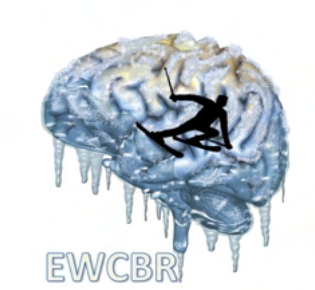
42nd E.W.C.B.R. / E.B.B.S WINTER CONFERENCE
Switzerland, Eurotel, Les Diablerets- January 18th – 25th, 2025

	sat 18/01	sun 19/01	mon 20/01	tue 21/01	wed 22/01	thu 23/01	fri 24/01	sat 25/01
08:00		sympo 1 New models in sleep and health J. Axelsson	sympo 3 Multidisciplinary approaches in translational neuroscience	sympo 5 Economic decision-making	sympo 8 From environmental neuroscience to clinic: Reviewing some environmental pollutants as risk factor for brain disorders	sympo 10 Neuroinflammation & periph-central immune crosstalk in neurological disorders H. Hirbec & G Dorothée	sympo 12 Neural and Behavioral Foundations of Dog-Human Interaction	departure
10:00		L. Balter	B. Frenguelli	C. Baunez	J. Badaut		M. Cordeau	
12:00								
16:00	Registration	sympo 2 Carving up the inflamed brain	sympo 4 Various approaches towards understanding and treating addiction	sympo 6 Voices Across Species: Emotional Comm and Vocal Perception	sympo 9 Social factors and immunity	sympo 11 Molecular mechanisms and neuronal circuitries behind opioid use disorder	sympo 13 Sick Brain: biomarkers of the future	
17:00			M. Naassila	D. Grandjean			N. Rohleder	
18:00		N. Harrison	M. Degoulet	sympo 7 Fatigue, motivation and pain in inflammatory states B. Karshikoff & S. Leknes	L. Hansson	E. Darcq	J. Lasselin	
19:30	welcome apero							
20:00								
21:00			Plenary lecture G. McNally (Sidney, Aus) Punishment: How risk and aversion shape our actions and choices Drinks at the bar		Special sympo Research at threat B. Sabel M Lekander			



SUNDAY 19th January

8:00 AM - SYMPO 1: New models in sleep and health

Chair & co-chair: John Axelsson ; Leonie Balter

In this symposium, each author will present a model or analytical approach that helps us understand and test mechanisms behind sleep/health related outcomes, ranging from everyday social behaviour and mental health to the development of conspiracy beliefs.

Leonie Balter, leonie.balter@su.se, Stockholm University, "Data-driven profiles of sleep, cognitive, and mental health dimensions", This talk will discuss the potential of data-driven analytical techniques for investigating individual differences. I will present data on transdiagnostic symptom pro files that cut across traditional diagnostic boundaries and highlight how integrating multiple cognitive and sleep features within the same individual can provide a more individualised framework for understanding and investigating mental health variability.

Tina Sundelin, tina.sundelin@psychology.su.se, A model for understanding how sleep and social life shapes one another, This talk will focus on the relationship between sleep and social connection, based on several studies on sleep and social perception, motivation, and interaction. The findings from these studies have inspired a new model of how sleep and social life influence one another, a relationship highly relevant for wellbeing. The model is the underlying basis for a planned intervention study on sleep and social connection, which will also be presented.

John Axelsson, john.axelsson@su.se, Stockholm University, How sleep dynamically adapts to facilitate recovery from different stressors, Stress and sleep are biological states that help us survive and thrive, show bidirectional associations, and strongly impact wellbeing and health. While stress is often seen as a primary cause for disturbed sleep, recent advances show that stress also increases the drive for sleep. I will first provide evidence for how different type of stressors shape sleep in specific ways, and that the stress induced alterations of sleep directly promote recovery specifically targeting the needs imposed by the specific stressor. I will thereafter present a model where sleep (through evolution) has become a primary response to different stressors, with the purpose to boost recovery from stress in a dynamic way. Sleep can hence be seen as an important dynamic behavior, promoting specific recovery processes depending on the needs.

Predrag Petrovic, predrag.petrovic@ki.se, Karolinska Institute, Development of COVID-19 conspiracy ideation over time and its consequences, In the present study, we tracked a large cohort of individuals (initial n = 1032) from 2018, prior to the outbreak of the COVID-19 pandemic, through the pandemic period (beginning in 2020), and until the end of 2021, when vaccinations became universally available. During the pandemic, we developed the COVID-19 Conspiracy Questionnaire (CCQ) and found that individuals with higher levels of delusion proneness at baseline were more likely to develop more COVID-19 conspiracy beliefs. Furthermore, our findings indicated that individuals who chose not to vaccinate exhibited greater delusion proneness, and among those who did vaccinate, the time taken to receive vaccination was positively associated with the degree of delusion proneness. Path analysis revealed that delusion proneness was associated with the development of COVID-19 conspiracy beliefs, which, in turn, were linked to the decision not to vaccinate. Additionally, we employed language models to gain deeper insights into the reasons underlying vaccine hesitancy. These findings are discussed within the framework of predictive coding theory of delusions (Petrovic and Sterzer, Schizophrenia Bulletin 2023).

4:00 PM - SYMPO 2: Carving up the inflamed brain

Chair: Neil Harrison

This session focuses on how inflammation impacts neural function and may contribute to various clinical conditions, emphasizing diagnostic and therapeutic innovations. Several presentations investigate systemic inflammation, induced by substances like lipopolysaccharide (LPS), and its effects on brain structures and processes. For example, talk 1 uses advanced MRI techniques to detect inflammation-related changes in glial cells, while talk 4 examines how LPS affects interoceptive processing through fMRI, providing insight into immune-brain communication.

Inflammation's role in altering fear-related neural pathways will be discussed in talk 2, which uses a mouse model of inflammatory bowel disease to show how chronic inflammation may promote maladaptive fear learning. Talk 3, will present data from cerebrospinal fluid (CSF) cytokine analysis in chronic pain patients which reveals an inverse correlation between certain cytokines and pain intensity, hinting at a possible protective role of inflammation in pain processing.

Finally, talk 5 shifts focus to the therapeutic potential of transcutaneous auricular Vagus Nerve Stimulation (taVNS) in managing pain and stress. This method targets autonomic and central pathways, although challenges with protocol variability highlight the need for optimization in terms of stimulation parameters and electrode placement.

Together, the talks underline inflammation's significant impact on the brain and nervous system, with potential

for developing biomarkers and refining interventions to manage inflammation-related neurological and psychological disorders.

Prof Neil Harrison. Cardiff University.

Title: Soma And Neurite Density Imaging (SANDI): A novel method for capturing changes in glial morphology induced by systemic inflammation

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Abstract:Introduction: Systemic inflammation is linked to mental illnesses and neurodegenerative diseases, likely affecting glial cells. Inflammatory changes in glial cells include altered morphology, with an increase in cell body volume and retracted cell processes, which may be detectable via diffusion-weighted (DW) MRI. Previous studies have shown increased diffusion in brain metabolites following low-dose lipopolysaccharide (LPS) injections, which induce inflammation. DW MRI, particularly using advanced models like Soma And Neurite Density Imaging (SANDI), could offer a sensitive biomarker for neuroinflammation. This study explores whether SANDI can detect neuroinflammatory changes in healthy participants after LPS versus placebo administration. Methods: Thirteen healthy adults (mean age 28.8) received intravenous injections of either LPS or placebo in separate sessions. Participants underwent MRI scans four hours post-injection, including diffusion-weighted imaging. Data processing corrected for imaging artifacts, and SANDI maps were created to show soma and neurite density, soma radius, extracellular fraction, and diffusivity. Brain regions were analysed, and changes in SANDI parameters between the LPS and placebo conditions were compared.

Results: The SANDI maps showed good quality across participants. The extracellular diffusivity (De) decreased, and the soma radius (Rsoma) increased in specific brain regions following LPS administration. After adjusting for multiple comparisons, significant reductions in De were observed in the post-central gyrus and superior parietal lobule, while Rsoma increased notably in the anterior insula.

Discussion: The study's findings suggest that DW MRI, specifically with SANDI modelling, is sensitive to inflammation-induced changes in glial morphology. Increased soma radius in the anterior insula supports the idea of cell body swelling, which aligns with the insula's role in immune-brain communication. Limitations include the small sample size and relatively low image resolution, which could affect accuracy. Ongoing analyses aim to further explore the relationship between glial morphology changes and immune responses. Conclusions: SANDI may serve as a valuable, non-invasive tool for assessing brain changes due to systemic inflammation.

