behavioral control and social devaluation of substance use. The findings of these studies will elucidate the role of age in the relation between neural processes underlying social cognition, substance use, and addiction.

ID: 267 / **Poster session 2: 68**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Cognitive control and executive function

Estimating foraging behavior in rodents using a modified paradigm measuring threat imminence dynamics

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Animals display defensive behaviors in response to threats to avoid danger and approach rewards. In nature, these responses did not evolve

alone but are always accompanied by motivational conflict. A semi-naturalistic threat imminence continuum model models the approach-avoidance conflict and is able to integrate multiple defensive behaviors into a single paradigm. However, its comprehensive application is hampered by the lack of a detailed protocol and data about some fundamental factors including sex, age, and motivational level. Here, we modified a previously established paradigm measuring threat imminence continuum dynamics, involving modifications of training and testing protocols, and utilization of commercial materials combined with open science codes, making it more standardized and easier to replicate. We demonstrate that foraging behavior is modulated by age, hunger level, and sex. This paradigm can be used to study defensive behaviors in animals in a more naturalistic manner with relevance to human approach-avoid conflicts and associated psychopathologies.

ID: 268 / **Poster session 2: 69**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

The binding problem revisited

H.Steven Scholte[1], Edward H.F. De Haan[2]
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The prevailing theory suggests that the brain processes motion, color, and shape via separate visual pathways, presenting a challenge to combine these distinct attributes, particularly when multiple objects are present. Although imaging and physiology evidence supporting this is, at least tacitly, acknowledged weak, lesion studies, showing deficits in isolation are considered conclusive proof of independent processing of these features. However, a closer look at the literature reveals biases and associated deficits in patient reportsindicating that this version of the binding problem is too much of a caricature.

We advocate for understanding the brain as a multipath neural network, shaped in response to the diverse environmental manifolds we encounter. This could both be a promising framework for understanding the visual brain's architecture and for viewing information processing in the brain as, for a substantial part, naturally bound.

This perspective suggests that areas like MT aren't solely for motion processing, but part of a system responding to interrelated features in the environment, with motion being just one key aspect. Idem for area V4, but then with variation of color being particularly informative. By recognizing patterns in the world, the brain might naturally process related features together, thereby mitigating the binding challenge.

ID: 270 / **Poster session 2: 70**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Emotion and motivation

How do choices affect learning under different predictabilities?

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Learning is facilitated when people can make their own choices about what to learn, when to learn, or where to learn. However, there is an ongoing debate whether this faciliatory effect on memory formation is due to the satisfactory feeling of freedom, i.e., a reward boost, or that making choices could help people predict what would happen next so that they are more prepared in an attentional-sensory manner. We designed a learning experiment in which first object names were presented on the screen and participants were asked to remember the objects shown afterwards. Participants were sometimes instructed to choose one of the names (choice) while in the other condition they were asked to just press the button indicated by the arrow (no choice). In addition, sometimes they would typically see the object chosen (high predictable) and sometimes not (low predictable). It was found that choice would always promote learning even when participants could not predict the outcome of choices. However, the choice effect became smaller when the predictability was low.

These findings have important implications for educational settings, in which both the feeling of choice and the attentional context of information are important features to motivate students to learn.

ID: 271 / **Poster session 2: 71**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Colorful predictions: When and where are color expectations formed in the human brain?

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Whether searching for ripe fruits, detecting warning signs of poisonous animals, or driving through city traffic – color is an essential feature of our visual world. Predictive processing theories posit that our brain continuously predicts upcoming input, but it is unclear whether this also pertains to color. Here, we ask: when and where are color predictions formed in the brain and how do they influence color processing? First, to be able to reconstruct color representations from the brain response, we used a color localizer task where we present human observers with different colors while recording the electromagnetic brain response (simultaneous electro- and magnetoencephalogram). Subsequently, participants viewed colored stimuli that were shown in a predictable order (80% valid, 20% invalid), thereby allowing participants to build up color expectations. We observed reliable color decoding peaking about ~120-130ms after color onset. Interestingly, the expected color could be

decoded before stimulus onset, and resulted in better decoding after stimulus onset. This suggests that color expectation results in a template already before color onset carrying color information, potentially facilitating subsequent color processing of the expected color.

ID: 272 / Poster session 2: 72
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

Mind wandering and executive functions: a vital union or separate realms?

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The necessity of executive functions in facilitating mind wandering has been a topic of debate. Executive functions, while demonstrating both interconnectedness (unity) and distinctiveness (diversity), remain enigmatic in terms of their recruitment for mind wandering. This study specifically examined three core executive functions: inhibition, updating, and shifting, each assessed through separate tasks. Additionally, participants' mental states, whether focused (on-task) or wandering, were determined through randomly administered attention reports. Our findings challenge the notion that mind wandering adversely impacts performance in inhibition, updating, and shifting tasks. This raises questions about the role of executive functions in mind wandering and contradicts the executive functions model of mind wandering.

ID: 273 / Poster session 2: 73
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Assessing changes in neural entrainment to increasingly irregular rhythmic stimulation

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Entrainment describes the alignment of rhythmic brain activity to the temporal structure of external and internal rhythmic events (1). There is clear evidence that entrainment to rhythmic components of sound plays an important role in the detection and perception of auditory stimuli (2) (3). Previous findings have shown that when near-threshold, silent gaps occur at a high-excitability phase of rhythmically entrained (at 3 Hz) neural oscillations, auditory perception is improved (4). Based on this paradigm, we investigate how rhythm degradation in frequency-modulated (FM) sounds affects auditory entrainment, both in behaviour and the brain. For this we assessed the effect of rhythm on the phasic modulation of gap detection rate and on the entrainment of low frequency (< 10 Hz) and alpha (8-12 Hz) band neural oscillations. We used a forward modelling approach, referred to as temporal response function (5) (TRF), to map how changing degrees of stimulus irregularity map to the neural response. We show that stimulus phase modulates behaviour and that low frequency (< 10 Hz) brain oscillations entrain to FM sounds, but increased rhythmic degradation causes this entrainment to break down. As performance is hampered with increasing irregularity, we further examine possible links between neural and behavioural entrainment.

ID: 274 / Poster session 2: 74
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Language

As the bilingual walked the garden-path was resolved easily: Bilingual processing of garden-path sentences

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Previous reading studies find mixed evidence of the effect of bilingualism on linguistic abilities in their second language and cognitive control. To examine this further, we performed an eye-tracking experiment assessing reading times and comprehension accuracy of complex sentences in English. We compared the performance of Dutch-English bilinguals (N=30) to native English speakers (N=22), hypothesising that Dutch word order constraints might assist bilinguals in processing temporarily ambiguous English garden-path sentences, such as: “While the chef cooked the lobster looked at the pot fearfully”. Stimuli started with a conjunction, which in Dutch would require the object to appear before the verb, potentially making it less likely that bilinguals incorrectly consider ‘lobster’ the object of ‘cooked’. The eye-tracking study indicated an advantage for bilingual participants in comprehension accuracy for the ambiguous items, and they showed shorter regressions from the ambiguous second half, suggesting bilinguals had less difficulty with the ambiguous verb ‘cooked’ than native English speakers. An ongoing phrase-by-phrase self-paced reading study aims to replicate this effect on a larger scale, and includes an ambiguous construction in English that would work similarly in Dutch, ensuring any effect observed is due to a language interaction, not a lesser sensitivity to ambiguity in English.

ID: 276 / Poster session 2: 75
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Emotion and motivation

Curiosity and learning in the face of extrinsic rewards:

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Curiosity is an intrinsic drive for information-seeking, and plays a vital role in learning. Intrinsic motivation, however, can be undermined by extrinsic rewards, as stated by Self-Determination Theory (SDT) and is dependent on whether the task is deemed interesting or not. However, the impact of extrinsic rewards on curiosity and the role of interest remains unknown. To address this research gap, this study aimed to investigate the interaction between rewards and interest in affecting curiosity, as well as memory. Participants engaged in an adapted version of the trivia question paradigm, in which they viewed trivia questions, rated their curiosity before the answers and were given the choice to obtain additional information after each answer. Primary analyses did not reveal a significant interaction between rewards and interest on curiosity. However, exploratory analyses hinted that rewards may diminish curiosity, particularly for higher interest items. Conversely, the findings suggested that rewards may enhance curiosity after previous exposure to rewards, regardless of interest. In addition, a week after the trivia session, participants performed a surprise memory test about the trivia answers. Results indicated that rewards may boost memory performance but only for items of lower interest.

ID: 277 / **Poster session 2: 76**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

The relationship between sensory hypersensitivity complaints and multisensory integration in patients with acquired brain injury.

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Sensory hypersensitivity complaints are often reported after acquired brain injury (ABI). These complaints are persistent, yet the underlying causes are still unknown. Given that multisensory integration facilitates sensory processing, this study explored altered multisensory integration as a possible underlying cause of sensory hypersensitivity after ABI. The relationship between multisensory integration and sensory hypersensitivity complaints was investigated in 104 patients with ABI and 72 healthy controls. The participants took part in an online study consisting of a questionnaire regarding sensory sensitivity (MESSY) and a multisensory response time task to measure multisensory integration using the race model inequality (RMI) violation. Patients reported increased multisensory, auditory, visual and motion sensitivity after ABI compared to the control group. We split the patient group into two subgroups based on their multisensory sensitivity scores. High self-reported multisensory hypersensitivity was related to slower response to uni- and multisensory stimuli, but not to RMI violation as a measure of integration after ABI. Future studies are needed to further explore the role of multisensory integration in sensory hypersensitivity complaints.

