university of groningen

bcn

BCN summer symposium 2021

MONDAY JUNE 28 – TUESDAY JUNE 29

Poster Sessions
The poster sessions will be hosted in GatherTown (*GT Poster Hall*). While your group is 'in the spotlight', please make sure to stand next to your poster and engage with interested attendees. Students from groups that are not currently in the spotlight can roam around freely and talk to those who are currently presenting their posters.

Student Presentations
Most of the student presentations will be held in-person and streamed via Blackboard Collaborate (*accessible from GT Lecture Halls 1 & 2*). Please make sure to attend the presentations of students from your own group either on campus or online. If none of the students from your group is presenting and you are attending online, you can choose freely which presentations you want to attend. However, if you are attending in person, please note that you will be restricted to one room.

How to sign up
If you want to attend the Symposium in person, please sign up in advance* (*there is a limited number of seats available per room, so please make sure to sign up early*). On each day, the rooms are available to students from 11:00 – 14:00. To limit movement within university buildings, you can reserve a spot in one particular room. Hence, you will listen to the student presenters scheduled for this room and you will not be able to switch to a different room.

	Room 1	*Room 2*
	Energy Academy	***Bernoulliborg***
Monday, June 28th	**5159.0029**	**5161.0151**
Tuesday, June 29th	**5159.0029**	**5161.0165**

Keynote lectures will be streamed to both lecture halls, allowing you to watch the lectures from within the rooms you signed up for. Additionally, they will be accessible via GatherTown (*Lecture Hall 1*).

Catering
Lunch will be provided to students who are present on campus.

COVID-19 Regulations
Due to the COVID-19 regulations, we ask you to consume lunch within the lecture hall, to maintain the 1.5 distance inside, and to avoid grouping up with more than 3 people outside. The COVID-19 regulations that are in place at the time of the symposium are to be respected at all times.

**Student presenters who will present in person do not need to sign up. A spot will be reserved for you.*

Title image taken from https://bit.ly/3cQyDEG

MONDAY, JUNE 28

9:00 **Word of Welcome**
Prof. Dr. Jean-Christophe Billeter — *GT Lecture Hall I*

Online Poster Sessions
9:15 Spotlight: Group A
9:45 Spotlight: Group B — *GT Poster Hall*

10:15 **Break**

Parallel Student Sessions

11:30 **Simon Robledo-Cardona** B-Track, Group A
"Sleep homeostasis in geese: effects of moon phase" — *Room 1 / GT Lecture Hall I*

Katerina Christodoulou C-Track, Group B
"Effects of working memory load on tacit coordination and inter-brain synchrony" — *Room 2 / GT Lecture Hall II*

11:50 **Vasileios Siozos** N-Track, Group A
„What triggers microglia priming?" — *Room 1 / GT Lecture Hall I*

Eshita Sengupta N-Track, Group B
"Developing and testing novel techniques to study neuronal development in zebrafish" — *Room 2 / GT Lecture Hall II*

12:10 **Veera Ruuskanen** C-Track, Group A
"Pinging the brain: investigating activity-silent working memory mechanisms" — *Room 1 / GT Lecture Hall I*

Ilse van Osselen B-Track, Group B
"Ambient temperature affects tau phosphorylation and hibernation pattern in the garden dormouse" — *Room 2 / GT Lecture Hall II*

12:30 **Lunch Break**

13:00 **Dr. Valeria Gazzola**
"The neural basis of empathy - evidence from human and rodent work" — *Room 1 & 2 / GT Lecture Hall I*

14:00 **End of Day I**

TUESDAY, JUNE 29

9:00	**Word of Welcome** *BCN Summer Symposium Committee*	*GT Lecture Hall I*
	Online Poster Sessions	
9:15	Spotlight: Group C	
9:45	Spotlight: Group D	*GT Poster Hall*
10:15	**Break** *Guided Meditation Session with dr. Marieke van Vugt from 10:15 to 10:30*	*GT Meditation Room*
	Parallel Student Sessions	
11:30	**Lucas Randt** B-Track, Group C *"An eye for change: visual plasticity in African cichlids"*	*Room 1 / GT Lecture Hall I*
	Greetje Huisman C-Track, Group D *"The neural mechanisms of positive fantasising to prevent relapse in depression: an EEG study within the MINDCOG trial"*	*Room 2 / GT Lecture Hall II*
11:50	**Reuben Arvind Rajadhyksha** N-Track, Group C *„Do drosophila melanogaster and humans share the same genetic architecture for sociability?"*	*Room 1 / GT Lecture Hall I*
	Mirthe Ronde N-Track, Group D *"Behavioural and immunohistochemical effects of two different types of sleep deprivation on spatial memory in mice"*	*Room 2 / GT Lecture Hall II*
12:10	**Thomas Wilschut** C-Track, Group C *"Categorizing color: the influence of color terms on visual working memory"*	*Room 1 / GT Lecture Hall I*
	Lukas Breitzler B-Track, Group D *"High throughput characterization of agonistic behavior in Danionella Translucida: a newly established model organism in neuroscience"*	*Room 2 / GT Lecture Hall II*
12:30	**Lunch Break**	
13:00	**Prof Dr. Chris de Zeeuw** *"Bound to go up or down – that is the question"*	*Room 1 & 2 / GT Lecture Hall I*
14:00	**Award Ceremony** *Prof. Dr. Jean-Christophe Billeter*	*Room 1 & 2 / GT Lecture Hall I*
t.b.a	**Socialising & Snacks**	

DR. VALERIA GAZZOLA

Leader of Gazzola/Keysers Research Group for Social Brain Lab at the Netherlands Institute of Neuroscience

“When witnessing someone fall, we do not only observe the body movements of the other person. Most of us will actually feel how painful the fall will be, how scary or worried the other person is. We vicariously fall with that person.

What are the brain mechanisms that allow us to feel with the others? And would this ability to share the emotions of other people act as motivators and make us choose to help the other person? During my lecture I will guide you through the human and animal work that is helping us understanding how the brain works under these circumstances.”

PROF. DR. CHRIS DE ZEEUW

Leader De Zeeuw Research Group for Cerebellar Coordination & Cognition at the Netherlands Institute for Neuroscience, Chair of Department of Neuroscience, Erasmus University Rotterdam

“Over the past several decades, theories about cerebellar learning have evolved. A relatively simple view that highlighted the contribution of one major form of heterosynaptic plasticity to cerebellar motor learning has given way to a plethora of perspectives that suggest that many different forms of synaptic and non-synaptic plasticity, acting at various sites, can control multiple types of learning behaviour. However, there still seem to be contradictions between the various hypotheses with regard to the mechanisms underlying cerebellar learning. The challenge is therefore to reconcile these different views and unite them into a single overall concept. In this lecture, I review our current understanding of the changes in the activity of cerebellar Purkinje cells in different ‘microzones’ during various forms of learning. I describe an emerging model that indicates that the activity of each microzone is bound to either increase or decrease during the initial stages of learning, depending on the directional and temporal demands of its downstream circuitry and the behaviour involved.”

STUDENT GROUPS

GROUP A		*10-24*	*Poster*
Almut Jebens	C	*Do sounds and words matter? Language effects on voice gender perception*	*A1*
Amber de Kok	B	*How does on-demand treatment for premature ejaculation work? A pharmacological study in serotonin transporter knockout rats*	*A2*
Anne Schipper	B	*Early life diet intervention with Nuturis® cannot reduce obesity risk after early life overfeeding in male mice*	*A3*
Annemarie de Vries	N	*Changed brain morphology in schizophrenic patients with hallucinations*	*A4*
Bibianne Joosten	B	*Tackling major depressive disorder with preventive cognitive therapy: an fMRI study*	*A5*
Felix Schroeder	C	*How autocorrelation affect ERP analyses*	*A6*
Heather Rennie	C	*A reliable method to test whether RSVP based CIT with pupillometry is vulnerable to similar information*	*A7*
Imke Hrycyk	C	*Comparing neural correlates of tinnitus with and without co-occurrence of hyperacusis based on auditory brainstem responses*	*A8*
Kriti Rajda	N	*The role of Cav3.2 channels in noise-induced hearing loss*	*A9*
Neomi Marsolo	B	*Couch potatoes of the sea: Do nurse sharks sleep? Investigation of sleep-like behaviour in nurse sharks: daily rhythmicity and homeostatic regulation*	*A10*
Simon Robledo-Cardona	B	*Sleep homeostasis in geese: effects of moon phase*	*--*
Vasileios Siozos	N	*What triggers microglia priming?*	*--*
Veera Ruuskanen	C	*Pinging the brain: investigating activity-silent working memory mechanisms*	*--*
Wiam Bouisaghouane	N	*Tamoxifen-induced cystathionine β-synthase (CBS) knockout in the brain: a molecular assessment of an astrocyte-specific CBS knockout mouse model*	*A11*
Zain Pardawala	N	*To identify the role of cellular senescence in acquired hearing loss with a focus on age-related hearing loss (ARHL)*	*A12*

GROUP B		*25-37*	*Poster*
Aleksandra Cywińska	N	*Influence of microenvironment on neural progenitor cells*	*B1*
Eleni Gkoktsi	N	*Sleep disturbances in phenylketonuria adult patients coming from different European regions*	*B2*
Eshita Sengupta	N	*Developing and testing novel techniques to study neuronal development in zebrafish*	--
Ilse van Osselen	B	*Ambient temperature affects tau phosphorylation and hibernation pattern in the garden dormouse*	--
Jennifer March	C	*The neural correlates of food viewing: a FMRI mega-analysis accounting for age, gender and body mass index*	*B3*
Jiawei Yu	N	*The effect of early-life stress and early-life dietary n-3 availability on blood fatty acid composition, brain specialized pro-resolving mediators, and microglial properties*	*B4*
Jonathan Breiter	B	*The role of post-translational modifications in α-synuclein liquid-liquid phase separation*	*B5*
Karina Koepke	N	*Mediating neuroinflammation using TNFR1 selective antibody in Alzheimer's disease mouse model*	*B6*
Katerina Christodoulou	C	*Effects of working memory load on tacit coordination and inter-brain synchrony*	--
Kimberly Wickborn	C	*Vascular integrity in progressive multiple sclerosis*	*B7*
Manouk Kuiper	C	*What does it take to change someone's mind? The role of explicitly manipulating feedback sequences*	*B8*
Nadieh Reinders	B	*Activity patterns of Great tits under gradients of artificial light at night and urban characteristics at the Zernike Campus*	*B9*
Rutger Boesjes	B	*Rescuing inaccessible fear memories after protein synthesis inhibition*	*B10*
Lauren Hansen-Manguikian		*Fast and Slow Relevance Judgements*	*B11*

GROUP C		*38-52*	*Poster*
Anne Ross	N	*Hibernation in garden dormice: ambient temperature effects and DNA damage & repair*	*C1*
Anouk van der Meij	N	*ATLAS987 & paroxetine: combinational therapy for the treatment of lifelong premature ejaculation*	*C2*
Berrit Stiensma	C	*Production of second language prosody in prelingually deaf adolescent cochlear implant users*	*C3*
Birgit the Brake	B	*The impact of noise-induced hearing loss on the hippocampus in adult Wistar rats*	*C4*
Carla Lembke	N	*Sensory processing and social behavior in a conditional PCDH9 reinstatement mouse model*	*C5*
Christy Donata	N	*Passive exercise as a therapeutic intervention for sleep deprivation: an exploratory study*	*C6*
Janine Kox	B	*The effect of external challenge on eating behaviour in decelerated and linear eaters*	*C7*
Lucas Randt	B	*An eye for change: visual plasticity in African cichlids*	--
Marie Mona Claes	C	*Neurobiological correlates of female dominance ranking in mixed-sex social rat colonies*	*C8*
Noa Schwensfeier	C	*Neural states of working memory: integrating activity-based and activity-silent neural mechanisms in a large-scale spiking neuron model*	*C9*
Ramya Rao	B	*Investigating the interactive effects of value priming and classical conditioning on pro-environmental consumer behaviour*	*C10*
Reuben Arvind Rajadhyasha	N	*Do drosophila melanogaster and humans share the same genetic architecture for sociability?*	--
Riona Burke	B	*Effects of hormones on nest defence and parental care in a population of black headed gulls (Chroicocephalus ridibundus)*	*C11*
Sophia Wilhelm	C	*The influences of different sleep deprivation conditions on synaptic plasticity in the hippocampus*	*C12*
Thomas Wilschut	C	*Categorizing color: the influence of color terms on visual working memory*	--

GROUP D		*52-67*	*Poster*
Alessandro Gustinelli	N	*Role of auditory input on endbulb morphology in the naked mole rat*	*D1*
Annika Sauter	C	*Object and boundary-vector coding in the human brain: development of a new spatial task for the detection of early entorhinal cortex changes in Alzheimer's disease*	*D2*
Dieta Gruppen	N	*Visualizing the visually impaired: reliability of anatomically estimated visual areas and their use in connective field modelling*	*D3*
Frederike Kroll	N	*Exploring the role of zinc transporters in the pathogenesis of multiple sclerosis*	*D4*
Friederike Axmann	B	*The influence of social stress and glucocorticoids on circadian organizations in peripheral tissues in mice*	*D5*
Greetje Huisman	C	*The neural mechanisms of positive fantasising to prevent relapse in depression: an EEG study within the MINDCOG trial*	*--*
Jelle Molenkamp	N	*Impact of MOAG-4 on in vivo polyQ aggregation kinetics*	*D6*
Lukas Breitzler	B	*High throughput characterization of agonistic behavior in Danionella Translucida: a newly established model organism in neuroscience*	*--*
Maarten Heegstra	B	*RBP4 and adipose tissue health in mice*	*D7*
Maria Markaki	C	*Categorical bias in visual working memory in healthy aged people*	*D8*
Michael van Dijk	B	*Lost connections: chemogenetic manipulation of forceps minor connectivity and its effect on sociability*	*D9*
Mirthe Ronde	N	*Behavioural and immunohistochemical effects of two different types of sleep deprivation on spatial memory in mice*	*--*
Tianyi Li	C	*The emergence of turn-taking structures in a language game*	*D10*
Tom Naber	N	*Molecular Validation of the Dentate Gyrus-CA3 Circuit in Pattern Separation Using Zif268 Immunohistochemistry*	*D11*
Valeria Cernei		*The work on working memory: territories of theoretical and epistemic conflict in the last decade (2010-2020)*	*D12*

