UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE

INSTITUTO DO CÉREBRO

X HOUSE SYMPOSIUM 2025



FROM CODE TO CONDUCT:
THE EMERGENCE OF BEHAVIOR

December, 11 – 12

INSTITUTO DO CÉREBRO
CAMPUS UFRN

NATAL

GREETINGS

It is a great pleasure to welcome you to the 10th House Symposium of the Brain Institute (ICe) at the Federal University of Rio Grande do Norte.

This year's symposium arrives at a particularly promising moment for our Institute. Our research community has secured substantial funding from multiple sources, ensuring the continuity and expansion of our scientific and educational programs in the years ahead.

The recent resumption of federal funding has also enabled us to welcome new researchers to our community, including former students returning as independent investigators. This meeting will therefore be an excellent opportunity to introduce our new colleagues, learn about their scientific interests, methodologies, and projects, and foster new collaborations across research groups.

Our theme this year, *"From code to conduct: the emergence of behavior",* captures well the core questions that motivate much of our research. With this in mind, this year's meeting features 21 scientific talks, including presentations by institute members and invited speakers, as well as 43 poster presentations.

We are especially pleased with the strong participation of Master's and PhD students from PGNeuro (the Neuroscience Graduate Program of the Brain Institute), who will use this occasion to share their latest results and further develop their communication skills. We are also glad to have the funding to award the best poster and oral presentations.

We hope you enjoy the energy of this symposium, made possible by the contributions of everyone who helps make the Brain Institute a vibrant, collaborative, and high-level scientific community.

We wish you a productive meeting, full of discoveries and good moments!

The Organizing Committee

Venue: Auditorium of the Brain Institute (Instituto do Cérebro), UFRN

http://www.neuro.ufrn.br/housesymposium



PROGRAM AT A GLANCE *

DAY 01 – DECEMBER 11

8:00
Welcome / Registration

8:45
Welcome by the Brain Institute's Director Kerstin Schmidt

Topic 1 – Coding the visual system
Chair: Kerstin Schmidt

9:00
Panta rhei: the importance of silent synapses for vision and visual plasticity
Prof. Siegrid Löwel, PhD
Johann-Friedrich-Blumenbach-Institute for Zoology and Anthropology
Göttingen Campus Institute for Dynamics of Biological Networks

10:00
Data blitz 1 (flash talks, 15 min)

10:15
Coffebreak with poster session (session 1)

11:00
Entrainment Dynamics in Early Visual Processing
Sergio Neuenschwander, PhD
ICe-UFRN

11:30
From interhemispheric integration to visual perception
Kerstin Schmidt, PhD
ICe-UFRN

12:00
Peephole: using a psychophysics experiment to teach visual perception
Claudio Queiroz, PhD
ICe-UFRN

12:15
Lunch

Topic 2 – Sound, touch and network integration
Chair: Rêmullo Brenno Galvão de Miranda Costa

14:00
Neural and computational principles of sound source locatization
Rodrigo Pavão, PhD
UFABC

14:30
Touch Without Primary Somatosensory Maps: Decision Making at the Edge of Sensory Loss
Aron Miranda Henriques-Alves, PhD
ICe-UFRN

15:00
Subspace communication in the hippocampal–retrosplenial axis
Joaquin Gonzalez
ICe-UFRN/NYU

15:30
Coffee break with poster session (session 1)

17:00
Higher-order effects of psychedelics: beyond pairwise interactions between cortical regions of the brain
Prof. Gandhimohan M Viswanathan, Ph.D.
FIS – UFRN

17:45
First Chess Tournament

19:00
CLOSING DAY 01

DAY 02 – DECEMBER 12

8:30
Data blitz 2 (flash talks, 15 min)

Topic 3 - Disrupted pathways
Chair: Catherine Caldas de Mesquita

9:00
Cell-type specific molecular and functional consequences of TDP-43 loss-of-function in human induced neurons
Marcos Romualdo Costa, PhD
ICe-UFRN

9:30
Influence of Zika virus infection on the maturation of the cerebral GABAergic system
Bruna Lorena de Melo Marcelino
ICe-UFRN

9:45
Characterisation of a synthetic analogue of psilocin (UL 001): chemical, electrophysiological, and behavioural analysis in a murine model
Mikaela dos Anjos Adur
ICe-UFRN

10:00
Coffebreak with poster session (session 2)

Topic 4 - From experience to behavior

Chair: Flávia Zacouteguy Boos

11:00
A vocal teaching system in marmoset monkeys
Daniel Takahashi
ICe-UFRN

11:15
Ethology as a tool to understand the multidimension of chronic pain
Laura de Oliveira Koren
ICe-UFRN

11:30
Experience-dependent remodeling of the extracellular matrix regulates perceptual skill learning and memory
Jessica Winne Rodrigues de Freitas, PhD
ICe-UFRN

11:45
Pursuing reconsolidation in ethanol-CPP: memory reactivation in different conditions did not trigger destabilization
Flávia Zacouteguy Boos, PhD
ICe-UFRN

12:15
Lunch

Topic 5 – Beyond behavior

Chair: Fernanda Palhano

14:00
Biomarker changes in the treatment of depression with ayahuasca
Abhranil Das, PhD
ICe-UFRN

14:30
Investigating psychoactive tryptamines as stimulators of neuronal plasticity, with a focus on hippocampal neurogenesis
Rafael Lima, PhD
ICe-UFRN

14:45
A smart camera for automatic respiration and reflex estimation in neonates
Aline Elvina Rodrigues Fernandes
ICe-UFRN

15:00
Multisensory activities and school naps to overcome letter mirroring in early lteracy:adaption of a protocol for the classroom
Flora Assaf de Sousa
ICe-UFRN

15:15
Designing Titanium Head-Fixation Prostheses for NHPs Without MRI/CT
Estevão Carlos-Lima, PhD
ICe-UFRN

15:30
Coffebreak with poster session (session 2)

17:00
Dynamics and Evolutionary Transformations of Cortical Circuitry
Prof. Fred Wolf, PhD
Göttingen Campus Institute for Dynamics of Biological Networks
Max-Planck-Institute for Dynamics and Self-Organization

18:00
Closing remarks

18:30
Happy hour @ Mahalila

* The Program at a Glance is subject to change.

ORAL PRESENTATIONS

OP01 - Entrainment Dynamics in Early Visual Processing

Prof. Sergio Neuenschwander, PhD
Vislab, Instituto do Cérebro - UFRN;

Precise timing in neuronal responses has been proposed as an encoding mechanism in the visual system (Meister, 2025). In the retina, this mechanism has been linked to gamma-band oscillations, but these rhythms critically depend on the level and type of anesthesia, particularly halothane and isoflurane (Neuenschwander et al., J. Neurosci., 2023). Here, we investigate how the entrainment of neuronal responses to periodic visual stimulation reveals underlying synchronization phenomena in the retina and lateral geniculate nucleus (LGN) of the anaesthetised cat. We developed a custom visual stimulation system based on concentric LED arrays organized in independently addressable groups, allowing precise control of flicker frequency, luminance amplitude, phase, and duty cycle. Using this system, we found robust entrainment of responses to periodic inputs under ketamine and propofol. This entrainment shares key properties with intrinsic gamma oscillations, including dependence on stimulus size and intensity. The peak frequencies of intrinsic rhythms (3 cats, 60 recording sites; mean 80 Hz, maximum 118 Hz) and entrained rhythms (tested up to 120 Hz) reached values far above the temporal resolution of X- and Y-cells in the cat LGN (12 and 20 cycles/s, respectively; Lehmkuhle et al., J. Neurophysiol., 1980). Interrupting stimulus continuity—through spatial or temporal discontinuities or phase rotations in surround and peripheral flickering stimuli—disrupts entrainment. These results suggest that entrainment of retinal ganglion cell responses relies on an active synchronization mechanism and may follow the same principles as visual binding, indicating that, at the retinal level, it is not oscillations per se, but their synchronization, that is functionally significant.

OP02 - From interhemispheric integration to visual perception

Prof. Kerstin Schmidt, PhD (Visual Lab, Brain Institute, UFRN)

OP03 - Peephole: using a psychophysics experiment to teach visual perception

Claudio Queiroz, PhD
Laboratório Aberto, Brain Institute / UFRN

How do we form a mental image from fragmented visual information? Although visual neuroscience has made major advances in explaining early perceptual stages, students often struggle to intuitively grasp how we transform partial visual inputs into a coherent mental image. Within *Laboratório Aberto*, an outreach program of the Brain Institute, we develop psychophysics experiments that make these processes accessible by providing hands-on, objective experiments for teaching and public engagement in visual neuroscience. Here, we present *Peephole*, an experimental paradigm designed both for research and as a didactic resource for teaching visual perception. Its main goal is to help students experience key properties of visual

scanning and object recognition. In this task, a masked image is revealed only through a movable circular window controlled by the participant, who explores the scene until the object is recognized. Reaction time, exploratory path, and written responses are recorded. To demonstrate the paradigm's potential, we manipulated three image variables: window size (six levels), semantic category (animals, fruits, tools, drawings), and color (colored vs. black-and-white). Volunteers completed 30 sessions. Preliminary results show that recognition time increases with smaller windows and for black-and-white images, underscoring the importance of chromatic cues for image recognition. Exploration trajectories also reveal spontaneous use of Gestalt principles such as closure and continuity. Beyond its research value, the *Peephole* paradigm provides an engaging, intuitive demonstration for teaching and outreach, allowing students to directly experience how the brain progressively integrates fragmented visual input into a coherent mental image.

OP04 - Neural and computational principles of sound source localization

Rodrigo Pavão, Boris Marin
UFABC

Animals determine the azimuth of sound sources mainly using Interaural Time Difference (ITD) cues. In the auditory neural pathways, there are ITD sensitive neurons, whose firing rate is modulated according to ITD (ITD tuning curves). The shape and distribution of these tuning curves vary across animal species and brain regions. In mammalian Inferior Colliculus, firing rate varies gradually across ITD (a rate code based on broad tuning curves which are similar across neurons), while in avians each neuron has a sharp ITD preference (a place code based on narrow tuning curves which are distinct for every neuron). In this study, we investigated general principles through which such different coding strategies (tuning curve placement and shape) may arise. Perceptual encoding can be framed under the efficient coding hypothesis, where stimulus discriminability is optimised. A classic study has shown that, when physiological and anatomical constraints are taken into account, it is possible to obtain tuning curve distributions that are compatible with what has been found experimentally for different animal species, if overall stimulus discriminability is maximised. On the other hand, these results lead to wrong predictions of psychophysical performance in discrimination tasks. We replicated and updated this classic model with a measure of discriminability that takes stimulus variability into account, which led to correct predictions of both tuning curve placement for different animal species, as well as accurate estimates of psychophysical experiments.

OP05 - Touch Without Primary Somatosensory Maps: Decision Making at the Edge of Sensory Loss

Aron Miranda Henriques-Alves, PhD
Brain Institute / UFRN

The contributions of the whisker-related primary somatosensory cortex (wS1) to perceptual decisions remain debated. While wS1 has been linked to stimulus detection, discrimination, active touch, and associative learning, rodents can fully recover performance in simple detection tasks following acute or permanent wS1 inactivation. A prevailing hypothesis suggests that wS1 supports general whisker system operations but becomes crucial as task complexity and perceptual demands increase. The

gap-crossing task offers a suitable model to explore wS1 function in complex decision settings, requiring mice to use their whiskers to locate a distant platform and execute a skilled action to cross the gap for a reward. Previous studies using wS1 ablation in the gap-crossing task often relied on partially sensory-deprived animals to facilitate experimental control, potentially masking the influence of cortical remapping in skill recovery. To address this limitation, we induced bilateral wS1 lesions before and after task learning in full-whisker mice. We used machine learning–based tracking tools to characterize gap-crossing behavior and assess resulting behavioral deficits after wS1 lesions. Full-whisker mice exhibited minimal performance deficits after wS1 lesions, recovered fully within a few sessions, and showed no clear impairment during task learning following wS1 lesions. Consistent with previous studies, partially sensory-deprived mice displayed significant impairments in recovering learned skills following wS1 lesions. Our findings highlight the importance of intact sensory input and detailed behavioral assessment for evaluating brain function. While wS1 may be dispensable for gap-crossing performance in full-whisker mice, its role becomes critical during recovery from sensory deprivation, highlighting the complex interplay between sensory processing, motor skills, and cortical plasticity in a challenging behavioral task.