ID: 278 / **Poster session 2: 77**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Decision Making

Neural mechanisms underlying costly fearful avoidance: How the brain weighs and integrates reward and threat

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Excessive avoidance, a hallmark of anxiety disorders, often involves sacrificing potential rewards to avoid potential threats. However, little is known about how the brain weighs and integrates reward and threat information when making approach-avoidance decisions. In this study, participants (N=31, 17F) completed a Fearful Avoidance Task (FAT) in the MRI scanner to assess active approach-avoidance decisions under varying reward (monetary gains) and threat (electrical stimulation) prospects.

Our preregistered analyses (https://osf.io/7sm9k) demonstrated that the FAT successfully induced approach-avoidance conflicts: threat-induced avoidance decreased with increasing reward. To investigate which brain regions track reward, threat, and approach-avoidance decision-making, we conducted Bayesian Multivariate Multilevel (BMM) analysis on trial-by-trial estimates from our preregistered ROIs. Interestingly, we found significant reward×threat×decision interactions in appetitive and defensive domains. Specifically, prior to approach decisions in low reward conditions, activity in the BNST, amygdala and ventral striatum decreased as function of threat. Conversely, prior to avoidance in low reward conditions, activity in the thalamus and ventral striatum increased as function of threat.

In conclusion, we found remarkably similar neural patterns across regions traditionally associated with reward and threat processing. This suggest a shared mechanism that that potentially contributes to the emergence of approach-avoidance decisions under varying reward and threat prospects.

ID: 279 / **Poster session 2: 78**
Abstract Submission for Poster / Talk

I prefer to present a poster.
Select best fitting topic: Attention

Distractor suppression operates in retinotopic coordinates

Yayla Amber Ilksoy[1], Dirk van Moorselaar[1], Benchi Wang[2], Sander Los[1], Jan Theeuwes[1]
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The present study used the additional singleton task and showed that observers are biased away from the location that is likely to contain a distractor. Consistent with previous studies, it suggests that through statistical learning the weights within the spatial priority map are adjusted: the likely distractor location becomes suppressed. The question we addressed here was whether this suppression operates in retinotopic (relative to the eyes) or spatiotopic (relative to the world) coordinates. In the current design, two displays were presented next to one other and observers performed the additional singleton task in one display and after several trials made an eye movement to the other display. Because of the eye movement, the previous retinotopic location became the spatiotopic location in the other display and the retinotopic location moved in space. The results showed that attentional suppression operates in retinotopic coordinates, even when spatiotopic suppression was promoted. These findings question the relevance of distractor location suppression learning in natural settings. However, it is important to note that in many real-world settings, such as driving a car, viewpoints are relatively stable, which makes distractor suppression in retinotopic coordinates sufficient, such as suppressing blinking advertisements alongside the road.

ID: 280 / Poster session 2: 79
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Methods and modelling

Predicting cognitive operations in a task through classification of neuro-physiological signatures

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Based on both empirical observations and theoretical considerations, task execution can be viewed as a sequence of *cognitive operations* such as pre-attentive attraction of attention, sensory information processing, working memory storage, long-term memory retrieval, decision-making, response execution, and so on.
The exact sequence of such cognitive operations for a specific task is however often unknown. The goal of the current project is to characterize the neurophysiological signatures of cognitive operations and use these signatures to identify similar cognitive operations in unseen data. To this end, we first identified the onsets of cognitive operations in EEG data of a perceptual speed-accuracy trade-off task. For this, we used a novel machine-learning method called *Hidden semi-Markov Modeling using Multivariate Pattern Analysis* (HMP). Next, we labeled the cognitive operations obtained in this way as *Pre-attentive*, *Encoding*, *Decision*, *Confirmation*, and *Response*, and trained convolutional neural networks to classify the EEG data according to these labels.
The results on left-out test data show that we can accurately predict the cognitive operation type on 89% of the trials. This proof-of-principle suggests that for a novel task that shares some of the cognitive operations the sequence of cognitive operations can also be detected.

ID: 282 / Poster session 2: 80
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Zooming on the spectrum: exploring the relationship between autistic traits, sensory sensitivity and Zoom-fatigue

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Since the onset of the COVID-19 pandemic, video conferencing(VC) has become an integral part of our society. Compared to face-to-face meetings, VC requires increased cognitive and sensory demands, which may induce symptoms of mental and physical exhaustion, or: *Zoom-fatigue*. Socio-communicative difficulties and alterations in *sensory sensitivity* associated with autism spectrum disorder(ASD) may pose as potential risk factors for Zoom-fatigue. We examined if individuals with high levels of *autistic traits* are more susceptible to Zoom fatigue. A large-scale online survey was conducted among older adolescents and adults with typical development, and individuals in the same age range with ASD. Zoom fatigue was measured using the Zoom Exhaustion & Fatigue(ZEF) scale. Autistic traits were assessed with the Autism Spectrum Quotient(AQ), and sensory sensitivity was measured using the Glasgow Sensory Questionnaire(GSQ). Data collection is ongoing. Preliminary results show that increased levels of autistic traits are associated with increased symptoms of Zoom fatigue, and that this relationship is partially mediated by sensory sensitivity. This suggests that individuals with increased autistic symptomatology may face unique challenges in the use of VC. These findings may help increase awareness of neurodiversity in computer-mediated communication, and may provide an impetus for the development of more inclusive VC solutions.

ID: 284 / Poster session 2: 81
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Learning & Memory

The laminar patterns of predicting content in learned audio-visual associations

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To make sense of the external world, our brains use contextual information to predict upcoming stimuli. Previous studies have shown that content ("what") and temporal ("when") predictions are supported by different mechanisms. In particular, "what" predictions are linked to stimulus-specific gain modulation. Here, we aimed to understand how these mechanisms are grounded within the laminar cortical architecture using laminar fMRI. Using an audio-visual associative learning paradigm, we examined responses to predictable and unpredictable stimuli (i.e., when no associations were present). Within the predictable context, we distinguish responses to valid and invalid predictions, as well as responses associated with the omission of the content. We use both univariate and multivariate analysis techniques (decoding and representational similarity analysis). Our preliminary results suggest that it is possible to discriminate predictable from unpredictable content, as well as valid from invalid predictions, using cortical activity. Future analyses will focus on investigating the laminar patterns related to these responses. Within the predictive coding framework, we hypothesize that prediction errors are linked to stronger responses in superficial layers of the superior temporal gyrus (STG) and within the inferior temporal gyrus, while the contrast between predictable and unpredictable content should be highlighted in deep layer activity in STG.

ID: 286 / **Poster session 2: 82**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Learning & Memory

The role of activity-silent working memory in protection against distraction

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Working memory temporarily maintains and manipulates information. Traditionally, theories have assumed that working memory requires persistent neural activity, but recent findings indicate that memories can also be maintained in an activity-silent state through short-term synaptic changes. Yet, the functional role of such activity-silent states is not well-understood. We hypothesized that items kept in a passive state may be more resilient to distraction or interference from other items compared to active maintenance. To test this, we designed a behavioral experiment using a prioritization paradigm that has been shown to modulate these working memory states. The participants memorized four items; two colors and two orientation gratings. One of these is prioritized, hence should be kept in an active state, and the other three items are deprioritized, hence should be passive. During the retention period, participants did a distraction task where they visually compared two randomly generated colors or orientations. Later, participants are first probed from the prioritized item, and then one of the three deprioritized items. Memory interference is expected to be greatest for dimensions matching the interfering task, but particularly so for the prioritized item held in an active state, indicating that passive maintenance is more robust to distraction.

ID: 287 / **Poster session 2: 83**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Social Cognition

Individual differences in interoception and autistic traits share altered facial emotion perception, but not recognition per se

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Alterations in both physiological responses to others' emotions as well as interoceptive abilities have been identified in autism; yet their relevance in altered emotion recognition is largely unknown. We therefore examined the role of interoceptive ability, facial mimicry, and autistic trait levels in facial affect processing in two experiments: Participants in a first online experiment (N = 99) performed a facial emotion recognition task, including ratings of perceived emotional intensity and recognition confidence, and reported on trait interoceptive accuracy, interoceptive sensibility and autistic traits. In a follow-up lab replication involving 100 participants, we additionally investigated links between facial mimicry, cardiac interoceptive accuracy and autistic traits in relation to emotion processing. Although recognition for certain expressions was reduced with higher autistic trait levels in both experiments, the interoception measures and facial mimicry did not account for these effects. Higher trait interoceptive accuracy was rather associated with more confidence in correctly recognizing some expressions, as well as higher perceived intensity ratings. According to exploratory analyses, those higher intensity ratings might be the result of a stronger influence of instant facial muscle activations, whereas higher autistic trait levels seemed to be associated with less integration of facial muscle activations in rating emotional intensity.

ID: 288 / **Poster session 2: 84**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Assessing the Role of Inter-Object Relations in Visual Responses to Natural Scenes

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Real-world scenes are more than collections of objects: they also involve *relations* between them. A scene with a chair *under* a table is substantially different from a scene with a chair *on top of* a table, and this difference can be readily perceived. Recent work shows that embeddings of scene descriptions, obtained from language deep learning models, better fit human fMRI responses to scenes than mere collections of object categories. Here, we investigate whether this is because scene descriptions include information about the relations among objects. We use a large-scale fMRI dataset of human natural image responses (~3000 images/subject), which includes explicit labels of the objects and relations present in each image. By fitting these labels to the brain data, we find that relations explain no unique variance, with most variance shared between objects and relations, and some unique to objects. Results are similar when object and relation labels are coded as binary vectors or as language model embeddings. These results suggest that inter-object relations are not encoded as different 'categories' in the visual system independently of the objects they contain, and raise the question of what additional information full scene descriptions provide beyond object identities.