A - ABSTRACTS

Do sounds and words matter? Language effects on voice gender perception

Almut Naja Jebens[1], Laura Rachman[2,3], Deniz Başkent[2,3]

[1] *Research Master Behavioural and Cognitive Neurosciences (C-Track), University of Groningen*
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BACKGROUND When listening to the human voice, listeners are able to perceive speaker-related information, for example the speaker's sex or gender. Voice gender perception is determined by two anatomically related vocal characteristics that vary with speaker size and hormone levels: the average fundamental frequency (F0), related to the glottal pulse rate, and perceived as the vocal pitch, and the formant frequencies, related to vocal tract length (VTL), described as the voice timbre. In speech, F0 and VTL are also used for discriminating and tracking one voice when listening to multiple talkers and are thus a prerequisite for linguistic processing. Previous research has shown that speaker identification and discrimination are influenced by linguistic processing, especially the familiarity with the spoken language facilitates voice perception. However, if this effect arises at the sound or word level is unclear, as well as how this influences the perception and use of certain vocal parameters for speaker discrimination or identification across listening conditions. *OBJECTIVE* Here, we study the effects of lexical-semantic and phonological processing on the weighting of F0 and VTL on voice gender categorization by manipulating the lexical status and recording direction on the one hand, and F0 and VTL properties of female reference voices on the other hand. *EXPECTED RESULTS* We expect that lexical-semantic and phonological processing interfere with voice perception: Listeners give F0 and VTL more weight for gender categorization when listening to words compared to pseudo-words and forward compared to reversed words since these are meaningful to the listener and adhere to the sound properties of the native language. *CONCLUSION* This study addresses the interplay between linguistic and perceptual processes for voice perception. This knowledge can be applied when developing and adapting hearing aids such as cochlear implants.

How does on-demand treatment for premature ejaculation work? A pharmacological study in serotonin transporter knockout rats

Amber de Kok[1], Jocelien Olivier[1]

[1]*University of Groningen, Neurobiology*

Serotonin plays a critical role in the inhibition of sexual behaviour. Antidepressants like selective serotonin reuptake inhibitors (SSRIs) have been effective in treating premature ejaculation, in particular after chronic administration. However, as long-term SSRI use has several adverse side effects, there is a high demand for on-demand treatment of premature ejaculation. Previous studies have found that co-administration of an SSRI and a serotonin-1a receptor antagonist can acutely inhibit sexual behaviour in rats. However, the antagonists used so far are not suited to administer in humans. This study investigates the acute effects of a new serotonin-1a receptor antagonist, which is approved for human use, combined with an SSRI on sexual behaviour. To assess the mechanisms underlying the acute inhibitory effects of these drugs on sexual behaviour, we compared the sexual performance of serotonin transporter knockout (SERT-/-) rats to wildtype (SERT+/+) Wistar rats. After extensive training on a sexual behaviour test, we selected 12 rats for our experiment. Different doses of the antagonist (du125530) together with the SSRI paroxetine were tested for their effects on sexual behaviour in the selected SERT-/- and SERT+/+ rats using a pseudo-randomised within-subjects design. Sexual behaviour was assessed within 30 minutes after the drug injections using the same sexual behaviour test as during the training sessions. Experiments are ongoing; the results will be presented during the symposium. We expect that the combination of du125530 and paroxetine dose-dependently reduces sexual behaviour in SERT+/+ and SERT-/- rats. Additionally, we expect that single doses of du125530 inhibit sexual behaviour in SERT-/- rats but not in SERT+/+ rats. The research findings could be directly applied to the treatment of premature ejaculation but could also advance the development of SSRIs with fewer sexual side effects.

Early life diet intervention with Nuturis® cannot reduce obesity risk after early life overfeeding in male mice.

Anne Schipper, Prof. Dr. Gertjan van Dijk, Steffen van Heijningen

Faculty of Science and Engineering
GELIFES — Groningen Institute for Evolutionary Life Sciences

BACKGROUND Breast feeding lowers obesity risk later in life compared to regular infant milk formula (IMF). This might be because breast milk contains lipid vesicles encapsulated by a Milk Fat Globule Membrane (MFGM). Nuturis® is an IMF that contains MFGM-like lipid vesicles, and early life feeding with Nuturis® is associated with improved growth in young animals and reduced fat accumulation in adulthood. *PROBLEM* It is unknow if the positive effect on growth, and anti-obesogenic effect of early life feeding with Nuturis® is robust when mice are made susceptible to become obese later in life by early life overfeeding. *METHODS* Small litter sizes (n=3) were used to induce early life overfeeding. Mice were fed either regular IMF, Nuturis®, or only Nuturis® ingredients without the vesicle structure. Mice were then challenged as an adult with a high fat diet. *RESULTS* Early life overfeeding increased subcutaneous fat in 21-day-old mice compared to non-overfed fed mice ($F(1, 42) = 9.1965$, $p > 0{,}005$). Adult males: % fat was higher when fed with a high fat diet ($F(1, 42) = 66.046$, $p > 0{,}0001$) and % fat was higher after early life overfeeding ($F(1, 42) = 12.134$, $p = 0.001$). Early life feeding with Nuturis® did not counter this fat accumulation and did also not affect lean mass and growth compared to control IMF. (Females still need to be analyzed.) *CONCLUSIONS* Fat accumulation after high fat diet was exacerbated by early life overfeeding. An early life, MFGM mimicking, IMF-diet did not reduce these effects. The (programming) effects of early life overfeeding might be too strong to reverse by an early life diet intervention.

Changed brain morphology in Schizophrenic patients with hallucinations

Annemarie de Vries[1], Branislava Ćurčić-Blake and André Aleman[2]

[1] *Faculty of Science and Engineering, University of Groningen*
[2] *Department of Biomedical Sciences of Cells and Systems, University of Groningen*

BACKGROUND Schizophrenia is a psychiatric disorder that expresses itself in abnormal mental function, disturbed behaviour and different brain morphology. For instance, the paracingulate sulcus (PCS) located in the medial prefrontal cortex seems to be related to the risk of experiencing hallucinations in schizophrenic patients, a symptom that 70% experiences. This makes it an interesting region to study in order to understand the development of hallucinations and schizophrenia pathology. *AIM* The aim of this study is to investigate if the length of the PCS and the cortical thickness of the regions around the PCS, paracingulate cortex and anterior cingulate cortex, are significantly different in schizophrenic patients with hallucinations compared to healthy controls and schizophrenic patients without hallucinations. *METHODS* This will be done by analysing MRI scans from former performed studies. The scans will be divided over three groups, healthy controls (N=28), patients with hallucinations (N=46) and patients without hallucinations (N=32). The analysis of the cortical thickness will be done by using FreeSurfer and Mango will be used to measure the PCS length. *EXPECTED RESULTS* Prior research has shown that the PCS is shorter in patients with hallucinations. This is related to an increased cortical thickness in the paracingulate cortex and decreased cortical thickness in the anterior cingulate cortex. *CONCLUSION* While people with Schizophrenia have a changed brain morphology compared to healthy controls, the morphology is also different between patients with hallucinations and without. This is interesting to know, because it shows that a symptom can be led back to brain morphology and this can help to understand the underlying mechanisms of Schizophrenia.

Tackling Major Depressive Disorder with preventive Cognitive Therapy: an fMRI study

Bibianne F.F. Joosten, M.J. van Tol

Faculty of Medical Sciences, University Medical Centre Groningen (UMCG), Department of Neuroscience

Major Depressive Disorder (MDD) is a disorder of which excessive negative thinking and disturbed emotional control are prominent features. An episode of MDD can be a huge burden on life quality. It is one of the most prevalent psychiatric disorders worldwide, with an additional problem of high prevalence of recurrence: 40% of MDD-patients will experience another MDD episode within 2 years after recovery. Therefore, it is important to understand the underlying mechanisms to target and prevent relapse most effectively.

One treatment showing promising results in preventing relapse is preventive Cognitive Therapy (pCT). However, the underlying neurocognitive mechanisms are still unknown. Therefore, the aim of this study is to investigate which brain areas are targeted by preventive Cognitive Therapy.

This study is based on the database of the NEW-PRIDE study, carried out at the University Medical Centre Groningen (UMCG) between 2017 and 2020 (METc 2015/284 – ABR: 53205). The study included 75 participants with remitted recurrent Major Depressive Disorder (rrMDD), who had at least 2 depressive episodes in the past five years. In a randomized controlled trial, 50 rrMDD participants received eight 45-minutes pCT sessions. The remaining 25 rrMDD participants were placed on a waiting list to receive pCT later. Based on BOLD fMRI scans, brain activities are compared between the pCT group and the no-treatment group. Brain activities were measured during a Verbal Working Memory task, where participants had to recall a particular sequence of different icons. The brain activity then reflects attentional cognitive control. Next to the neurocognitive comparison, some self-assessed behavioural questionnaires related to depressive behaviour and depressive levels are compared between the pCT and no-treatment group. For the questionnaires, rrMDD participants who received pCT are expected to have lower rates of depressive levels and less depressive behaviour compared to the rrMDD participants who did not.

For the neurocognitive measures, brain activity levels are expected to be lower in the Dorsolateral Prefrontal Cortex and Anterior Cingulate Cortex for the group that received pCT, compared to the no-treatment group.

How Autocorrelation Affect ERP Analyses

Felix Schröder[1], Benedikt Ehinger[2], Sebastiaan Mathot[3], René Skukies[2]

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[2] *Stuttgart Center for Simulation Science, University of Stuttgart, Stuttgart, Germany*
[3] *Faculty of Behavioural and Social Sciences, University of Groningen, Groningen, Netherlands*

Electrophysiological research has always been limited in its experimental design choices by the overlapping nature of brain responses. Averaging epoched data to analyse event-related brain potentials (ERPs) relies on stringent rules for the participants ("don't move or blink") and tightly controlled designs. A possible alternative to classical ERPs takes inspiration from the fMRI literature. It uses well established regression techniques to not just model and deconvolve overlapping brain responses but also take all kinds of additional covariates into account. This allows for more naturalistic and ecologically valid study designs. While previous studies showcased this approach's potential by reanalysing experimental data, the current study tests its bias in the face of autocorrelated signals. Autocorrelation may cause violations of the assumption of independent and identically distributed residuals (i.i.d.), which in turn biases the least-square estimates of the model. How bad the bias in the context of deconvolved estimates could be, has not yet been investigated. To find out how robust the overlap correction approach is to violations of the i.i.d. assumption, we simulated and modelled signals containing varying degrees of autocorrelation. We expect to find higher false-positive rates with higher degrees of autocorrelation. If this holds, we will implement necessary warnings and established type 1 error corrections when needed in the Unfold toolbox. This open-source toolbox combines mass-univariate, linear deconvolution, and non-linear modelling into one framework. With it, regression-based EEG analysis, which holds great potential for naturalistic or quasi-experimental designs, should become more accessible. More naturalistic study designs, like allowing for unconstrained eye movements, become more and more popular with the rise of VR and mobile brain imaging studies. Validating their methods is an important step in understanding our brains outside the laboratory.

A reliable method to test whether RSVP based CIT with pupillometry is vulnerable to similar information.

Heather Rennie[1], Dr Sebastiaan Mathot[2], Ivory Chen (PhD)[2]

[1]Faculty of Science and Engineering [2] Faculty of Behavioural and Social Sciences

This research aims to examine reliable methods so to detect hidden knowledge, using precise methods to measure in which we can assess whether responses to specific memories can be dissociated from response to similar items. 30 participants were tested, stimuli were presented using Open Sesame software. Pupil size was recorded in arbitrary units using Eyelink 1000 (SR Research) and throughout each trial PyGaze was used. Participants were presented with a learning session in which they learned a specific orientation of a Gabor, which they will have to recall at the end of each block. They also learned a target Gabor in which they were to monitor the RSVPtrial for. Either a target or a non-target will be presented at this position. Within the targets, four different orientations, the same as the non-targets, were randomly selected. In non-targets there were four different orientations: exact match, close match, far match and control. At the end of each trial they were asked to pay attention to the end of the RSVP stream and whether a dashed line (---) or an equal sign (===) was presented. We are researching how pupils react differently to the four conditions within the non-targets. We are expecting to see pupil dilation, mainly towards the exact match. In conclusion, we hope to find whether responses to specific memories can be dissociated from responses to similar items using data from pupil response.