Prof Harald Engler. University of Essen.

Title: Functional changes in central fear network in chronic inflammatory bowel disease

Email: harald.engler@uk-essen.de

Abstract:Inflammation has been shown to play a critical role in the pathophysiology of many clinical conditions, ranging from inflammatory diseases to neuropsychiatric disorders and chronic pain. Our previous findings in healthy humans under experimental inflammation and in patients with chronic inflammatory bowel disease (IBD) suggest that recurrent inflammation may lead to structural and/or functional changes in the central fear network, facilitating maladaptive fear learning and memory processes. Here, I will present behavioural and neurobiological data from fear conditioning studies in a preclinical mouse model of IBD (dextran sulphate sodium-induced colitis). Overall, the results confirm and extend our findings in IBD patients at the cellular and molecular level. Consistent with our fMRI findings in patients, colitis mice showed an altered neuronal activation during fear acquisition in key regions of the central fear network including hippocampal (CA1, CA3, DG) and amygdala (BLA, CeA) subregions. This altered neuronal activation pattern was found only after multiple inflammatory hits and not after a single inflammatory bout, suggesting that disease progression is a critical factor driving the fear learning-associated functional brain changes in inflammatory disease.

Prof Eva Kosek. Karolinska Institutet/Uppsala University, Sweden

Title: Cerebrospinal fluid, a window to the human CNS - what can we learn regarding pain, fatigue and sleep.

Email: Eva.Kosek@ki.se

Abstract:Cerebrospinal fluid (CSF) forms a basis of diagnosing different neurological/infectious diseases as it is readily obtained by lumbar puncture. Although it must be remembered that the protein levels in lumbar CSF are influenced by many factors e.g., the integrity of the blood-CSF-barrier, CSF still offers a unique method to assess various pain-related proteins within the CNS. A recent review of cytokine concentrations in the CSF of patients suffering from various types of chronic pain (1) revealed, as expected, that several cytokines (n=21) were rather consistently upregulated, while none were reported to be consistently downregulated compared to controls. However, the associations between CSF cytokine levels and reported pain intensity were unexpected, as many of the cytokines traditionally regarded as key players in chronic pain, based on results from animal pain models (e.g., TNF, IL-1b, IL-6, IL-8, CCL2/MCP1 and BDNF and bNGF), were not consistently associated with the reported pain intensity in patients. Rather, the results from individual studies, that need to be reproduced, show an inverse correlation between many pro-inflammatory cytokines and pain intensity in chronic pain patients, suggesting their possible protective, analgesic effects. The limited number of studies preclude any conclusions regarding the specific roles of certain cytokines in particular types of pain, except supporting upregulation of IL-8 in nociceptive

pain conditions. Finally, in a recent study of chronic pain patients suffering from mainly nociceptive pain conditions, we found evidence suggesting different profiles of proteins related to pain and fatigue, respectively, while no proteins in CSF related to sleep disturbance were identified in our analysis.

1. Rosenström AHC, Konsman JP, Kosek E. Cytokines in Cerebrospinal Fluid and Chronic Pain in Humans: Past, Present, and Future. Neuroimmunomodulation. 2024;31(1):157-172. doi: 10.1159/000540324. Epub 2024 Jul 16. PMID: 39008963.

Prof Kristoffer Månsson, Karolinska Institutet/Uppsala University, Sweden
Title: Interoceptive neural response and inflammatory activation
Email: kristoffer.mansson@ki.se
Abstract: This study aimed to examine the acute neural effects of endotoxin exposure (i.e., lipopolysaccharide, LPS) during an interoceptive task, using functional magnetic resonance imaging (fMRI) to capture neural responses. Twenty-three healthy participants completed four fMRI sessions: one during intravenous administration of LPS (0.8 ng/kg body weight), one during a saline placebo, and two baseline sessions without any exposure. Preliminary data suggest alterations in neural response during LPS administration, indicating a possible modulation of interoceptive processing by immune activation. Further analysis is underway to detail these effects and to clarify how immune signalling might influence neural circuits related to bodily awareness. This work could contribute valuable insights into the neurobiological links between immune activity and brain function, shedding light on mechanisms that may underlie immune-related behavioural and psychological symptoms. Future research may expand on these findings to understand the role of interoceptive sensitivity in immune-related disorders and its potential as a target for therapeutic intervention.

Sigrid Elsenbruch
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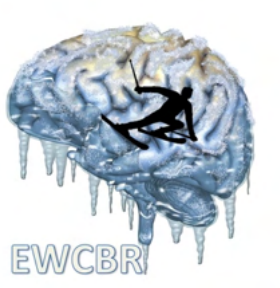
Department of Medical Psychology & Medical Sociology, Ruhr University Bochum, Germany,
Inflammatory Abdominal Pain: From Mechanisms to Modulation along the Gut-Brain Axis

Chronic inflammatory bowel diseases (IBD) and other conditions involving the gut-brain axis, involve complex interactions between inflammatory states, psychosocial factors and recurring symptoms of pain. The specific mechanisms underlying inflammation-related pain and its modulation by psychosocial factors remain incompletely understood, hampering the development of treatment options. This talk will provide an overview into inflammatory vs. non-inflammatory abdominal pain conditions, focusing on how psychosocial factors may shape visceral pain perception and pain-related outcomes in IBD and IBS. It will provide examples into transdisciplinary research approaches, based on patient studies and experimental approaches to better understand visceral pain mechanisms. This includes insights from brain imaging studies that reveal neural correlates of pain processing in different patient cohorts, as well as experimental methods such as lipopolysaccharide (LPS) administration, which enables the study of inflammation-induced pain under controlled conditions. Together, these approaches offer new insights into how inflammation and the gut-brain axis converge in abdominal pain, paving the way for novel interventions that address both biological and psychosocial dimensions of visceral pain.



MONDAY 20th January

8:00 AM - SYMPO 3: Multidisciplinary approaches in translational neuroscience

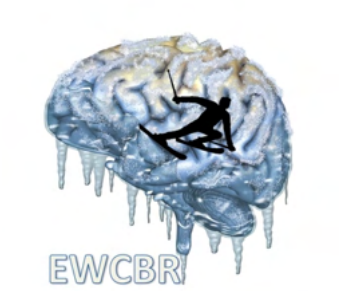
Chair & co-chair: Bruno Frenguelli ; Caroline Herron

The complexity of the brain and nervous system raises questions that can only be addressed via multidisciplinary, multi-technique approaches. This symposium brings together four independent research groups, each asking different questions and each using a variety of tools with which to answer those questions. Frenguelli describes a range of approaches, from in silico molecular modelling through to in vivo physiological recordings, to understand the basis of the highly unusual properties of a novel adenosine A1R agonist in eliciting analgesia in the absence of the well-documented cardiorespiratory depression caused by prototypical A1R agonists. Herron uses electrophysiological, transgenic and proteomic techniques to investigate the actions of cannabinoids in a mouse model of Alzheimer's disease, while Bashir utilizes sophisticated molecular genetic approaches to identify and selectively manipulate engram neurons recruited in recognition memory. Finally, Irving describes the use of electrophysiology, cell signaling, imaging and receptor trafficking techniques to probe the actions of synthetic and endogenous ligands at GPR55. The symposium thus promises to be of general interest through both the questions being asked and the diversity of approaches being used to answer them.