ID: 290 / Poster session 2: 85
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

The effect of Ownership on Boundary Extension

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Boundary Extension is the tendency to remember scenes as larger than their original boundaries, resulting in the inclusion of more information in memory than was originally present (a form of mental 'zooming out'). This study investigates the relationship between Boundary Extension and object knowledge effects, in particular ownership. Ownership is linked to memory benefits, with owned objects being remembered more accurately (Cunningham et al., 2008), which may counteract the effects of Boundary Extension. Moreover, owned objects tend to be remembered to be closer by in 3D-space, compared to non-owned objects (Coventry et al., 2014). Even when ownership is merely indicated by a verbal description of an object ("*your/my* [object]) (Gudde et al., 2016). We hypothesized that object ownership may induce a Boundary Contraction (or 'zooming in') counteracting Boundary Extension. In a scene memory task, participants remembered the location of objects in scenes, verbally primed with '*your/the* [object]', to examine whether ownership mitigates the effects of boundary extension. They performed two tasks for each scene: indicating the exact remembered location and scaling the scene and object individually. Results shed light on the interplay between boundary extension and object knowledge effects.

ID: 291 / Poster session 2: 86
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Methods and modelling

Single-trial onsets of cognitive events in EEG/MEG time series using HMP

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Breaking down the nature and speed of information processing stages happening between a stimulus and a response (i.e. reaction time, RT) is a more-than-century-old problem in psychology and neuroscience. By extending the hidden semi-Markov MVPA model (Anderson, Zhang, Borst, & Walsh, 2016) we show how we can provide an answer to this problem with electro- or magneto-encephalographic data. In this method, a trial-wise sequence of multivariate patterns, a presumed sequence of cognitive stages, is expected to develop at every RT. This linear progression in patterns closely mimics classical assumptions regarding information processing steps. By combining this sequential pattern analysis with the expectation that each realization (i.e. trial) of a stage follows a probability distribution, we are able to estimate the single trial onset of the information processing stages within RTs. This extended hidden Markov pattern analysis (HMP) estimates the number, cortical signature and single trial onset of these cognitive stages for any experimental condition. We show how to easily estimate this model using the open-source HMP Python package and demonstrate its merits on publicly available datasets. These demonstrations show what gain the HMP method represents for the field of mental chronometry and more generally cognitive science.

ID: 292 / Poster session 2: 87
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Consciousness

A behavioural marker to dissociate subjective experience from perceptual decisions in a detection experiment

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A central goal in consciousness research is to determine what is consciously experienced and what is not. Unfortunately, behavioural measures are known to be sensitive to non-perceptual biases. We have previously validated a new measure called 'controlled reproduction', which dissociates changes in conscious experience from those arising from non-perceptual biases. However, our previous experiments rely on categorical judgments, while a key feature of consciousness is subjective detection (e.g., seen vs unseen). Here we present a new experiment in which we asked observers to detect dim Gabor patches. We investigated three bias manipulations: an attentional cue (cf Carrasco et al., 2004), a pay-off scheme and an asymmetrical base-rate, combined with a standard detection measure and the controlled reproduction measure. While the proportion of 'seen' trials increased under all manipulations, only the attentional cue consistently affected observers' reproduced strength of stimulus contrast, suggesting that payoff and baserate are unlikely to affect conscious experience. Our findings suggest the existence of two distinct phenomena that operate in a detection context: (1) a signal reflecting the subjectively perceived strength of a stimulus (2) a threshold process that is used to make present-absent decisions. We propose that (1), but not (2) reflects changes in conscious experience.

ID: 293 / **Poster session 2: 88**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Methods and modelling

Rapid Invisible Frequency Tagging (RIFT) in a novel setup with EEG

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Steady-State Visual Evoked Potentials (SSVEPs) provide a high-SNR, report-free and continuous measure of neural processing. Increased SSVEP responses to flickering stimuli have been used as markers of spatial attentional allocation. Due to the limited framerate of commercial LED monitors, most SSVEP work has been conducted in the 10-25Hz range where the flicker is clearly visible. This presents a challenge: the visibility of these stimuli weakens effects of endogenous attentional shifts through exogenous flicker-caused distractions. To circumvent this issue, with the right apparatus multiple stimuli may simultaneously be presented within the 60Hz-80Hz range - high enough to evade perceptibility, while still evoking an oscillatory neural response.

Known as Rapid Invisible Frequency Tagging (RIFT), this technique has only been used in combination with Magnetoencephalography (MEG) which is far less accessible compared to EEG. Here we present a first glimpse into the performance of a successful RIFT-EEG implementation in terms of the magnitude and locus of the RIFT response, and its comparison to that of MEG. Furthermore, we implemented a visual working memory (VWM) task with RIFT-EEG to assess its utility as a technique to track the prioritization of individual items in VWM.

ID: 294 / **Poster session 2: 89**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Social Cognition

Domain-specific and domain-general neural network engagement during human–robot interactions

Ann Hogenhuis[1], Ruud Hortensius[2]
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To what extent do domain-general and domain-specific neural network engagement generalize across interactions with human and artificial agents? In this exploratory study, we analysed a publicly available functional MRI (fMRI) data set (n = 22) to probe the similarities and dissimilarities in neural architecture while participants conversed with another person or a robot. Incorporating trial-by-trial dynamics of the interactions, listening and speak- ing, we used whole-brain, region-of-interest and functional connectivity ana- lyses to test response profiles within and across social or non-social, domain- specific and domain-general networks, that is, the person perception, theory- of-mind, object-specific, language and multiple-demand networks. Listening to a robot compared to a human resulted in higher activation in the language network, especially in areas associated with listening comprehension, and in the person perception network. No differences in activity of the theory-of-mind network were found. Results from the functional connectivity analysis showed no difference between interactions with a human or robot in within- and between-network connectivity. Together, these results suggest that although largely similar regions are activated when speaking to a human and to a robot, activity profiles during listening point to a dissociation at a lower level or per- ceptual level, but not higher order cognitive level.

ID: 295 / **Poster session 2: 90**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Language

Individual differences in disfluency production

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Producing spontaneous speech is challenging. It often contains disfluencies like repetitions, prolongations, silent pauses or filled pauses. Previous research has largely focused on the language-based factors (e.g., planning difficulties) underlying the production of these disfluencies.

But research has also shown that some speakers are more disfluent than others. What cognitive mechanisms underlie this difference? We reanalyzed a behavioural dataset of 112 participants, who were assessed on a battery of tasks testing linguistic knowledge, processing speed, non-verbal IQ, working memory, and basic production skills and also produced six 1-minute samples of spontaneous speech (Hintz et al., 2020). We assessed the length and lexical diversity of participants' speech and determined how often they produced silent pauses and filled pauses. We used network analysis, factor analysis and non-parametric regressions to investigate the relationship between these variables and individual differences in particular cognitive skills. We found that individual differences in linguistic knowledge or processing speed were not related to the production of disfluencies. In contrast, the proportion of filled pauses (relative to all words in the 1-minute narratives) correlated negatively with working memory capacity.

ID: 296 / **Poster session 2: 91**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Emotion and motivation

A cross-cultural comparison of intrinsic and extrinsic motivational factors on learning

Claire Zhang[1], Lieke van Lieshout[1], Olympia Colizoli[1], Haoqian Li[2], Chao Liu[2], Shaozheng Qin[2], Harold Bekkering[1]
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Intrinsic factors like the autonomous feeling of control and extrinsic factors like monetary reward can both benefit learning. Recently, we investigated this idea in in an explorative learning task during which Dutch participants viewed partially obscured images that they needed to subsequently remember. We found that autonomy always benefits recognition memory. Rewards also improved recognition memory, but only when participants were not acting autonomously. The aim of the current study was to compare the effects of autonomy and extrinsic rewards on recognition memory between Dutch and Chinese students. For both countries we found strong effects of autonomy, such that students learned better in autonomous compared with non-autonomous conditions. However, we found that the effect of reward on memory performance was stronger for Chinese than for Dutch students. We will discuss whether these findings can be interpreted in the light of differences in norms and values between eastern and western cultures. These findings have important implications for educational settings, in which both autonomy and extrinsic rewards (i.e., grades) are commonly used to motivate students and urge for more attention to sociocultural factors of learning.

ID: 298 / **Poster session 2: 92**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Decision Making

In danger: measuring action biases to avoid or escape threats and obtain rewards

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Our behaviour is shaped by 'Pavlovian' responses elicited by the prospect of something good (or bad): we hold back when threatened but invigorate responding for a potential reward. A similar, invigorating effect is elicited in an ongoing aversive situation. In a recent optogenetic study, the activation of serotonergic neurons in mice was causally related to strengthening these Pavlovian responses to threat, but not to reward: Both behavioural inhibition for distal threat, and invigoration when escaping an acute aversive situation were more pronounced (Seo et al., 2019). In contrast, in humans, administration of SSRI led to invigoration of both avoidance and reward responses (Guitart-Masip et al., 2014). To simultaneously capture the motivational action biases elicited by Reward, Avoid, and Escape contexts, we develop a task where participants learn to respond or hold back to avoid or escape an unpleasant sound, or to gain a reward. We expect invigoration (more and faster responses) in the Escape and Win conditions, and inhibition in the Avoid condition (fewer and slower responses). This task allows us to separately characterise general aversive processing from threat versus reward-induced invigoration. We will use this task to study the role of serotonin in such contextual modulation of behaviour.

ID: 299 / **Poster session 2: 93**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Language

Modality-dependent and independent cortical representations of Letters and Numbers

Zhiwei Chen, Milene Bonte, Agustin Lage Castellanos, Dora Gozukara, Andy Hendrikx, Francesco Gentile
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Numeracy and literacy are fundamental skills that rely on culturally acquired mappings between visual symbols (e.g., 3, v) and their corresponding spoken language representations (e.g., /three/, /v/). The present study explored to which extent numbers and letters share the same brain networks of modality-specific and modality-independent processing.