Comparing neural correlates of tinnitus with and without co-occurrence of hyperacusis based on auditory brainstem responses

Imke Hrycyk[1,2], Jose L. Santacruz,[1,2] Emile de Kleine[1,2] & Pim van Dijk[1,2]

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[2] *Department of Otorhinolaryngology/Head and Neck Surgery, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands*

Chronic tinnitus describes the perception of sounds, such as ringing or whistling in the ears or in the head, without any external sound sources, and has high prevalence especially among elderly and people with hearing loss. Hyperacusis, a sensitivity to sounds of mild to moderate intensity, presents a high comorbidity with tinnitus, but effective treatment for either one is lacking. As both phenomena are subjective and heterogeneous perceptions, assessment and distinction of patient groups for specified treatments are generally difficult. Past research begs the question if hyperacusis merely differentiates subgroups within tinnitus patients or whether tinnitus with and without hyperacusis is caused by distinct underlying mechanisms. One method to potentially distinguish patients with tinnitus with and without hyperacusis are auditory brainstem responses (ABR). ABR waves represent activations along the auditory neural pathways and by comparing amplitude and latency of the evoked potentials between patient groups, differences in neural correlates between both conditions could be uncovered. Our expected results are to find that patients with tinnitus but without hyperacusis will show a reduced amplitude and prolonged latency in wave V. Contrary, tinnitus with hyperacusis should be accompanied by enhanced amplitude and shortened latency of wave III and wave V. If observed, our results hint at different symptom processes, in which tinnitus without hyperacusis would be related to a frequency-specific enhanced neural gain, and tinnitus with hyperacusis to broad neural gain enhancement. Such a finding could have implications for the differential diagnosis of tinnitus and subsequent treatment options, possibly paving the way for more effective amelioration of tinnitus and/ or hyperacusis complaints.

The role of Cav3.2 channels in noise-induced hearing loss

Kriti Rajda[1], Dora Persic[2], Sonja Pyott[2]

[1]*N-Track, Research School of Behavioural and Cognitive Neurosciences, Faculty of Science and Engineering, Rijksuniversiteit Groningen.*
[2] *Department of Otorhinolaryngology, Universitair Medisch Centrum Groningen.*

The prevalence of noise-induced hearing loss (NIHL) has been growing since the onset of the 21st century. The molecular pathology of NIHL is not yet well-known; previous research points to dysregulation of calcium homeostasis in the inner ear being an important cause. In this study, we focus on the role of calcium and its ion channels in the mechanism of hearing, and how they affect the auditory system's response to noise exposure.

Voltage-gated calcium channels (VGCCs) have an α-subunit with ten possible isoforms, and the Cav1.3 isoform is the most essential for hearing. Among other variants, we focus on the Cav3.2 isoform, encoded by the CACNA1H gene, prominently expressed in the cochlea and auditory brainstem. Earlier studies show that Cav3.2 knockout (KO) mice at five months show elevated auditory thresholds compared to wild type (WT) mice; therefore, this gene may also be essential. However, considering the advanced age of the mice in those studies, absence of this channel may merely accelerate age-related hearing loss; therefore younger knockouts must be tested.

The current study examines effects of noise exposure on CACNA1H KO and heterozygous (HET) mice at six weeks of age. This was done through a combination of auditory brainstem response (ABR) studies on WT, KO and HET mice, in baseline conditions, 24 hours after noise exposure, and at 7-day and 14-day intervals after noise exposure. KO mice had elevated auditory thresholds, lower wave I amplitudes and higher wave I latencies, meaning their hearing is impaired by loss of Cav3.2. The cochlea were dissected and immunostained before imaging with confocal microscopy and counting inner hair cells and associated synapses. No significant differences were seen between the synapse or cell densities of WT and KO mice.

The current conclusions of the study are that absence of both copies of the CACNA1H gene impairs hearing and affects the extent to which noise exposure damages it, making KO mice more susceptible to hearing impairment. However, the damage is usually lessened in heterozygous mice.

Couch potatoes of the sea- Do nurse sharks sleep? Investigation of sleep-like behaviour in nurse sharks: daily rhythmicity and homeostatic regulation

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Sleep has been studied in a plethora of animals, from mammals to birds, reptiles to fish, and even jellyfish. Sharks are the earliest jawed vertebrates yet we know surprisingly little about their fundamental biology, including whether they sleep.
Studying sleeping patterns in sharks should help with our understanding of sleep evolution as well as providing groundbreaking knowledge on shark biology.
Nurse sharks (*Ginglymostoma cirratum)* are found in shallow waters and are buccal pumping sharks. They are able to stay motionless for extended periods of time however, it is unknown whether these episodes of inactivity represent sleep.
To investigate circadian rhythmicity, the sharks' movements were tracked over several days by attaching accelerometers (activity loggers) to the sharks' dorsal fins.
To check for homeostatic regulation, the sharks were put through a sleep deprivation protocol for nine hours on the fourth day. Additionally, baseline gill ventilation rates were measured every three hours for 24h, as well as during the sleep deprivation day and the following recovery day.
Nurse sharks were found to be predominantly nocturnal and to mostly rest during the day, although variations exist between individual sharks. Ventilation rates showed that during active periods, nurse sharks breathe less while swimming. Our results support previous research on buccal pumping sharks, suggesting that nurse sharks may not show a homeostatic regulation of their rest.
Further research, such as electrophysiology, would allow us to comprehensively understand sleep/wake recordings of brain activity in cartilaginous fish and shed light on the questions of whether sharks sleep and the evolution of sleep.

Sleep homeostasis in geese: effects of moon phase

Simón Robledo-Cardona, Sjoerd van Hasselt, Dr. Peter Meerlo

Birds and mammals spend a third of their lives asleep. However, despite ample evidence that suggests a homeostatic regulation of sleep (Kreutzmann et al., 2015), the exact function of this brain state is not completely understood (Siegel et al., 2005). Adding to the puzzle, recent studies show that for humans and birds, the amount of sleep is modulated by the lunar cycle, with individuals sleeping less during full moon compared to new moon (van Hasselt et al., 2021; Casiraghi et al., 2021). Furthermore, the same studies have suggested that effects of moon phase on sleep may be partly independent of moonlight, with changes in electromagnetic and gravitational fields associated to the moon cycle as hypothetical additional candidates (Bevington, 2015). However, this has yet to be proven. Our project aims to elucidate the effect of moon phase on sleep, using barnacle geese as the experimental species. Geese were divided over two outdoor enclosures where they perceived natural light-dark cycle and ambient temperatures. Electroencephalogram (EEG), electromyogram (EMG) and head accelerometer measurements were recorded during full moon and new moon, while covering one aviary with black plastic and the other with transparent plastic in a cross-over design, in order to control for the effect of moonlight. The amount of lux and the light spectrum were measured as an indicator for light perceived by the geese. Preliminary data of the full moon recordings suggests that geese sleep the same amount independently of the light level they are exposed to during the night, suggesting an effect of the moon mediated through other pathways than light. New moon recordings are currently being analyzed. If geese during full moon sleep less than geese during new moon with no effect of light level, this project would support the hypothesis that changes in the electromagnetic and gravitational fields might be causes for the sleep-suppressing effect of full moon.

What triggers microglia priming?

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Microglia, the resident tissue macrophages of the central nervous system (CNS), constantly monitor the brain microenvironment, and respond to pathophysiological changes in order to maintain brain homeostasis. Upon exposure to inflammatory mediators, microglia can acquire a 'primed' state, which is associated with enhanced sensitivity to subsequent inflammatory insults. This phenotype has been observed during aging and under neurodegenerative conditions and is implicated in neuropathological processes. To elucidate what underlies the emergence of this functional state, we studied microglia from Ercc1$^{\Delta/-}$ mice, a mouse model of accelerated aging, to identify the transcriptional network underlying priming, and to examine the morphology of primed microglia in different brain regions.

Morphometric analysis revealed that microglia display different morphologies across all brain regions inspected. Microglia from Ercc1$^{\Delta/-}$ mice have larger somas, show less branching complexity, and cover less area of the tissue, compared to the highly ramified microglia from wild-type mice. Clustering analysis revealed multiple morphological clusters of microglia from Ercc1$^{\Delta/-}$ mice, mainly based on the degree of branching, suggesting that several intermediate forms are present. Additionally, microglia show increased density in different brain regions of the Ercc1$^{\Delta/-}$ mice.

To identify priming-associated transcription factors and gene regulatory networks, chromatin immunoprecipitation followed by next-generation sequencing (ChIP-seq) is being performed on chromatin from isolated microglia.

Accumulating evidence suggests that in chronic disease states, such as in neurodegeneration, and in aging, priming of microglia can aggravate the inflammation in the CNS. Our data show that microglia from Ercc1$^{\Delta/-}$ mice show unique morphological alterations across the mouse brain indicating an associated change in their function. After identification of the exact transcriptomic regulators triggering microglial priming, using ChIP-seq, this study would establish the fundamental understanding of this functional state, allowing for future functional perturbation studies to further elucidate the role of primed microglia in neurodegeneration and potentially identify novel therapeutical strategies.

Pinging the brain: Investigating Activity-Silent Working Memory Mechanisms

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Working memory (WM) is a core cognitive function critical for storage and manipulation of information. The mechanisms by which working memory representations are maintained in the brain are still a topic of debate, however.

Recent evidence suggests that representations can be maintained in so-called 'activity-silent' states, meaning that continuous neural activity is not necessary for maintenance. Instead, representations are stored as item-specific changes in the functional state of the underlying neural network. Such functional states are essentially temporary changes in the strength of connections between neurons, driven by incoming input (i.e., the to-be-maintained memory content). Functional states serve as neural context for further processing, thus shaping responses to further input.

Information stored in activity-silent states therefore does not emit measurable activity. However, it can be decoded by 'pinging': presenting a neutral stimulus during the maintenance period of a WM task. The stimulus drives activation through the neural population, creating a measurable EEG response, that reflects the underlying connectivity network. Memory-item-specific information can then be decoded from this response.

However, some authors have questioned this method, claiming that instead of revealing truly activity-silent representations, pinging simply reduces noise in the EEG, thus uncovering active representations obscured by noise.

Thus, our aim was to further investigate and validate the method. To this end, we showed participants two different kinds of impulse stimuli during the maintenance period. The stimuli either matched or did not match the memory content in spatial frequency.

We expect more precise decoding from the EEG response to an impulse matching the memory content in spatial frequency, as opposed to the response to non-matching stimuli.

This result would provide evidence for activity-silent WM mechanisms, and further validate 'pinging' as a method to study them. Thus, this study will shed light on how WM representations are maintained in the brain.

Tamoxifen-Induced Cystathionine β-Synthase (CBS) Knockout in the Brain: a molecular assessment of an astrocyte-specific CBS knockout mouse model

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BACKGROUND Cystathionine β-synthase (CBS) is a vitamin B6-dependent enzyme and catalyser of the primary step of the transsulfuration pathway, thereby gaining prominence as a key contributor to the hydrogen sulfide (H2S) production in the brain. Dysfunction of the CBS/H2S pathway can result in homocystinuria (HCU) and hyperhomocysteinemia (HHcy), recently linked to various neurodegenerative diseases. However, it is unclear to what extent dysfunctions in this pathway are dependent on the neuronal or astroglial synthesis of H2S, as the underlying mechanisms remain largely unknown. *AIM* The primary goal of this project is to assess and validate a novel mouse model for conditional astrocyte-specific CBS knockout in the brain, by studying the localisation and expression-levels of CBS in the mouse brain. Furthermore, the neuroinflammatory state of the CBS knockout in the brain of this strain will be investigated. *METHODS* An Aldh1l1/CreERT2 mouse model is used to assess the selective CBS knockout in astrocytes (N=24). Western blot and qPCR are used to test the efficacy of the CBS knockout. Additionally, the endogenous H2S producing capacity of CBS in brain tissue is assessed using lead acetate assays. Immunofluorescence is employed to determine the localisation of the CBS enzyme. Furthermore, expression-levels of inflammatory markers and astroglial markers are investigated. *EXPECTED RESULTS* We expect ALDH1L1-Cre CBS knockout mice to show significantly decreased levels of CBS expression and increased levels of inflammatory markers in cortical and hippocampal regions. *CONCLUSION* In this research we expect to demonstrate that a deficiency in CBS expression has functional and structural implications on glial cell populations. These results could shed new light on the potential protective mechanisms the CBS/H2S pathway holds in the brain, especially in relation to CBS-related pathologies which pose a risk factor to various neurological diseases.

To identify the role of cellular senescence in Acquired Hearing Loss with a focus on Age-Related Hearing Loss (ARHL)

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The one universal process that most living organisms on this planet go through is ageing. Amongst this, age-related hearing loss (ARHL) is one of the most prevalent disorders affecting the older population. Despite this enormous prevalence, our knowledge of its underlying mechanisms are shockingly limited and, as a result, there are no pharmacotherapeutics to treat ARHL. Based on the fact that cellular senescence drives ageing and age-associated pathologies all over the body we hypothesize that cellular senescence is the primary and central mechanism underlying ARHL. To investigate this hypothesis, the project aims to study the effects of senotherapeutic agents (drugs combating cellular senescence) on gene expression and the morphology of cochlear cell types in ageing mice. These senotherapeutics were systemically administered via an IP injection. We measured the expression levels of senescence-associated genes (p53, p16, p21 and IL6) using qPCR. The effects on morphology were measured using confocal microscopy and quantitative imaging. The preliminary results indicate that in both, the 6-month-old mice (young) and the 2-year-old mice (old), there are no differences in the density of the inner hair cells (IHCs) and outer hair cells (OHCs) between the control mice and the treated mice. Gene expression analyses in the 2-year-old mice show a trend in the reduction of SASP factors and the tumour suppressor gene *p16* in the treated mice. These findings indicate the treatment is successful in lowering senescence-associated inflammation in the inner ear. A similar trend is expected in the 6-month-old mice as well. Therefore, the development of safe senotherapeutic agents to combat ARHL is a promising strategy to safely prevent and possibly reverse ARHL.