Speakers: Mauchand M., Filippa M. (Mael.Mauchand@unige.ch;Manuela.Filippa@unige.ch)
Neuroscience of Emotions and Affective Dynamics lab, Department of Psychology and Educational Sciences and Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
Emotional and Acoustic Markers of Adults' Perception of Infants' Emotional Vocalizations: A longitudinal view through the emergence of language
A large amount of research focused on behavioral and brain activation to infant's cry as a peculiar signal for triggering caregiving behaviors. Here, we expand the research focus on positive infant affective vocalizations, which can function as innate releasing mechanisms for biologically rooted caregiver behaviors. If a behavioral and neural model of infant cry perception has been defined following a meta-analysis of the numerous existing studies, a similar model on positive (cute) vocalization's perception is still missing.
In Study 1 we will examine adults' emotional responses to infants' affective vocalizations (positive, neutral, or negative) longitudinally, from 0 to 12 months, considering the influence of recipient characteristics such as age, gender, parental status, and psychological traits. In Study 2 we have identified the key acoustic features involved in the affective perception process. Perspectives for future research will also be discussed.
Speakers: Benis, D., Filippa, M. (Damien.Benis@unige.ch;Manuela.Filippa@unige.ch)
Neuroscience of Emotions and Affective Dynamics lab, Department of Psychology and Educational Sciences and Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
Atypical environments, atypical brains: impact of prematurity on auditory development at birth
The impact of atypical early sensory experiences on brain development is striking, shaping neural pathways during critical periods of growth. To investigate the consequences of prematurity on the perception of voice, music, and language at birth, we conducted a high-density EEG study with ten preterm and ten full-term newborns during the presentation of their mother's or a stranger's speech, in both forward and backward order. Time–frequency EEG analysis revealed that preterm infants showed selective responsiveness to stranger voices in both temporal hemispheres but lacked selective brain responses to their mother's forward voice (Study 1). In the second study, 12 preterm infants were exposed to six blocks of auditory stimuli, including maternal singing, a stranger's singing, instrumental melodies, background music, and gamma beats. Results showed that monaural maternal singing enhanced brain synchrony across the scalp, while binaural presentation decreased it, particularly in the frontal region. Gamma beats elicited widespread gamma responses, suggesting potential for restoring brain frequency equilibrium disrupted by immature thalamocortical connections in preterm infants. Maternal singing emerged as a potential key stimulus for brain activity in the neonatal intensive care unit environment.
Speaker: Leonardo Ceravolo (Leonardo.Ceravolo@unige.ch)
Neural underpinnings of the processing and recognition of nonhuman primate vocalizations by humans
Neuroscience of Emotions and Affective Dynamics lab, Department of Psychology and Educational Sciences and Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
In recent years, research on voice processing in the human brain was dedicated almost exclusively to conspecific vocalizations. In the present two fMRI studies, we focused on cross-species processing and categorization of nonhuman primate vocalizations by human participants. Our data emphasize orbitofrontal and inferior frontal activations underlying the probability of correct and incorrect species recognition (study 1), respectively; we also reveal a region of the anterior human temporal voice areas that are selective to processing chimpanzee calls (study 2), a primate species with the most phylogenetic and acoustic proximity to our species, Homo. Taken together, our results add more weight to the hypothesis of a preserved neural substrate between human and nonhuman primates. They also favor the assumption that our last common ancestor with the Pan branch (chimpanzees, bonobos) may have produced vocalizations acoustically closer to those of modern chimpanzees.
Speakers: Thibaud Gruber & Bruno Marcos (Thibaud.Gruber@unige.ch;Bruno.Marcos@unige.ch)
eccePAN lab, Department of Psychology and Educational Sciences and Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
What do we hear, what do they hear? Analyzing how human and nonhuman primates treat primate emotional (and meaningful) vocalizations
The debate on the production and perception of primate vocalizations has been shaped by a dichotomy between emotion and meaning for over 40 years. For example, vervet alarm calls have been seen either as meaningful or reflecting the internal state of individuals, whether producing or hearing the calls. Yet, there is no theoretical reason that makes this dichotomy valid. In this talk, on the one hand, we will summarize how apes understand each other's soft hoo call vocalizations. In particular, we will present evidence that these calls contribute to social cohesion, while possibly expressing a desire of the caller, with the audience reacting accordingly. On the other hand, we will illustrate how humans categorize the emotional content of ape calls, and whether they can classify the emotional content of a vocalization based on their acoustic features. Overall, our cross-specific analysis of vocalization understanding can meaningfully inform debates on the evolution of emotional communication and language.

4:00 PM - SYMPO 4: Various approaches towards understanding and treating addiction

Chair & co-chair: Mickael Naassila ; Mickael Degoulet
The symposium will present research that assess the links between sociability (P de Timary), social context (C Baunez) and substances of abuse consumption. It will also address how neuronal plasticity of the subthalamic nucleus can be a marker of addiction (M Degoulet). Finally, in line with the blooming interest for psychedelics in the context of addiction treatment, the effects of psilocybin, LSD and ketamine on alcohol consumption will be reported.
Philippe de Timary, philippe.detimary@uclouvain.be ; université catholique de Louvain, brussels, Belgium Alcohol, moicrobiota and sociability
Christelle Baunez, christelle.baunez@univ-amu.fr ; Influence of the presence of a peer on cocaine and alcohol consumption: involvement of the subthalamic nucleus and sex influence
Mickael Degoulet, mickael.degoulet@univ-amu.fr ; Subthalamic excitatory signature of compulsive-like cocaine seeking
Mickael Naassila, mickael.naassila@u-picardie.fr ; Psychedelics (psilocybin and LSD) and psychedelics-like (ketamine) to treat alcohol addiction: targeting specific symptoms and brain mechanisms



TUESDAY 21th January
8:00 AM - SYMPO 5: Economic decision-making
Chair: Christelle Baunez
The symposium will present and discuss various approaches to assess decision-making under uncertainty in animals and human subjects
Patrick Pintus ; patrick.pintus@univ-amu.fr ; Specific Sensitivity to Rare and Extreme Events: Quasi-Complete Black Swan Avoidance vs Partial Jackpot Seeking in Rat Decision-Making
Lola Soubeyrand; lola.soubeyrand@univ-amu.fr ; From rat to human: adaptation of the decision-making task with rare and extreme events
Mael Lebreton; mael.lebreton@googlemail.com ; Risky decisions under instructions: neurocomputational dissociation of preference decisions and expected-value maximization
Tobias Kalenscher ; Tobias.Kalenscher@uni-duesseldorf.de ; Steeper social discounting after human basolateral amygdala damage

4:00 PM - SYMPO 6: Voices Across Species: Exploring Acoustical, Behavioural, and Brain Mechanisms of Emotional Communication and Vocal Perception in Humans and Non-Human Primates
Chair : Didier Grandjean

In this symposium we will delve into the intricate study of vocal perception across humans and non-human primates. We will discuss a diverse range of research topics that shed light on the emotional and acoustic dimensions influencing these interactions.
Firstly, Mauchand and Filippa will investigate how adults perceive infants' emotional vocalizations beyond cries, emphasizing positive vocal expressions as potential triggers for caregiving responses. Their longitudinal study examines adults' emotional reactions to these vocalizations over the first year of life, considering variables like age, gender, and psychological traits, while identifying key acoustic features.
Benis and Filippa will provide insights into how atypical sensory environments, such as those faced by preterm infants, impact auditory development. Their EEG studies reveal differences in neural responses to vocal stimuli between preterm and full-term infants, suggesting that maternal singing could enhance neural synchrony, offering potential therapeutic benefits in neonatal care settings.
Leonardo Ceravolo's research focuses on the neural processing of nonhuman primate vocalizations by humans, highlighting areas of the human brain activated during cross-species vocal recognition. His findings suggest a shared neural substrate between humans and primates, offering clues about our evolutionary past and the nature of primate communication.
Finally, Gruber and Marcos will explore the interpretation of primate vocalizations, challenging the dichotomy between emotion and meaning. They will discuss how apes use vocalizations for social cohesion and how humans perceive these calls, broadening our understanding of emotional communication evolution.
Together, these contributions offer comprehensive insights into the complexity of vocal interpretation across species, enhancing our understanding of emotional communication's evolution. In this symposium, we will focus on the complex study of vocal perception in humans and non-human primates. We will discuss a wide range of research topics that highlight the emotional and acoustic dimensions that influence social interactions in the auditory modality.

Speakers: Mauchand M., Filippa M. (Mael.Mauchand@unige.ch;Manuela.Filippa@unige.ch)

Neuroscience of Emotions and Affective Dynamics lab, Department of Psychology and Educational Sciences and Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
Emotional and Acoustic Markers of Adults' Perception of Infants' Emotional Vocalizations: A longitudinal view through the emergence of language
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In Study 1 we will examine adults' emotional responses to infants' affective vocalizations (positive, neutral, or negative) longitudinally, from 0 to 12 months, considering the influence of recipient characteristics such as age, gender, parental status, and psychological traits. In Study 2 we have identified the key acoustic features involved in the affective perception process. Perspectives for future research will also be discussed.