Twelve Dutch native speakers participated in six runs of a 3T fMRI experiment. Each run consisted of four blocks where either twelve letters or numbers were presented in a visual (d, v, and z; 3, 5, and 6, respectively) or auditory modality (/dee/, /vee/ and /zet/; /drie/, /vijf/, and /zes/, respectively).

A first univariate analysis revealed no symbol-specific regions (i.e., letters vs. numbers). Interestingly, within the STG, STS, MOC and IPL, we observed clusters of voxels responding to both auditory and visual numbers or letters (*multimodal-number* and *multimodal-letter* regions).

Next, using multivariate pattern analysis (MVPA), we investigated whether activity patterns within these regions enable distinguishing *individual* letters (or numbers) and whether this classification generalizes across modalities. Preliminary results suggest that the left STG of six participants discriminated the three numbers in each modality as well as across modalities, while letters did not exhibit such distinctions.

ID: 300 / **Poster session 2: 94**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Navigational affordances in real-world scenes: A comparative study of human and CNN perception

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To navigate the immediate visual environment, humans use a variety of locomotive actions, such as walking, swimming or climbing. How does the brain represent such environmental action affordances and which visual features drive these representations? Here, we compared representations of visual properties derived from behavioral annotations (N=152), human fMRI measurements (N=20), and various deep neural networks (DNNs) on a new set of real-world scenes that afford distinct locomotive actions in a diverse set of indoor and outdoor environments. Representational similarity analysis shows that scene-selective brain regions represent information about action affordances as well as materials and objects and that these representations are partly task-dependent. In contrast, standard off-the-shelf scene- and object-classification trained DNNs do not strongly represent these action affordances, indicating a need for different training objectives. Indeed, preliminary analyses suggest that language-supervised models such as Contrastive Language-Image Pre-training (CLIP) represent action affordances more strongly, yielding better predictions of behavioral affordance recognition as well as brain activity. Together, these results suggest that models need to integrate representations of semantic information to capture how the brain computes the action affordances of scenes.

ID: 301 / **Poster session 2: 95**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Development

Maternal anxiety during pregnancy is associated with weaker prefrontal functional connectivity in adult offspring

Marion I. van den Heuvel[1], Elise Turk[1], Charlotte Sleurs[1], Thibo Billiet[2], Maarten Mennes[3], Bea R.H. Van den Bergh[4]
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The connectome, constituting a unique fingerprint of a person's brain, may be influenced by its prenatal environment, potentially affecting later-life resilience and mental health. Here, we conducted a prospective resting-state functional Magnetic Resonance Imaging study in 28-year-old offspring (N=49) of mothers whose anxiety was monitored during pregnancy. We identified two offspring anxiety subgroups, a "high anxiety" (n=13) subgroup and a "low-to-medium anxiety" (n=36) subgroup, based on maternal self-reported anxiety at 12-22 weeks of gestation. To predict resting-state functional connectivity, maternal anxiety during pregnancy was included as a predictor in general linear models for both ROI-to-ROI and graph theoretical metrics. We found that higher maternal anxiety was associated with weaker functional connectivity of medial prefrontal cortex with left inferior frontal gyrus ($t = 3.45$, $p_{FDR} < 0.05$). We did not observe significant differences in global brain networks between groups. To conclude, we found weaker (medial) prefrontal cortex functional connectivity in adults prenatally exposed to maternal anxiety, showing that prenatal exposures can have long-lasting consequences for brain functioning.

ID: 302 / **Poster session 2: 96**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Methods and modelling

A nudge in the 'right' direction: biasing eye movements with ultrasonic stimulation

Soha Farboud, Solenn L.Y. Walstra, Marwan Engels, Benjamin R. Kop, Lennart Verhagen, Hanneke E.M. den Ouden
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Transcranial Ultrasonic Stimulation (TUS), a millimeter-resolution non-invasive brain stimulation method, is well-established in animals, but evidence for human online neuromodulation is limited, and may be marred by auditory confounds (Kop et al., 2023). We aim to establish an effective online TUS protocol in humans by adapting a validated non-human primate model (Kubanek et al., 2020), which demonstrates eye movement biasing following frontal eye field (FEF) stimulation.

We selected this FEF paradigm for its translational potential, due to the well-defined link between FEF neural activity and eye movement control across species. The FEFs control voluntary contralateral eye movements, with excitation/inhibition driving contralateral/ipsilateral responses, respectively. To control for auditory and somatosensory confounds, we stimulate an active control area (primary hand motor cortex, M1), which is also lateralized but unrelated to eye movements. Preliminary (n=24/36) results show significant contralateral biasing of eye movement induced by FEF stimulation. This is suggestive of an excitatory TUS effect, replicating earlier macaque observations. However, these results should be treated with caution as weaker (non-significant) biasing also emerges for M1 stimulation. This study embodies a crucial first step to precisely validate, characterize, and quantify the effects of online TUS in humans.

ID: 303 / Poster session 2: 97
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Language

Quantifying the flexibility of knowledge structures in language

Elena Mainetto[1], Hanneke E. M. den Ouden[1], Danny Merkx[2], Lisa I. Horstman[1], Anna Naomi de Haas[1], Mona M. Garvert[3], Andrea E. Martin[1,4], Roshan Cools[1,5], Xiaochen Y. Zheng[1]

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Knowledge structures are flexible. This is exemplified by language. The sentence “She got cash from the bank” does not make us think about the bank of a river. Our brains must house representations of word meaning that are constrained by the stable form of the word, but also by flexibly changing contexts. Here, we quantified the effect of flexibly changing sentential context on word representations relative to that of stored word form.

Participants learned to associate symbols with homonyms, where they derived the homonym’s meaning from its sentence context (e.g.,“she got cash from the [bank]”). Word meaning flexibility was estimated with: (1) a spatial multi-arrangement task, where participants positioned the symbols in a space based on their associated word meaning, and (2) a repetition priming task, where participants made speeded judgements about a sequence of symbols.

The spatial multi-arrangement task successfully captured the flexibility of word meaning, showing larger distances between symbols associated with homonyms (e.g., river- vs cash-bank) than between isonyms (e.g., river- vs river-bank). This effect was as large as that of stable word-form (e.g., “bank” vs “chair”). Ongoing fMRI work will address the role of hippocampus-medial frontal circuitry in representing these flexible context-dependent versus stored word-form representations.

ID: 304 / Poster session 2: 98
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Learning & Memory

Priority-based encoding changes the nature of representations in working memory

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Working memory (WM) performance is determined not just by its capacity but also by the incorporation of memory strategies. We examined the effects of different WM encoding strategies, as a function of recall priority. In a block-designed EEG study, participants memorized the orientations of two colored gratings presented simultaneously on the screen, followed by the sequential presentation of two probes, each preceded by an impulse stimulus to perturb the underlying brain states. In the fixed-order condition, the memory items could be prioritized, as participants consistently recalled the fixed grating first, followed by the other. In contrast, in the random-order condition, participants recalled gratings based on color without knowing the order.

Results showed in interaction for WM precision for encoding condition and recall order condition. Precision decreased when comparing late-tested to early-tested gratings in the fixed-order condition, but in the random-order condition, no precision differences were found between early and late-tested stimuli. Additionally, WM precision for early-tested gratings decreased compared to the fixed-order condition. The behavioral results provide preliminary evidence of priority-induced shifts in WM representations. To further investigate the changes in representation during both encoding and maintenance, we will decode stimulus orientation from EEG data in response to impulses.

ID: 305 / Poster session 2: 99
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

Social error monitoring in professional basketball games

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Social error monitoring involves adapting after another’s errors, just as we do after our own errors. This effect depends on the observer-agent relationship and is more pronounced in a cooperative relationship. In this study, we analyze professional basketball games to investigate if players adapt their shooting strategy after missed attempts of teammates other than they do after missed attempts of the competing team. Previous analyses have predominantly focused on the adaptation of the shooting player only, overlooking the importance of adapting to teammates in team sports. Using online play-by-play logs from NBA games from 2006 to 2010, we compare players’ shooting strategy after a teammate or opponent missed a shot, with players’ shooting strategy following a successful shot by the teammate or opponent. Importantly, we assess whether these differences in shooting strategy vary depending on whether the other player is a teammate or an opponent. The data will

offer valuable insights not only into sports dynamics but also into theoretical frameworks on social error monitoring. Our analysis seeks to determine if adaptation effects following observed errors versus successes are influenced by the observer-agent relationship, potentially supporting the goal representation hypothesis in real-life sports performance.

ID: 306 / Poster session 2: 100
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Development

Adolescent development of body image: an fMRI study

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Both self-concept, the perception of who you are, and the physical body undergo changes throughout adolescence. These two processes might affect the development of body image, a complex construct that comprises one's thoughts, feelings, and perception of their body. In this study we aim to better understand the development of body image and its neural correlates. Adolescents aged 11-21 from the longitudinal Leiden Self-Concept study (N=160 at the first timepoint) were followed for three consecutive years. Their body image was measured using a figure rating scale and a body satisfaction questionnaire. Body estimation was calculated based on what adolescents thought they looked like and their BMI. Additionally, participants evaluated their physical appearance in an fMRI task. Results revealed that body estimation and body dissatisfaction increased with age. Heightened inferior parietal lobe (IPL) activation during physical self-evaluation was associated with lower body estimation, meaning that the neural network involved in thinking about one's physical traits is more active for individuals who perceive themselves as larger than they are. The IPL activity showed continued development during adolescence, suggesting an interaction between neural development and body perception. These findings highlight the complex interplay between affective, perceptual, and biological factors in shaping body image.