B - ABSTRACTS

Influence of microenvironment on neural progenitor cells

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Microenvironment plays a big role in modulating cellular behavior. Especially in the case of stem cells, proliferation and fate determination is largely influenced by extracellular cues. Moreover, in neurodegenerative diseases such as Alzheimer's Disease, the neurodegeneration often occurs alongside a pre-determined anatomical order – possibly due to different cellular composition and extracellular matrix (ECM) features in different brain regions. Here, we focused on investigating the influence of scaffold composition, ultrastructure and stiffness on the neuronal progenitor cells (NPCs) morphology, proliferation and differentiation. To investigate that, we wanted to compare the influence of ECM obtained from different brain regions on NPCs derived from induced pluripotent stem cells (iPSCs) from AD patients (with the PSEN1 mutation) and controls. To assess the cellular interaction with the scaffold, NPCs were seeded in 3D nanostructures with different pore sizes coated with laminin. To evaluate the influence of scaffold stiffness and composition, we tested hydrogels with different stiffness derived from decellularized porcine brain. Our preliminary data show that NPCs interaction with different scaffolds influence their morphology and proliferation. NPCs seeded in stiffer gels display higher proliferation while the morphology of the cells is more elongated in softer gels. To further explore the influence of scaffold composition on NPCs behavior, we will also create hydrogels with region-specific porcine ECM and induce within them neuronal differentiation. Our results will help clarify the mechanisms by which the microenvironment modulates progenitor cell niche in neurodegeneration.

Sleep disturbances in Phenylketonuria adult patients coming from different European regions

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Phenylketonuria (PKU) is a metabolic disorder caused by an inborn metabolic error in the autosomal recessive gene for the phenylalanine hydroxylase enzyme. As a result, the amino acid Phenylalanine cannot be converted into the amino acid Tyrosine. Because Phenylalanine is accumulated in the blood, it interferes with the transfer of amino acid Tryptophan into the brain. Thus, less dopamine and serotonin, which are important for the sleep/wakefulness regulation, are produced by Tyrosine and Tryptophan, respectively. Dopamine promotes wakefulness and serotonin induces sleep. Indeed, studies show differences in sleep between PKU patients and healthy people. PKU infants have different EEG spindles compared to healthy infants, while PKU adults scored higher in sleep tests regarding insomnia, circadian rhythms, sleep quality, and daytime sleepiness than healthy adults. However, it is still unknown if PKU patients in general cope with certain sleep disturbances or if these problems differentiate among different regions. Thus, we aim to determine the sleep disturbances PKU adult patients cope with compared to healthy people among six European countries. We recruited adult participants via the ESPKU conference, patient organizations, websites, and social media. We are going to analyze participants' responses based on the Holland Sleep Disorders Questionnaire, Munich Chronotype Questionnaire, Pittsburgh Sleep Quality Index, Epworth Sleepiness Questionnaire, and a general information questionnaire. We expect that PKU patients in general will have more sleep problems compared to the healthy population, and that sleep disturbances will differentiate among the countries probably because of cultural differences in their habits. To conclude, this project gives the opportunity to understand to what extent a specific metabolic disorder such as PKU could affect the quality of sleep. Also, we will gain more knowledge about specific disturbances that may vary among countries, a fact that could be a motivation to focus on novel treatments in future studies.

Developing and testing novel techniques to study Neuronal development in Zebrafish

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The formation of neurons is a complex process that is undertaken by proliferative radial glia cells early on during the embryonal development. The radial glia cells undergo cell division to form neurons and glial cells. Although several factors that regulate the daughter cell fate are identified, it is still unclear what makes these individual cells decide to divide and become neurons. We are currently developing a method (CoBar labelling) that will allow us to combine live imaging and single cell transcriptomics to study fate decisions in proliferating cells. In our project, we decided to work on developing strategies to check the cleavage efficiency of two different 2A cleaving peptides; T2A and P2A in Zebrafish. We injected mRNA synthesized from bi-cistronic 2A constructs into zebrafish embryos and checked their expression using microscopy. Comparison of the protein expression and fluorescent intensity among the different 2A constructs showed that protein expression at the second gene position was the best for the T2A while it was quite low for the P2A. The protein at the second position was not efficiently expressed in case of the P2A construct. We also tested the Cre/LoxP expression system in zebrafish. A transgenic line was created using a gene construct containing LoxP sites flanking a Multiple Cloning Site. To check recombination, Cre mRNA along with a fluorescent gene construct was injected into the transgenic embryos and checked using microscopy. We were able to see some cells showing Cre-mediated recombination. The techniques we develop during the project will further help in creating a library of plasmids for the CoBar project and design experiments to express these in the zebrafish genome. The CoBar labelling system, once developed, will provide us a very robust tool to analyse mechanisms of neurodevelopment.

Ambient temperature affects tau phosphorylation and hibernation pattern in the garden dormouse

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Alzheimer's disease (AD) is characterized by the presence of hyperphosphorylated and misfolded tau protein resulting in aggregation. Hibernation models are used to study early AD as these models show similar changes in tau biology during torpor when they temporarily abandon euthermia by reducing their metabolic rate. However, in contrast to AD, these animals show reversible phosphorylation of tau when they periodically arouse and warm up to euthermic body temperatures.

Arousals are counterintuitive because they are energetically costly while hibernation is an energy-saving strategy. However, their universal presence suggests an important function. This function is currently not understood. The remarkable observation in tropical hibernators that show continuous torpor for months due to passive diurnal temperature fluctuations, suggests that the function of arousals primarily depends on reaching a certain body temperature. Correspondingly, torpor duration is temperature-dependent in cold hibernators. Whether cold hibernators can elongate their torpor under tropical conditions is currently unknown.

This study aimed to elucidate the effects of ambient temperature on hibernation pattern and tau phosphorylation and to gain more mechanistic insights into the function of arousals.

Dormice hibernating at lower stable ambient temperatures have longer torpor bouts. Since we hypothesize that phosphorylated tau accumulates during torpor and possibly functions as a kind of trigger for an arousal, we expect to find increasing tau phosphorylation levels over time during torpor and slower accumulation at lower ambient temperatures. Furthermore, the dormice showed torpor for up to a month under daily fluctuating temperatures suggesting that passive body temperature fluctuations are sufficient to fulfil the function of arousals. Lastly, a temperature pulse (30°C) delays an arousal with a normal torpor bout duration suggesting that passively warming-up functions as an artificial arousal.

This research provides insights into the role of body temperature dynamics in cellular homeostasis during hibernation and may hold great clinical promise for novel AD treatments.

The Neural Correlates of Food Viewing:
A fMRI Mega-Analysis Accounting for Age, Gender and Body Mass Index

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BACKGROUND The omnipresence of food cues in our environment stimulates overeating and contributes to the obesity epidemic. The neural response when viewing these food cues could elucidate the mechanism through which they stimulate overconsumption, but heterogeneity between studies conducted so far and small sample sizes may have impeded the detection of small effects. These limitations may be overcome by data pooling on the participant-level (i.e., mega-analysis). *OBJECTIVE* The present mega-analysis aims to establish consistent activation in brain regions upon exposure to visual food cues. Specifically, we investigate brain activation in response to food versus non-food (1) and high- versus low-caloric food images (2). We expect age, gender, and Body Mass Index (BMI) to modulate (1) and (2). *METHOD* Studies were searched using the database PubMed; previous reviews and expert recommendations augmented the search. Eligibility criteria included the publication in English in a peer-reviewed journal, between 2005 and 2021 reporting fMRI brain response using a passive food viewing paradigm. The authors of the 144 eligible studies were contacted and asked to provide single-participant statistical parametric maps (T-maps and parameter estimate maps). We will perform a systematic whole-brain mega-analysis using a random-effects model in line with Zunhammer and colleagues[1]. We correct for multiple comparisons using family-wise-error level at p<.05 (nonparametric permutation-based). *RESULTS* So far, we collected data from 25 passive food viewing functional neuroimaging studies: 23 studies (1028 participants) with the contrast food versus non-food images and 19 studies (1125 participants) with the contrast high- versus low-caloric food images. Results of the mega-analysis will be presented at the symposium. *CONCLUSION* This fMRI mega-analysis may provide novel and reliable insights into the neural correlates underlying food viewing. Advantages and pitfalls of pooling fMRI studies on the participant-level are discussed.

The effect of early-life Stress and early-life dietary n-3 availability on blood fatty acid composition, brain specialized pro-resolving mediators, and microglial properties

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Early-life stress (ES) is associated with impaired cognitive function and altered neuro-immune system later in life. Early-life nutrition may restore the detrimental effects of ES. N-3 and n-6 polyunsaturated fatty acids (PUFAs) influence microglia and we have shown that they modulate ES-induced deficits. Their respective metabolites, specialized pro-resolving lipid mediators (SPMs) and cyclooxygenase-2 (COX-2)-catalyzed derivatives have anti- and pro-inflammatory properties. We hypothesize that ES leads to a lipid mediator profile featuring more COX-2 expression and n-6 derivatives, which are associated with enhanced microglia activation and altered phagocytosis in mice. Increasing the dietary availability of n-3 PUFAs would lead to a lipid mediator profile richer in SPMs, which we expect to normalize microglia activation and phagocytosis in the ES-exposed mice. This study elucidates (a) the effect of ES and dietary n-3 availability on blood fatty acid composition, brain SPMs, and microglial properties and (b) explores the relationship between SPMs and microglial properties. ES was induced with the limited nesting and bedding paradigm in mice from postnatal day (P)2-9 and either a high or low n-3 availability diet was provided during P2-42 (males, 4 groups, n = 12/group). At P60, one hemisphere was submitted to liquid chromatography-tandem mass spectrometry for SPMs in the hippocampus and hypothalamus. The other half was stained with markers for microglia activation and phagocytosis. There is an effect of ES and dietary intervention on the peripheral fatty acid composition and analyses of the brain SPM profile and microglial properties are currently ongoing. This study will give new insights in how ES affects the SPM microenvironment and microglia and if and how dietary n-3 PUFA availability modulates these further.

The Role of Post-Translational Modifications in α-synuclein Liquid-Liquid Phase Separation

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The protein α-synuclein is implicated in the pathogenesis of Parkinson's disease (PD), where it is found to be misfolded and assembled into amyloid-containing aggregates in the brain called Lewy Bodies (1-5). Recent evidence shows that α-synuclein can aggregate through a process called liquid-liquid phase separation, in which the protein forms a droplet state which then rapidly matures into an amyloid-rich hydrogel (6-8). The amyloid species from such hydrogels can be found in matured Lewy Bodies in Parkinson's patients' brains. It is unclear, however, to what extend post-translational modifications of the protein can influence α-synuclein's propensity to phase separate and aggregate into amyloid fibrils. This study investigates how post-translational modifications (PTMs) of the three different domains of α-synuclein can malleate its aggregatory propensity towards amyloids within the condensation pathway (6). Especially the phosphorylation (p) of the Serine (S) 129 in α-synuclein shows significant prevalence in PD patients brains (>90% of α-synuclein) compared to healthy controls (<4% of α-synuclein) (9). However, it is unclear whether the p-S129 is co-responsible for pathogenesis, or whether this PTM has protective properties. Phosphorylation of three different sites of α-synuclein (S42, S87, S129) is achieved by utilizing site-directed mutagenesis to create Serine-Cystine mutants of these residues. Consequently, chemical mutagenesis is employed to create phosphomimetics of the mutants. These are then assayed in a novel in vitro phase-separation protocol (Dada et al., unpublished), which yields information on both the propensity of the phosphomimetics to phase separate, as well as the rate of maturation into amyloidal structures from a thermodynamic perspective. These experiments will further our understanding of the relevance of phosphorylation of α-synuclein in disease, specifically in relation to how PTM of the three distinct domains of the protein modulate its aggregatory behavior. This knowledge can enable novel pharmacological strategies which target phosphorylated variants of α-synuclein specifically in order to inhibit the progression of pathology.

Mediating Neuroinflammation Using TNFR1 Selective Antibody in Alzheimer's Disease Mouse Model

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Alzheimer's disease (AD) is a common neurodegenerative disease resulting in neuronal dysfunction and dementia. Finding disease-altering treatments is complicated due to the disease's complexity, therefore current treatments mainly address symptoms as no effective treatment has been found yet. Targeting early-stage AD related neuroinflammation may alter the disease's pathogenesis and progression and may be achieved by modulating the immune system. An important mediator of the immune system is tumor necrosis factor α (TNF-α), a pro-inflammatory cytokine implicated in neurodegeneration.
Anti-TNF-α therapeutics have failed to treat neurodegenerative diseases, mainly due to the antithetic effects of the two TNF-α receptors. This study aims at modulating neuroinflammation and -degeneration mediated by TNF-α receptor 1 with a selective antagonistic antibody, Atrosimab, in a mouse model of acute neurodegeneration.
The nucleus basalis magnocellularis (NBM) of 25 male mice was lesioned in order to mimic early AD neurodegeneration by cholinergic fiber loss and neuroinflammation. Mice were injected with NMDA to elicit lesion in the NBM and co-administered with Atrosimab or control antibody. Their behaviour was assessed in elevated plus maze, Y-maze and passive shock avoidance paradigms. After termination, immunohistochemistry was performed to assess lesion size due to the injections and to assess cholinergic fiber loss in the cortex.
Long-term associative memory assessed by passive shock avoidance was rescued in NBM lesioned mice treated with Atrosimab compared to control mice. Anxiety-related exploration and short-term spatial memory did not significantly differ between groups. We expect an increased number of cholinergic fibers and a decreased lesion size in the NBM of Atrosimab treated mice due to the blocking of TNF receptor 1 by Atrosimab.
This study aims at the *in vivo* validation of the antibody Atrosimab. If the antibody is effective in counteracting cholinergic fibre loss and neuroinflammation, this may contribute to the development and application of an effective TNF-α directed treatment of neurodegeneration and AD.