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Neuroscience of Emotions and Affective Dynamics lab, Department of Psychology and Educational Sciences and Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
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eccePAN lab, Department of Psychology and Educational Sciences and Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
What do we hear, what do they hear? Analyzing how human and nonhuman primates treat primate emotional (and meaningful) vocalizations
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9:00 PM - SYMPO 7: Fatigue, motivation and pain in inflammatory states

Chair & co-chair: Bianka Karshikoff ; Siri Leknes

In inflammatory states, fatigue and pain can have a substantial impact on quality of life, adding to the problems from the primary diagnosis. Short-term inflammatory models have repeatedly shown that fatigue and pain increase as part of sickness behavior, and motivations change. The challenge is to translate these findings to relevant clinical populations. In this symposium, fatigue, motivation and pain effects in more long-term inflammation are presented. The effects of cancer, long-covid, IBS and allergy are discussed, and homeostatic imbalances that arise during inflammation.

Marieke van der Schaaf
M.E.vanderSchaaf@tilburguniversity.edu
Tilburg University, Department of Cognitive Neuropsychology, Tilburg School of Social and Behavioral Sciences.

Differential processes drive decision making of effort-expenditure during acute and long-term phases of disease.

Fatigue symptoms are inherent to acute disease, but in some people, these symptoms persist long after infections or medical treatments. These long-term symptoms considerably impact daily social and occupational functioning, as they change decisions to engage in effortful physical or cognitive activities. Specifically, they have been associated with alterations in decisions to engage in activities that involve weighing of the costs (e.g. effort investments) against the benefits (e.g. the experience of pleasure) of that activity. However, how fatigue relates to decision making and whether this is the same during acute and persistent phases of a disease, is currently unclear. Accordingly, we used a well-established computerized online decision-making task to test how fatigue symptoms relate to effort and reward sensitivity during decisions to engage in effortful activities. In two separate studies we collected data in cancer-survivors who received curative chemotherapeutic treatment for testicular cancer 2-10 years ago (study 1: N=49) and in people who had COVID <4 weeks ago, >12 weeks ago, or NO COVID (study 2: N=62/81/90). Results indicate that fatigue in cancer-survivors is associated with higher effort-sensitivity, mirroring changes observed after acute systemic inflammation, (i.e. lipopolysaccharide (LPS)), while fatigue >12 weeks after COVID is more strongly associated with lower reward sensitivity, compared to the <4 weeks and NO COVID groups. These results indicate that differential processes may underly acute and long-term fatigue symptoms in COVID and testicular cancer-survivors and that long-term fatigue after COVID may involve reward-processing deficits. Results will be discussed with regard to current literature on how inflammation affects motivational circuits in the brain.

Siri Leknes
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University of Oslo, Department of Psychology

Does anhedonia result from homeostatic imbalances?

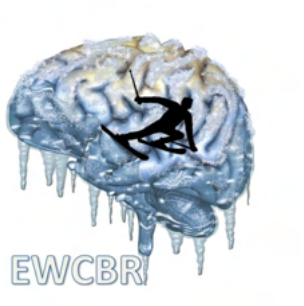
Homeostatic imbalances such as sleep deprivation, sickness or thirst promote motivations that help restore homeostasis, i.e., for rest or drinking. Motivations for other activities are often dampened, a phenomenon that can be called motivational sharpening. The subjective experience of actions is also altered. Alliesthetic processes also come into play, enhancing the reward value of actions that restore the organism to a balanced state. There is however little evidence for hedonic sharpening, i.e., reduced enjoyment of typically pleasurable actions due to homeostatic imbalance. Here, I will discuss the state of the evidence in light of what's known about brain mechanisms of motivation and hedonics, notably hedonic hotspots that are typically localized close to hedonic coldspots in the brain. I will also explore links between motivational and hedonic effects of acute homeostatic imbalances, and persistent anhedonia.

Bianka Karshikoff
bianka.karshikoff@uis.no
University of Stavanger, Department of Social Studies

Seasonal allergy increases stress but not pain sensitivity

Prior research using acute experimental models of inflammation has repeatedly shown that humans subject, like animals, become more pain sensitive as part of the inflammation-induced sickness response. As these effects are short-term, the findings are not easily transferable to clinical populations with long-term inflammation and/or pain. We explored a novel inflammatory model using seasonal allergy as a natural immunostimulant, representing a more chronic inflammation. The Scandinavian four-season climate allowed us to study individuals with seasonal allergies and healthy controls in the spring (in season) and in the fall (out-of-season) in a repeated measures design with matched pairs. Allergic participants (n=23) were not allowed to take any medications during the study. 51 men (n=28) and women (n=23) were subjected to an experimental testing on both occasions. We assessed deep pain sensitivity with pressure pain thresholds, and cold pain sensitivity with the cold pressor test. Subjective stress was assessed with a VAS scale. Based on previous studies, we hypothesized that allergic individuals would be more stressed and more pain sensitive compared to controls, and in the allergic state (in season), i.e. during active inflammation. We could show that allergic participants were subjectively more stressed than controls ($p = 0.015$) overall, but that the stress levels did not differ significantly between seasons in the allergic group. The presence of allergy did not affect the pain measures, either in comparison to controls or due to season.

Prof Henrik Børsting Jacobsen, University of Oslo, Norway
Title: Transcutaneous auricular Vagus Nerve Stimulation (taVNS)
Email: henrbors@uio.no
Abstract:I will explore the therapeutic potential of transcutaneous auricular Vagus Nerve Stimulation (taVNS) in pain and stress, focusing on its mechanisms in inflammation, pitfalls, and the role of frequencies, electrode placement, and bioimpedance in optimizing outcomes. I would begin by discussing how taVNS is thought to modulate autonomic and central nervous system pathways through afferent vagal fibres. Despite promising results, the heterogeneity in study protocols presents significant pitfalls, such as variability in electrode placement and stimulation parameters, which may influence outcomes. I then want to discuss the importance of stimulation frequency and its impact on efficacy, emphasizing that selecting the right frequency range is critical for targeting specific neural pathways. The choice of electrode placement, particularly on the tragus or cymba conchae, will be examined for its influence on therapeutic effectiveness. Bioimpedance will be discussed as a factor in ensuring consistent and effective stimulation. Finally, I want to focus on the differential roles of A and C fibre activity in afferent signalling and their contributions to the therapeutic effects observed in my randomized controlled trial (RCT). Also, how we can understand the cell properties in this kind of space. By understanding these aspects, I think we can refine taVNS application, paving the way for improved clinical outcomes.



WEDNESDAY 22nd January
8:00 AM - SYMPO 8: From environmental neuroscience to clinic: Reviewing some environmental pollutants as risk factor for brain disorders
J Badaut

4:00 PM - SYMPO 9: Social factors and immunity
Chair: Lina S. Hansson

Social factors play a critical role in shaping immune responses and health outcomes. This symposium will explore how cognitive behavioral therapy for health anxiety affects perception of sickness cues, how healthcare provider behavior affects sickness behavior, and how prosocial behavior impacts immune function. It will also examine the links between social connection and vaccine efficacy, as well as the interplay between behavioral disease avoidance and immune system activation. Together, these topics provide new insights into the complex relationship between social factors and immunity.
"Lina S. Hansson, lina.hansson.2@ki.se, Karolinska Institutet & Stockholm University, Sweden

Health Anxiety in a Disease-Avoidance Framework: Effects of Cognitive Behavior Therapy on Disease Perception in Responses to Sickness Cues
Avoidance of disease-related cues and heightened disgust sensitivity are key characteristics of health anxiety. Previous research has shown that individuals with severe health anxiety, compared to healthy individuals, perceive sick individuals as less healthy, more contagious, and more disgusting. However, little is known about how treatments for health anxiety may influence these biases. In the present study, 99 patients with severe health anxiety rated pictures of faces displaying varying degrees of sickness cues and completed a questionnaire on disgust sensitivity. Data were collected during a screening session, as well as before and after cognitive behavioral therapy (CBT). The effect of treatment on disgust sensitivity was analyzed using a paired samples Wilcoxon test. Patients undergoing CBT showed significantly lower disgust sensitivity after treatment compared to before treatment ($V = 3330$, $p < 0.001$). Additional findings on the potential treatment-related effects on the perception of sick faces will be presented at the conference."
"Julie Lasselin, julie.lasselin@ki.se, Karolinska Institutet & Stockholm University, Sweden