ID: 307 / Poster session 2: 101
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Action

Internal states and internal models dissociate components of motor beta oscillations

Tom R Marshall[1,2], Mengxi Wang[2], Emma Lawrance[3], Nils Kolling[4], Jill X O'Reilly[2]
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Effector movements are typically accompanied by a desynchronization, followed by a rebound, of neuronal oscillations in the beta (16-24Hz) range. Are desynchronization and rebound two sides of the same coin, or do they reflect distinct neural processes? By combining a novel orientation change detection task requiring the integration of distinct sources of uncertainty, and quantification of beta oscillations with scalp EEG, we show evidence of a cognitive double dissociation between beta desynchronization and rebound: Whereas the former indexes the internal state of the agent, the latter indexes the agent's confidence in their internal world model.

ID: 308 / Poster session 2: 102
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Dissecting temporal Preparation: neurophysiological And computational evidence for its underlying cognitive steps

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Prominent models of temporal preparation characterize it as a direct mathematical transformation from event probability distributions to reaction times. In contrast, the multiple trace theory of temporal preparation (MTP) is a neurocognitive process model where preparation results from a learning process that unfolds on each trial. In the model, memory traces are formed through associative learning between a neural representation of passing time, and inhibiting and activating motor processes. On subsequent trials, inhibition and activation are retrieved and dynamically affect response times. MTP accounts well for various effects that are ignored in other models. Nevertheless, it remains subject of debate whether the assumed complexity of the model is warranted and empirically supported.

In a study with four continuous duration distributions, we demonstrate that the predictions of MTP outperform competing models. This held even when all parameters are fixed in MTP, but free to vary in other models. Furthermore, we present EEG- and pupillometry results from preparation experiments, and relate physiological signals to separate model computations: the CNV and beta-suppression relate to retrieved inhibition, baseline pupil size relates to subsequent memory retrieval, and the target P3b related to reaction times. Together, these results uncover the cognitive building blocks that underlie preparation.

ID: 309 / Poster session 2: 103

Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Development

Family environment in adolescence predicts well-being in young adulthood: A test of longitudinal ventral striatal activity as a differential susceptibility factor for developmental outcomes

Kayla Green[1], Elisabeth Schreuders[2], Neeltje Blankenstein[2], Barbara Braams[3], Simone Dobbelaar[2], Suzanne van de Groep[1], Eva Telzer[4], Eveline Crone[1,2]

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In the present study, we examined whether heightened neural and behavioural reward sensitivity across adolescence makes individuals more susceptible to parent-adolescent attachment, and predicts alcohol use, prosocial behaviour, and wellbeing in young adulthood. This fMRI study took place in 2011 (n = 299), 2013 (*n* = 287), 2015 (*n* = 275), and 2022 (*n* = 108). We hypothesized *for better and worse* scenarios for young adults who showed higher reward sensitivity as adolescents compared to their peers with lower reward sensitivity. Results showed that avoidant parent-adolescent attachment in adolescence was negatively associated with wellbeing in young adulthood seven years later. We confirmed the adolescent peak in neural rewards sensitivity in the ventral striatum. However, the results showed no evidence for reward related ventral striatal activity as neurobiological susceptibility marker. Greater ventral striatal activity in response to a reward for a friend, however, was associated with less prosocial behaviour towards an unknown peer during young adulthood, suggesting ventral striatum activity for close others as an index for ingroup-outgroup differentiation. Together these findings highlight how social experiences and brain development during adolescence may have prolonged impact on socioemotional outcomes later in life.

ID: 310 / Poster session 2: 104
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Consciousness

Causes and Consequences VR-induced Psychedelic Experiences: A preregistered field study at Lowlands Science

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Psychedelic substances, such as LSD and psilocybin, are increasingly being used for the treatment of a wide variety of psychopathological disorders. However, psychedelic experiences can be challenging and specific contraindications (e.g., risk for psychosis and use of concurrent medications) limit the applicability of these substances. Virtual Reality (VR) can provide a promising tool to mimic some of the classical psychedelic effects. In this study (N = 238) which was conducted in a field-setting at Lowlands Science, we aimed to assess the feasibility and efficacy of a psychedelic VR induction method developed by the artist collective Plantfictions. We assessed the role of personality, prior psychedelic experiences, expectations, current drug use, acute changes in physiological responses and subjective effects associated with a VR psychedelic experience. We found evidence for our preregistered hypotheses (https://osf.io/5gws8/): the personality trait of absorption, prior expectations and current drug use predicted stronger VR psychedelic experiences. We willuse time-varying multivariate autoregressive models (TV-MVAR) using heart-rate, skin conductance, and dial-event time series (i.e., intensity of subjective effects) of each participant to investigate linear Granger causal interactions between our variables. Our findings provide key insight in the factors that can enhance the immersion and intensity of VR psychedelic experiences.

ID: 312 / Poster session 2: 105
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Attention

Reduced inattentional blindness for upright human bodies

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The rapid detection of other individuals is a crucial first step in social cognition. Previous research has provided evidence for a body inversion effect in simple detection tasks, suggesting enhanced visual sensitivity to the shape of the human body. However, an alternative interpretation of these results is that participants preferentially attended to upright body shape, thereby increasing detection performance. Here, we used Mack and Rock's inattentional blindness paradigm to test whether the body inversion effect persists when tested on a single trial on a large sample of naïve participants (N=6028), who do not expect any stimulus to appear. In the critical trial, a silhouette was presented while participants were engaged in an attention demanding task at fixation. On average, 48% of participants failed to notice the silhouette, demonstrating inattentional blindness. Importantly, however, upright person silhouettes were more likely to be noticed (59%) than inverted silhouettes (53%). Furthermore, this inversion effect was specific to person (vs. plant) silhouettes. These results indicate that the upright human figure has privileged access to awareness, even when nothing is expected.

ID: 314 / Poster session 2: 106
Abstract Submission for Poster / Talk

I prefer to present a poster.
Select best fitting topic: Action

Active inference slows reversal learning in uncertain and volatile environments

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Perception is often framed as the inference of hidden states from noisy sensory input. Depending on whether sensory observations are passively sampled or actively generated, prior beliefs guiding the inference process can be informed by probabilistic sensory cues, or by knowledge about action-outcome relationships. Recent studies suggest that humans may hold stronger prior beliefs about the expected outcomes of actions than about sensorily cued observations. Here, we compared the outcomes of inference for perceptual judgments or goal-directed actions under different conditions of uncertainty and volatility. In a probabilistic reversal learning task, participants were either asked to infer a hidden state from computer-sampled observations, or to sample observations determined by a hidden state, while we manipulated the uncertainty of sensory observations (Experiment 1) or the volatility of the environment (Experiment 2). Both tasks required learning of the probabilistic relationship between hidden states and observations, and keeping track of sudden reversals in the hidden state. Critically, participants received identical sequences of evidence for the current hidden state under each instruction. Results show that active inference may slow reversal learning by reducing responsiveness to conflicting evidence. This indicates that by acting, we can stabilize our beliefs about the inherently uncertain and changing world.

ID: 315 / Poster session 2: 107
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Methods and modelling

A population receptive field model of the event-related MEG response

Kathi Eickhoff[1,2,3], Arjan Hillebrand[4], Maartje C. de Jong[1,2,5], Serge O. Dumoulin[1,2,3,6]
[1]Spinoza Centre for Neuroimaging; [2]Netherlands Institute for Neuroscience; [3]Vrije Universiteit; [4]Department of Clinical Neurophysiology and Magnetoencephalography, Amsterdam UMC; [5]University of Amsterdam; [6]Utrecht University; k.eickhoff@spinozacentre.nl

The visual system is organized retinotopically. In humans, this organization can be studied by estimating population receptive fields (pRFs) with functional magnetic resonance imaging (fMRI). However, fMRI is too slow to capture visual temporal dynamics that operate on the scale of milliseconds. Other techniques such as magnetoencephalography (MEG) provide this temporal resolution, however, they lack the spatial resolution to disentangle the precise locations of pRFs in the cortex. Here, we introduce a forward modeling approach combining fMRI's spatial- and MEG's temporal resolution, to measure pRFs on neuronal timescale. First, we estimate the participants pRFs using conventional pRF modeling with fMRI. The participants then viewed contrast-defined shapes and we measured event-related field (ERF) responses to these stimuli with MEG. Next, the pRF models and a forward model are combined to predict the MEG sensor responses to the stimuli. Lastly, we computed the goodness of fit between the predicted and measured MEG responses at each time-point using cross-validated variance explained. We found that the pRFs explained up to 90% of the variance in individual sensor's ERF responses. Importantly, the amount of variance explained differed over time-points. This modeling approach enables future research to investigate the spatiotemporal dynamics of pRFs with millisecond resolution.

ID: 317 / Poster session 2: 108
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Language

The role of disfluencies when predicting uhh language: combining EEG and eye-tracking with virtual reality

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Language comprehension may be facilitated by prediction, where a listener's eye-gaze moves towards a referent before it is mentioned if the noun is predictable. Anticipatory fixations reduce when speech contains disfluencies (hesitations/repairs). Changes to the pattern of anticipatory fixations could result from a change in prediction or an attention shift. We combined EEG and eye-tracking to study the prediction of language in naturalistic, virtual environments (experiment 1 & 2) and the influence of disfluencies on predicting language (experiment 2). Participants (n=32; preliminary n=19) listened to sentences spoken by a virtual agent in various virtual scenes (e.g., office, street) while participants' eye-movements and EEG were recorded. Spoken sentences were predictable or unpredictable, based on the verb constraints and referents were visible or absent in the scene to be congruent or incongruent with listeners' predictions, respectively. In experiment 2, sentences were additionally either fluent or disfluent with ahesitation (uhh). Increased processing, reflected in increased theta power, was greater either at the predictive verb onset or at unpredictable noun onset in fluent sentences, but was observed at both predictable and unpredictable noun onsets in disfluent sentences. Our findings provide preliminary evidence supporting that hesitations reduce the weight listeners place on their predictions.