Effects of working memory load on tacit coordination and inter-brain synchrony

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Theory of mind (ToM) is proposed to allow agents to theorise about others' internal states (e.g., beliefs and intentions). In this way, it facilitates dynamic behavioural adjustment and enables tacit coordination for achieving mutual goals. Working memory (WM) is considered a fundamental part of ToM, as it maintains and actively manipulates social information. However, to what extent WM affects multi-person social coordination on a behavioural, cognitive and neural level is still unknown. To explore this, the present study employed EEG hyperscanning to simultaneously measure two participants playing a pure coordination game while performing an n-back task. We evaluated differential effects of low and high cognitive load on behavioural coordination and electrophysiologically. We examined WM effects both on single participants by measuring event-related potentials (ERPs) and dyads by estimating a-band interbrain synchronization (IBS), which is said to indicate the formation of shared representations and information transferring between individuals. Linear mixed model analysis revealed that coordinating performance deteriorates under high WM load as compared to low load, an effect that corresponded to significantly less IBS in the right dorsolateral and ventrolateral prefrontal regions. Both regions have been suggested to play a primary role in cognitive control. Additionally, ERP analysis highlighted a P3 component in parietal areas that is often correlated with WM updating. P3 amplitude was significantly decreased under high versus low cognitive load. This result is in line with the idea that WM resources were depleted by the non-social n-back task in the high load condition and thus the effective processing of interpersonal information was impeded. Taken together, our results demonstrate that WM is crucial for processing social information and can hamper a-band IBS in the prefrontal areas in dynamic social exchanges requiring ToM.

Vascular integrity in progressive multiple sclerosis

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Multiple sclerosis (MS) is a neurodegenerative disease that is characterized by central nervous system damage. Focal lesions in MS appears to be present due to a disruption of the blood-brain barrier, demyelination, and inflammation. However, although MS has been known for decades, neither its aetiology nor its cure is known.
The overall objective of this study is to further elucidate the different aspects of vascular architecture in progressive MS. Therefore, 11 patients with progressive MS and six healthy controls underwent CT, PET, MRI (T1-weighted before and after gadolinium contrast, T2 and FLAIR), SWI MRI, and perfusion DSC MRI. Perfusion metrics from PET and DSC-MRI scans were assessed to compare cerebral perfusion in MS and healthy controls. Among others, these parameters include cerebral blood volume (CBV), cerebral blood flow (CBF), and mean transit time (MTT). For MS patients, we expect to find an increase in CBF and CBV for active lesions (compared to normal-appearing white matter (NAWM)) and a decrease in CBF and CBV, with increased MTT in chronic lesions (compared to NAWM).
In comparison to white matter in healthy controls, we expect decreased CBF and CBV and increased MTT in NAWM of MS patients. Lastly, quantitative susceptibility maps (QSM) will be extracted to investigate the structural aspects of vascular damage in MS. Mapping out aspects of vascular integrity in progressive MS could provide more clinically relevant markers, improve early detection of new lesions, inform treatment choice and response assessment, or even serve as a starting point for developing new treatment options.

What Does it Take to Change Someone's Mind? The Role of Explicitly Manipulating Feedback Sequences

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Experimental Psychology

Throughout our entire lives we often make decisions of which the outcomes are uncertain. Previous research has demonstrated that this uncertainty has an impact on our perceptions of the outcomes of our decisions. Providing people feedback on their decisions is a method to alleviate this ambiguity. We do, however, not learn from a single instance of feedback. This is because the outcomes of our daily lives are highly probabilistic, implying that the same action does not always result in the same outcome. Accordingly, learning regularities between actions and outcomes is critical, which can only be accomplished when integrating feedback over multiple experiences. In our study, we will induce varying levels of certainty, for a particular choice, by manipulating the feedback information participants receive on their previous choices, in a probabilistic reward-magnitude learning task. Subsequently, we will again utilize feedback manipulation to try to elicit changes in participants' choice-behavior after this accumulation of certainty. We will accomplish this by abruptly imposing a significant loss for the 'certain' choice. The aim of our study is to investigate whether our susceptibility to manipulation is determined by the level of certainty. In comparison to a higher level of certainty, we predict lower levels of certainty, for a particular choice, to result in more prominent and faster adaptions in choice-behavior. Furthermore, we expect that those who learn faster will be less likely to adapt their choice-behavior, as past research has shown that they do better in integrating previous feedback, which is crucial for optimal adaptation. More knowledge on whether we can manipulate choice-behavior through feedback allows us to investigate the extend to which it is possible to update or re-learn previously received information. Future EEG studies can use this behavioral data to map the cognitive processes underlying this behavior more accurately.

Activity patterns of Great tits under gradients of artificial light at night and urban characteristics at the Zernike Campus

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Artificial light at night (ALAN) has shown a rapid increase all over the globe, and continues to increase. An accurate timing of activity is regulated by natural light cycles, and crucial for an organism's fitness. ALAN disturbs natural light cycles and can subsequently change activity patterns. This stresses the importance to understand the timing of activity in species living in a rapidly changing world. Therefore, I aim to investigate the timing of activity of the urban dwelling Great tit (*Parus major*) in an urban habitat: the Zernike Campus of the University of Groningen (NL). Furthermore, I will explore how the distance to the roads and buildings covary with this timing.

Nest boxes were distributed over a gradient of ALAN and urban characteristics during winter. Newly developed activity loggers in these boxes and radio telemetry techniques measured bird activity. I calculated the onset and offset of daily activity from the logger data with a self-developed R script, and applied a behavioural change point analysis for the telemetry data. Furthermore, I calculated the distances from each nest box to the nearest road and building in QGIS. I analyzed the relationship of ALAN and these distances with daily activity onset, offset and duration in a linear mixed model and compared logger and telemetry data in a linear model. In line with previous research, it is expected that the onset advances with increasing ALAN, but that the offset does not vary. Consequently, the total duration of daily activity will be longer with increasing ALAN.

This research is one of the first in a series of studies on this population at the Zernike Campus. It will contribute to a better understanding of urban ecology and it will open new doors to develop biodiversity friendly urban areas, right here at the Zernike campus, but also globally.

Rescuing inaccessible fear memories after protein synthesis inhibition

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The consolidation of recently acquired information into a stable memory that can be retrieved at a remote timepoint requires the synthesis of new proteins in the hours after a learning episode. Although inhibiting protein synthesis after a learning task interferes with the retrieval of a memory by natural retrieval cues, artificial retrieval of these inaccessible memories is still possible through optogenetic stimulation of memory-engram neurons. Nonetheless, optogenetic stimulation only temporarily manipulates memory retrievability and still leaves the memory inaccessible for retrieval under natural conditions. In this project, we sought to improve the natural retrieval of fear-memory in mice after inhibition of protein synthesis. Mice underwent contextual fear conditioning and were immediately injected with the protein synthesis inhibitor anisomycin. Three days later, fear-memory was optogenetically reactivated and animals received injections of the PDE4-inhibitor roflumilast. Five days later, we assessed natural retrieval of fear-memory by measuring freezing behavior in the fear conditioning box. We observed reduced freezing behaviour in groups that were treated with anisomycin, but found no effect of roflumilast-injection after optogenetic stimulation. We conclude that natural retrieval of inaccessible memories cannot be rescued by roflumilast-administration after optogenetic stimulation, but suggest that this result might be explained by the fact that reactivation of the fear engram took place in a context too dissimilar from the training context.

Fast and Slow Relevance Judgments

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Objects rated with relevance to a survival scenario are more likely to be remembered than those same objects rated with relevance to a moving scenario (Nairne et al. 2009). The survival processing advantage has been replicated many times, yet the mechanism behind this advantage is still unknown. This project attempts to elucidate the process of making a relevance judgment by testing a theory that we make a serial or parallel search for possible uses of the object and match them to our goals. First participants rated the object under time pressure, and then they were given a second chance to rate the same objects with no time limit. We categorized the objects into 3 different types: highly relevant, ambiguous, and irrelevant. We found that participants were able to make accurate judgments in on average 669ms, and that they changed their judgment mainly for ambiguous objects. This indicated that the added time was used to consider more possibilities and thus more relevant matches were made. In a broader perspective, this provides evidence for a serial search for possible uses and matches to possible goals, and that the act of searching should be investigated as a possible mechanism for the memory advantage.

C - ABSTRACTS

Hibernation in garden dormice: ambient temperature effects and DNA damage & repair

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Hibernation serves as seasonal coping mechanism to adapt to challenging seasonal environments. The majority of hibernation is spend in torpor and is alternated with short periods of arousal. Torpor is characterized by reduction of body temperature a few degrees above ambient temperatures, reduction of the basal metabolic activity and decrease in tissue perfusion. During interbout arousal these physiological parameters return to euthermic levels. Hibernating mammals experience repeated ischemia and reperfusion during the torpor-arousal cycle without significant organ damage. Studying hibernators with higher thermal and ischemic tolerance can give more understanding of DNA damage and repair during extreme alternating conditions.

In this project the effect of environmental temperature on hibernation duration and DNA damage were investigated in garden dormice.

To study the effect of temperature on DNA damage and repair, garden dormice were kept on different ambient temperatures in climate chambers and were sacrificed during different time points during hibernation or spring/summer euthermia. This was followed by comet assay and pulsed field gel electrophoresis to investigate DNA damage during the hibernation cycle. In addition, temperature and activity were measured during the whole hibernation period and spring/summer euthermia.

Comet assay results show less DNA migration during late torpor compared to arousal early, spring and summer euthermia.

Garden dormice hibernating on higher ambient temperature had shorter torpor bout duration and longer arousal duration. In addition, arousal frequency increases with higher ambient temperature. In summary, ambient temperature influences torpor and arousal duration in garden dormice. Hibernating garden dormice experience DNA damage during hibernation with less DNA damage during late torpor. More knowledge about hibernation and DNA damage could provide the foundation for human organ transplantation, traumatic CNS injury and space travel.

ATLAS 987 & paroxetine:
Combinational therapy for the treatment of lifelong premature ejaculation

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For a high quality of life many individuals report how valuable sexual intimacy between partners is. But the neural and physiological processes underlying aspects of intercourse are extremely complex and, so far, not fully understood. This has caused a lack in effective treatments for many sexual disorders, like premature ejaculation (PE). Most common treatment strategies exist either out of behavioral therapies, or certain pharmacological interventions, like the daily administration of selective serotonin reuptake inhibitors (SSRIs). However, adverse effects and discontinuation rates among patients are still high.
SSRIs only reach their highest efficacy after a long period of administration due to desensitization of the serotonin 1A receptors. Normally, these receptors will inhibit neuronal firing, but this effect is diminished after continuous receptor stimulation. Based on this, a proposed novel therapeutic strategy to treat PE acutely is the combination of a 5-HT1A-R antagonist (Atlas987) with an SSRI (paroxetine). By means of administrating different combinational dosages and testing different exposure times the efficacy of this combinational therapy in male rats is determined.
Sexual behaviours were scored and analysed during behavioural experiments in which sexually trained male rats were exposed to a receptive female for 30 minutes. The experiments showed that 10mg/kg paroxetine together with 30mg/kg of Atlas987, independent of exposure times, was most effective in reducing the frequency of ejaculations. Demonstrating that the combinational treatment may already be effective after 1 hour at a high combinational dose. This new and acute pharmacological intervention for PE could enhance sexual intimacy and QoL between partners of whom a man suffers of premature ejaculation.

Production of Second Language Prosody in Prelingually Deaf Adolescent Cochlear Implant Users

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Individuals who suffer from severe or profound hearing loss often receive a cochlear implant: an implanted electronic device that partially restores hearing. However, despite improving speech communication, the spectral resolution is compromised by a CI. This limits access to prosodic cues and consequently reduces performance of speech production of prosody in a native language. The central question the current study seeks to address is how, if at all, prosody production is affected by CI use in a second language (L2). The objective of this study is to compare production of second language linguistic prosody of prelingually deaf adolescents with cochlear implants (CI) with normally hearing (NH) peers. In order to do this, semi-spontaneous speech of participants with a CI (N = 8) and NH adolescents (N = 7) was recorded. Acoustic cues from the spectral, intensity and temporal dimension were extracted from the speech recordings. Acoustic analyses reveal no significant differences between L2 prosody production of CI users and NH individuals. Further, no correlation with hearing age is found. Also, L2 prosody production is not correlated with the Sentence Verification Task and the C-test. In summary, the findings indicate that L2 prosody production is not affected by CI use. Furthermore, L2 prosody production is not related to hearing age, language proficiency and language processing. For many years, it was thought that despite improvement in speech of individuals with hearing loss as a result of a CI, they would not be able to produce speech sounding similar to NH peers. However, results from the current study would suggest otherwise: L2 prosody production in adolescents using a CI seems comparable to that of NH peers. The current findings therefore underline the great benefits of CI use for individuals with hearing loss on speech and hence, quality of life.