OP06 - Subspace communication in the hippocampal-retrosplenial axis

Joaquín Gonzalez, Mihály Vöröslakos, Deren Aykan, Nina Soto, Noam Nitzan, Rachel Swanson, Zhe Sage Chen, & György Buzsáki
Neuroscience Institute, New York University Grossman School of Medicine

The capacity and flexibility of hippocampal circuits for transforming inputs into downstream outputs is fundamental for navigation and memory, yet the circuit-level mechanisms that allow this operation to adapt across experiences remain unknown. We approach this problem by performing large-scale (up to 1024-channel) recordings across the hippocampal–retrosplenial cortex (RSC) circuit in behaving mice, enabling simultaneous access to spiking activity in dentate gyrus (DG), CA3, CA2, CA1, RSC. Based on a linear dimensionality reduction technique known as partial canonical correlation analysis, we identify low-dimensional communication subspaces1 between two regions while accounting for measured third-area influences. These subspaces captured distinct input–output transformations in CA1, linking upstream (DG, CA3, and CA2) hippocampal activity to downstream cortical targets (RSC). Iintrinsic firing properties and anatomical location constrained subspace memberships—members were mapped to deep sublayers of the CA3-CA1-RSC axis during both spatial and non-spatial tasks. These subspaces could recombine overlapping neuronal pools to support distinct interareal interactions across changing experiences and brain states. Reactivation patterns of CA1-CA3 subspaces, but not those of CA1-RSC, during post-experience sleep correlated with replay, reflecting a plasticity-stability balance of the input-output transformation in the hippocampal-retrosplenial axis. Our data suggest a model in which hippocampal-neocortical communication reconfigures predetermined circuit motifs to flexibly encode experiences.

OP07 - Cell-type specific molecular and functional consequences of TDP-43 loss-of-function in human induced neurons

Vera Gysin Filippa, Karsten Bach, Vitaliy Kolodyazhniy and Marcos Romualdo Costa
Brain Institute, UFRN; Roche Pharma Research & Early Development

Amyotrophic Lateral Sclerosis (ALS) is a devastating neurodegenerative disorder characterized by motor neuron loss, with cytoplasmic mislocalization and aggregation of the TDP-43 protein being a hallmark pathology in the vast majority of cases. The resulting nuclear TDP-43 depletion impairs its function as an RNA-binding protein, notably by compromising the repression of cryptic splicing events. ALS targets both

glutamatergic upper motor neurons (UMNs) and cholinergic lower motor neurons (LMNs). We systematically investigated the molecular and functional consequences of TDP-43 loss-of-function in human induced pluripotent stem cell (hiPSC)-derived glutamatergic neurons (iGNs) and cholinergic motor neurons (iMNs) using antisense oligonucleotide (ASO)-mediated knockdown. We demonstrated that TDP-43 knockdown elicits widespread and cell-type-specific changes in both gene expression and alternative splicing. Importantly, a shared subset of known ALS-associated targets, including STMN2 and UNC13A, were consistently downregulated and mis-spliced in both iGNs and iMNs. Functionally, TDP-43 knockdown induced a hyperexcitable phenotype in both neuronal subtypes, as revealed by Microelectrode Array (MEA) recordings, with distinct network activity patterns observed between iGNs (synchronized bursting) and iMNs (asynchronous firing). Specifically, iGNs showed a significant shift in their overall electrophysiological profile, driven by array-wide spike detection rate (ASDR) metrics, which was not observed in iMNs. Furthermore, we demonstrated that the inclusion of astrocytes in co-culture models expanded the repertoire of detectable cryptic splicing events to include an event in HDGFL2, previously found in ALS patient cerebrospinal fluid. Despite these profound molecular and functional deficits, TDP-43 knockdown did not impact neuronal viability or increase susceptibility to glutamate-induced excitotoxicity in either cell type. Our findings validate hiPSC-derived iGNs and iMNs as relevant models for studying TDP-43 pathology and highlight the critical need to consider cell-type specificity when elucidating ALS pathogenesis and developing targeted therapies.

OP08 - Influence of Zika virus infection on the maturation of the cerebral GABAergic system

[1,2]Marcelino, B. L. M.*, [2]Gomes, E. S., [2]Torres, Y. J. S., [2]Leao, R. N., 2Leao, K. E., [2]Sequerra, E. B.
[1] Postgraduate Program in Neuroscience, UFRN, Natal/RN
[2] Brain Institute, UFRN, Natal/RN

Patients affected by the Congenital Zika Virus Syndrome (CZVS) often experience epileptic seizures that tend to increase over time and are resistant to medication. During embryonic development, the main inhibitory neurotransmitter, gamma-aminobutyric acid (GABA), excites immature neurons due to the higher expression of the chloride ion importer NKCC1 compared to the exporter KCC2, leading to a high intracellular concentration of chloride ions (Cl^-). After birth in rodents, there is a decrease in NKCC1 expression and an increase in KCC2, causing an inversion of the intracellular Cl^- potential. This inversion causes Cl- influx uponGABAA receptor opening. However, developmental disturbances, as the treatment with valproic acid, X-fragile syndrome or maternal immune activation, can inhibit Cl^- potential inversion. Here, we test the hypothesis that Zika virus (ZIKV) infection maintains a high intracellular Cl^- concentration, thereby decreasing the effectiveness of anticonvulsant drugs. We tested whether the postnatal infection of the developing brain by ZIKV prevents the inversion of intracellular Cl^- concentration in C57BL/6 mice and whether pharmacological inhibition of NKCC1 with bumetanide (BUM) attenuates the resulting neurological symptoms. On the first postnatal day (P1), we injected 1 µL of 0.9% saline solution (CTRL) or a solution containing 1,000 plaque-forming units (PFU) of ZIKV into the right lateral ventricle of mice. Animals were weighed daily, and reflexes tested from the sixth day post-infection (6 dpi), showed behavioral decline together with weight loss from 11 dpi. Treatment at 10 dpi, with BUM generated milder reflex deficits, better weight maintenance, and higher survival rates, suggesting attenuation of ZIKV severity. In order to test the effect of ZIKV on the excitability of hippocampal granule neurons (P7, P13 and P15), we conducted current-clamp experiments to evaluate basic firing properties. We also applied isoguvacine 10µM, a GABAA agonist, to test whether GABAergic transmission in that

circuit resulted in inhibition or excitation. Our preliminary data indicate that, after 15 dpiisoguvacine reduced the number of action potentials, in controls, while slightly depolarized cells and allowed firing of action potentials with weaker stimuli in ZIKV animals. Preliminary results also indicate a more hyperpolarized resting membrane potential before isoguvacine application and distinct responses to subsequent stimuli. Future experiments will further study the effects of isoguvacine and diazepam, an allosteric modulator of GABAA, to elucidate the effects of ZIKV on GABAergic neurotransmission.

OP09 - Characterisation of a synthetic analogue of psilocin (UL 001): chemical, electrophysiological, and behavioural analysis in a murine model

Mikaela dos Anjos Adur[1], Marceli Cássia de Almeida Barbosa[1], Sérgio Ruschi Bergamachi Silva[1], Uroš Laban[2], Sidarta Ribeiro[1], Richardson Naves Leão[1]
[1] Instituto do Cérebro, Universidade Federal do Rio Grande do Norte
[2] Ewelabs, 1255 N. Sandburg Chicago, Il 60610

Psilocybin and its active metabolite, psilocin (4-hydroxy-N,N-dimethyltryptamine), have attracted significant clinical interest due to their potential in treating mood disorders resistant to conventional interventions. UL 001 is a synthetic analogue with potential effects similar to those of psilocin. This work aims to characterise the chemical, electrophysiological, and behavioural profile of UL 001, comparing it with classic reference compounds such as N,N-dimethyltryptamine (DMT) and psilocin. UL 001 was obtained via chemical synthesis, and its identity was confirmed through thin-layer chromatography. For functional assessment, we will use whole-cell patch-clamp electrophysiology in brain slices to measure drug-induced alterations in neuronal excitability. Concomitantly, we will conduct in vivo behavioural assays using the Head Twitch Response (HTR) model in mice, the gold standard for screening hallucinogenic activity mediated by 5-HT2A receptors, using a variable magnetic flux approach. A more detailed structural characterisation will be performed, including purity analysis via NMR, melting point, and liquid chromatography coupled with mass spectrometry. The patch-clamp experiments seek to correlate these structural characteristics with the potency in modulating the ionic current crossing the neuronal membrane, whilst the HTR data will demonstrate the in vivo effects of the molecule. By integrating chromatography data with advanced functional assays, this study provides insights into the pharmacology of novel synthetic tryptamines, contributing to the understanding of the structural requirements necessary for serotonergic activity and the development of new therapeutic tools.

OP10 - A vocal teaching system in marmoset monkeys

Daniel Y Takahashi
Brain Institute / UFRN

OP11 - Ethology as a tool to understand the multidimension of chronic pain

Laura de Oliveira Koren
Brain Institute / UFRN

Pain is often mistaken for merely an unpleasant physical sensation, but it extends far beyond this. It affects emotional, cognitive, social, and nociceptive aspects of the individual experiencing it. So why do we predominantly treat only the latter? It is logical that medications for chronic pain target the inhibition of pain stimuli, closing "the gate" and preventing pain information from reaching supraspinal levels for processing. However,

these medications (such as opioids, gabapentinoids, and tricyclic antidepressants) are effective for only 30%-40% of patients suffering from chronic pain, leaving the majority without adequate assistance or effective options for symptom relief. Furthermore, in pre-clinical models for studying pain pathologies, the gold standards rely exclusively on nociceptive metrics, and even when researchers include experiments to observe emotional comorbidities, these are typically conducted in different animals, making data integration and correlation more difficult and, consequently, hindering translation to the clinic. In this scenario, the ethological approach emerges as a valuable tool for studying pain in all its aspects, integrating nociceptive metrics—such as mechanical and thermal hyperalgesia—with emotional, social, cognitive, and well-being parameters. In this study, we propose a new model to investigate C57BL/6 mice behavior throughout the chronification of neuropathic pain, induced by chronic constriction injury of the right sciatic nerve. After monitoring the animals for three weeks and collecting data on 13 different parameters, classified as sensory-discriminative, socio-emotional, cognitive, and general state, we applied comparative analyses between the injury and control groups, drew correlations between parameters, and subsequently applied principal component analysis to identify which components are most relevant in pain assessment. The main objective of this project is to better characterize the manifestation of neuropathic pain to optimize the development of new therapies targeting multiple aspects of pain, while also optimizing the use of animals in experimentation. This involves reducing the number of experimental subjects by applying multiple tests to a single animal and decreasing human intervention in test application—many of the parameters analyzed are derived from continuous recordings of animals in their housing cages, which reduces animal stress and better approximates the experimental environment and behavioral responses to natural pain manifestations, facilitating clinical translation.

OP12 - Experience-dependent remodeling of the extracellular matrix regulates perceptual skill learning and memory

Jéssica Winne[1,2], Rebecca Schrader[2], Makayla Anfuson[2], Melissa L. Caras[2].
[1]Hearing and neuronal activity lab, [2]University of Maryland, College Park,

Perceptual training (a regimen in which a stimulus feature is gradually made more difficult to detect or discriminate) can improve a listener's ability to detect weak acoustic stimuli or discriminate highly similar sounds. This process shapes the acquisition of speech, language, and musicianship, transforming a perceptual novice into an expert. Although prior work has revealed a critical link between cortical plasticity and the emergence of expertise, we still do not understand how perceptual expertise is consolidated. One compelling but unexplored candidate is the extracellular matrix (ECM), a complex network of proteins and carbohydrates that surrounds cells of the central nervous system. ECM components are synthesized and secreted by both neurons and glia and form both a diffuse interstitial lattice and highly condensed structures termed perineuronal nets (PNNs) that surround individual neurons. In the cortex, PNNs predominantly enwrap parvalbumin-expressing (PV+) inhibitory interneurons, where they regulate plasticity by influencing the localization of ion channels and receptors and by serving as a physical barrier to synaptic rearrangement. Here we show that auditory perceptual training triggers rapid, reversible ECM remodeling in primary auditory cortex (A1), with ECM degradation emerging four hours after training and full restoration within 24 hours. This degradation–renormalization cycle repeats across training sessions but gradually diminishes as expert performance emerges, and ECM expression levels predict final perceptual thresholds. Notably, this plasticity signature is specific to A1 and does not occur in somatosensory cortex. To

test functionality, we enzymatically degraded the ECM with chondroitinase ABC (chABC) during training. Pre-training ECM ablation did not impair basic task acquisition, but chronic PNN destabilization slowed day-to-day improvements and hindered consolidation of expert-level thresholds without affecting instrumental behavior. Furthermore, post-training ECM digestion destabilized previously acquired perceptual skills, indicating a role for ECM restoration in memory maintenance. Together, these results reveal that the ECM dynamically regulates adult auditory cortical plasticity, enabling rapid synaptic reorganization during learning and promoting network stabilization necessary for the consolidation and long-term retention of perceptual expertise.