Care for me or let me be: a randomized control trial testing the effect of healthcare provider's behavior on sickness outcomes using experimental endotoxemia
Doctor-patient relationship is believed to be crucial for patients' health outcomes. Yet, the way healthcare providers behave is often disregarded, possibly because of the lack of experimental evidence. Here, we used experimental endotoxemia to test the hypothesis that participants being taken care of by a warm and empathic healthcare provider ("augmented" condition) will exhibit lower sickness behavior, compared to participants being taken care of by a healthcare provider limiting interactions with the participant ("limited" condition). We conducted a randomized control trial in which 34 participants (mean age=25, 17 women) were randomized to the "augmented" or the "limited" condition, and received an intravenous injection of lipopolysaccharide (1.0 ng/kg body weight). Participants completed self-rated questionnaires at baseline and every hour up to five hours post-injection, and a questionnaire on quality of care (CARE scale) at the end of the study day. We used linear mixed

models to assess the effect of 1) the “augmented” vs “limited” condition, and 2) quality of care (perfect CARE score vs lower CARE score), on sickness responses after LPS injection. Participants rated the quality of care significantly lower in the “limited” vs “augmented” condition. Participants in the “augmented” condition reported stronger increase in sickness behavior 2h post-injection, compared to the participants in the “limited” condition. Participants who rated their caregiver with a perfect CARE score reported lower sickness behavior and lower physical fatigue at baseline, but stronger increase in these symptoms and in depressive symptoms 2h post-injection. Our findings indicate that limited care during acute sickness might sometimes be beneficial. Our study also supports the notion that the way healthcare providers behave can strongly affect sickness outcomes, even in a highly controlled setting such as experimental endotoxemia."
"Estherina Trachtenberg, Estherina.Trachtenberg@mrc-cbu.cam.ac.uk, Cambridge University, UK

The Effects of Prosocial Behavior During Social Isolation on Neuroendocrine-Immune Status and Behavior in Rats
The COVID-19 pandemic emphasized the critical role of the social environment in public health, with social isolation (SI) and loneliness linked to increased morbidity and mortality. While the detrimental effects of SI are well-documented, the mechanisms by which prosocial behavior influences peripheral immunity remain unclear and underexplored. This pilot study examined the effects of prosocial behavior during SI on neuroendocrine-immune status and behavior in adult female rats. Using a Helping Behavior Test (HBT), rats were assigned to one of three groups: CTRL-HBT (socially housed), SI-HBT (isolated with daily prosocial opportunities), or SI-empty (isolated without prosocial opportunities). Over 20 sessions, SI-HBT rats demonstrated significantly faster door-opening latency, higher door-opening frequency, and greater interaction with restrained rats compared to the other groups, indicating enhanced motivation to help and heightened sensitivity to social cues during SI. SI-HBT rats exhibited less body weight loss compared to SI-empty rats, suggesting that prosocial behaviour may mitigate the stress-related physiological effects of SI. Immunological analyses revealed decreased monocyte and B cell proportions in both SI-HBT and SI-empty groups compared to CTRL-HBT, consistent with SI-induced immune dysregulation observed in our previous findings. In the central nervous system, SI-HBT rats showed altered gene expression, with increased mRNA levels of oxytocin receptor (Oxtr) and serotonin receptor 1A (5htr1a) in the nucleus accumbens (NAc). Additionally, co-expression of Oxtr, dopamine receptor D1 (Drd1), and the immediate early gene cFos was elevated, suggesting enhanced neuromodulatory gene activation during prosocial engagement. These findings indicate that engaging in prosocial behavior may help counteract the negative neuroimmune effects associated with social SI. The results suggest that social engagement could contribute to maintaining immune function and influencing stress-related neuronal pathways. This has potential implications for developing therapeutic strategies aimed at addressing the health impacts of social isolation."
"Stephanie J. Dimitroff, stephanie.dimitroff@umontana.edu, University of Montana, USA

Social connection and immune response to COVID-19 vaccination
Social connection has been shown to be related to the production of antibodies after flu vaccination (Pressman et al., 2005). The current study aimed to investigate whether social connection and loneliness were related to antibody production after COVID-19 vaccines. 166 adults between the ages of 18-60 were recruited approximately two weeks after their second COVID-19 vaccination. Participants completed questionnaires to assess social network size, social support and loneliness, and had their blood drawn. Antibody titers from their COVID-19 vaccination were measured. Results revealed no association between any social variables and COVID-19 antibody levels. These findings are not in line with previous psychoneuroimmunological work that has linked social connection to bettered immune function (Leschak & Eisenberger, 2019). COVID-19 vaccines utilize new mRNA technology that results in significantly higher antibody production than traditional vaccine types (Asderakis et al., 2022); which may explain why any effects of social connection on immune function may be drowned out. As vaccine technology progresses mRNA vaccines may eliminate the effect of social disconnection on lowered vaccine protection."
"Marta Zakrzewska, marta.zakrzewska@ri.se, Research Institutes of Sweden, Sweden

The reciprocal relationship between the immune system, disgust and behavioural disease avoidance: A systematic review of human studies.
Infectious diseases account for more deaths worldwide than all other forms of mortality combined. One evolved response to this threat is the immune system - said to be comprised of two parts. Besides the physiological immune system (which attempts to neutralize invading pathogens) we use behavioral disease avoidance, motivated by disgust and aiming to avoid potential disease-threats. Importantly, there is now evidence to suggest, that behavioral disease avoidance and the physiological immune system may relate to each other - and that this relationship may be adaptive for humans. Disease avoidance may have a complimentary relationship to the physiological immune system - such that exposure to a disgusting-stimulus (pathogen-related) may upregulate immune function, as a preparatory immune response (e.g., increase circulating levels of pro-inflammatory cytokines after seeing spoiled

food). It may also have a compensatory relationship with the immune function, such that that trait levels of disgust (i.e., baseline sensitivity to pathogen threats), may negatively relate to one's baseline immune function. We conducted a systematic review following Prisma guidelines. We searched the following databases: PsycINFO, Web of Science, and PubMed, using keywords and search terms relevant to disgust, behavioural and physiological immune function. Only articles with English language abstracts were extracted. We identified a total of 247 papers (107 duplicates across databases, 140 unique results). Of these, 23 papers (25 studies) were deemed eligible after abstract screening. Of these studies, most (70%) looked at disgust-induced changes in blood levels of interleukin 6 (IL-6), or the salivary levels of salivary immunoglobulin A (sIgA). A small number of studies fond support for the complementary relationship between disgust and the immune system. However, a larger body of research points to no relationship between a variety of cytokines and disgust induction. The review provides inconclusive evidence of the relationship between disgust and immune system activation. We outline the methodological and theoretical aspects that need to be addressed in any future research on the topic."

9:00 PM - SPECIAL SYMPO: Current research at threat

We will describe and talk about the various elements that contribute to put good reliable scientific research at threat. Fake publications, published via paper mills are multiplying those days. The situation and the mechanisms of paper mills will be described by B Sabel. How editors can react will be discussed by B Frenguelli, C Bernard and C Baunez, editors. One major problem related to the publishing issue is the reproductibility of results, that will be discussed by C Bernard. Finally, most treatments related to brain disorders are based on animal research. However, there is a constant pressure on animal research with citie-zen initiatives and political positions towards the phasing-out of animal use on research by 2030. How to react? This will be discussed by C Baunez, chair of the FENS CARE committee.

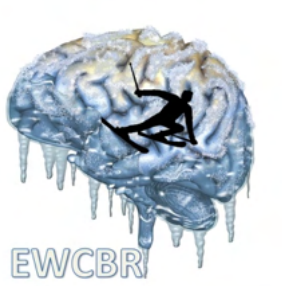
Bernhard Sabel, Otto-von-Guericke-Universität Magdeburg, Germany. "Fake-Publishing in Science - an update". Mechanisms and aims of the paper mills will be presented.

Bruno Frenguelli, univ Warwick, UK "How can editors of established journals react to fake publishing?" The point of view of editors will be presented.Bruno Frenguelli was the Editor-in-Chief of the Elsevier Journal, Neuropharmacology from 2011-2024 and before that acted as an Associate Editor from 2006-2011. During his time at Neuropharmacology he handled nearly 3000 manuscripts and dealt with a number of issues relating to publishing and research ethics. He is now the Editor-in-Chief of another Elsevier journal, Brain and Environment, that he set up and launched at the end of 2024.

Disclosure: Bruno Frenguelli is remunerated by Elsevier for his services as Editor-in-Chief of Brain and Environment and previously for Neuropharmacology.