The impact of noise-induced hearing loss on the hippocampus in adult Wistar rats

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In recent years scientists have started to uncover serious health problems that often accompany hearing loss in people. Among these are anxiety and depression, but also cognitive decline. The underlying neurobiological mechanisms that link hearing loss to these social and cognitive problems remain largely unknown. This project is part of a larger study, in which we have already shown that cognition was impaired in a rat model, which had undergone noise-induced hearing loss (NIHL) at four weeks of age. At six weeks of age, these rats showed elevated auditory thresholds to 16 and 32 kHz. In the current study, the goal is to find out whether NIHL had an effect on the hippocampus of these rats as well. The hippocampus is a neural structure in the medial temporal lobe that is vital to many cognitive functions. It is also a major site for neurogenesis in the brain, and is known to play important roles in learning, memory, mood and spatial navigation. We hope to answer the following questions: Do NIHL rats have a smaller hippocampus size than control rats? And do NIHL rats show a lower amount of neurogenesis in the hippocampus? We make use of a cresyl-violet staining to determine the size of the hippocampus, and a DCX staining to determine the amount of neurogenesis. Hippocampal size is not expected to differ between groups, based on current literature. Furthermore, it is expected that NIHL rats show less neurogenesis than control rats (Kraus et al., 2010). By tackling these functional questions we hope to find an anatomical transformation that is mediated by NIHL. If we find such a change, we open up a way to new interventions that can prevent further damage from NIHL, and new forms of therapy to treat people with hearing loss in a more specific manner.

Sensory processing and social behavior in a conditional PCDH9 reinstatement mouse model

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Sensory processing is a complex task often affected in neuropsychiatric disorders and may contribute to social interaction deficits observed in such disorders. However, not much is known about the underlying neurobiological mechanisms of sensory processing dysfunction. One genetic factor of interest is the expression of the protocadherin 9 (*Pcdh9*) gene, which is implicated in the development of sensory-related circuits and has been associated with Autism spectrum disorder. This study investigated basic sensory functions and social recognition in conditionally mutated mice to examine whether localized *Pcdh9* expression in layer 6 corticothalamic neurons is necessary and sufficient to rescue the phenotype observed in *Pcdh9* deficient mice.

Localized gene expression was achieved by using the Cre-lox system in combination with the Ntsr1 promoter specific to layer 6 corticothalamic neurons. Behavioral assessments were performed for general and specific olfaction, sensory gating, and social recognition. We expect to find no differences in olfaction between all experimental groups since olfactory processing is largely independent of the thalamus and should therefore not be influenced by the development of corticothalamic projections. However, sensory gating and social recognition should be impacted by the aberrant development of corticothalamic projections associated with *Pchd9* deficiency. Furthermore, we expect this phenotype to be partially rescued in layer 6 *Pcdh9*-reinstated mice.

This study further establishes *Pcdh9* expression as a genetic factor contributing to sensory processing dysfunction, which links the gene to several neuropsychiatric disorders. Furthermore, it highlights the relation between sensory processing and social interaction deficits. If results are in line with our expectations, this would suggest that the aberrant development of corticothalamic projections is a crucial component of sensory processing dysfunction.

Passive exercise as a therapeutic intervention for sleep deprivation:
An exploratory study

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BACKGROUND Sleep deprivation (SD) is considered to be a modern plague on society. The repercussions of SD not only render individuals inept to maintain a functionally- and socially demanding life, but also increase the risk of developing certain diseases. Prior studies have shown that a brief period of SD negatively impacts spatial memory; intriguingly, engaging in regular active exercise prior to one night of SD did not alter spatial memory. However, as not every individual is able to engage in active exercise, passive exercise such as whole-body vibration (WBV) could be an alternative. Moreover, WBV could be implemented at one's convenience due to its straightforward design principle. *METHODS* Male C57BL/6J mice will be divided into 4 groups: pseudo-WBV (placed on platform without vibrations), WBV, pseudo-WBV + SD, and WBV + SD. All groups will receive two daily sessions of 10 minutes for five weeks of their respective treatments. After the acquisition trial of the object location memory task (OLM), the mice will be sleep deprived for 6 hours via the gentle stimulation method. After 24 hours, the integrity of the animals' spatial memory will be investigated. *EXPECTED RESULTS* It is postulated that pseudo-WBV + SD would score the lowest on the OLM task, WBV would score the overall highest, and WBV + SD would not be significantly different from pseudo-WBV. *OBJECTIVE* This study could provide an innovative and non-invasive intervention to counteract the behavioral and cognitive drawbacks of SD. Therefore, the aim is to elucidate whether regular passive exercise could offset the negative effects of SD on attention, mood, and learning & memory. The consolidation of the animals' spatial memory will be assessed after a night of SD with the help of the OLM following a 5-week WBV intervention.

The Effect of External Challenge on Eating Behaviour in Decelerated and Linear Eaters

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External challenges such as distracted or fast eating can overrule our physical hunger signals in terms of overeating. But maybe not for everyone: people being prone to eating disorders often have a linear eating pattern by eating at a constant rate along with a reduced food intake in contrast to healthy decelerated eating. In addition, there might be gender differences in eating behaviour and risks for disorders in general. Until now, it remains unknown how and why external challenges affect eating behaviour differently across individuals. Therefore, the current study aims to investigate the effect of external challenges on eating behaviour in decelerated and linear eaters and see whether disordered eating types and gender might mediate this relationship. To investigate, the innovative Mandometer computer system was used to record food intake, duration and eating rate with its scale beneath the plate. For the control condition, voluntarily recruited subjects were first served lunch with the Mandometer scale beneath. Disordered eating was measured with the Dutch Eating Behaviour questionnaire. In the speed challenge condition, the subjects were asked to speed up their eating rate by 35 % compared to the control condition. In the mindless condition, the subjects were exposed to a movie while eating. It was expected that both external challenges are related with a higher food intake for males compared to the control condition, but lower for females along with a more linear eating pattern and a higher risk towards disordered eating. The upcoming findings have important implications by identifying potential risks of external challenges on eating behaviour and by whom these should be particularly avoided. Thereby, the development of eating disorders in non-clinical populations can be prevented by learning how to eat in a healthy way, namely through the avoidance of external challenges and unhealthy eating patterns.

An Eye for Change: Visual Plasticity in African Cichlids

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Phenotypic plasticity allows organisms to adjust their phenotype to environmental conditions without requiring changes in genetic coding sequence. In the visual system, such adjusting to ambient light conditions occurs via altering the expression rates of opsins, proteins that determine photopigment wavelength sensitivities. The degree to which a species is thus visually plastic is theorized to be related to its feeding ecology, seasonal variation in light conditions, and phylogenetic species richness. However, empirical research on this relationship has been scant. We here assessed plasticity in opsin expression in three African cichlid fish from Lake Victoria and Lake Tanganyika. 30 adult fish of each species were placed in three artificial light environments (blue-shifted, red-shifted, broad-spectrum) emulating spectral conditions encountered in the wild. After one month, the fish were sacrificed and their eyes dissected. We then used quantitative real-time PCR to estimate relative retinal expression levels of six cone opsin genes. This work is ongoing; gene expression levels will be compared between light conditions and between species to evaluate each species' degree of visual plasticity. We expect to find higher visual plasticity in species following a generalist diet, experiencing stronger seasonal variation in lake conditions, and descending from more species-rich lineages. The project will provide insight on ecological, environmental, and phylogenetic factors associated with phenotypic plasticity. Later, data from this project will be fed into a larger PhD project aiming to elucidate the relationship between visual plasticity and speciation rate in African cichlids.

Neurobiological correlates of female dominance ranking in mixed-sex social rat colonies

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Majority of humans face varying degrees of stress daily [1]. The stress is also psychosocial in nature due to our complex social structure [2]; one of the most critical social stressors is derived from interpersonal relationships, which are based on individual's hierarchical position within society [1]. The Visible Burrow system (VBS) is commonly used in the laboratory to capture the psychosocial nature of stressor and dominance hierarchy among animals [1]; the subordinate rodents are continuously exposed to stress and there are also behavioral, physiological and neuro-morphological alterations that occur during the VBS housing [1]. One of the most prominent alterations is the dendritic spine alterations: hypotrophy of neurons in the hippocampus and the medial prefrontal cortex and hypertrophy of the amygdala [3]. What is known about the effect of chronic social stress based on dominance hierarchy is largely based on male rodents. Unfortunately, not much is known about the role of females in dominance hierarchy nor in social groups [4,5]. The tendency to apply data obtained from male directly to female is problematic since increasing studies have shown that there is a large discrepancy in how the two sexes respond to stress [4,6]. In my projects, rodents were placed in the VBS for 10 days. The dendritic spines were analyzed using a BX61 microscope and female estrous cycle was analyzed using microscopic Giemsa staining. My study aims to shed a new light how stress also influences females, the importance of including females (different levels of estrogen) in studies and I have also hypothesized that the dendritic alteration we see in rodents will be due to the circulating estrogen rather than stress since estrogen have shown directly alter the neuro-morphology of different brain regions, which also seems to have a neuroprotective effect [6].

Neural States of Working Memory: Integrating Activity-Based and Activity-Silent Neural Mechanisms in a Large-Scale Spiking Neuron Model

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BACKGROUND Consensus regarding the neural correlate of working memory (WM) has recently shifted from considering persistent neural activation to underlie WM to the idea that activity-silent mechanisms such as short-term synaptic plasticity can maintain WM information in the absence of a continuous neural trace. Persistent activation may track the focus of attention rather than WM content per se, leaving unattended WM content for storage in activity-silent states. *OBJECTIVE* Using computational neuron models, activity-based and -silent WM mechanisms are explored with the ultimate goal of developing an integrated spiking neuron model that accommodates attended and unattended information in WM by flexibly utilizing appropriate neural mechanisms. *METHODS* We modified Pals and colleagues' (2020) activity-silent spiking neuron model to utilize activity-based WM mechanisms: to achieve activity-based maintenance of WM content, a persistent-activity-model feeds activation back to itself via a recurrent connection, whereas a reactivation-pulse-model receives generic external reactivation in the alpha frequency range. Models were used to simulate Wolff and colleagues' (2017) study, which required WM maintenance of information while manipulating the direction of attention, and the human (cross-temporal) decoding patterns were compared to model patterns. *RESULTS* Compared to human data, the persistent-activity-model shows weaker overall decoding and a loss of precision, suggesting that too much noise is introduced over time. While fitting aspects of the human cross-temporal decoding patterns better, the reactivation-pulse-model distorts the pattern over time, leading to chance task-performance. *CONCLUSIONS* Neither explored WM mechanism fits human task performance and (cross-temporal) decoding patterns. The results are in line with evidence suggesting a link between alpha activity and distractor suppression, potentially rendering our reactivation pulse a clearance rather than a maintenance mechanism. Given the potential of the reactivation-pulse-model to account for human data, pulses in frequency bands associated with WM maintenance, such as the gamma-band, should be explored before developing an integrated model.

Investigating the interactive effects of value priming and classical conditioning on pro-environmental consumer behaviour

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Global environmental issues concerning climate change and depletion of resources are partly rooted in human behaviour and are paving the way for an unsustainable future. A substantial change in human behaviour is a promising way to address these alarming challenges. Our study focuses on formulating ways to encourage pro-environmental consumer behaviour to address this desired behavioural shift. We use a novel approach of combining methods from the fields of environmental psychology (value priming) and experimental psychology (classical conditioning) to assess pro-environmental consumer behaviour in an online experiment. Using Open Sesame, we programmed an online task with three major components including and in the order of - a value priming message, a classical conditioning paradigm and a 'willingness to pay' task. Our subjects (N= 47) were randomly divided into two groups: the biospheric group was value-primed with environmental/biospheric values while the control group was value-primed with non-environmental/self-direction values. The classical conditioning paradigm common to all participants contained different products (conditioned stimulus), each paired with a different valence of environmental image either positive, negative or neutral (unconditioned stimulus) in a forward conditioning sequence. Lastly, participants were asked to indicate their willingness to pay for each product (in euros). The experiment was presented to the participants as an assessment of visual attentiveness thus it also contained a secondary attentional task. We expect a higher willingness to pay for products associated with positive environmental stimuli in the biospheric group than the control group, indicating a value priming - classical conditioning interactive effect. This interdisciplinary approach creates opportunities for novel strategies to be incorporated not only in the better scientific understanding of pro-environmental consumer behaviour but also in the marketing of sustainable brands and products.

Do Drosophila melanogaster and humans share the same genetic architecture for sociability?

Reuben Rajadhyaksha, Sanne Lamers, Jean-Christophe Billeter

Sociability is defined as the propensity of an individual to participate in non-aggressive activities with conspecifics. This tendency is a fundamental feature across the animal kingdom. Sociability is an imminent part of social behavior. Individuals who have a low sociability score are said to have a higher chance of undergoing neurological disorders like depression, anxiety, and dementia. Recently, a genetic factor to sociability was found in humans. A multi-trait genome wide association study (GWAS) revealed 18 independent loci and 56 gene-wide genes that play a role in sociability in humans. This gives me an opportunity to compare the sociability genes of other animals to that of humans. However, as off yet no comparable studies have been performed in other animals. Therefore, I will try to find the sociability genes of Drosophila Melanogaster in this study. Drosophila melanogaster, or the fruit fly, is one of the most widely used animal model. Since, humans and D. melanogaster have about 50% genes in common. I carried out 3 different behavioral assays on fruit flies to assess their sociability. With these results I will try to identify the genes involved in sociability in D. melanogaster using GWAS. These GWAS results, will then be compared to the genes that were identified as sociability gene in humans. This allows us to identify if genetic pathway for sociability are conserved in humans and fruit flies or they evolved with time.