OP13 - Pursuing reconsolidation in ethanol-CPP: memory reactivation in different conditions did not trigger destabilization

Flávia Zacouteguy Boos[1], Beatriz Déo Sorigotto[1], Cristiane Aparecida Favoretto[1], Fabio Cardoso Cruz[2], and Isabel Marian Hartmann de Quadros
[1] Psychobiology Department, Federal University of São Paulo, São Paulo, Brazil
[2] Pharmacology Department, Federal University of São Paulo, São Paulo, Brazil

Consolidated memories can return to a labile state during retrieval, through destabilization, and must be reconsolidated to persist. Associative memories of contextual cues paired with hedonic effects of drugs of abuse exert a pivotal role in maintaining maladaptive behaviors in addiction. Thus, impairment of reconsolidation of drugassociated memories may provide a potential strategy to reduce drug-seeking and relapse in addiction. It is critical to understand the conditions under which a consolidated memory becomes labile and may undergo reconsolidation. After inducing ethanol Conditioned Place Preference (CPP; 2 g/kg ethanol, i.p.) in male mice, we examined different parameters during the reactivation session that could turn memory susceptible to disruption by systemic injection of the protein synthesis inhibitor cycloheximide (CHX, 100 mg/kg, i.p.). Reactivation with free access to the apparatus (similarly to a Test session, for 10, 5, or 3 min) or Reactivation sessions restricted to ethanol-paired compartment with no ethanol (for 10 or 5 min), or with the administration of a low dose of ethanol (5 min session), failed to reduced ethanol-preference after CHX administration. These findings suggest that boundary conditions constraint memory in ethanol-CPP to undergo reconsolidation.

OP14 - Biomarker changes in the treatment of depression with ayahuasca

Abhranil Das, Isaac Campos-Braga, Inácio Gomes Medeiros, Emerson Arcoverde, Sergio Mota-Rolim, Bruno Lobão-Soares, Nicole Galvão-Coelho, Fernanda Palhano-Fontes, Draulio B de Araujo
Instituto do Cérebro, Universidade Federal do Rio Grande do Norte, Brasil

Ayahuasca is a traditional Amazonian psychedelic brew with potential antidepressant properties. Here we present the findings of a secondary analysis of a double-blind, parallel-arm, randomized placebo-controlled clinical trial of ayahuasca on 42 healthy controls and 28 patients with treatment-resistant depression. We measured 25 biomarkers, often used as indicators of physical and psychological health, in these participants. The four questions we ask here are: i.) Which biomarkers differ most between healthy and depressed individuals, and in what way? ii.) How are their distributions altered by an ayahuasca vs. a placebo dosing session in healthy subjects, and iii.) in depressed patients? iv.) Which biomarker changes correlate most with the

antidepressant effect reported by the subjects? To answer these questions, we use machine learning methods such as the random forest model, as well as statistical methods that we have newly developed ourselves. We identify awakening salivary cortisol, C-reactive protein, and cholesterol, as the key markers differentiating healthy from depressed subjects. In healthy subjects, the random forest model can barely distinguish the effect of ayahuasca from placebo, suggesting that there is minimal impact on biomarkers there. But in depressed patients, the model identifies several biomarker changes. Finally, our analysis indicates that the self-reported therapeutic effect of ayahuasca in depressed patients is most correlated with changes in BDNF and plasma cortisol.

OP15 - Investigating psychoactive tryptamines as stimulators of neuronal plasticity, with a focus on hippocampal neurogenesis

Rafael Lima, PhD
Brain Institute / UFRN

Over the past twelve years, I have focused on neuroplasticity as a central mechanism underlying the therapeutic action of psychedelics, particularly adult neurogenesis in the context of depression. During my master's degree, supported by the tools of the molecular neurodynamics laboratory, I developed the hypothesis that the rapid and long-lasting antidepressant effects of these substances would be reflected in measurable changes in neurobiology and electrophysiology. Using 5-MeO-DMT, we investigated this idea in the hippocampus. Our results showed that a single dose of the compound was sufficient to induce significant alterations in the maturation process of newborn neurons in the dentate gyrus. My doctoral work advanced this line of inquiry by applying it to an animal model of depression. We chose N,N-DMT to explore symptom mitigation. The experimental design expanded, incorporating a robust battery of behavioral tests to quantify symptom reduction and behavioral modulation. This phase not only provided detailed insights into the antidepressant effects of DMT in the model but also added important nuances to our understanding of the limitations and potential of this powerful psychoactive compound. In essence, my research traces the causal link between the acute impact of psychoactive tryptamines on hippocampal plasticity and their long-lasting effects on neural function and behavior.

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OP16 - A smart camera for automatic respiration and reflex estimation in neonates

Aline Elvina Rodrigues Fernandes*; Helton Maia; Richardson Naves Leão
Brain Institute / UFRN

Physiological and behavioral parameters, including respiratory rate variability and neonatal reflex responses, serve as critical biomarkers for the early detection of neurological abnormalities in newborns. Traditional monitoring in NICUs relies heavily on contact-based sensors and direct clinical observation, which can cause skin irritation, increase false-alarm rates, and introduce subjectivity into clinical assessments. Advances in computer vision, such as the YOLO pose-estimation framework and the Eulerian Video Magnification (EVM) technique for motion and color amplification, offer promising avenues for non-invasive, real-time physiological monitoring. We propose a smart-camera platform integrated with the incubator's native

imaging system, designed to automatically detect respiratory dynamics and quantify both primitive and non-primitive neonatal reflexes using video data alone. This contact-free approach aims to standardize monitoring practices, reduce dependency on sensor-based measurements, and enhance the precision of early clinical detection. The proposed system has the potential to overcome limitations of conventional methods, improve diagnostic accuracy, and support more effective decision-making in neonatal care.

OP17 - Multisensory activities and school naps to overcome letter mirroring in early literacy: adaption of a protocol for the classroom

Flora Assaf de Sousa
Brain Institute / UFRN

Achieving full literacy at the appropriate age remains a challenge in Brazil, where only 53% of 2nd-grade students were considered literate. In this context, effective and scalable methodologies that can be implemented across schools are urgently needed. In our study, we evaluated the effects of a multisensory activity protocol combined with a school nap on the reading and writing skills of 1st-grade children from public schools in the state of Rio Grande do Norte. The protocol is a classroom adaptation of an intervention originally designed for individual application, which had doubled participants' reading speed. The activities target the overcoming of mirror invariance for letters, a phenomenon that must be suppressed during the literacy process. The nap component, in turn, aims to support the consolidation of learning into long-term memory. For three weeks, students engaged in 20–30 minutes of activities followed by up to two hours of napping after lunch. The results show that the adapted version has not yet produced the expected effects. These findings provide initial evidence of the challenges involved in translating laboratory-based interventions into real classroom environments, contributing to the advancement of evidence-based literacy practices in Brazil.

OP18 - Designing Titanium Head-Fixation Prostheses for NHPs Without MRI/CT

Estevão Carlos-Lima, Tiago Fonseca, Lucca Freire, Sergio Neuenschwander
Instituto do Cérebro - UFRN (Vislab)

Stable, long-term head fixation in nonhuman primates (NHPs) is essential for extended combined electrophysiological and behavioral studies. However, standard approaches typically depend on CT/MRI-based planning and large bone-cement constructs, which are invasive, infection-prone, and difficult to maintain—especially in species with fragile skulls or in settings where cranial imaging is unavailable. Here, we present a less invasive method for designing and fitting titanium head-fixation prostheses that eliminates the need for imaging and avoids the use of bone cement. Our approach combines low-tech tools (manual cranial measurements, aluminum molds, basic metalwork, and soldering) with high-tech methods (modeling in Blender and 3D printing). We developed an in-lab cranial measurement system using a movable arc to acquire a grid of 91 surface points describing each animal's skull curvature. These coordinates are transferred to a digital skull model from the American Museum of Natural History, refined in Blender, and then 3D-printed in PLA. An aluminum mold cast from the printed model is used to shape a custom titanium prosthesis featuring threaded rings that serve as stable bases for later attachment of recording cylinders. This technique has been used to manufacture two prostheses for capuchin monkeys,

which were successfully implanted in 2025 using epidural screws. Both implants show excellent postoperative outcomes, with no infections or complications, and are currently undergoing osseointegration in preparation for long-term head-fixed training. By providing a stable, low-maintenance, and visually unobtrusive implant, this hybrid low-/high-tech workflow enables chronic studies in NHPs under modest infrastructure conditions and is readily adaptable to other species (e.g., cats, rhesus monkeys).

KEYNOTE LECTURES

KL01 - PANTA RHEI: THE IMPORTANCE OF SILENT SYNAPSES FOR VISION AND VISUAL PLASTICITY

Prof. Siegrid Löwel, PhD (Johann-Friedrich-Blumenbach-Institute for Zoology and Anthropology, Göttingen Campus Institute for Dynamics of Biological Networks)

KL02 - HIGHER-ORDER EFFECTS OF PSYCHEDELICS: BEYOND PAIRWISE INTERACTIONS BETWEEN CORTICAL REGIONS OF THE BRAIN

Prof. Gandhimohan M Viswanathan, PhD (Physics Department, UFRN)

KL03 - DYNAMICS AND EVOLUTIONARY TRANSFORMATIONS OF CORTICAL CIRCUITRY

Prof. Fred Wolf, PhD (Göttingen Campus Institute for Dynamics of Biological Networks, Max-Planck-Institute for Dynamics and Self-Organization)

POSTER SESSION 1 (THURSDAY)

P01 - EFFECTS OF DREAM RECALL ON EMOTIONAL REGULATION OF STIMULI WITH NEGATIVE VALENCY

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Given that dreams could play an important role in emotional regulation, we sought to investigate whether increased dream recall could influence this process. To investigate this association, 41 individuals (19 women) aged between 18 and 35 years old were recruited and agreed to participate in the study. Participants were then divided into two groups and completed the Cognitive Emotion Regulation Experiment (CERT) forms twice. After the first exposure to CERT, the experimental group (G1, n = 21) completed a dream diary for 14 days to encourage increased dream recall frequency (DRF). The control group (G2, n = 20) completed a sleep diary. After this stage, participants underwent the CERT again. During the two moments of CERT, to assess emotional regulation based on exposure to negative and neutral images from the IAPS (International Affective Pictures System, 1979), the Self-Assessment Manikin (SAM) instrument was used and the oxygenation of areas of the cerebral cortex was monitored using functional near-infrared spectroscopy (fNIRS). Participants also completed questionnaires on sociodemographic, clinical, and dream conditions. Statistical analysis used the Mann-Whitney and Wilcoxon tests, with p-values < 0.05. The results showed that the use of the Dream Diary was not effective in increasing DRF in G1 compared to G2, as both groups showed increased DRF. It was also observed that G1 presented statistically significant lower activity in the anterior region of the Prefrontal Cortex post-intervention, as evidenced by fNIRS. This difference was restricted to the Negative_View condition of the CERT, indicating that the changes recorded in G1's brain activity are likely related to implicit, but not explicit, emotional regulation. It is unclear, however, whether these changes are related to increased DRF, or even to better emotional regulation. Analysis of SAM and RGP, for example, did not reveal significant differences between groups regarding variation in emotional response between experiments. However, analyzing each group separately, G2 showed a decrease in both measures (regarding arousal) in the NegVis condition. Furthermore, SAM indices indicated that, for participants in both groups, the negatively valenced images did not achieve scores similar to those reported in the literature, which may have contributed to the lack of significant behavioral differences between the groups. Furthermore, the intensity of the RGP suggests that the conditions tend to differ in terms of instruction (Reevaluate vs. Visualize), but not in terms of image valence (Negative vs. Neutral). Given the observed results, the findings of this study are insufficient to support the hypothesis that increased DRF positively modulates emotional regulation. It is recommended that future research on this topic include a passive control group, that is, one that does not perform any task during the intervention period. It is also proposed that studies previously evaluate the possibilities of using stimuli that are more effective in causing emotional impact and that they also add positively valenced images to balance the emotional contexts.