ID: 318 / Poster session 2: 109
Abstract Submission for Poster / Talk
I would like to be considered for a talk.

Select best fitting topic: Methods and modelling

The degree to which DCNNs are human-like depends on the training set and not architecture.

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Deep Convolutional Neural Networks (DCNNs) perform on par with humans on certain visual decision-making tasks. However, this does not mean that DCNNs use the same information as humans: for example, DCNNs have been found to rely mostly on texture when classifying objects, while humans rely more on shape. Here, we investigate whether this texture bias is inherent to DCNNs or if it results from the quality of visual input used to train the model. We collected the Open Amsterdam Data Set (OADS), an unprecedented high-resolution dataset containing labelled objects in images of natural scenes. We trained DCNNs on OADS and ImageNet and fine-tune pre-trained models on the respective other data set. Our results show that DCNNs trained on OADS display less texture bias and more shape-bias. Shape-bias also increases for ImageNet-pre-trained models with increasing training resolution or, crucially, with increasing fine-tuning on OADS. High shape-bias on OADS persists even when models are trained on lower resolution or lower image quality. Together, our results suggest that low similarity between human and DCNN behavior in terms of shape-bias is not inherent to DCNNs but heavily depends on the quality of training data.

ID: 319 / Poster session 2: 110
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Development

Developmental trajectories of trust and their underlying neural correlates in adolescents of different SES

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During adolescence, sociocognitive processes underlying trust such as social learning processes and perspective-taking develop. Trust has been correlated with individuals' socioeconomic status (SES), with high SES individuals reporting higher trust. The influence of SES on adolescents' trust and the underlying neural mechanisms remain unknown. Hence, we aim to examine whether adolescents' trust varies between different targets of society, how their trust develops, and the influence of their SES, age, and gender. We will employ the modified economic fMRI Trust Game to determine adolescents' trust behavior towards different targets including close (i.e. friends), societal (i.e. authoritative/institutional), and distant others (i.e. unknown peers) in 600 adolescents aged 10 to 20. We expect a positive correlation between adolescents' level of trust and the distance of the target. We also anticipate an age-dependent increase in trust and gender-differences with adolescent males reporting higher trust than adolescent females. Additionally, we hypothesize that the target differentiation will be more pronounced for low SES adolescents. Lastly, we expect neural activity in social brain regions, including the precuneus and temporal parietal junction, to reflect this target differentiation. As part of the GUTS consortium, this research contributes to understanding how adolescents grow up in an increasingly complex society.

ID: 320 / Poster session 2: 111
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Topographic connectivity in the cerebellum for different cognitive states

Wietske Zuiderbaan[1,2], Wietske van der Zwaag[1,2], Tomas Knapen[1,2,3]

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Introduction

Recently, the view on cerebellar functioning has changed from sensorimotor to involvement in a broader set of cognitive and associative functioning, including visual processing. Previous work found three retinotopically organised clusters in the cerebellum. These regions were found using a standard bar mapping stimulus with fixation task. This situation is very different from our everyday vision. Here, we study the visual topographic organization of the cerebellum with more naturalistic conditions.

Methods

We used the 7T fMRI dataset from the Human Connectome Project (HCP) for Movie Watching (MW) and Resting State (RS). Using topographic connectivity from V1 we investigated the visual topographic organization in the cerebellum, and its dependence on cognitive state (comparing MW and RS experiments).

Results & Discussion

Topographic connectivity analysis confirmed the previously found retinotopically organised clusters. In the more active naturalistic condition data

(MW), we found a new topographically organized area in the Crus II. Also, we found an eccentricity gradient in the oculomotor vermis only for MW. These results show that the topographical organization is flexible across tasks, and underline the importance of using naturalistic stimuli to probe high-level visual-topographic function.

ID: 321 / **Poster session 2: 112**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Language

Parallel syntactic processing in the flankers task

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To what extent can skilled readers extract higher-order information from multiple words in parallel? The answer to this question has remained controversial with regards to how our brain deals with processing incoming visual information. On the one hand, both eye-tracking and behavioral studies consistently found an effect of parafoveal stimuli on the processing of the fixated foveal stimulus. On the other, effects of higher-order lexical information such as syntax, semantics and grammar have remained largely elusive. In this ongoing project, I will present data from a study which used ERP recordings to investigate the timeframe of how higher-order information -in this case, syntax- impacts ongoing word and sentence recognition. In this study, we used the lexical flanker paradigm in which participants had to classify foveal target words as either being a noun or an adjective. Targets could either be flanked by syntactically congruent/incongruent words (e.g.; *noun noun noun* vs. *adjective noun adjective*) or syntactically compatible/incompatible words (e.g., *adjective noun verb* vs. *verb noun adjective*). These results will tell us if I) our reading system can extract and process syntactic information from multiple words in a short timeframe, and II) syntactic units are integrated as a single (i.e., sentence) unit.

ID: 322 / **Poster session 2: 113**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Attention

Pupillometry reveals proactive attentional priority driven by statistical learning

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Recent studies have shown that the effects of statistical learning on attentional selection are typically proactive (they occur before the onset of a search display). However, these studies used salient stimuli sharing the same shape features as the ones in the subsequent trials, and in some cases these stimuli were task-relevant. Thus, it is hard to claim that the attentional setting due to statistical learning is already in place proactively as salient stimuli preceding the display may have reactivated the learned spatial biases. In our study, we used less-salient, brief, and task-irrelevant stimuli to probe locations prior to the onset of each search display. We used pupillometry to measure responses to these probes. In our task (singleton paradigm), the target shape had a higher chance of occurring in one location versus all other locations, leading to facilitation. The pre-trial probe had an equal chance of occurring at any location. The results show that the pupils dilated more for probes occurring in the high-probability target location versus other locations. This suggests that these probes were perceived as more salient and behaviourally relevant. Our findings give further support to the idea that changes in attentional priority via statistical learning are proactive.

ID: 324 / **Poster session 2: 114**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

Working memory in context: The role of alcohol distractors in low to heavy alcohol drinkers

Karis Colyer-Patel[1], Emese Kroon[1,2], Christophe Romein[1], Hanan El Marroun[3,4], Janna Cousijn[1,2]
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While widely known that both motivational and cognitive control processes are important in addiction, studies have focused on these processes independently. Deficits in working memory have long been associated with the development and maintenance of alcohol use disorder, yet findings on a behavioural level have been mixed. This may be context-dependent; working memory performance may be reduced only in the presence of alcohol-related cues or contexts.

This study aimed to investigate whether adding an alcohol-related context to a working memory task affects performance, and whether these alcohol-context effects would be associated with severity of alcohol use.

We developed an online N-back flanker task, building on the standard letter N-back task, by bilaterally flanking letters with either alcohol-related or neutral flankers.

Results showed reduced accuracy with increasing working-memory load, and accuracy was lower when presented with alcohol-related flankers relative to neutral flankers. Interestingly, an interaction effect was observed; reduced accuracy was found when presented with alcohol flankers

and a higher working memory load relative to neutral flankers and a lower working memory load.

Our findings suggest that an alcohol-related context impacts working memory performance, particularly when cognitive demand is high. However, working memory performance was not associated with alcohol use severity.

ID: 326 / **Poster session 2: 115**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Emotion and motivation

Blowing Minds: the effects of medicinal and recreational cannabis use on mental health

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Due to proposed medicinal properties of cannabis (in part) for mental health, worldwide legislation is easing. Conversely, regular users may also experience increased mental health and cognitive difficulties.

To examine this discrepancy, we will follow an international sample of regular 1800 cannabis users (18-65 years old) for two years, who use for recreational or medicinal purposes, or both. They will complete baseline and follow-up online assessments regarding their mental health, cognition and details on the participant's motives and type of cannabis use. Additionally, participants participate in a 3-week experience sample method (ESM) study, during which amount and frequency of cannabis use, craving, sleep, affect states, and motives for usage are measured 5-10 times per day. This allows us to investigate the daily life determinants and effects of cannabis use, how this relates to participants' (changes in) affect states throughout the day, prevalence and risk of cannabis use disorder, and whether motive of use matters for symptomatology.

This study will be one of the largest ESM studies to date and novel in its kind by taking a cross-cultural approach to unravel differences and similarities between medicinal and recreational cannabis use, focusing on both the potential positive and negative health effects.

ID: 328 / **Poster session 2: 116**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Decision Making

Mechanisms of motivational biasing: Disentangling Pavlovian cueing from Pavlovian learning

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Optimal decision-making involves maximizing rewards while minimizing punishments. This can be achieved through flexible instrumental learning of action-outcome contingencies. Additionally, our behaviour is influenced by motivational prospects in a seemingly hardwired way. A promise of reward invigorates action, while the threat of punishments elicits inhibition. These biases may serve as useful priors, for example novel environments, but can lead to decision-making anomalies when conflicting with instrumentally learned actions (Guitart-Masip et al., 2011). While the presence of motivational biases is firmly established, there are multiple neurocomputational mechanisms through which they may arise, but these are difficult to disentangle in standard paradigms. Here, we introduce a novel paradigm that allows us to disentangle two different accounts: instantaneous effects of Pavlovian priors versus cue-outcome based Pavlovian learning. This paradigm will form the basis of future fMRI and brain stimulation studies aimed to disentangle the putative amygdala versus striatal basis of these different mechanisms.