Effects of hormones on nest defence and parental care in a population of black headed gulls (*Chroicocephalus ridibundus*)

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The challenge hypothesis broadly states that in birds that display biparental care of offspring, after an initial spike of testosterone at the start of the breeding season to promote courtship and mating behaviour, the bird then becomes insensitive to the hormone. This is because testosterone is thought to reduce the levels of prolactin hormone. As prolactin is responsible for the promotion and maintenance of parental care, this is a very important trade off. This study will lend support to the challenge hypothesis specifically in colony birds as most of the early research was conducted in isolated nesters. In colony birds, territory is restricted by space leading to higher levels of territorial-induced aggression which causes spikes of testosterone that, if the challenge hypothesis still applies, may lead to a reduced level of investment in offspring thus potentially leading to a lower offspring survival rate.
40 breeding pairs (80 birds) of *C. ridibundus* will be observed over the course of their breeding season from March to August in our captive colony. Observations on the frequency and intensity of territorial behaviour will be made as well as the frequency of parental care displayed. At the end of the incubation period, birds will be captured, and the levels of testosterone and prolactin measured. We expect to see that birds with a higher level of territoriality will have higher testosterone levels and lower incidences of parental care, conversely, birds displaying lower territorial aggression will display the opposite trend.

The influences of different sleep deprivation conditions on synaptic plasticity in the hippocampus

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Sleep deprivation (SD) is a central issue in current society, where the speed of life is faster of faster than ever before. Previous research has shown that SD has detrimental effects on brain plasticity. After only 5 hours of SD, mice show a drastic decrease in synaptic connections in the brain (Havekes et al., 2016). This decrease in brain plasticity is further linked to behavioural impairments, such as decreased performance in learning and memory tasks. However, another hypothesis in the literature, commonly referred to as the synaptic homeostasis hypothesis (SHY) provides contradictory evidence and states that SD leads to an increase in synaptic connections (Tononi & Cirelli, 2014). One discrepancy between the two findings is a difference in methodology used to keep the mice awake. While Havekes and colleagues use a gentle handling method, where animals are kept awake by tapping on the cage as they show signs of tiredness, Tononi and colleagues use a more active approach and provide the animals with novel objects in order to trigger their natural sense of curiosity. The current study therefore set out to test if this difference in methodology could explain the contradictory findings reported in the literature by directly comparing these two SD methods. We predict that our results will show that we find increased levels of proteins that are indicative of synaptic facilitation for the novelty SD method, whereas we find molecular evidence of synaptic depression for the gentle handling method. These results would thus provide evidence for the hypothesis that the differences reported in the literature about how SD influences the brain could be caused by the way the animals are kept awake. This opens up an interesting new line of research as it suggests that the way we spend our time if we cannot sleep distinctively matters in terms of brain health.

Categorizing Color: The Influence of Color Terms on Visual Working Memory

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Everyday color vision relies both on perception and on visual working memory (VWM). Although both cognitive processes have received extensive scientific attention separately, the interaction between perception and VWM has only recently been a topic of investigation. Recent behavioral studies found that VWM for color imposes a categorical bias on perception: observers typically remember colors as more prototypical to the category they belong to than they actually are. Here, we further examine the mechanisms involved in VWM for color, extending earlier studies that proposed the possibility to infer VWM content from pupil size. Participants were asked to remember and reproduce a color. During the retention interval, colored circles were shown to the participants. We found that the pupil constricts most strongly for new colors that do not match the color that is maintained in VWM. Later in the pupil response, the effect shifts to the opposite direction: the recovery of the pupil to its original size is slower for memory-matching compared to non-matching colors. We found no effects of color category on pupil size: colors that were in the same category as the color maintained in memory resulted in the same response as colors that did not match this category. These results are important in two ways. First, in line with earlier studies, they show that it is possible to use pupil size to infer memory content. In addition, they better show the complex nature of these effects by demonstrating the differences between early and later pupil responses. Second, by showing no color category effects on pupil size, they contradict the importance of color categories for VWM. These findings enhance our understanding of the relation between pupil responses and VWM content and of the effects of color categories on perception, opening the way to the further examination of these effects.

D - ABSTRACTS

Role of auditory input on endbulb morphology in the naked mole rat

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BACKGROUND Sensory input shapes circuitry in the brain, the influence of this has been most extensively studied using applied sensory deprivation. Reduced hearing abilities in cats and mice were shown to drive changes that already manifest in the cochlear nucleus. *QUESTION* Exactly how input is related to changes in subsequent brain regions is unclear. This project takes advantage of a unique model species, the naked mole-rat (Heterocephalus glaber), which exhibits elevated auditory thresholds, poor frequency selectivity and limited ability to localize sound, in order to examine the influence that auditory input imposes on brain circuitry. *METHODS* Serial section transmission electron micrographs were used to 3D-reconstruct endbulbs of Held in the cochlear nucleus of naked mole-rat. A total of 54 endbulb profiles from 3 animals were reconstructed. Mitochondria volume fraction and features of synaptic architecture, including number and shape of postsynaptic densities (PSD) and number of docked vesicles were quantified. *RESULTS* Naked mole-rat endbulbs were similar in size to values reported in other species, including mouse and cat, reaffirming the high degree of evolutionary conservation in this region. Size and shape of PSDs were not indicative of any apparent deafness associated changes previously reported in the cat. A correlation was found between endbulb profile size and number of PSDs. Further work is ongoing to determine how these parameters are related to each other. *CONCLUSION* Current findings suggest that naked mole-rats, despite their elevated auditory thresholds, do not exhibit changes in synaptic ultrastructure characteristic of congenitally deaf animals. This suggests that reduced auditory input has a diminished impact in the cochlear nucleus of naked mole-rats. These findings could help identify potential mechanisms in the naked mole rat that could be used to prevent neuroanatomical changes triggered by reduced auditor input in other animals including humans.

Object and Boundary-Vector Coding in the Human Brain: **Development of a New Spatial Task for the Detection of Early Entorhinal Cortex Changes in Alzheimer's Disease**

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Alzheimer's disease (AD) is marked by the pathological accumulation of proteins that cause progressive neuronal damage, which is followed by cognitive deficits such as spatio-navigational impairments and episodic memory loss of the patients. When assessing a patient's state of disease, primarily memory loss has thus far been exploited as a cognitive marker. However, the AD-specific decline in spatio-navigational abilities might have the potential to be superior in differentiating it from other forms of dementia or the healthy ageing population and to detect pathological changes already in preclinical stages of the disease. The spread of neurofibrillary tangles, neurotoxic proteins of AD pathology, originates in the entorhinal cortex (EC), a region highly relevant for spatial navigation. A link from early pathological changes in the EC to a navigational phenotype of preclinical AD patients would therefore provide a useful cognitive tool to advance current diagnoses procedures towards a more specific and earlier detection. This requires a better knowledge about the functioning of navigationally-tuned cell types in humans. The objective of this work was to develop an experimental paradigm in virtual reality that could be used to evaluate the spatial-navigational performance, particularly the object and boundary-vector coding, of healthy controls and AD patients. In the current study with healthy participants, it is expected that a smaller object size, a larger distance and a larger facing angle to the object would decrease pointing accuracy towards it. These hypotheses build on earlier findings about navigational strategies and spatial cells in rodents. The developed task can be adapted to be used during fMRI, thereby providing insight in AD-dependent changes of brain activity during navigation. Prospectively, this project could help to establish whether object or boundary-vector coding deficits are present in AD and contribute to a more detailed understanding of the spatial functions associated with the human EC.

Visualizing the visually impaired: Reliability of anatomically estimated visual areas and their use in connective field modeling

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In understanding the functioning of the brain, one has to know how neuronal responses in one brain region can be influenced by neuronal activity from another brain region. These cortico-cortical interactions can be assessed by connective field (CF) modeling. When applying this CF approach to the visual cortex, visual stimuli are commonly used to manually determine the distinctive visual areas. Since visually impaired people have difficulties perceiving these visual stimuli, it is difficult to differentiate these areas in the visual cortex. One solution is defining the visual areas based on anatomical data. But, how reliable are anatomically estimated visual areas compared to the manually drawn ones based on stimuli-driven data, especially when used in CF modeling? This question will be addressed using resting state functional magnetic resonance imagesfrom 18 primary open-angle glaucoma patients (e.g. visually impaired) and 18 age-matched healthy controls. The expectation is that the anatomy-based visual areas do not differ significantly from the ones based on stimuli-driven data in the healthy controls and can thus be used in CF modeling. However, there might be a difference found in glaucoma patients, because their visual areas are difficult to determine based on stimuli-driven data as they lack visual perception. Therefore, the anatomy-defined visual areas can be preferred in this population. In conclusion, anatomically estimated visual areas are reliable and can be used in CF modelling approaches. Defining anatomy-based visual areas is not perception driven, so it works in visually impaired populations too. This can be beneficial in a clinical setting, for example to assess whether the visual impairment is due to a problem in the eye, the brain or both, which subsequently contributes to determining the route of treatment. Moreover, the approach is automated and thus less prone to human error. Ultimately, it will open a new line of research into determining the cortico-cortical connections in all kinds of visually impaired populations, and even contributes to answering person-specific clinical questions.

Exploring the role of zinc transporters in the pathogenesis of multiple sclerosis

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INTRODUCTION Multiple sclerosis (MS) is an autoimmune-mediated disorder characterized by myelin sheath destruction and oligodendrocyte (OLG) death, ultimately leading to neurodegeneration. The etiology of MS is not fully understood, however, is hypothesized that toxic intracellular zinc (Zn) accumulation in neurons and OLGs may mediate the pathology. The project aims to characterize Zn transporter (ZnT) expression in primary oligodendrocytes (OLGs) and (reactive) astrocytes and to investigate whether modulating Zn levels will interfere with cell maturation and behavior. *METHODS* A database analysis was used to identify the expression of Zn transporters in CNS resident cells. Ten ZnTs were selected and their expression analyzed using qPCR. LDH/MTT assays were conducted to assess the cytotoxicity of ZnCl2, DTPA and TPEN, as well as their effects on the viability of cells. Appropriate concentrations were chosen to model the effect of excess Zn (ZnCl2), decreased extracellular (DTPA) and intracellular (TPEN) Zn levels on the maturation of OLGs and reactivity of astrocytes. Effects were assessed with MBP staining for OLGs and GFAP staining and Western Blot analysis for (activated) astrocytes. *RESULTS* Four members of the SLC30 and five members of the SLC39 ZnT family were identified as relevant. qPCR data suggests that there is higher expression of SLC39A1 in reactive cortical astrocytes and SLC39A12 in reactive non-cortical astrocytes; expression levels in OLGs have yet to be determined. Concentrations of ZnCl2 100uM, DTPA 1uM and TPEN 0.1uM were chosen for the OLG maturation assay and astrocyte reactivity stainings. MBP staining results suggest that TPEN treatment throughout development or during the immature stage decreases myelin sheath formation; GFAP staining and WB results have yet to be analyzed. *CONCLUSION* Intracellular Zn depletion negatively affects OLG maturation and myelin sheath formation and may have an impact on astrocyte reactivity, which could indicate a role of Zn in the pathogenesis of MS.

The influence of social stress and glucocorticoids on circadian organizations in peripheral tissues in mice

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Many mechanisms within our body are regulated by circadian rhythmicity e.g. activity but also the rhythm of peripheral organs. Thereby, the suprachiasmatic nuclei functions as endogenous clock within the brain and is known to synchronize these rhythms within the body via the hypothalamus-pituitary-adrenal axis. Additionally, CLOCK genes such as Per2 play a crucial role in these processes and can be observed in peripheral tissues. Since stress is known to disturb this circadian rhythmicity, we conducted this study to examine the effects of stress as well as glucocorticoids on activity and circadian rhythmicity in peripheral tissues. For the first experiment, we compared mice after five days of chronic social defeat stress (SD) with a control group in running wheel activity and the circadian PER2 expression within liver and white adipose tissues (WAT). Thereby, the SD mice showed significantly lower running wheel activity during the stress condition compared to the control mice and the baseline measurement. Moreover, the PER2 within the WAT showed a significantly longer phase as well as a later second peak for the SD mice. During the second experiment, mice received adrenalectomy or sham surgery to investigate the effect of different corticosterone level (natural, none, high and low) on running wheel activity and the circadian PER2 expression within liver and lung tissues. Resulting from that, mice with a higher corticosterone level showed lower running wheel activity compared to other groups. Furthermore, within the lung, analysis revealed longer phases and a later second peak for none compared to natural corticosterone level. Also, an earlier second peak for a low compared to a high level within the liver could be found. Concluding from this, stress as well as a high corticosterone level seem to determine physical activity in addition to influencing the circadian rhythmicity of peripheral tissues.