P02 - PSYCHOPHYSICAL SIGNATURES OF VISUAL INTERHEMISPHERIC CONNECTIONS ACROSS ADULTHOOD

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Aging affects several cognitive functions, including sensory perception, which can be assessed through behavioral methods. This project aims to characterize age-related changes in visual perception, with a particular focus on inter- and intra-hemispheric connectivity of the visual cortex. We investigate asymmetries in human perception across the vertical midline (VM) of the visual field, translating insights from neurophysiological studies in animals with high visual acuity. Evidence suggests that the corpus callosum—the major commissural fiber tract connecting the cerebral hemispheres and supporting perceptual continuity—undergoes age-related degeneration along an anterior-to-posterior gradient. Although its posterior portion, including visual callosal connections, is considered relatively preserved in normal aging, these regions are known to be especially vulnerable in the early stages of Alzheimer's disease (AD). Understanding how healthy aging affects inter-hemispheric visual processing is therefore of particular importance. Preliminary work from our laboratory has shown that asymmetries in the perception of apparent motion induced by the bistable Motion Quartet Task (MQT) in healthy young adults can be amplified when collinear or non-collinear contours are associated with the quartet's elements (Galdino, 2023, thesis). These findings support the idea that such perceptual asymmetries may serve as behavioral markers of the integrity and selectivity of visual callosal circuits across adulthood. In the present study, we tested whether healthy aging alters visual perception by affecting neural circuits responsible for perceptual grouping and collinear facilitation across the VM. Specifically, we examined (1) the detection of apparent motion, (2) the latency to the first perceived direction of motion, (3) the number of switches between horizontal (inter-hemispheric) and vertical (intra-hemispheric) motion percepts, and (4) the modulatory influence of different first- or second-order contours. To this end, we applied three visual tasks combining the MQT with collinear Gabors or 3D shapes, and MQT presentation at different visual-field positions in young adults (18–30 years; n = 31) and older adults (60–80 years; n = 30). Our findings indicate that, on average, older adults exhibit significantly longer reaction times to report the first perceived direction of motion (collinear task: 4.7 s vs. 3.48 s in young adults; 3D-shape task: 5.19 s vs. 2.70 s). Moreover, they show reduced asymmetries in motion perception across different MQT configurations and appear to benefit less from first- or second-order contours that facilitate perceptual grouping in younger adults. This loss of facilitation is particularly pronounced for collinear horizontal contours supporting apparent motion along the horizontal axis of the visual field. We therefore conclude that our behavioral parameters capture both inter-hemispheric integration across the VM and intra-hemispheric integration along the VM, reflecting the feature-selective asymmetric networks in V1, most likely influenced by feedback from area MT. These results may contribute to the development of preclinical diagnostic tools capable of detecting subtle visual changes that deviate from the healthy aging trajectory, as expected in conditions such as Alzheimer's disease.

P03- Effects of physical training on the theta waveform shape during phasic and tonic REM sleep in the rat hippocampus

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This study analyzed the theta rhythm waveform shape (5 - 12 Hz) of phasic (pREM) and tonic (tREM) REM sleep in Wistar rats before and after four weeks of treadmill running training. Previously, eight adult male rats were implanted with microelectrodes in the dorsal CA1 hippocampal region and subjected to a treadmill running protocol for 28 days. REM sleep periods were selected based on LFP and accelerometer signals, as

well as analysis of video recordings of behavior. pREM events were defined as periods with higher power and frequency of the hippocampal theta rhythm compared to the rest of REM sleep. The following theta wave parameters were analyzed: period, amplitude, peak, trough, rise and decay phases, peak-trough symmetry, and rise-decay symmetry. Data analysis was performed using the bycycle package in Python, and statistical tests were performed in MATLAB. The results showed that training promoted significant changes in the following metrics: increased peak-trough asymmetry ($p = 0.05$) and decreased trough duration ($p = 0.04$) during pREM sleep; and decreased amplitude voltages ($p = 0.05$), peak ($p = 0.05$), trough ($p = 0.05$), decay ($p = 0.05$), and rise phases ($p = 0.05$) during tREM sleep. These results indicate a differential effect of exercise on pREM and tREM sleep, amplifying the specific characteristics of each REM sleep phase.

P04 - Biopsychosocial predictors of burnout in high school students: The role of family support and cortisol

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Adolescence is a critical phase of human development, marked by rapid physical and behavioral transformations, as well as increased vulnerability to social and cultural challenges. In this context, the family and school environments play essential roles in the socialization process and in supporting young people's well-being. As a result, various initiatives have been implemented globally to develop programs and public policies aimed at promoting mental health among adolescents, particularly high school students. This study aimed to investigate the biopsychosocial conditions of high school students in order to identify potential associations between psychophysiological and pathophysiological variables and school burnout syndrome. The research was conducted in two of the most traditional full-time public high schools in the city of Natal, Brazil, with a sample composed of 95 students from the 1st ($n = 50$) and 3rd ($n = 45$) years of high school. To assess burnout, sociodemographic data were collected, along with psychometric instruments measuring empathy, school satisfaction (relationships with teachers and peers), family support, and salivary cortisol as a physiological marker. High scores in the emotional exhaustion and cynicism dimensions were observed in 88.4% and 68.4% of the students, respectively, while 41.1% showed low professional efficacy. Statiscal analysis of the R language presents results that show that 28.4% of the students presented signs of burnout syndrome, characterized by high scores in emotional exhaustion and cynicism and, simultaneously, low professional efficacy. The analysis of school burnout showed that the "cynicism" subdomain had a significant positive effect ($\beta = 0.749$), whereas professional efficacy had a significant negative effect ($\beta = -0.369$; $p = 0.012$). Regarding empathy, 1% of the students were classified as having low empathy, while the majority were classified as moderately empathetic (72%) or empathetic (27%). High scores were observed in the dimensions of perspective-taking (66.3%), interpersonal flexibility (18.9%), altruism (33.7%), and affective sensitivity (75.8%). However, the total score of the effect of empathy on burnout was not statistically significant. In terms of family support, low or moderately low perceptions were observed in the subdomains of consistent emotional support (77.9%), family adaptability (71.6%), and autonomy (71.6%). In the school environment, most students reported high or moderate satisfaction with their teachers (91.6%) and peers (73.2%). The variable "sex" showed no significant differences in burnout prevalence. The structural equation modeling analysis indicated that family support had a significantly negative and moderate effect on burnout ($\beta = -0.63$; $p < 0.0001$). Third-year students showed significantly higher cortisol levels, which were associated

with higher levels of emotional exhaustion, a core subdomain of burnout. The main findings highlight the crucial role of family support in students' school well-being and reveal that higher cortisol levels are associated with burnout in the final year of high school. These findings underscore the need for targeted interventions involving both parents and students to mitigate burnout and promote well-being, thereby supporting student retention in the school environment.

P05 - CB1R-βAR Crosstalk Shapes Declarative Memory Storage

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Object recognition memory (ORM) plays a key role in identifying familiar items and encoding episodic information. Its consolidation depends on ß-adrenergic receptor (ßAR) signaling and is associated with increased BDNF expression in the dorsal hippocampus. While previous research has shown that hippocampal activation of cannabinoid type-1 receptors (CBR1s) impairs ORM consolidation, the underlying mechanisms remain unclear. In this study, we used a novel object recognition learning task to examine the interaction between CB1Rs and ßARs during ORM consolidation in adult male Wistar rats. Intra-dorsal CA1 infusion of the CB1R agonist ACEA, the ßAR antagonist propranolol, or the PKA inhibitor myristoylated PKI14-22, administered 5 min post-training, impaired ORM consolidation. Notably, co-administration of the PKA activator 8Br-cAMP or the ßAR agonist isoproterenol reversed ACEA-induced amnesia. In contrast, the CB1R inverse agonist AM251 failed to reverse propranolol-induced amnesia, which was rescued by recombinant BDNF infusion into the hippocampus 120 min post-training. These findings suggest that hippocampal CB1Rs regulate ORM consolidation by acting upstream of ßARs via a signaling cascade involving PKA activation and BDNF expression.

P06 - The Proteasome Drives Extinction Memory Reconsolidation

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Impaired fear extinction contributes to the persistence of maladaptive avoidance in post-traumatic stress disorder (PTSD), highlighting extinction memory as a critical therapeutic target. Extinction memories can become unstable upon retrieval and require reconsolidation to be maintained, yet the underlying molecular mechanisms remain unclear. Using step-down inhibitory avoidance (SDIA), a single-trial, hippocampus-dependent learning task modeling complex fear-motivated avoidance behaviors, we show that proteasome activity in dorsal CA1 is essential for extinction memory reconsolidation in adult Wistar rats. Post-reactivation infusion of the irreversible proteasome inhibitor clasto-lactacystin β-lactone (LAC) disrupted extinction retention and reinstated avoidance behavior; the effect was long-lasting, time-dependent, and was reproduced with the reversible inhibitor MG-132. Crucially, this amnesia required prior destabilization, as blocking GluN2B-containing NMDARs before, but not after, reactivation prevented LAC's effects. Proteasome inhibition did not alter extinction when delivered without reactivation or after a pseudo-reactivation in a neutral context. These findings identify proteasomal degradation in the hippocampus as a core mechanism enabling the reconsolidation of extinction memories and suggest a potential target for modifying pathological fear.

P07 - Analysis of the presence of autoantibodies against central nervous system targets in mother-child pairs with congenital Zika virus exposure

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Fetal infection of the central nervous system (CNS) by the Zika virus (ZIKV) leads to inflammation and neurological malformations. Along with the virus' direct effect on neural cells, fetal and maternal immune responses can also contribute to the observed damage. A way to gain insight into what occurred during gestation is to test the immunological memory of neural tissue inflammation in mothers and their infected offspring. To investigate this, we analyzed blood serum samples from mother–child pairs affected by ZIKV-associated microcephaly, searching for neural autoantibodies. Samples were collected when the children were approximately two years old (692 ± 87 days). ELISA assays using adsorbed antigens were performed to detect autoantibodies, and part of the samples was also reacted against extracts of human astrocytes. We observed that some mothers had antibodies against ZIKV and all four dengue virus serotypes, whereas the children, despite intrauterine exposure, showed no serological evidence of immunization. To determine whether mothers produced antibodies targeting the embryonic CNS, we examined reactivity against the protein ENGRAILED-1 (ENG-1), highly expressed in the developing rhombencephalon. Mothers of children with congenital Zika syndrome (CZVS) exhibited elevated levels of anti–ENG-1 IgG and IgM, while the children showed increased IgM only. However, the children who have IgGs and IgMs anti–ENG-1 are not the same. Additionally, a commercial ELISA for autoantibodies against basal ganglia antigens revealed high IgG levels in both mothers and children. We aim to investigate the expression of neural autoantibodies as a potential prognostic indicator. To do this, we are evaluating pertinent information of these patients near their 10th anniversary. A total of 82 children with CZVS were registered at HUOL, currently ranging from 4 to 10 years of age. Among them, 12% have died. Of those still in follow-up, 77% present epilepsy. Approximately 20.6% require enterogastric feeding, and among these children, 33.3% are eutrophic, indicating good nutritional response. A high prevalence of underweight status was observed among epileptic patients, who also showed severely impaired motor development. Most children present cerebral and cerebellar atrophy as well as pachygyria. No overlap was found between serological results and major clinical phenotypes. The study will continue with the construction of a Bayesian network model to determine statistical probabilities among variables collected over ten years, advancing understanding of mechanisms involved in CZVS.

P08 - DeepLabCut Matches Commercial Tools in Object Memory Analysis

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Object recognition memory (ORM), a form of memory essential for identifying familiar items and encoding episodic information, is typically assessed in rodents by their preference for novel stimuli in the novel object recognition task. Commercial software like TopScan is widely used for tracking, but open-source alternatives such as DeepLabCut (DLC) have gained traction. However, a thorough validation of DLC in replicating cognitive outcomes like the Discrimination Index (DI) is lacking. In this study, we validated DLC by directly comparing it with TopScan. We tracked rat trajectories from videos analyzed with both systems, using a model trained iteratively to track key body points, including the snout, neck, mid-body, and tail. We compared the output of both systems in terms of spatial trajectories, positional error (RMSE and Fréchet Distance), and DI. DLC demonstrated high accuracy, with minimal positional error, and tracked trajectories that closely matched those from TopScan in both spatial and temporal dimensions. While positional errors increased with the animal's speed, they were minor and did not affect overall accuracy. Behavioral measures, such as exploration time for novel vs. familiar objects, were consistent between systems. Importantly, the DI was closely matched. These findings confirm that DLC is a reliable and accurate open-source alternative for replicating the behavioral and cognitive outcomes typically obtained with commercial systems.