ID: 329 / **Poster session 2: 117**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Social Cognition

Tracking other's biases in medial wall and temporal cortex

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Communication with others is a well-developed faculty in human behavior. Recently, Kolling et al. (2021) developed a paradigm to differentiate own and other's sources of information in a way that was easy to quantify.

We adopted this paradigm to investigate neural computations underlying using knowledge about a biased confederate. 33 healthy participants (age = 18-44, m = 24.89, sd = 4.91) completed the task. On each trial, participants indicated the discrepancy between a target-state and partial evidence ('Self') or additionally accounted for learned confederate bias ('Other') (Figure 1).

Participants successfully integrated missing evidence and – where appropriate – confederate bias in their recommendations (Figure 2a). We found neural correlates of bias integration in the right temporo-parietal junction and contralateral frontal pole (Figure 2b). We found correlates of social aspects of task performance in a ventral subset of activity in the ventromedial prefrontal cortex monitoring error generally (Figure 2c). This information was also coded in the beginning of the succeeding trial in more dorsal areas of medial prefrontal cortex (Figure 2d).

Kolling, N., Braunsdorf, M., Vijayakumar, S., Bekkering, H., Toni, I., & Mars, R. B. (2021). Constructing others' beliefs from one's own using

medial frontal cortex. *Journal of Neuroscience*, *41*(46), 9571-9580.

ID: 331 / **Poster session 2: 118**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Learning & Memory

Neural effects of feedback magnitude and valence during probabilistic learning

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We can learn which choice has a better outcome through trial and error. A child, for example, can learn that asking dad for a cookie results in a 'yes' more often than asking mom, so they learn to ask dad. This type of probabilistic learning requires updating stimulus-reward associations in the brain using feedback information. Feedback valence (i.e. loss or gain) is known to influence neural ERP markers related to feedback processing, however, less is known about the influence of feedback magnitude. We examined the effect of feedback magnitude during probabilistic learning. EEG recordings of 41 participants were made during the performance of a probabilistic learning task where in each trial participants chose between a picture of a face or a house. Based on their choice participants received feedback of various magnitudes (i.e. 0, 3, or 8 points). In each 20-trial learning set (30 sets in total), either houses or faces had a higher probability of gain feedback (60% vs. 40%). Preliminary results suggest that both feedback valence- and magnitude influence neural activity, but they do so at distinct time intervals following the presentation of feedback, that is the processing of magnitude seems to precede the processing of feedback valence.

ID: 332 / **Poster session 2: 119**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Social Cognition

Pro-social behavior enhances stimulus-driven attention

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As social animals, humans demonstrate prosocial behavior if they can prevent harm to others. However, to what extent prosocial behavior under threat engages less controlled cognitive processes to save the other remains unclear. Here we examined how threat exposure to an anonymous other modulates stimulus-driven attention. Individuals performed an exogenous spatial cueing task and their performance determined whether they themselves or the anonymous co-participant received electric shocks. Threat of shock to the co-participant as well to the participants themselves resulted in faster orienting and reorienting responses than in the safe condition. This improvement was associated with a state of arousal indexed by increased pupil dilation when participants avoided the shocks to the co-participant and to themselves. Together, these results suggest that prosocial behavior can be observed at the level of involuntary cognitive processes, and that the improvement in stimulus-driven attention is associated with enhanced arousal.

ID: 333 / **Poster session 2: 120**
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Perception & Sensory Integration

Investigating the benefits of temporal neural adaptation on recognition of objects in noise

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Neural responses in visual cortex exhibit history-dependent adaptation, showing reduced activity for repeated stimuli. While it has been suggested adaptation is a consequence of optimised neural processing, it is still unclear how it may benefit behaviour. Here, we investigate the influence of adaptation on humans' ability to recognize objects in temporally repeated noise and study the associated neural responses. Participants were instructed to classify target digits embedded in noise patterns, while varying the degree of temporal adaptation (by using identical or different noise patterns preceding the target digit) and task difficulty (by varying the contrast of the target digit). We observe a performance increase as a result of adaptation to the noise, with higher recognition scores for similar compared to different noise preceding the target digit. This benefit of adaptation was most pronounced for intermediate task difficulties. Preliminary EEG analyses indicate adaptation to the noise is evident in ERP amplitude differences, showing decreased amplitudes for same compared to different noise adapters. This suggests that the behavioural benefit may be mediated by improved neural representation of the target digit due to suppression of the surrounding noise. Overall, we reveal benefits of temporal adaptation and link the behavioural outcomes to neural representations.

ID: 334 / **Poster session 2: 121**
Abstract Submission for Poster / Talk
I prefer to present a poster.

Select best fitting topic: Learning & Memory

How to behave variably? Adapting learning rate, epsilon or choice-bias.

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Everyday life requires variability. For example, in sports (e.g., tennis, boxing), it is important that opponents cannot predict one's next move. Behavioral experiments in which variable responding is rewarded show that humans and nonhuman animals are able to strategically increase response variability. However, it remains unclear how such variable behavior is established. One hypothesis, often assumed in many computational models of decision-making, assumes biological agents have a random generator. Alternatively, variable behavior may result from a dynamic reinforcement-extinction process. Yet another explanation assumes that biases against recently chosen options can be learned. To assess these hypotheses, we developed three versions of a Rescorla-Wagner model with an epsilon-greedy decision policy, that either meta-learned epsilon (linked to hypothesis1), learning-rate (hypothesis2) or choice-bias (hypothesis3). Simulations were done in three reinforcing environments, requiring different amounts of variability. Results showed that all models can adapt to these varying contexts. Additionally, we fitted a Rescorla-Wagner model to four datasets (2 human, 1 pigeon and 1 rat) where variable responding was reinforced. All species exhibited high epsilon, learning-rates were species-specific and humans uniquely valued unchosen options. The next step is to fit the models to a novel behavioral experiment, in which different variability contexts will be compared.

ID: 335 / **Poster session 2: 122**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Language

A tradeoff between acoustic and linguistic feature encoding in spoken language comprehension

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When we comprehend language from speech, the phase of the neural response aligns with particular features of the speech input, resulting in a phenomenon referred to as *neural tracking*. In recent years, a large body of work has demonstrated the tracking of the acoustic and linguistic units at the phoneme and word levels, and beyond. However, the degree to which speech tracking is driven by acoustic edges of the signal or by internally-generated linguistic units, or by the interplay of both, remains contentious. We used naturalistic story-listening to investigate whether phoneme-level features are tracked over and above acoustic edges and whether word entropy, which can reflect sentence- and discourse-level constraints, impacted the encoding of acoustic and phoneme-level features of a first language (Dutch) compared to a statistically-familiar but uncomprehended language (French). We show that encoding models with phoneme-level linguistic features uncovered an increased neural tracking response; this signal was further amplified in a comprehended language, putatively reflecting the transformation of acoustic features into internally-generated phoneme-level representations. Phonemes were tracked more strongly in a comprehended language, suggesting that language comprehension functions as a neural filter over acoustic edges of the speech signal as it transforms sensory signals into abstract linguistic units.

ID: 336 / **Poster session 2: 123**
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Development

The potential structural effects and biological pathways of in-utero air pollution exposure on early brain development

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Air pollution is a significant global threat that is linked to negative neurological/cognitive effects and developmental disorders. However, it remains unclear to what degree exposure influences structural (early) brain development. This study reviews the latest research on in-utero air pollution exposure and brain development by i) investigating underlying mechanisms and ii) reviewing all peer-reviewed ultrasound studies until March 2023 (N=24) investigating structural brain changes upon exposure.

The literature on mechanistic pathways indicates increased inflammatory processes upon exposure. Prolonged activation could potentially lead to neuroinflammation and subsequent neurotoxicity. It is not understood yet whether this could disrupt developmental processes during pregnancy. In addition, recent evidence shows pollutants crossing the placenta, potentially directly affecting fetal neurodevelopmental processes.

Previous and recent prenatal ultrasound studies found no structural changes in relatively low air pollution areas. This aligns with a recent systematic analysis on MRI studies. In relatively high air pollution areas, ultrasound studies detected a smaller head circumference and/or biparietal diameter. So far, the underlying pathways and subsequent functional outcomes later in life are not well understood. The results indicate a potential link between in-utero air pollution and brain development, which is vital information that supports (pro-active) global efforts to reduce air pollution.

ID: 338 / **Poster session 2: 124**
Abstract Submission for Poster / Talk
I prefer to present a poster.

Select best fitting topic: Perception & Sensory Integration

Inhomogeneities in human responses to zero-coherence dot motion carry over even as more and more sensory evidence is added

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The human brain combines prior knowledge with sensory information to make inferences about the environment and construct our perception of the world. To find out if people prefer certain responses over others when recalling a direction of motion, and to see if such inhomogeneities in response preference persist as increasingly more sensory evidence is provided, we had human participants recall the direction of motion of moving dot stimuli at four different levels of coherence (0%, 25%, 50%, and 75%). Across trials *with* coherent motion, we ensured uniform sampling of all possible directions of motion, which means that in the case of accurate recall (plus noise), we expect a uniform distribution over all possible response options. Similarly, on trials *without* coherent motion, random responses should also lead to a uniform response distribution. Our data revealed striking inhomogeneities, with many more reports at cardinal and oblique directions compared to others. And while performance increased with higher coherence, these non-uniformities persisted even on high coherence trials. This suggests an integration of existing inhomogeneities in response preference (revealed in the 0% coherence condition) and sensory information, where direction estimation is increasingly less affected by this "response prior" as sensory certainty goes up.