The neural mechanisms of positive fantasising to prevent relapse in depression: An EEG study within the MINDCOG trial

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Major Depressive Disorder (MDD) is a disorder often characterised by relapse and remittance. While Preventive Cognitive Therapy (PCT) has been found effective at reducing relapse rates in individuals with remitted MDD, little is known about the mechanism of action of this cognitive intervention. Emotion regulation has been hypothesised as a potential target of PCT, as individuals with (remitted) MDD are more likely than controls to use maladaptive emotion regulation strategies, and use of such strategies increases relapse risk. The current research aims to find out whether an intervention based on positive fantasising, a core aspect of PCT, has a positive influence on neural markers of implicit emotion regulation. A mixed group of 15 participants with remitted MDD and healthy controls followed a week-long positive fantasising intervention. Before and after the intervention participants completed an implicit emotion regulation task, and EEG was used to record their Late Positive Potential (LPP) response. Preliminary results (with N = 12) show that there is a near-significant reduction of the LPP after the positive fantasising intervention ($p = .057$), but no differential effect on positive, negative, and neutral stimuli was found. Furthermore, the intervention had no significant effect on participants' scores on the Positive and Negative Attitudes Scale (PANAS). Further analyses are still being done on differential effectiveness of the intervention, with the expectations that high trait fantasising increases trait effectiveness while high levels of perseverative cognition decrease it. Results thus far suggest that positive fantasising has little impact on implicit emotion regulation beyond a general habituation effect, but the intervention also failed to reduce participants' negative attitudes or improve positive ones. This contrasts with earlier findings on the effectiveness of PCT, and may suggest that it is necessary to follow the entire PCT intervention to experience benefits.

Impact of MOAG-4 on *in vivo* polyQ aggregation kinetics

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A small group of neurodegenerative disorders called polyglutamine disorders are characterized by the aggregation of cell endogenous proteins due to the genetic expansion of their polyQ tract. The longer the expansions, the more prone the proteins become for aggregation and the faster the pathology develops. *In vitro* studies have revealed a lot about the molecular mechanisms behind such aggregation-prone proteins by globally fitting kinetical data to mathematical models describing the process of aggregation. This biophysical approach has helped us to understand the mode of action of a plethora of interaction partners in the cell including the evolutionary conserved protein SERF/MOAG-4 who, interestingly, promotes the formation of aggregates of amyloidogenic proteins in the cell. However, the environment of a cell in a living organism is drastically more complex than of a test tube, raising the question whether here the same biophysical principles will hold up. In this study, we utilized *C. elegans* to study the aggregation kinetics of fluorescent tagged polyQ proteins *in vivo*. We especially focused on the impact of MOAG-4 and how it affects the method of aggregation of polyQ in the cell. We expect, based on previous *in vitro* data, that MOAG-4 will impact the biophysical parameters describing aggregation such as the nucleation order and rate constant. Moreover, we believe that MOAG-4 will impact the morphology of the aggregates and to show different behavior when under or overrepresented in the cell. Regardless of the outcome, the work from this study will describe the kinetics of polyQ aggregation (with and without SERF/MOAG4) in a setup which comes significantly closer to the situation in the polyQ pathologies, thereby bringing *in vitro* and *in vivo* research closer together.

High throughput characterization of agonistic behavior in Danionella Translucida: A newly established model organism in Neuroscience

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Danionella Translucida (DT) are transparent fish and among the smallest living vertebrates with a body length of about 1.2 cm. DT display a rich repertoire of behaviors. They are a social species which forms schools, displays agonistic behaviors, and possesses the ability to vocalize. However, DT behavior remains entirely unstudied. Using quantitative approaches, we study the behavior of DT groups and analyze corresponding vocalization patterns in order to gain insights into the role of vocalizations in this species.

To study DT group behavior, 22-hour video and audio recordings of varying group sizes of males (3, 4, 6, 8, 11, 15 fish; 4 recordings each) were performed in a round arena (25x25cm). A custom-built machine learning algorithm and audio analysis script tracked the coordinates of each fish and analyzed vocalizations. Using tracking data, multiple behavioral measures were extracted. At the group level, this included pairwise distances, duration of pairwise interactions, individual distances to the group's centroid, and speed and heading angle correlations. Using these metrics, schooling, fighting, and chasing behavior were automatically characterized.

Preliminary data analysis (one 11-fish tank) shows that DT groups transition between exploratory and schooling stages, which was detected by comparing far and close mean distances from group centroids (7.33 ± 0.37cm vs. 5.26 ± 0.77cm). Furthermore, preliminary recordings also show that only a small subset of fish pairs engage in fights (3 out of 55 possible pairs). Nevertheless, fighting occurred at multiple timepoints throughout the recording and lasted up to 50 minutes in one instance.

Current work focuses on analyzing these behavioral metrics together with vocalization data. We expect to see a significant correlation between vocalizations and agonistic behavior. These quantitative descriptions of behavior are essential to understanding the role of vocalizations, and can provide valuable insights to inform further studies at the level of neural circuits.

RBP4 and adipose tissue health in mice

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Healthy adipose tissue is essential for maintaining the metabolic health of an animal. In this state it can expand to serve as a nutrient sink hereby protecting other parts of the body like the heart and liver from excess nutrients. One protein that seems to negatively affect adipose tissue (AT) health is retinol binding protein 4 (RBP4). However the current knowledge on this topic is limited especially regarding RBP4 that is secreted by AT. The current study aims to measure markers of AT health (e.g. insulin sensitivity, serum triglycerides, CD11c+ & CD206+ macrophages) in mice and see to what extent AT secreted RBP4 can explain found differences and to see if these effects are independent of AT retinol levels. Four groups of mice (High fat + sugar diet & low-fat diet, individual housing & social housing) will be tested. Giving a comprehensive view of specific interactions between RBP4 and diet/environment and a general insight on the effects of different housing/diet conditions on AT health.
It is expected that RBP4 levels will be strongly associated with the proinflammatory CD11c+ macrophages and that it is independent of AT retinol levels. CD11c+ together with the anti-inflammatory macrophage CD206+ are likely able to explain differences in insulin sensitivity and other markers of AT health. In terms of the different groups socially housed mice and mice on a low fat diet are expected to have a better metabolic profile than the other groups.
This study shows that AT secreted RBP4 is likely to be an important factor in AT dysfunction trough recruitment of proinflammatory CD11c+ macrophages.

Categorical bias in visual working memory in healthy aged people

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Visual Working Memory is defined as the limited amount of visual information that can be maintained when visual stimuli are not visible. Many studies have shown that during healthy aging VWM capacity is reduced and the resolution of representations in VWM declines. The aim of this study is to compare VWM representations in healthy aged adults with those in younger adults, to determine whether older adults show a stronger categorical bias than young adults do, and to what extent the categorical bias of older adults depends on the number of items that they need to remember. In order to complete this project, we collected data from 91 people in evenly distributed age groups, 18-29, 30-59, 60-70. The participants took part in an online task and were recruited through Prolific. In each task a memory display with colored circles was placed evenly in a circular arrangement around a fixation sign. The size of the set was between 1 and 4 memory items. We used a color delayed estimation task, which allowed us the access to categorical and continuous representations of VWM in healthy aged people. We found that VWM representations become progressively more categorical with increasing set sizes as well as with increasing age. In our research gained insight on the representations of working memory in older people which can inform the question if older people's working memory stores more items but tends to be more categorical at the same time. Therefore, we provide evidence that representations in VWM change during the aging process.

Lost connections: Chemogenetic manipulation of forceps minor connectivity and its effect on sociability

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Lowered sociability is a shared symptom across varying neuropsychiatric disorders such as Autism, Schizophrenia Major Depressive Disorder and Alzheimer's disease. Recent human imaging studies in a heterogenous group of patients, revealed an association between lowered sociability scores which were innovatively established by smartphone data, and altered integrity of forceps minor functioning. The forceps minor is a white matter bundle that is part of the corpus collosum and connects left and right orbitofrontal cortices (OFC) in both directions. The objective of this study is to experimentally manipulate forceps minor functioning in mice, to investigate its causal role in social behavior and social sensory related processing. To do this, the forceps minor will be experimentally manipulated in mice by means of Designer Receptors Exclusively Activated by Designer Drugs (DREADDs). By employing a combination of viral vectors, DREADDs will be introduced locally in neurons connecting both OFC's, thereby targeting the forceps minor. Mice will be tested in (social) sensory-related and behavioral assays, as well as in a semi-natural social housing conditions to establish the effect of experimental manipulation of forceps minor functionality on social behavior. Although pilot results are not expected before the end of June, we expect to see decreased social sensory processing and sociability in each of our planned experiments in the future. Taken together, this study will establish whether the forceps minor plays a causal role in sociability and may be the neurobiological substrate of lowered sociability across neuropsychiatric disorders. Since lowered sociability is shown to negatively impact overall health and may contribute to poor disease outcomes, these findings will advance the increasing demand for early diagnosis, treatment options, and pharmacological interventions.

Behavioural and immunohistochemical effects of two different types of sleep deprivation on spatial memory in mice

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Sleep is one of many things that keep our general health in balance. Although the exact function of sleep is still unclear, we know it is crucial for a wide range of functions, of which memory is one. In rodents, the two main methods to study the effects of sleep loss are the gentle handling method for sleep deprivation (SD) and SD by introducing novelty. The latter method, however, has not been used in sleep and memory research. As novelty contributes to memory formation and neuronal plasticity, sleep depriving by using novelty might impact memory differently than SD by gentle handling.

To investigate if novelty modulates the relationship between sleep and memory and to clarify whether or not both methods can be used in this field, we compared the effects of both SD methods on spatial memory.

We subjected male C57Bl6/J mice to an object location task. By sleep depriving the animals between the training and the test phase of this task using either of the SD methods, we investigated how both methods impact spatial memory. Other animals were sacrificed post-SD to study the impact of both methods on the expression of two immediate early genes involved in cognitive processes.

In the behavioural experiments we found that both SD methods impaired spatial memory. Although it seems logical to expect similar outcomes in the immunohistochemical experiment, it is possible that different types of wakefulness impact expression of the genes differently, since both novelty and upregulation of the two genes were associated with increased cognitive performance.

Our behavioural results demonstrated that SD is detrimental for spatial memory formation in rodents, regardless of which method was used. This would suggest that both types of wakefulness influence cognitive processes such as memory similarly. However, results from immunohistochemical experiments might give additional insights into this matter.

The emergence of turn-taking structures in a language game

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Turn-taking is an essential part of human communication. People signal to each other and adjust when to start and stop speaking. In addition, research on experimental semiotics has shown that participants could rapidly establish new signals to make conventions with their partners without using language. However, little research has focused on whether participants will make conventions as taking turns. Here we try to investigate if people could communicate through turns when prevented from using natural language. And if so, whether this kind of created convention is group-specific. We use the Dialogue Experimentation Toolkit(DiET) to implement an interactive game. Participants play the game in pairs: one of the two as the director and the other as the matcher. The director would see a target sequence and inform the matcher how to complete it by pressing keys. Participants are assigned into groups of four. For the training sessions, participants will randomly play with two members of their group. After that, half of the participants will play with the member they haven't met before in the same group, and another half will switch to a partner from a different group. We analyse the sequences they send using cross-recurrence quantification analysis(CRQA). The (expected) results show the participants tend to have similar turns as the communication goes. When they play with members from a different group, the interaction is disrupted compared to within the group since they fail to follow the established conventions. These findings help us better understand how people use turn-taking conventions to coordinate actions through communication.

Molecular Validation of the Dentate Gyrus-CA3 Circuit in Pattern Separation Using Zif268 Immunohistochemistry

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Pattern separation is a hippocampal process that serves to distinguish highly similar episodic memories and is profoundly impacted by sleep deprivation. During pattern separation, the dentate gyrus forwards information from the entorhinal cortex to the CA3 area of the hippocampus, where the input information is encoded as a unique firing pattern of pyramidal cells. Activity in the dentate gyrus during pattern separation tasks has been demonstrated in functional neuroimaging studies, but to date, no involvement of the dentate gyrus at a molecular level has been seen. The present study aims to investigate neuronal activation of the dentate gyrus by measuring the expression of Zif268 in a pattern separation task. Zif268 is an immediate early gene, which serves as a marker for neuronal activity in the DG and is involved with reconsolidation. 18 male C57BL/6J mice are randomly distributed amongst three experimental groups in which the mice perform an object pattern separation task, an object location memory task, or a control task. Immunohistochemistry is performed on the brain slices to determine Zif268 expression in the various areas of the hippocampus. Preliminary data suggests that there are no significant differences in Zif268 expression in the dentate gyrus or other areas of the hippocampus between the pattern separation, object location memory, and control group. Thus, this study does not find molecular evidence for the involvement of the dentate gyrus in pattern separation. These results suggest that the hippocampus may perform its role in pattern separation through mechanisms that are undetectable by investigating immediate early gene expression. Future studies on this topic may further elucidate the molecular mechanisms of pattern separation, in order to improve our understanding of how sleep deprivation differentially impacts pattern separation and object location memory.

The Work on Working Memory: Territories of Theoretical and Epistemic Conflict in the Last Decade (2010-2020)

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Since the term “working memory” (WM) was introduced in the early 1960s, more than 11,600 articles containing this term in the title have been published, proposing numerous WM models. The abundance of empirical studies, rather than amounting to an in-depth understanding of WM, has resulted in a fragmented and vast research area where contradicting theories coexist. This fragmentation may have created more confusion around the phenomenon under investigation than insight, as suggested by the fact that there is no broadly agreed-upon definition of WM within the field. In light of the consequences of this theoretical segmentation, such as cumbersome collaboration and halted theory development, efforts are required in the direction to unifying theories, approaches, and research frameworks. The current research is motivated by these circumstances and comes in acknowledgment of the need for active questioning and analysis of theoretical landscapes. To this end, I discuss the main developments in the field of WM as instantiated in a set of literature reviews and meta-analyses published between 2010 and 2020. Further, I offer a more detailed picture of the field by analyzing WM models discussed in the literature between 2015 and 2020. One of the focal points of this inquiry is outlining territories of theoretical and epistemic conflict (such as the scope, capacity, functions, and implementation of WM) and proposing an integrative framework for future WM research. This work at the intersection of cognitive neuroscience, experimental psychology, history and philosophy of science raises more questions than it answers.