P09 - Effects of Napping on Memory Retention and Reading Development

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Sleep plays an essential role in memory consolidation and is widely recognised as a fundamental component for retaining new information and strengthening newly acquired skills. During the learning process, experiences and content that are initially recorded in an unstable form undergo stages of neural stabilisation that occur, for the most part, during sleep. Evidence accumulated over recent decades shows that periods of rest, especially during specific phases of the sleep cycle, promote the reorganisation of neural networks, optimise the consolidation of what has been learned, and facilitate subsequent performance in cognitive tasks. In children, who have greater physiological sleep needs and a rapidly developing nervous system, these effects are even more pronounced, directly influencing school progress, attention span, and mastery of basic skills such as reading and reasoning.In addition, there is evidence that sleep plays a key role in memory consolidation and learning new skills, including linguistic and perceptual skills. Based on these premises, our study applied a scientifically based intervention to

first-year primary school students at SESI Escola, located in the city of Macau, Rio Grande do Norte. The overall objective was to investigate whether regular periods of nap after lunch could promote the consolidation of cognitive and reading skills compared to a group that did not sleep during this interval. The protocol was implemented over five weeks, during which students participated in a structured routine consisting of up to two hours of napping after lunch. Before these rest periods, we applied two standardised instruments: the PCM (Raven's Progressive Coloured Matrices), designed to assess non-verbal reasoning and general aspects of cognitive ability, and the LPI (Reading of Isolated Words and Pseudowords), used to measure both reading fluency and accuracy. The students were divided into two groups: the intervention group, composed of children who took the tests and participated in the daily sleep period; and the control group, whose participants also took the tests, but without the subsequent rest component. This design allowed us to directly compare the evolution of performance between children exposed to sleep after cognitive activities and those who were not. Preliminary analysis of the data suggests that the intervention group showed more consistent improvements in reading and reasoning tasks, raising the hypothesis that post-task sleep may act as a facilitator in the consolidation of these skills. These findings reinforce the relevance of considering school practices that integrate structured rest periods into children's daily lives, especially during critical phases of reading acquisition.

P10 - Integrating ZBTB20 Knockout Signatures with hdWGCNA Modules Reveals Regulatory Networks in Mouse Cortical Development.

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MCB - LAB

Primrose syndrome is a neurological condition with severe phenotypes, including intellectual disability, macrocephaly, and behavioral abnormalities. In addition, the syndrome is an autosomal dominant condition caused by missense mutations that primarily affect a specific gene, ZBTB20. Thus, the transcription factor ZBTB20 plays a central role in directing neurogenic programs and specifying cell identities. More specifically, the mouse conditional Zbtb20-KO model leads to expansion of neuronal cortical layer IV, with a consequent decrease of layer II/III. Later in development astrogliogenesis is also affected, expanding a subset of astrocytes expressing GFAP. Despite this, the central roles of the gene signatures affected by ZBTB20 knockout (KO) and the biological processes in which they participate are not yet detailed. This work aims to build co-expression genes networks and their functional modules/hubs from a scRNAseq transcriptomic atlas of cortical development in mice, and after this, enrich these modules for data signatures related to ZBTB20 knockout. Annotated scRNA-seq data were analyzed using the hdWGCNA computational framework to build pairwise correlation networks, enabling the identification of co-expressed gene modules across different cell types. Seventeen clusters were identified, representing the major cell types found in the developing cortex from embryonic day 10.5 (E10.5) to postnatal day 4 (P4). Each cell type exhibited distinct modules, potentially reflecting coordinated biological functions. In parallel, using microarray data analysis, a gene signature

that is directly regulated by the transcription factor ZBTB20 was identified. Subsequently, an overrepresentation analysis was performed to verify the performance in regulating an entire network of co-expressed genes in normal development versus knockout development. Our analyses reveal a set of significantly enriched modules related to zbtb20 knockout. From this, we are able to pinpoint which cell types and developmental stages are most affected and also which pathways might be altered by loss of ZBTB20 function.

P11 - Sex Diferences in Cortical Motor Processing During Kinesthetic Motor Imagery, Action Observation, and Finger Tapping

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Sex differences in motor control and motor cognition have been increasingly recognized in behavioral and clinical research, yet the neural mechanisms underlying these differences remain understudied. Motor-related cortical rhythms in the alpha (8–13 Hz) and beta (15–30 Hz) bands provide an important window into how men and women process, plan, and simulate movement. Tasks such as Kinesthetic Motor Imagery (KMI), Action Observation (AO), and the Finger Tapping Test (FTT) evoke modulations of these rhythms, allowing the investigation of both overt and covert components of motor function. Specifically, KMI requires individuals to internally simulate the sensation of performing an action, engaging sensory-motor regions even in the absence of movement. AO, in contrast, activates visuomotor networks through the passive observation of another person's movement. The FTT adds a measure of manual motor speed and rhythmicity, eliciting Event-Related Spectral Perturbation (ERSP) changes tied to actual movement execution. These tasks together span a continuum from purely mental motor simulation to visuomotor resonance and overt performance. The present study examines whether men and women differ in cortical oscillatory responses and behavioral performance across these tasks. We will analyze sex-related patterns in alpha and beta ERSP modulation, motor execution speed, and tapping variability. Additionally, because circulating sex steroids may contribute to sex-related variability in motor processing, we will also assess hormone levels to explore whether they partially explain individual differences within each sex. By combining EEG measures with behavioral data, this study aims to clarify how men and women differentially engage sensory-motor networks during motor simulation and execution. We hypothesize that hormonal modulation exerts a phase-dependent effect on sexual dimorphism, wherein the follicular phase exacerbates neurophysiological and motor processing differences between sexes, whereas the menstrual phase promotes greater performance similarity between males and females, and the luteal phase attenuates manual asymmetry. Understanding these sex-specific neural signatures may improve our characterization of normative motor cognition and shed light on factors that contribute to sex differences observed in motor-related neurological conditions.

P12 - LABORATÓRIO ABERTO: STRENGTHENING SCIENTIFIC LITERACY IN NEUROSCIENCE EDUCATION

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Laboartório Aberto, Brain Institute, UFRN

The Laboratório Aberto, an outreach initiative of the Brain Institute at the Federal University of Rio Grande do Norte (UFRN), aims to strengthen scientific literacy and transform educational practices through lectures, workshops, roundtables, and mentoring programs. In 2025, the project conducted cognitive neuroscience activities in the Potiguar Coastal region in partnership with the 5th Regional Directorate of Education and Culture (DIREC). These initiatives reached over 1,600 individuals, including teachers, students, and school administrators, across 11 state schools, with notable participation in science fairs and academic showcases at three of these institutions. Additionally, the workshop "Scientific Methodology in School: Scientific Training for Teachers" was provided to public school educators during their Professional Development Week (Jornada Pedagógica). A major highlight of the year was the five-day Winter Course in Electrophysiology, which covered both theoretical and practical aspects of Electromyography (EMG), Electrocardiography (ECG), and Electroencephalography (EEG). Finally, to broaden the dissemination of neuroscience and electrophysiology, SomaLab was launched as a spin-off of Laboratório Aberto. This initiative was selected by the SuperNova program to foster university entrepreneurship, and by Sebrae Conexão to be presented in Foz do Iguaçu under the theme "From Classroom to Innovation: The New Generation of Innovation." Ultimately, this experience underscores the significant potential for enhancing education, fostering scientific literacy, and democratizing access to complex technologies across diverse age groups.

P13 - BEHAVIORAL PATTERNS PREDICTIVE OF FEAR EXTINCTION IN RODENTS

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Experiences of intense threat lead to the formation of persistent aversive memories, often expressed as avoidance behavior. Although avoidance may serve as an adaptive coping strategy, its expression in safe contexts reflects maladaptive memory, as observed in phobias. Current treatments, including extinction-based cognitive behavioral therapy, often require multiple sessions and do not always produce lasting improvements. This highlights the need to identify individual factors that influence extinction efficacy. In this study, using the step-through inhibitory avoidance task in Wistar rats combined with deep learning–based behavioral tracking and computational analysis, we characterized behavioral patterns expressed during fear-memory retrieval and examined whether they predict subsequent extinction performance. We hypothesize that some animals may initiate extinction-related processes even before formal extinction training, particularly when they engage in risk-prone exploratory behaviors. Metrics of risk engagement and risk assessment showed predictive value for post-retrieval behavioral outcomes. These patterns suggest that certain animals actively test

environmental contingencies through risk-oriented strategies that may facilitate the incorporation of non-aversive information and promote extinction learning. Our findings indicate that individual variability in behavioral states shapes extinction efficacy. Identifying such predictors may help refine experimental models by distinguishing extinction-susceptible from extinction-resistant animals.

P14 - CaMKII Gates Memory Destabilization Through Theta Gamma Coupling.

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Object recognition memory (ORM), a form of memory essential for identifying familiar items and encoding episodic information, can be updated if reactivated in the presence of novelty, a process that depends on memory destabilization prior to reconsolidation. The dorsal CA1 region is central to these operations, yet the specific role of Ca^{2+}/calmodulin-dependent protein kinase II (CaMKII) and its influence on hippocampal oscillatory dynamics remain unclear. Combining behavioral, pharmacological, and electrophysiological approaches, we show that CaMKII activity in dorsal CA1 is dispensable for ORM recall and reconsolidation but essential for novelty-induced destabilization. CaMKII inhibition selectively prevented the increase in theta-gamma cross-frequency coupling (hPAC) normally triggered by novelty during reactivation, thereby blocking subsequent memory updating. These findings identify CaMKII-dependent modulation of hPAC as a critical mechanism gating the destabilization step that permits ORM modification.

P15 - Silencing CA1→Prelimbic Pathway Disrupts Memory Reconsolidation

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Fear-motivated avoidance memory reconsolidation requires coordinated interactions between the hippocampus and prefrontal cortex, yet the contribution of specific pathways remains unclear. Using optogenetic silencing of dorsal CA1 (dCA1) terminals in the prelimbic cortex (PrL), we examined the role of this monosynaptic projection during reconsolidation of the memory for step-down inhibitory avoidance (SDIA), a single-trial, hippocampus-dependent learning task modeling complex fear-motivated avoidance behaviors, in adult male Wistar rats. Silencing the dCA1→PrL pathway exclusively during non-reinforced reactivation impaired later retention, producing the delayed amnesia characteristic of reconsolidation blockade. Neither stimulation in the absence of reactivation, nor delayed post-reactivation silencing, nor light delivery outside the pathway produced any effect. Moreover, identical manipulation did not disrupt retention in reconsolidation-resistant animals. These results demonstrate that direct hippocampal–prelimbic communication is essential for updating reactivated aversive memories and identify the dCA1→PrL pathway as a key circuit mechanism supporting reconsolidation.

P16 - Beyond the Racine's score: An ethological characterization of PTZ-induced ictal activity in mice

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Seizures are stereotyped manifestations resulting from abnormal neuronal excitability. Drugs that increase excitation or decrease synaptic inhibition can induce seizures. However, the behavioral expression of seizures varies depending on the neural circuits involved. Traditionally, seizure severity is quantified using the Racine scale, a classification system that emphasizes limbic seizures while neglecting other important ictal and non-ictal behaviors. In this study, we propose a new ethology-based classification system to describe PTZ-induced ictal behaviors. Through computer-assisted analyses of video recordings, we observed that spasms, tremors, and myoclonus precede the expression of limbic seizures (as quantified by the Racine scale), and that the interval between these events decreases as the limbic seizure approaches. This observation is supported by electrophysiological recordings obtained from electrodes implanted in the hippocampus and retrosplenial cortex. Our results indicate that spasms and myoclonus are relevant phenomena in the progression of ictal activity, and that their application in the acute PTZ seizure model has predictive value and complements the Racine scale.

P17 - PKMζ Restabilizes Spatial Memory

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Non-reinforced reactivation of spatial memory in the Morris water maze (MWM) triggers a destabilization phase that requires reconsolidation to restore memory stability. Protein kinase M ζ (PKMζ), a constitutively active atypical PKC isoform, is implicated in memory storage, but its role in reconsolidation remains unclear. In adult male Wistar rats, we found that inhibiting PKMζ in dorsal CA1 immediately after non-reinforced reactivation produced robust, time-dependent, and long-lasting amnesia. Similar effects were observed when PKMζ translation was blocked with antisense oligonucleotides, whereas inhibition of the related kinase PKCι/λ had no effect. ZIP-induced amnesia was prevented by blocking GluN2B-containing NMDA receptors with RO25-6981, proteasomal degradation with clasto-lactacystin β-lactone, or AMPA receptor endocytosis with dynasore hydrate, indicating that PKMζ acts downstream of canonical destabilization mechanisms. Importantly, PKMζ inhibition had no effect when administered without reactivation or following reinforced reactivation. These results identify hippocampal PKMζ as a critical determinant of spatial memory reconsolidation, specifically stabilizing reactivated memories without affecting their passive maintenance.

P18 - NeuroScope: a user-friendly tool for automated sleep scoring and analysis

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The characterization of the sleep-wake cycle in animal models is a fundamental step in neurophysiological research. Although many automated sleep-scoring methods exist, available softwares are often proprietary or require programming skills to operate. Also, only a few of them can efficiently handle long-term recordings while allowing expert users to verify, correct and validate sleep-wake classification with-in a user-friendly interface. Here, we introduce NeuroScope, an open-source software for visualization, analysis, and scoring of long-term electrophysiological data. Developed in Python, the software uses a PyQt5-based graphical interface with widely used scientific libraries for spectral analysis, amplitude and phase coherence, normalization, and machine-learning-based automatic sleep scoring. To ensure smooth navigation through large datasets, the software incorporates visualization-optimization algorithms that enable fast rendering of long recordings without memory overload. Computer-generated hypnograms can be easily inspected, edited, and validated by the specialists with no programming experience. Additionally, NeuroScope provides temporal synchronization between the electrophysiological data and behavioral video recordings. Altogether, NeuroScope offers a robust and accessible platform that streamlines sleep-scoring workflow and supports standardized data export for further statistical analyses.