Christophe Bernard, INS, INSERM & Aix-Marseille Université, Marseille, France "Reproductibility in research"

Christelle Baunez, INT, CNRS & Aix-Marseille Université, Marseille, France "Animal use in brain reserach is at threat: how and why to react?" Chair of the FENS CARE committee (committee on animals in research), I will present the various types of threats we are facing and what fake news circulate to put pressure to phase-out animal research in Europe.



THURSDAY 23rd January

8:00 AM - SYMPO 10: Neuroinflammation & peripheral-central immune crosstalk in neurological disorders

Chair & co-chair: Hirbec Hélène & Guillaume Dorothée

"Neuroinflammation is a common hallmark across most, if not all, neurological disorders, with outcomes that may be either beneficial or harmful depending on the specific context. Microglia and astrocytes, as the brain's primary immune cells, are key drivers of neuroinflammation and play critical roles in disease progression. Although the interactions between central and peripheral immune responses remain incompletely understood, peripheral immune cells are increasingly recognized for their important contributions to disease pathophysiology in multiple neurological disorders.

This symposium will present recent advancements in our understanding of microglial diversity, the interplay between central and peripheral immune cells, and their implications in neurodegeneration. The session will feature five talks from senior scientists, presenting insights derived from both mouse models and human studies.

Hélène Hirbec will share her work combining laser microdissection and RNA-seq to elucidate early microglial responses in Alzheimer's disease mouse models, unveiling potential molecular targets. Michel Bottlaender will highlight the use of [18F]-DPA-714 PET imaging as a valuable tool for understanding and monitoring the profile of central neuroinflammatory responses in neurodegeneration. Guillaume Dorothee will discuss the interplay

between T cell immunity and glial cells in Alzheimer's disease and other Tauopathies, including the therapeutic potential of regulatory T cells, while Etienne Audinat will emphasize similar crosstalk in temporal lobe epilepsy. Concluding the session, Delphine Boche will highlight her research on the central-peripheral immune interplay in human brains affected by frontotemporal lobar degeneration or dementia with Lewy bodies, focusing on microglial and astrocytic responses as well as T-cell infiltration."
Helene Hirbec, Helene.hirbec@igf.cnrs.fr, Institute for Functional Genomics (Montpellier, Fr), Transcriptome remodeling in plaque-distant microglia in Alzheimer Disease: unveiling early targets
Michel Bottlaender, michel.bottlaender@universite-paris-saclay.fr, Unité de recherche en NeuroImagerie Applicative Clinique et Translationnelle (Saclay, Fr), Non-invasive imaging of neuroinflammation in neurodegenerative diseases in human: PET studies using [18F]DPA-714
Guillaume Dorothée, guillaume.dorothee@inserm.fr, Centre de Recherche Saint-Antoine (Paris, Fr), T cell immunity in Alzheimer's disease and Tauopathies
Etienne Audinat, etienne.audinat@igf.cnrs.fr, Institute for Functional Genomics (Montpellier, Fr), Microglia-Tregs crosstalk in epilepsy
Delphine Boche, D.Boche@soton.ac.uk, University of Southampton (Southampton, UK), Cerebral T cells in dementia: human post-mortem studies

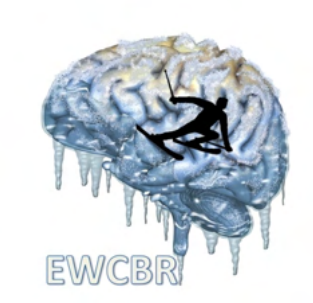
4:00 PM - SYMPO 11: Molecular mechanisms and neuronal circuitries behind opioid use disorder
Chair & co-chair: Emmanuel Darcq ; Marie Eikemo
This symposium will focus on recent advancements in understanding the molecular mechanisms and neuronal circuits involved in opioid use disorder in human and rodents. Presenters will highlight the critical role of specific brain regions and pathways, with an emphasis on the distinct effects of opioids on neural activity, stress-related drug seeking, non-drug reward processing and withdrawal-related negative emotions.

Christian Lüscher will present new research on the μ-opioid receptor (μOR) in various brain circuits. By selectively deleting μORs in specific neuronal populations, Lüscher's team demonstrate how μORs in GABA neurons within the ventral tegmental area (VTA) influence positive reinforcement, while μORs in the central amygdala are crucial for withdrawal symptoms.
Marie Eikemo will explore the impact of acute stress on the abuse liability of intravenous opioids in humans. Using a placebo-controlled, double-blind design, her team observed that pre-drug social stress affects self-administration of oxycodone in healthy men, but not women. The findings reveal a putative mechanism for increased prevalence of opioid use disorder in men and underscore the importance of stress management in preventing opioid misuse.
Zsolt Lenkei will present findings from functional ultrasound imaging studies that reveal large-scale effects of opioids on brain activation and connectivity in awake mice. By mapping "functional fingerprints" of opioid compounds like morphine and fentanyl, Lenkei will showcase how opioids disrupt thalamocortical connectivity and correlate with behavioral outcomes such as analgesia and locomotion.
Vesa Putkinen will delve into the intersection of music and the opioid system, exploring how music activates the endogenous opioid system and modulates emotional responses. Using PET imaging, his research provides novel insights into non-pharmacological ways to influence the brain's reward pathways. Putkinen's results provide the first-ever neuroimaging evidence that listening to pleasurable music modulates MOR system activation.
Finally, Emmanuel Darcq will present the role of habenular opioid-responsive neurons (HbMOR) in the negative affective states associated with opioid withdrawal. Darcq's team will show how HbMOR neurons encode aversion during withdrawal.

Together, these presentations will expand our understanding of opioid addiction's neurobiological underpinnings and reveal potential therapeutic pathways for treating opioid use disorder.
Christian Luscher , Email: Christian.Luscher@unige.ch
Institution: Dept Basic Neuroscience & Clinic of Neurology, University of Geneva, Switzerland
Title of the talk: Deleting μ-opioid receptor expression distinct neuronal populations to parse opioid action
Abstract: Opioids have many effects, mediated by three GPCRs expressed in many brain cells. We use μOR floxed transgenic mouse lines to identify neuronal ensembles in distinct brain circuits. We observe that positive reinforcement is reduced when μORs are deleted in GABA neurons of the VTA, yet withdrawal remains unchanged. Conversely, deleting μORs in neurons of the central amygdala abolishes jumps typically observed during opioid withdrawal but does not affect positive reinforcement. These experiments provide a roadmap to function-specific opioid pharmacology.
Marie Eikemo , Email: marie.eikemo@psykologi.uio.no
Institution: Dept. Psychology, University of Oslo, Norway and Dept. Research and Development, Section for Emergencies and Critical care, Oslo Univ Hospital, Oslo, Norway