ID: 339 / Poster session 2: 125
Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Attention

Statistical learning and internal selective attention

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It is well-established that the brain can exploit statistical regularities to selectively guide attention towards task-relevant information in the external world, even without explicit awareness of these regularities. This study examined whether such 'statistical learning' can also guide the selection of previously encoded information held in working memory. In this online study, 65 participants performed a working-memory task. In each trial two tilted colored bars were shown, followed by a sound. After a short delay, participants had to either reproduce the orientation of one of the bars (5/6 of trials), or report the pitch of the sound (1/6 of trials). Critically, unbeknownst to the participant, the sound's pitch functioned as an implicit retrocue, predicting which bar was likely to be the target in that trial. We found tentative evidence that participants were faster when asked to report a validly predicted target compared to invalidly predicted targets, while showing no explicit awareness of the sound-to-memory-item regularity. We are currently conducting a follow-up experiment in an attempt to yield more robust effects. This would provide initial evidence of statistical learning guiding internal selective attention, and suggest that we learn to direct our attention internally and externally using common mechanisms.

ID: 340 / Poster session 2: 126
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Decision Making

Role of the hippocampus in economic decision making: evidence from intracranial recordings

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The hippocampus, a brain area traditionally associated with episodic memory, spatial cognition and associative learning, has been found to be involved in economic decision making and especially in the process of option value retrieval. We sought to further investigate a hippocampal involvement in economic decision making and in the presence of a framing effect, where decisions with identical outcomes are influenced by their presentation either in a gain or a loss frame, and for which insofar the amygdala and prefrontal cortex have been implicated. With the use of intracranial encephalography recordings in the hippocampi of 9 epileptic patients, we showed that hippocampal theta (1-8Hz) power was substantially modulated in the decision-relevant periods, and that this modulation was significantly stronger in the loss frame. Additionally, we found a hippocampal event-related potential (ERP) time-locked to option presentation onset (~700ms), with stronger amplitude in the gain frame. Lastly, we investigated the occurrence of hippocampal sharp wave ripples (SWRs) throughout the task and found an increased average SWR rate during decision-relevant periods. Taken together, we demonstrate novel evidence pointing to a hippocampal involvement in economic decision making in the absence of episodic stimuli, and that the hippocampus encodes information regarding the frame of options.

ID: 124 / Poster session 2: 127

Abstract Submission for Poster / Talk
I would like to be considered for a talk.
Select best fitting topic: Language

Memory mechanisms of serial recall can explain the preponderance of center embedded syntactic structures in human languages

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A defining characteristic of human language is hierarchical recursion. Recursive loops (e.g. relative clauses) in sentences can either be embedded in a sentence or cross each other. It is still unknown why in Indo-European languages the possibility for center-embedded (CE) recursion seems ubiquitous as in *The boy A_1 the dog A_2 chases B_2 falls B_1* ($A_1A_2B_2B_1$), whereas crossed-dependent (CD) orderings of recursion hardly ever occur ($A_1A_2B_1B_2$). In both structures, serially encoded words (e.g. *boy* and *dog*) must be retrieved and bound to later upcoming words (*chases* and *falls*). The rarity of CD as compared to CE grammars is surprising considering that the latter produce dependent elements at longer distances than the former. We propose that the preponderance of CE can be explained by retention and retrieval mechanisms of serial recall combined with word binding operations. Our account explains that, backward retrieval (retrieving *dog*(A2) first, and *boy*(A1) next, as in CE) optimizes memory performance as compared to forward retrieval, as in CD. Independent serial recall data support this difference in efficacy between the two strategies. We propose that CE is better molded to human memory for serial recall than CD, which might explain why CE has prevailed during language evolution.

ID: 138 / Poster session 2: 128
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Social Cognition

Reducing credibiity through inoculation

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Fake news contains misinformation that is difficult to correct. Inoculation theory (McGuire, 1961) provides a framework of how to make news consumers more resistant to misinformation, akin to how a vaccine works against a virus. Empirical studies have focused on the effects of playing a Bad News game to inoculate players to misinformation techniques which turned out to be successful (Roozenbeek & van der Linden, 2019). The current study aimed to inoculate participants against misinformation by having them play an inoculation quiz (experimental group) in which several misinformation strategies were exposed and explained or a general knowledge quiz. Before and after playing the inoculation quiz or a control quiz, participants evaluated true and fake tweets on their credibility. Participants also indicated their engagement on social media. The results demonstrated a group by time interaction for the credibility ratings on the tweets, with lower credibility ratings over time for the tweets for the experimental group compared to the control group whose ratings remained more the same over time. No 3-way interaction with type of tweet was found, suggesting a more critical attitude in the experimental group towards the tweets after playing the quiz overall, not just for content with misinformation.

ID: 436 / Poster session 2: 129
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Selectivity and temporal dynamics of neural responses in category-selective cortex are associated with differences in spatial tuning

Lasse Dietz[1], Amber Brands[1], Giovanni Piantoni[2], Stehpanie Montenegro[3], Adeen Flinker[3], Sasha Devore[3], Orrin Devinsky[3], Werner Doyle[3], Patricia Dugan[3], Daniel Friedman[3], Nick Ramsey[2], Natalia Petridou[2], Jonoathan Winawer[4], Iris Groen[1]
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The human visual cortex contains neural populations that selectively respond to faces or scenes and are clustered in specific anatomical locations. This functional separation is thought to arise from different visual processing demands, with face processing requiring detailed analysis of foveated retinotopic inputs, whilst scene processing requires large-scale integration of the full visual field. However, this association between retinotopy and category-selectivity has so far predominantly been studied with fMRI. Here, we confirm this association in direct electrophysiological recordings in the human visual cortex. An analysis of 55 electrodes in ECoG data of 14 participants shows that scene-selective electrodes have more peripheral and larger spatial population receptive fields (pRFs) than face-selective electrodes. Moreover, we leverage the high temporal resolution of ECoG to demonstrate that increased pRF sizes are associated with slower rise and decay of responses to face and scene stimuli. Fits of temporal population receptive field models to the neural response time courses indicate possible differences in temporal dynamics depending on category content. These results extend fMRI observations of a link between spatial tuning and category preference of neural population responses and additionally demonstrate a separate influence of spatial tuning and category on neural response dynamics.

ID: 432 / Poster session 2: 130
Abstract Submission for Poster / Talk

I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

To adapt or not to adapt: task-switch frequency modulates task-switch cost in the absence of control adaptation

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Goal-directed behavior relies on the ability to optimize cognitive control to our current environment. Two well-established findings are traditionally interpreted as evidence of control optimization: participants reduce their 'task-switch costs' when they need to more frequently switch between performing two different tasks, and they reduce their 'incongruence cost' when more frequently responding to response-incongruent stimuli. However, control optimization is likely effortful and costly, thus participants might not always optimize their control for each different task demand (i.e. frequency of task-switches and response-incongruent stimuli). Instead they might compromise by attempting to optimize across all different demands. Leveraging a mechanistic model of task-switching, we determined optimal model parameters for these two different scenarios (i.e. parameters that maximize the average reward rate). We used these parameters to simulate task performance under different frequencies of task-switches and response-incongruent stimuli. We find taskswitch cost in particular is sensitive to the frequency of task-switches in both scenarios, i.e. even without optimization for each different task-switch frequency. Our findings recontextualize the cognitive control literature, by showing that sensitivity of behavioral performance to task demands is not necessarily evidence of control optimization. This underscores the utility of detailed computational modelling in exposing the dynamics of cognitive control.

ID: 431 / Poster session 2: 131
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Perception & Sensory Integration

Modelling the recurrent dynamics of recognizing familiar and novel images with artificial neural networks

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Feedback signalling is thought to provide a high-level interpretation of incoming sensory input to lower brain regions, thereby benefitting perception. However, it remains unclear whether such recurrent processing is also essential for the perception of familiar input, where a fixed mapping to an interpretation might have been established already. Here, we presented images of fantastical hybrids to an artificial neural network with feedback connections. To simulate the consequences of familiarity for recurrent neural processing, we fine-tuned the network on a subset of images and then evaluated its classification performance on these familiar vs. unseen novel images. We expect to find that the initial feedforward sweep of the network is sufficient to classify familiar images, while later recurrent feedback is only needed for novel images. In the next step, we will compare the network activations to functional magnetic resonance imaging data from humans viewing the same hybrid images to test whether recurrent processing is limited to novel input in the brain.

ID: 430 / Poster session 2: 132
Abstract Submission for Poster / Talk
I prefer to present a poster.
Select best fitting topic: Cognitive control and executive function

The impact of controllability on motivation for effort and its relationship to subclinical depression

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Lack of motivation and anhedonia are hallmark symptoms of Major Depressive Disorder (MDD, carrying substantial individual and societal burden. Prior studies investigating motivation in MDD mainly focused on reward and punishment sensitivity, with mixed findings and neglected two key aspects: the willingness to exert effort (to gain reward or avoid punishment), and the impact of environmental controllability, i.e., whether the exerted effort successfully delivers the desired outcome. Here, we investigated whether motivational impairments emerge in individuals with higher subclinical depression levels, particularly when exposed to uncontrollable environments. In two online studies (n = 164) we induced the experience on (un)controllability, by exposing participants to either a controllable environment (i.e., they could avoid a punishment if they exerted effort) or an uncontrollable environment (i.e., no matter how much effort they exerted, they would be punished anyways). Subsequently, we administered an effort/reward task, where controllability was fully restored. Confirming our hypothesis, higher subclinical depression was associated with reduced willingness to exert effort to gain reward, particularly after exposure to an uncontrollable environment, and for harder and less rewarding trials. Our results highlight the failure to recover from experienced uncontrollability as an important mechanism in vulnerability to MDD.