P19 - CHARACTERIZATION OF SLEEP DEVELOPMENT AND EXPRESSION IN OCTOPUS INSULARIS

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The biological cycles of invertebrates and studies of brain activity in these animals have supported the notion that sleep-like states have an ancient origin and play a fundamental role in brain function. However, the definition of sleep in invertebrates remains uncertain, underscoring the need for further investigation on this topic. Octopuses exhibit sophisticated cognitive capacities, supported by a centralized nervous system that includes a dedicated learning lobe. Recently, behavioral patterns and electrophysiological recordings have been described that indicate the presence of at least two sleep phases in octopuses. However, knowledge about the characterization of this phenomenon across different life stages, its consequences

for learning, and the effects of sleep deprivation in these animals remains enigmatic. Therefore, the primary aim of this project is to investigate and characterize sleep in the species Octopus insularis through comprehensive behavioral quantification. To achieve this, three complementary lines of inquiry will be pursued: (1) to investigate and behaviorally describe in detail the sleep stages of O. insularis across its developmental stages; (2) to identify potential ontogenetic differences in sleep expression; and (3) to assess whether sleep deprivation interferes with learning processes, with a particular focus on whether learning is dependent on quiet and/or active sleep. Preliminary results suggest that, under sleep deprivation, the animals exhibit increased expression of other behaviors, such as “half-and-half” patterns and unilateral REM-like states. Regarding learning, sleep-deprived animals show reduced task performance compared to non-deprived animals.

P20 - Honing tones: wild young marmosets vocal development

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The white-tufted marmoset (Callithrix jacchus) is a species of neotropical primate native to northeastern Brazil, inhabiting the Caatinga and Atlantic Forest regions. They have many biological and social characteristics similar to humans, including a cooperative breeding system and gregarious habits, combined with a broad vocal repertoire. In addition to being targets of interest in biomedical research due to their similar biology and for being easy to keep in captivity, the vocalizations of these animals have been extensively studied recently, with increasing evidence of learning mechanisms and vocal plasticity. However, few studies evaluate the natural context in which they occur in the species, with most of them focusing on the infancy and adulthood phase of these animals. Our research investigated acoustic parameters variations of four types of vocalizations in juvenile marmosets (5-10 months) over a six-month period in a natural environment: “phee”, “cry”, “twitter” and “trill”. We then compared these variations with those of adult marmosets (from 15 months of age), seeking to understand the vocal development of young marmosets and social context in which calls are used. We did not observe significant variations in acoustic parameters of the analyzed vocalizations in juvenile marmosets throughout the study, nor any noticeable influences of vocal feedback for young individuals. However, we did observe differences in frequency values of “cry” and “phee” between juveniles and adults, with a tendency for juvenile averages to approach those of the adults. Our data also confirms the presence of vocalizations from infant to the adult phase in marmosets and shows variations in usage frequency and context for all vocalizations. As indicated by previous authors, these subtle and gradual variations in acoustic parameters and in vocalizations usage in juvenile marmosets suggest that, despite a vocal profile that can be largely explained by biological development, social experiences must be important for maturation and contextualization of the main vocalizations of marmosets.

P21 - TEMPORAL REORGANIZATION OF PTZ-INDUCED ICTAL EVENTS BY PHYTOCANNABINOID TREATMENT

Antonio Jhones Rocha, Ana Augusta C. Rangel, Claudio Marcos Queiroz
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Phytocannabinoids derived from Cannabis species have attracted considerable interest due to their potential therapeutic actions in neurological disorders. Although cannabidiol (CBD) has been investigated in the context of epilepsy, far less is known about the antiseizure properties of other naturally occurring cannabinoids, including cannabinol (CBN) and cannabigerol (CBG). Both molecules were identified during the 20th century, yet their influence on neuronal excitability, seizure initiation, and ictal expression remains poorly characterized. In this study, we examined how acute administration of CBD, CBN, and CBG modulate behavioral manifestations of PTZ-induced seizures in mice. Animals received a single intraperitoneal injection of CBD, CBN, or CBG at doses of 3, 30, or 300 mg/kg. Behavior was recorded for one hour following injection, after which seizures were induced with pentylenetetrazole (PTZ, 60 mg/kg, s.c.). Animals were monitored for an additional hour, and three ictal behaviors were quantified: spasms, myoclonias, and limbic seizures. Two vehicle groups—corn oil and MCT oil—were included to account for potential vehicle-specific effects. Vehicle comparisons revealed no differences in spasm number ($p = 0.492$), seizure incidence ($p = 0.168$), or seizure duration ($p = 0.690$). However, locomotor activity differed significantly between vehicles, with MCT-treated animals showing increased mean speed ($p = 0.007$) and greater distance travelled ($p = 0.005$). Time spent in the center of the arena did not differ between vehicles. Across phytocannabinoids treatments, there were no differences in latency to the first spasm, number of spasms, or inter-event interval ($p > 0.05$). A strong negative correlation between spasm count and inter-event interval was observed ($rho = –0.81$, $p < 0.001$), indicating that animals with more spasms tended to exhibit shorter intervals between events. For myoclonias, most measures were unchanged across treatments, although CBN-300 increased event number ($p = 0.004$). As expected, diazepam abolished all limbic seizures and markedly reduced spasm and myoclonia counts. For all other groups, seizure incidence, latency, and duration did not differ from vehicle ($p > 0.05$). Temporal pattern analyses revealed clear treatment-dependent modulation of ictal event distribution. Vehicle-treated animals exhibited a characteristic bimodal pattern of spasms and myoclonias, with peaks at approximately 10 and 30 minutes after PTZ. Several phytocannabinoids treatments altered this organization: CBD-3 and CBD-30 shifted events into single peaks at ~12 and ~20 minutes, respectively (both $p < 0.001$). Likewise, CBG-3 (~12 minutes, $p = 0.003$), CBG-30 (~17 minutes, $p < 0.001$), and CBG-300 (~28 minutes, $p < 0.001$) produced single-peak distributions whose timing varied with dose. CBN generally preserved the bimodal structure, except at

30 mg/kg, which showed a broader peak between 15–30 minutes. Event distribution across 5-minute bins revealed additional early effects: CBG-3 increased event concentration during the first 5 minutes ($p = 0.040$), while CBN-30 reduced events in the 5–10-minute interval ($p = 0.02$), further supporting treatment-dependent temporal reorganization. Locomotor analyses demonstrated dose-dependent effects of CBN. Prior to PTZ, CBN-300 reduced center time ($p = 0.011$); CBN-3 and CBN-30 reduced mean velocity ($p = 0.048$ and $p = 0.004$); and CBN-300 reduced distance traveled ($p = 0.012$). After PTZ, CBN-30 increased center time ($p = 0.043$) and reduced distance traveled ($p = 0.041$). Overall, CBD, CBN, and CBG did not prevent ictal behaviors nor reduce seizure severity. Instead, these compounds modulated the temporal structure of ictal events, often consolidating them into discrete episodes, and produced dose-dependent locomotor effects. These findings suggest that phytocannabinoids influence seizure dynamics without exerting robust antiseizure actions at the behavioral level. Future studies should investigate electrophysiological correlates, evaluate intermediate doses, and assess alternative treatment time windows to further clarify their mechanisms of action.

P22 - ARTEMIS: A PYTHON TOOLBOX FOR BEHAVIORAL ANALYSIS OF RODENTS

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The analysis of animal behavior from video recordings is a fundamental approach for investigating cognitive functions, drug effects, and therapeutic interventions. The development of computer vision-based tools, such as DeepLabCut, has expanded the automated extraction of movement metrics, reducing analysis time, improving accuracy and reproducibility, and facilitating integration with neural data. However, a gap remains between coordinate tracking and standardized behavioral analysis, which often requires segmentation and classification of postural and displacement patterns. In this work, we present Artemis, an open-source Python toolbox designed for automated analysis of animal behavior from spatial data obtained through tracking systems. Modular and customizable, Artemis is compatible with multiple acquisition platforms and can be integrated into diverse experimental paradigms. Its functionalities include the extraction of kinematic metrics, quantification of time spent in regions of interest, and characterization of spatial movement patterns. The system was applied to Wistar rats performing various behavioral tasks, including object recognition, open-field exploration, the elevated plus maze, and the cheeseboard maze. Validation was carried out through comparisons with manual annotations and the SimBA software, demonstrating high concordance across methods. Together, these results indicate that Artemis provides an accessible, reproducible, and robust solution for

the scientific community, contributing to the standardization and advancement of behavioral analyses in animal models.

P23 - CaMKII Drives Recognition Memory

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Object recognition memory (ORM) is a hippocampus-dependent form of memory that supports episodic representations. Ca^{2+}/calmodulin-dependent protein kinase II (CaMKII), a serine/threonine-specific kinase highly enriched in the hippocampal formation, acts as a critical calcium-responsive effector in memory processes. Training rats in an ORM-inducing task rapidly increased CaMKII autophosphorylation in the CA1 region of the dorsal hippocampus. Early post-acquisition intra-dorsal CA1 administration of the substrate-competitive CaMKII inhibitor myristoylated auto-inhibitory peptide (AIP) impaired long-term ORM, while leaving short-term ORM and previously consolidated memories unaffected. The same deficit was produced by the calmodulin-competitive CaMKII inhibitor KN93, but not by the inactive analogs of either KN93 or AIP. Notably, these effects were consistent regardless of sex, age, or the time of day of training. Together, these findings demonstrate that hippocampal CaMKII activity is required shortly after learning for normal ORM consolidation, highlighting its critical role in encoding new object information without disrupting existing memories.

POSTER SESSION 2 (FRIDAY)

P24 - Sex differences and Parkinson Disease: speech motor aspects by UPDRS

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Sexual dimorphism in humans involves biological, cultural, and social influences, and hormone-driven differences play an important role in nervous system organization. Sex steroid hormones modulate neuronal connectivity, brain morphology, and disease progression. In Parkinson's disease (PD), incidence is 1.5 to 2 times higher in men. Evidence suggests that slower progression in women may be related to the neuroprotective effects of estrogen before menopause, whereas in men mitochondrial dysfunction appears to contribute more strongly. These observations raise the question of whether clinical findings support sex-related

differences in speech motor dysfunction and cognition impairments in PD. This pilot study was approved by the Brazil Platform Ethics Committee (CAAE: 78246223.4.0000.5537). The sample included 50 individuals with idiopathic PD: 36 men (mean age = 60 years) and 14 women (mean age = 56 years). Exclusion criteria included history of brain trauma, drug-induced symptoms, deep brain stimulation, and hormone therapy. Participants underwent a structured clinical interview and assessment with the Movement Disorder Society–Unified Parkinson Disease Rating Scale (MDS-UPDRS), focusing on cognitive dysfunction (item 1.1) and speech (item 2.1). Descriptive analysis was performed on cognitive and speech dysfunction and the sample data. Mann-Whitney and Shapiro tests were used with $p<0.0016$. Results: Speech dysfunction was identified in 72% of the sample (n = 36). Among these, 77% were men (n = 28) and 23% were women (n = 8). In the female group, 57% also showed speech impairment. Regarding cognition, women presented a higher proportion of cognitive problems (64%) compared with men, despite 62% of the total sample showing no cognitive impairment. Speech impairments are common in PD and often manifest as hypokinetic dysarthria, involving reduced loudness, limited prosody, and imprecise articulation. These findings align with prior evidence showing early vocal changes and later articulation deficits, particularly in long-standing PD in men. Cognitive demands further worsen speech performance, especially in spontaneous speech tasks, which may explain the higher impairment observed in women in this sample. Overall, both sexes demonstrated significant speech difficulties, but cognitive differences may contribute to variability in presentation. Future research incorporating sex-specific analyses is needed to clarify these patterns and improve early detection and personalized interventions in PD.

P25 - NOP Receptor Activation Disrupts the Encoding of New Memories

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Nociceptin/orphanin FQ (N/OFQ), the endogenous ligand of the NOP receptor, modulates learning and memory, yet its precise hippocampal function remains unclear. Here, we examined how activation of hippocampal NOP receptors influences distinct stages of object recognition memory (ORM), a form of memory essential for object identification and episodic encoding. Adult male Wistar rats trained in the novel object recognition task received bilateral intra-dorsal CA1 infusions of N/OFQ either 20 min before or 5 min after training, or 20 min before a 1-d retention test. Pre-training N/OFQ infusion markedly impaired ORM retention without affecting locomotor or exploratory behavior, whereas post-training or pre-test infusions had no effect. The selective NOP receptor antagonist UFP-101 blocked the amnesic effect of N/OFQ but had no influence alone. Pre-training N/OFQ administration also failed to alter performance in the step-down inhibitory

avoidance task, excluding sensory or motivational confounds. Thus, hippocampal NOP receptor activation selectively disrupts ORM acquisition while sparing consolidation and recall, identifying the N/OFQ-NOP system as a negative modulator of recognition memory encoding mechanisms.