Title of the talk: Effects on acute stress on the abuse liability of intravenous opioids in healthy humans
Abstract: Most people will receive an opioid drug at some point in their lives. The rate of addiction following prescription opioid use is alarming. Preclinical, epidemiological, and clinical studies have highlighted stress as a key risk factor for addiction. However, how stress influences opioid effects and use in humans remains unclear. We examined the effects of pre-drug social stress on opioid use in 63 healthy men (N=31) and women (N=32) using a double-blind, placebo-controlled, randomized, repeated-measures design. In each session, participants completed a state induction (stress or control) before receiving a sampling dose of oxycodone (i.v. 3mg/70kg) or saline. The initial oxycodone dose was piloted to produce noticeable effects with minimal adverse consequences. Fifteen minutes later, participants could work to earn up to 125% of the sampling dose during an effort-based self-administration task. The resulting dose was administered ~40 minutes later. Subjective state, physiological and endocrine measures were collected throughout each session. We observed that stress increased oxycodone self-administration by 5 percentage points, with a robust sex difference (16 percentage points). Stress increased self-administration in men only, despite higher stress responsivity in women. Overall, oxycodone induced a high but did not improve mood or cause clear stress relief. Stress-enhanced drug wanting was not related to stress relief or drug liking.
Zsolt Lenkei ,Email: zsolt.lenkei@inserm.fr
Institution: Institute of Psychiatry and Neurosciences of Paris, INSERM U1266, Laboratory of Dynamics of Neuronal Structure in Health and Disease, Université Paris Cité, Paris, France
Title of the talk: Large-scale effects of opioids on neural circuit dynamics
Abstract: Imaging 'fingerprints' of drug action on activation and functional connectivity in the awake mouse brain, a major preclinical model organism, is important both for mechanistic understanding of neuronal drug modulation and for developing and validating novel pharmacological compounds of therapeutic value. Here we used a novel pharmacological functional ultrasound (Pharmaco-fUS) imaging approach, a recently established minimally-invasive, specific and sensitive brain imaging modality, in awake and behaving mouse cohorts. We report that the major opioid compounds morphine and fentanyl produce robust and reproducible changes in dynamic brain activation and connectivity patterns - i.e. functional pharmaco-fUS fingerprints. These fingerprints are dose-dependent, correlated with known pharmacodynamic patterns and sensitive to pharmacological or genetic inactivation. Specifically, we show that opioid drugs robustly disrupt functional thalamocortical connectivity. We also show that functional connectivity and brain perfusion fingerprints are selectively correlated with distinct behavioural read-outs, such as analgesia, locomotion, respiration and analgesia. In conclusion, we propose that the functional fingerprints of neuropsychiatric drugs have a predictive value and may help to accelerate both academic research and drug development.
Vesa Putkinen , Email: vesa.putkinen@utu.fi , Institution: Turku PET Centre, University of Turku, Finland
Title of the talk: Unlocking Aesthetic Reward: μ-Opioid Receptor Activity During Pleasurable Music Listening.
Abstract: The μ-opioid receptor (MOR) system mediates incentive motivation and the hedonic component of primary rewards such as food and sex. However, there is no direct in vivo evidence for the involvement of the MOR system in pleasure derived from aesthetic rewards such as music. We measured MOR activation with positron emission tomography (PET) and the agonist radioligand [11C] carfentanil during the listening of pleasurable music and neutral baseline condition. Haemodynamic responses to pleasurable music were measured using functional magnetic resonance imaging (fMRI). The PET results revealed that pleasurable music increased [11C]carfentanil binding in several cortical and subcortical regions, including ventral striatum and orbitofrontal cortex, known to contain "hedonic hotspots". Individual variation in baseline MOR tone influenced pleasure-dependent haemodynamic responses during music listening in regions associated with interoceptive, sensorimotor, and reward processing. Our results provide the first-ever neuroimaging evidence that listening to pleasurable music modulates MOR system activation and indicate that the μ-opioid system governs complex aesthetic rewards in addition to biologically salient primary rewards.
Emmanuel Darcq , Email: edarcq@unistra.fr
Institution: INSERM, Strasbourg translational neurosciences and Psychiatry (U1329), Strasbourg, France
Title of the talk: Implications of Habenular Opioid Responsive Neurons in Negative Affect of Opioid Withdrawal
Abstract: The mu opioid receptor (MOR) is highly involved in hedonic homeostasis, and the rewarding and negative emotional states linked with opioid use. While the implication of MOR in aversive states is demonstrated, the role of MOR-expressing neurons, which represent the primary cellular target of morphine, is still undetermined. Recently, we investigated the role of these neurons in the habenula (HbMOR), an aversion center, in affective states. We used Oprm1-Cre knockin mice combined with optogenetics and behavioural testing to investigate the consequences of HbMOR stimulation on emotional responses. Our first findings showed that HbMOR neurons encode aversive states in a projection-specific manner (Bailly et al., 2023). We thus hypothesize that endogenous opioid release limits aversive states at the level of the habenula, and that adaptations following repeated opioid exposure lead to a hyperactivity following opioid withdrawal. To test this hypothesis, using fiber photometry in Oprm1-Cre knockin mice, we first measured neuronal activity of HbMOR during blockade of endogenous and exogenous opioid tone by administration of naloxone, an opioid receptor antagonist. We found increased activity

of HbMOR neurons following high-dose (10mg/kg) naloxone administration in a naive state, and low-dose (0.1mg/kg) naloxone in an opioid-dependent state. To then test causality between increased HbMOR activity and aversion, we chemogenetically inhibited HbMOR during conditioned place aversion to high-dose and low-dose naloxone in naïve and morphine-dependent states, respectively. We found that HbMOR inhibition decreased avoidance of naloxone-paired compartments in both naïve and opioid-dependent mice. These findings highlight the role of endogenous opioid activity in limiting aversion at the level of the habenula, and that alterations to this circuitry underlie negative affect during withdrawal from opioids.



FRIDAY 24th January

8:00 AM - SYMPO 12: Neural and Behavioral Foundations of Dog-Human Interaction

Chair: Mélina Cordeau

This symposium brings together cutting-edge research on the neural and behavioral mechanisms underlying the processing of auditory and visual information in dogs, as well as their unique interactions with humans. By exploring diverse methodologies—ranging from diffusion MRI, functional MRI to EEG and behavioral studies—we aim to uncover the intricate networks and evolutionary adaptations that shape canine cognition and communication.

Mélina Cordeau , melina_cordeau@fas.harvard.edu
Evolutionary Neuroscience Lab, Department of Human Evolutionary Biology, Harvard University, Cambridge MA, USA

Cortical connectivity supporting auditory processing in dogs.

Dogs and humans have co-evolved for millennia, offering a unique opportunity to explore neural adaptations enabling cross-species communication. While previous fMRI studies in dogs highlighted activations related to human voice perception, the specific neural pathways involved in processing and responding to human language remain largely unknown.

In this talk, I will present findings from a large-scale diffusion MRI study of 110 dogs across 16 breeds. Using probabilistic tractography, we identified white matter pathways linking temporal regions—key for perceiving communicative signals—with frontal regions involved in generating responses.

Our results detail how these brain regions are connected, both in terms of connection strength and interactions between lobes. Hierarchical clustering further revealed that some regions share similar connectivity patterns, suggesting shared functional roles even without direct connections.

The ectosylvian gyrus, which contains early steps of the auditory processing streams, clusters with prefrontal regions. Meanwhile, the sylvian gyrus, which contains higher-order multimodal sensory regions, clusters with vocal premotor cortex. These results suggest that integration between sensory input, motor output, and higher-order cognitive functions occurs along multiple pathways in the canine brain, highlighting the complexity of this circuitry and its propensity for adaptive behavior in the context of cross-species communication.

Claus Lamm , claus.lamm@univie.ac.at
University of Vienna

Using comparative canine functional magnetic resonance imaging to explore the convergent evolution of social cognition.

Dogs not only share several thousand years of co-existence with humans but also display analogues of many of our advanced socio-cognitive skills. The recent advent of canine functional magnetic resonance imaging provides ever more detailed insight into the neural underpinnings and the possible convergent evolution of these skills. The aim of the talk is to demonstrate the role of the domestic dog as a powerful comparative model species, to provide novel insights into the evolutionary roots of social cognition, and to identify current methodological and technological challenges in comparative canine neuroimaging. Based on a series of comparative canine-human fMRI studies, I will highlight neocortical canine brain areas implicated in visual social perception (face, body, and emotion perception), dynamic action, affective touch, and social interaction observation. These findings provide converging evidence that the temporal cortex of dogs plays a significant role in their socio-cognitive skills.

Marianna Boros
marianna.cs.boros@gmail.com
Neuroethology of Communication Lab, Department of Ethology, ELTE University, Budapest, Hungary

Word representation in the dog brain.

Immersed in the human social and linguistic environment, dogs are exposed to speech on a daily basis and show adequate behavioural reactions to a variety of words. This suggests that word representations can emerge in dogs, however, their nature and the underlying neural mechanisms remain largely elusive. In my talk, I will present convergent evidence from non-invasive, awake EEG and fMRI on the capacity of dog brains to both represent the auditory forms of words and the meanings attributed to them. I will show that dog brains extract words from speech using similar computations and neural structures as humans do, but that auditory word form representations are

coarser-grained in dogs than in humans. I will also demonstrate that word-elicited semantic expectations in dogs can be detected in an N400-like ERP mismatch effect, in brain activities of semantically relevant brain regions, perhaps reflecting embodied meaning processing, and also in a representational geometry organized along semantic similarity in the auditory cortex. Together these findings indicate that the cognitive and neural architecture of word processing in dogs is surprisingly similar to that in humans.
Theophanne Piette
Department of Basic Neurosciences, Faculty of Medicine, University of Geneva, Geneva, Switzerland
Confirmation and abstract to follow.