P26 - Reconsolidation Creates Shared Persistence Between Object Memories./ The Claustrum Regulates Memory Accessibility

Thais Lima-Silva* , Livia Carneiro, Raquel Araujo, Nina Cammarota, Anna Lyvia Azevedo, Lucas Ribeiro, Janine I. Rossato, and Martín Cammarota. / Thais Lima-Silva*, Gênedy Apolinário, Anna Lyvia Azevedo, Nina Cammarota, Janine I. Rossato, and Martín Cammarota
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Memory recall can destabilize consolidated object memories, requiring reconsolidation to preserve them, yet the adaptive function of this process remains unresolved. Here, we show that reconsolidation creates functional links between object memories in rats. Reactivating a consolidated memory in the presence of a novel object induced hippocampal D1/D5 dopamine receptor-dependent destabilization and reconsolidation, after which the two memories became mutually dependent: once either trace naturally decayed, a brief reminder with one object reinstated both its own memory and that of its reconsolidated partner. This bidirectional reinstatement was selective for the paired memories and was blocked by D1/D5 receptor inhibition at reactivation. Preventing decay of one member of the reconsolidated pair, either through post-reactivation reminders or by enhancing persistence and blocking active forgetting with post-training manipulations, also preserved the other. Notably, these manipulations conferred durability not only to memories consolidated under their influence but also to those later encoded through reconsolidation mechanisms, indicating that this process transfers stability-related properties from the original trace to its reconsolidated counterpart. These findings demonstrate that reconsolidation integrates new information into existing object memories, allowing episodic reminders to propagate across linked engrams and supporting the coherence of memory networks. / The claustrum is a densely connected structure implicated in sensory integration and cognitive control, yet its contribution to aversive learning remains unclear. Using step-down inhibitory avoidance (SDIA), a single-trial learning task modeling complex fear-motivated avoidance behaviors, we found that post-training blockade of either NMDA receptors, transcription, or translation within the claustrum did not impair long-term memory formation in adult male or female rats. In contrast, reversible pre-training inactivation selectively disrupted SDIA long-term, but not short-term, memory, indicating that the claustrum modulates processes supporting enduring avoidance learning. Surprisingly, inhibiting hippocampal protein synthesis, required for SDIA consolidation, did not prevent the expression of avoidance memory acquired during a second training

session in rats rendered amnesic by claustrum inactivation, demonstrating robust mnemonic savings. These results suggest that the claustrum does not directly mediate acquisition or storage of SDIA memory but regulates the persistence and accessibility of consolidated aversive information, influencing its later expression.

P27 - NECTA: An Interactive Computational Framework for Dynamic Mesoconnectome Exploration

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Connectome analysis reveals network topology (Dann et al., 2016) but often overlooks the dynamic "dynome" (Kopell et al., 2014). We introduce NECTA (Neural Electrophysiological Connectivity Time-resolved Analysis), an interactive framework that processes raw electrophysiological data (LFP/spikes) to explore dynamic mesoconnectomes. NECTA calculates Partial Directed Coherence (PDC) (Baccalà & Sameshima, 2001) using a sliding-window approach (Allen et al., 2014) and surrogate data (Schreiber & Schmitz, 2000) to derive graph metrics (Rubinov & Sporns, 2010). The framework utilizes a Dask-based engine for real-time exploration via a Dash/Cytoscape visualization interface. Validation on a 48-channel visual cortex dataset (A17, A18, TZ) revealed a Low Gamma hierarchy with A17 as the primary Source (+1.10) and A18 as the Sink (-1.36). Dynamic analysis showed that despite temporal volatility, A17 and TZ hubs maintain stable rhythmic organization. NECTA successfully translates raw signals into dynamic insights, characterizing A17 as a "Volatile Source" and A18 as a "Stable Sink."

P28 - Untangling RTT MECP2-related mechanisms using cortical brain scRNA-seq networks

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Rett Syndrome (RTT) is a severe neurodevelopmental disorder caused mainly by mutations in the MECP2 gene on the X chromosome, resulting in profound gene expression dysregulation that impairs several features throughout brain development. Since clinical symptoms typically emerge after 6-18 months of apparently normal development, RTT is primarily considered a disorder of neuronal maturation and maintenance. OBJECTIVES: The central objective of this study was to investigate whether the gene expression signature of RTT, caused by Mecp2 loss-of-function, is significantly enriched in specific developmental modules, revealing a potential overlap between the pathology and normal neurodevelopmental processes. METHODS: To achieve this, we analyzed a transcriptomic atlas of mouse cortical development combining single-cell RNA sequencing (scRNA-seq) and chromatin accessibility profiling (scATAC-seq) across

11 developmental stages. We employed hdWGCNA to identify cell-type-specific gene modules with highly correlated expression patterns across 17 distinct cell types. Furthermore, we curated molecular signatures of RTT from the literature, comprising downregulated genes associated with neuronal maturation and upregulated genes linked to the NF-kB pathway, and performed an over-representation analysis to assess the statistical overlap between developmental modules and pathological signatures. RESULTS: Our results reveal 18 network modules significantly associated (P.adjust < 0.05) with RTT signatures. Notably, the upregulated signature overlapped with 13 modules across diverse cell types, including glia and progenitors, whereas the downregulated maturation signature was restricted to 5 modules, predominantly in neurons such as CThPN and SCPN. DISCUSSION: These findings provide a systems-level insight into the disease's origins, highlighting the link between developmental trajectories and pathological mechanisms.

P29 - How Wistar Rats Adapt Locomotion to Increasing Treadmill Speed: An Exploratory Kinematic Study

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Locomotion is widely recognized as a sensitive and informative motor behavior, both in studies of spontaneous exploration and in research involving therapeutic or pharmacological interventions. Changes in locomotor patterns reflect adaptations in neural control, biomechanical conditions, and the motor strategies adopted by the organism. Classical literature describes quadrupedal gait as organized into three primary classes—walk, trot, and gallop—each characterized by distinct kinematic metrics such as limb extension, intersegmental synchronization, cycle duration, and step transitions. Despite advances in the field, the automated quantification and classification of these patterns in rodents remain limited, particularly in tasks involving increasingly demanding locomotor dynamics. This study aims to develop tools for automatic extraction and classification of gait patterns and to describe how these patterns change as treadmill speed increases. To this end, videos were recorded in sagittal and transverse planes from nine adult male Wistar rats during a progressive speed locomotion task. The recordings were processed using DeepLabCut to track 18 anatomical landmarks, including the nose, base of the tail, and limb joints. The results indicate that the network provides stable and consistent tracking. Positional data from the paws and the dorsal midline were analyzed to extract spatial and temporal locomotor metrics. The distance between each paw and the dorsal center of mass (x-axis) was normalized and used to compute the stride cycle. Exploratory analysis allows visualization of trajectories, joint angles, and synchronization patterns across limbs as speed increases, revealing progressive changes throughout the protocol. These findings

support the construction of windows of interest that will be used to train unsupervised models for clustering locomotor patterns. Establishing a standardized processing pipeline contributes to the reproducibility and precision of behavioral assessments across laboratories and experimental models. Future steps include integrating these measures with additional behavioral and physiological variables recorded during the task. This approach may contribute to the development of novel quantitative biomarkers of motor performance in natural conditions and neurological dysfunction.

P30 - EEG correlates of lucid dreaming during sleep onset (N1) and light sleep (N2)

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Lucid dreaming (LD) is a state of consciousness during which the dreamer becomes aware of the oneiric state and may be able to control the dream content. LD is predominantly associated with REM sleep and is objectively verified by the pre-agreed eye movement technique, in which subjects perform voluntary eye signals upon becoming lucid (. During REM sleep, LD is correlated with enhanced activity and connectivity in frontal regions, in the precuneus, and in the right temporo-parietal junction (TPJ). LD can also occur during sleep onset (N1) and light sleep (N2); however, little is known about the neural correlates of LD in these other stages. As part of a broader effort to advance the scientific understanding of dreaming, we are also developing an integrated research platform dedicated to sleep, dream health, and lucid dreaming phenomena, designed to centralize data collection, streamline analysis, and support large-scale studies in the field (https://neuro.ufrn.br/sonhoslucidos/). Objective: In the present work, we aimed to investigate LD correlates during N1 and N2 sleep stages. Methods: We analyzed brain (EEG), eye (EOG), and muscle (EMG) activity from three case reports of eye-signaled, verified LD during N1 and N2 sleep. Preprocessing included removal of eye-movement artifacts over frontal channels using independent component analysis (ICA). We then staged the sleep epochs and plotted multitaper spectrograms. Results: We observed no significant changes in the spectrograms after the pre-agreed eye movement compared to preceding periods. We will increase the number of subjects and additionally analyze the power spectral density of the main EEG oscillations. The new platform under development will facilitate the expansion of this dataset and enable more systematic exploration of LD across sleep stages.

P31 - Characterization of the "Half-and-Half" Behavior in Octopus insularis during Laboratory Acclimation and Post-Acclimation Periods

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Cephalopods are noted for their remarkable behavioural and neural complexity. Recent studies have identified in Octopus insularis an “sono ativo” (SA; hereafter called the active sleep) state analogous to vertebrate REM sleep. Other complex, dynamically colour-changing behaviours are also observed, such as the “Meio a Meio pattern” (MM; hereafter called the half-and-half pattern), in which one half of the body darkens while the other remains pale. To clarify the nature of MM and its relationship to SA, six O. insularis specimens were collected, housed in the laboratory, and filmed under artificial light during the 12 h light phase. MM and SA behaviours were quantified for duration and frequency in two periods: acclimation (four days after arrival) and post-acclimation (four days after at least 20 days of acclimation). Video analysis showed that the MM state comprises three subdivisions: “Meio a Meio Forte” (MMFo; hereafter called the strong half-and-half pattern), “Meio a Meio Fraco” (MMFr; hereafter called the weak half-and-half pattern), and “Meio a Meio Manchado” (MMM; hereafter called the half and half stained pattern). A significant increase was found in MM duration ($p = 0.02$) and frequency ($p = 0.034$), as well as in SA duration ($p = 1 \times 10^{-6}$) between the two periods. MM was also more closely associated with the “Alert” and “Quiet” behaviours. The presence of three MM subdivisions underscores its varied and dynamic nature. The post-acclimation rise in both the occurrence and duration of MM, together with the longer SA bouts, may indicate habituation to the new environment. Furthermore, the stronger association of MM with the “Quiet” and “Alert” states suggests that MM functions as a sleep phase in these animals.

P32 - SEX DIFFERENCES IN INHIBITORY CONTROL AND IMPLICIT MOTOR IMAGERY: EVIDENCE FROM GO/NO-GO AND HAND LATERALITY RECOGNITION TASKS

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Men and women differ in several aspects of executive motor control, inhibitory performance, and spatial representation of the body, but the neural mechanisms underlying these differences are not well established. Oscillatory activity in the alpha (8–13 Hz) and beta (15–30 Hz) bands allows the examination of how each sex recruits sensory-motor and prefrontal regions during cognitive-motor tasks. Motor inhibition and implicit motor imagery are two domains in which sex-related patterns may emerge. The Go/No-Go task assesses inhibitory control by requiring rapid initiation or suppression of movement. Successful inhibition is typically accompanied by beta synchronization and prefrontal involvement, whereas errors

show distinct spectral patterns. Although sex differences in inhibitory performance have been described, their neurophysiological correlates remain uncertain. The Hand Laterality Recognition Test (HLRT) evaluates implicit motor imagery by asking individuals to judge the laterality of rotated hand stimuli. This mental rotation engages sensory-motor regions and modulates event-related spectral perturbation (ERSP) in alpha and beta frequencies. Behavioral differences between men and women in mental rotation tasks are known, but fewer studies have examined the corresponding cortical activity during hand-specific imagery. This study investigates whether men and women differ in cortical activation and behavioral performance during the Go/No-Go and HLRT tasks. ERSP analyses will be used to characterize sex-related oscillatory patterns associated with inhibition, error processing, and mental rotation. Circulating sex hormone levels will also be measured to evaluate whether they contribute to variability within each sex. By combining behavioral performance and EEG measures, this study aims to clarify how men and women engage cortical networks involved in inhibitory control and implicit motor imagery, with potential implications for understanding sex-related variation in motor function.