4:00 PM - SYMPO 13: Sick Brain: exploring biomarkers of the future
Chair: Nicolas Rohleder ; Julie Lasselin

Identifying sick people while sick yourself: a study of identification of facial cues and walking patterns of sick individuals during experimental endotoxemia
Lina Hansson, Karolinska Institutet , lina.hansson.2@ki.se
Humans and other animals are able to detect sick others, but it is not known if the health status of the observer affects such abilities. Detecting sick others while sick yourself might be especially important to avoid contagious others while in a vulnerable state. In this study, participants performed a sickness detection task, once when made acutely sick experimentally and once when healthy. We hypothesized that sick participants, in comparison to when healthy, would be more likely to rate others as sick. Participants (N=35, 18 women) completed a sickness detection task after an intravenous injection of lipopolysaccharide (1.0 ng/kg body weight) and in a healthy condition (control), in a randomized within-subject design. In the task, participants watched photos of faces and video clips of individuals walking (i.e., walkers), obtained from individuals who were either sick (received lipopolysaccharide at 2.0 ng/kg bw) or healthy (received saline). Participants rated each stimulus as belonging to someone sick or healthy. Using binary logistic generalized estimating equations, we analyzed the effect of participant's condition (LPS vs. control), the stimulus condition (sick vs. healthy), and the interaction (LPSxSick stimuli) on ratings (sick vs. healthy), separately for faces and walkers. In both conditions, participants could detect sick faces and walkers above chance level (B(SE)=1.01-1.33(0.09-0.11), p<.001). Participants injected with LPS incorrectly rated more healthy walkers as sick compared to when in the control condition (B(SE)=-0.36(0.12), p<.01), and were thus less good at discriminating between sick and healthy walkers when sick themselves. There was no difference between conditions in the ratings of photos of faces. Our findings suggest that sick individuals may perceive healthy others more often as sick, at least from the way the others walk. This increase in "false alarms" may speculatively be favorable for sick individuals who are in a vulnerable state of sickness.

Expert clinical judgments of sickness
Mats Lekander, Stockholm University and Karolinska Institutet, mats.lekander@ki.se
When care is reorganized and technical tools become available at a fast pace, what is the role of clinical judgement? The present talk will present and discuss the role of global judgments in clinical consultations, and present data on doctors' as compared to lay peoples' accuracy in detecting sickness in others.

The face of sickness- how novel imaging methods reveal acute sickness
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Many people claim that they can perceive if others are acutely ill, such as having the flu, just by looking at them. The look of sickness is also a recurring theme in human art and literature since ancient times. Current research points to several cues being important for the perception of a fellow human as sick or healthy. Among these, posture, gait pattern, facial expressions and- especially- the appearance of the skin seem to have a strong influence on our assessment of the health status of others. However, surprisingly little is known about the physiological mechanisms behind the "look of sickness", and how these mechanisms reflect the systemic immune response upon acute infection. Previous studies indicate that alterations in the cutaneous microcirculation of the face may be a central process for the look of sickness, and that these microcirculatory changes may also convey important information about the circulatory status of the individual.
Thus, in this ongoing study, we plan to include 28 healthy volunteers (age 18-39) who will randomized to receive either bacterial lipopolysaccaride (LPS) at a dose of 0,8 ng/kg body weight to elicit an infection-like inflammatory state on one study day, and saline solution on one study day in a crossover fashion. The microcirculatory response is assessed using several novel imaging modalities, such as laser-doppler based flowmetry coupled to tissue oxygenation, reflectance spectroscopy and hyperspectral imaging. Preliminary results based on approximately 10 subjects indicate that there are several stereotypical changes occurring both in blood distribution and blood flow dynamics in the face upon LPS-administration, and that some of these changes correlate strongly with the facial pallor and fever.

In Sickness and in Health. Microcirculatory changes during inflammation.
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Background: Acute systemic inflammation/infection manifests by physiological responses such as e.g. fever, pain, nausea and increased tendencies of syncope, often connected with a sickness appearance. The physiological responses to inflammatory activation vary greatly between individuals. The knowledge about what causes these differences is sparse, but plausible explanations are variations in sensitivity to inflammation and inflammation-induced brain changes. Positioned at the interface between circulating blood and surrounding tissue, endothelial cells, which line the inner walls of blood vessels, play a crucial role in the response to pathogens. The endothelium serves various functions essential for maintaining organ homeostasis, including vasoregulation, selective vascular permeability, and providing an anticoagulant surface. However, during systemic infection, the normal physiological functions of the endothelium are disrupted, contributing to the organ failure characteristic of sepsis. As the skin is readily accessible, it provides an appropriate site to assess microvascular reactivity during systemic inflammation. Moreover, recent technological advances have provided non-invasive bio-optical methods to assess skin microvascular function. Therefore, human cutaneous circulation could be used as a surrogate marker of systemic microvascular function in inflammation. In the present study, we use experimentally induced immunological activation in healthy humans to study microcirculatory skin changes and individual sensitivity to an acute inflammatory stimulus. Using the model of experimental endotoxemia with a sterile activation of the immune system, obtained by intravenous injection of an endotoxin; lipopolysaccharide (LPS) from E. coli., the functionality of the vascular endothelium is thought to be affected. Novel bio-optical imaging methods can visualize microcirculatory changes in skin during sickness and give us clues to the sickness appearance in infected humans.
Methods: In an ongoing study, double-blind, within-subject cross-over, placebo-controlled, finally including a total of 26 healthy volunteers in the age 18-40, are injected with 0.8 ng/kg LPS. With bio-optical imaging such as MultiFlow (Multi Exposure Laser Speckle Contrast Imaging and diffuse reflectance spectroscopy), EPOS Enhanced Perfusion and Oxygen Saturation), LDF (Laser Doppler Perfusion imaging) and TiVi (Tissue Viability Imaging) oxygen saturation, red blood cell tissue fraction, speed resolved perfusion, red blood cell concentration etc, can be measured in skin in larger areas such as face and sternum. The vascular function is also tested by provocations such as heating of the skin during bio-optical measurement or repeated capillary refill tests (skin pressure of the fingertip and sternum until blanching and then removal of pressure under observation with reflectance spectroscopy of the capillary refill in the skin). Temporal mappings of temperature in face and sternum are also recorded during the study.
Preliminary Results: Capillary refill test seem prolonged (unlike the results in our blood loss simulation model) during acute sickness suggesting different physiological mechanisms in blood loss compared to acute systemic inflammation. Decreased blood flow e.g. on and around the skin of the nose is apparent during the acute sickness period and the skin becomes hyperemic in the resolution phase of the inflammatory reaction. The results imply effects on the vasomotion as well as on the microcirculatory reaction of local skin heating.
Conclusion: Acute sickness, as induced by the experimental sepsis-model, causes changes in basal microcirculation and the microcirculatory reactivity of the skin.
Trial registration: The study was registered on Clinicaltrials.gov identifier: NCT06618716
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In sickness and in health. Microcirculatory changes during systemic inflammation.
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In sickness and in health. Microcirculatory changes during systemic inflammation.

Stress-induced movement inhibition during acute psychosocial stress predicts biological stress responses
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Background: The experience of social-evaluative threat leads to strong physiological and behavioral responses. Individuals exposed to acute psychosocial stress via the Trier Social Stress Test (TSST) show significant reductions in body movements, such as head rotation, upper body sway, and arm movement, compared to a stress-free control condition (friendly-TSST; f-TSST). While these differences can be consistently observed across all individuals, they are characterized by high inter-individual variability, requiring the normalization of movement parameters using the f-TSST as a baseline. This work aims to characterize the temporal characteristics of movement reduction induced by social-evaluative threat using only movement information from the TSST.
Methods: Thirty-nine healthy individuals (41% women) underwent the TSST while wearing a full-body motion capture suit. We extracted movement features for multiple body parts for overlapping signal windows during TSST and used 1-d and 2-d polynomial regression models to operationalize temporal feature changes.

Results: Individuals showed a reduction in head and upper body movements during the TSST. Higher cortisol increases were, among others, predicted by stronger head velocity reduction ($F = 7.039$, $p = 0.012$, adj. $R2 = 0.137$) and stronger trunk entropy reduction ($F = 7.325$, $p < 0.001$, adj. $R2 = 0.333$).
Conclusion: Our study suggests that the amount of movement reduction during the TSST can predict established psychobiological stress responses without the need for an external baseline, providing an important link between objective movement parameters and acute psychosocial stress. These findings can lay the groundwork for using body movements as a novel digital stress biomarker and for predicting other biological changes, such as the inflammatory stress response.