P33 - Introspection, Self-Assessment and Academic Performance: Evidence of Overestimation among Undergraduate Students

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Neuroscience has increasingly been used by educators to support pedagogical practices and propose approaches to overcome classroom challenges. Considering that emotional states influence decision-making, attention and motivation, it is essential to understand how these cognitive factors relate to the teaching and learning process. This study investigated the relationship between self-reported emotional states, self-assessment and academic performance (CAAE: 87717925.6.0000.5292). Undergraduate students enrolled in courses offered by the Center for Biosciences and the Brain Institute at UFRN participated in the study. Emotional, attentional and motivational introspection was measured using Likert-scale questionnaires administered before and after classes throughout the semester. Academic performance was assessed through an exam graded independently by two evaluators. In the dataset presented here, the class consisted of 40 students, from whom 731 responses were collected across 12 sessions over six weeks. After applying exclusion criteria, primarily irregular participation, the final analyzed sample comprised 25 students. The results indicated a weak but significant negative correlation between the final grade and the difference between the self-assigned grade and the actual grade (R^2 = 0.2417; r = –0.46; p = 0.0027), suggesting a tendency toward overestimation of one's own performance. No significant correlations were observed in the other analyses, indicating that the

reported emotional variations were not associated with academic performance or engagement in this sample.

P34 - AUTOMATED TRACKING AND IDENTIFICATION OF MARMOSET BEHAVIORS

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Ethological analysis is a key component of behavioral neuroscience, as it enables the establishment of relationships between neural mechanisms and specific behavioral patterns. However, traditional observational methods for behavioral quantification still widely used rely on manual scoring, making them time-consuming, prone to bias, and poorly reproducible. These limitations hinder the precise correlation between behavioral measures and neural recordings. To address this challenge, we developed an open-source Python library designed for automated tracking and quantification of behaviors in marmosets (Callithrix jacchus), aiming to provide more precise, standardized, and reproducible behavioral assessments. The library receives CSV files containing the (X, Y) coordinates of body points over time. In this study, these coordinates were obtained using the deep-learning tool DeepLabCut, based on videos recorded simultaneously from top and lateral camera views of the experimental apparatus. The library is organized into three main modules. The pre-processing module filters noise in the coordinate time series using spatial and moving-average filters, also performing interpolation of missing values. The derived-metrics module, supported by NumPy, computes variables such as speed (Euclidean distance between consecutive points over time), head orientation (angle derived from the nose–body vector), and angular head velocity (temporal variation of these angles). The visualization module allows plotting the computed metrics and marking temporal events consistent with behaviors previously described in the literature. To evaluate the applicability of the tool, we used the library to analyze data from an experimental protocol involving different visual stimuli. In this study, the behaviors were identified through manual grouping based on conditional rules defined by angular-velocity thresholds and gaze direction. This approach enabled automatic quantification of behavior durations according to ethological criteria. Preliminary results indicate that the tool is effective for the automated analysis of behaviors in primates, providing a standardized alternative to manual scoring and contributing to improved precision and reproducibility in behavioral neuroscience.

P35 - HIPPOCAMPAL RHYTHMS REVEAL THE DYNAMICS OF FEAR EXTINCTION.

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Learned fear helps animals avoid danger, but trauma can lead to maladaptive overgeneralization, a core feature of post-traumatic stress disorder (PTSD). Fear extinction forms a safety memory that suppresses, rather than erases, fear memory. The oscillatory dynamics underlying this process remain poorly defined. Using the step-down inhibitory avoidance task (SDIA), a single-trial, hippocampus-dependent learning task modeling complex fear-motivated avoidance behaviors, we recorded hippocampal local field potentials in adult male Wistar rats during a single 5 min extinction session carried out 24 h post-training. Theta power increased progressively across extinction and peaked during late exploration, coinciding with active updating of the contextual representation. High-gamma and high-frequency oscillations (HFOs) showed similar but slower-evolving dynamics, whereas slow-gamma exhibited an early peak that remained stable until the session's end. Delta and beta oscillations were unchanged. These results reveal discrete stage-specific temporal profiles of theta-gamma-HFO activity during extinction and suggest that coordinated modulation of these rhythms supports the adaptive revision of fear memories.

P36 - THETA SYNCHRONY LINKS DORSAL HIPPOCAMPUS AND PRELIMBIC CORTEX DURING RECONSOLIDATION

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Reconsolidation enables the updating of reactivated memories through plasticity mechanisms that depend on coordinated activity across distributed circuits. Using step-down inhibitory avoidance (SDIA), a single-trial, hippocampus-dependent learning task modeling complex fear-motivated avoidance behaviors, we examined theta-frequency interactions between dorsal CA1 (dCA1) and prelimbic cortex (PrL) during memory reactivation in adult male Wistar rats. Rats were either pre-exposed to the training context, a prerequisite for reconsolidation, or handled without pre-exposure. During reactivation, pre-exposed animals showed marked increases in theta coherence, phase locking, and spectral Granger causality from dCA1 to PrL, whereas handled controls showed minimal coupling. Enhanced dCA1→PrL directional influence occurred specifically during the reconsolidation-enabling reactivation session. These findings show that hippocampal→prefrontal theta synchrony supports the induction of reconsolidation and establish theta-band coordination as a key mechanism for routing memory-updating signals across the circuit, informing novel strategies for targeting maladaptive memory processes.

P37 - THE SEROTONERGIC SIGNALING TRANSCRIPTION ATLAS DURING HUMAN BRAIN DEVELOPMENT

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Serotonin (5-HT) is generally regarded as the neurotransmitter responsible for mood regulation. However, its role is already present during development, when the brain is being shaped. It acts silently in neurogenesis processes, from migration to differentiation and the formation of the first neural circuits. During embryogenesis, the serotonergic system is one of the first to emerge, which means it influences the formation of a wide variety of brain regions. This system is formed by a diverse set of genes, including: TPH2 and DDC, which participate in serotonin synthesis; the SLC6A4 transporter (SERT), responsible for regulating its reuptake; the MAOA/B enzymes, which act in its degradation; and receptors such as HTR1A, HTR2A, and HTR6, which modulate the response of neuronal tissue at different ages and brain regions. The differentiation of 5-HT-producing neurons depends on some specific transcription factors, such as Lmx1b and Pet-1, whose expression is predominant during the fetal period, when these neurons are being generated. Here, we utilized a publicly available database of RNA expression in human brain regions (BrainSpan) to investigate the expression patterns of key serotonin signaling molecules during human development. The database has RNA-Seq read counts normalized to reads per kilobase per million mapped reads (RPKM) and averaged to the gene level. Data were processed in R (v4.4.1) using the dplyr, tidyr, ggplot2, and ggseg packages. When we follow the transcriptome of the developing human brain, it becomes clear that serotonin-related genes do not follow a fixed pattern; instead, they change over time and vary between different brain regions. Data indicate that the HTR2A receptor exhibits moderate levels during fetal trimesters but predominates in the postnatal period, particularly in the cortex. This increase suggests direct participation in the maturation and plasticity characteristic of early childhood. In contrast, TPH2 maintains high levels of expression from the early stages in the raphe nuclei, reflecting its function as a central component in the initial establishment of the 5-HT system. The SLC6A4 transporter appears highly expressed when serotonergic projections are forming, gradually decreasing in adulthood. Other receptors, such as HTR1A and HTR6, follow their own trajectories, each associated with the modulating demands of different developmental stages. Meanwhile, transcription factors such as Lmx1b and Pet-1 maintain concentrated expression in the brainstem and embryonic phase, reinforcing their importance for the identity of serotonergic neurons. Effector genes, receptors, transporters, and enzymes, on the other hand, show a wider distribution and fluctuations that accompany cortical and subcortical maturation. In short, the data indicate the

existence of plasticity windows, primarily during childhood. During these periods, the amplification of gene expression, such as HTR2A, suggests a brain that is especially sensitive to environmental and pharmacological influences. This vulnerability may help explain why alterations in the serotonergic system are linked to the emergence of disorders such as depression, anxiety, and OCD. The transcriptional atlas, therefore, not only highlights the central role of serotonin in the construction of the human brain but also reinforces the importance of integrating different levels of analysis to understand how it contributes to mental health throughout life.

P38 - Zika Virus Brain Infection via Macrophage/Microglial Activation in the Embryonic Olfactory Epithelium

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Gestational Zika virus (ZIKV) infection can cause a broad spectrum of neurological abnormalities, such as microcephaly, cortical reduction, impaired neuronal migration, and structural damage to nervous tissue. Given that the observed malformations appear to originate in the anterior encephalic region and, in severe cases, extend to posterior areas, we hypothesized that an anterior entry route explains the observed pattern. Our objective was to determine whether ZIKV uses the embryonic olfactory epithelium as an entry point into the Central Nervous System (CNS). We also investigated whether microglia could participate in viral transport between peripheral structures and the CNS. Pregnant mice at embryonic day 15 (E15) were anesthetized via intraperitoneal injection with 13.3 mg/kg xylazine and 83.3 mg/kg ketamine. The uterus was exposed, and each fetus received 1 µL of ZIKV containing 105 Plaque Forming Units (PFU) in the amniotic fluid, or the same volume of 0.9% saline solution for the control group. The animals were returned to their original position, and the female was sutured. After the procedure, embryos were collected at 1, 2, or 3 days post-infection (dpi). Brains were fixed and cryoprotected for sectioning in a cryostat. We performed immunofluorescence to label microglia (Iba1) and the Envelope protein of ZIKV (an antibody that recognizes the protein of all Flaviviruses). At 1 and 2 dpi, there was not sufficient expression of ZIKV in the olfactory epithelium (OE) or the brain. The Iba1+ cells in the transition between the OE and the olfactory bulb (OB) have a complex, branched morphology. At 3dpi, we observed infected cells in the OE, cribiform plate, and OB. Notably, these infected cells in the OB are located closer to the meninges and rarely close to the ventricles. We have also observed Iba1+ in some infected cells, which acquire a rounded morphology. We cannot yet distinguish whether ZIKV+/Iba1+ cells were infected or have phagocytosed the virus. Our preliminary data suggest that microglia can function as “Trojan horses”

and carry ZIKV from the periphery, where it contacts the amniotic fluid, to the brain. We will soon determine the proportion of ZIKV+/Iba1+ cells at 3 dpi in the OE, cribriform plate, and OB. We plan to use molecular markers of phagosomes to test the presence of ZIKV in these vesicles or in the cytoplasm. Moreover, we will pharmacologically inhibit microglia activity to test if we can inhibit or mitigate brain infection.

P39 - Experience-dependent remodeling of the extracellular matrix regulates perceptual skill learning and memory

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Perceptual training (a regimen in which a stimulus feature is gradually made more difficult to detect or discriminate) can improve a listener's ability to detect weak acoustic stimuli or discriminate highly similar sounds. This process shapes the acquisition of speech, language, and musicianship, transforming a perceptual novice into an expert. Although prior work has revealed a critical link between cortical plasticity and the emergence of expertise, we still do not understand how perceptual expertise is consolidated. One compelling but unexplored candidate is the extracellular matrix (ECM), a complex network of proteins and carbohydrates that surrounds cells of the central nervous system. ECM components are synthesized and secreted by both neurons and glia and form both a diffuse interstitial lattice and highly condensed structures termed perineuronal nets (PNNs) that surround individual neurons. In the cortex, PNNs predominantly enwrap parvalbumin-expressing (PV+) inhibitory interneurons, where they regulate plasticity by influencing the localization of ion channels and receptors and by serving as a physical barrier to synaptic rearrangement. Here we show that auditory perceptual training triggers rapid, reversible ECM remodeling in primary auditory cortex (A1), with ECM degradation emerging four hours after training and full restoration within 24 hours. This degradation–renormalization cycle repeats across training sessions but gradually diminishes as expert performance emerges, and ECM expression levels predict final perceptual thresholds. Notably, this plasticity signature is specific to A1 and does not occur in somatosensory cortex. To test functionality, we enzymatically degraded the ECM with chondroitinase ABC (chABC) during training. Pre-training ECM ablation did not impair basic task acquisition, but chronic PNN destabilization slowed day-to-day improvements and hindered consolidation of expert-level thresholds without affecting instrumental behavior. Furthermore, post-training ECM digestion destabilized previously acquired perceptual skills, indicating a role for ECM restoration in memory maintenance. Together, these results reveal that the ECM dynamically regulates adult auditory cortical plasticity, enabling rapid synaptic reorganization during learning and promoting network stabilization necessary for the consolidation and long-term retention of perceptual expertise.

P40 - Biopsychosocial Predictors of Burnout in High

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Introduction:Adolescence is a critical developmental stage marked by rapid physical, cognitive, and social changes, increasing vulnerability to stress and cultural pressures. This study investigated the biopsychosocial conditions of high school students to examine associations between psychophysiological and pathophysiological variables and school burnout syndrome. Methods: This cross-sectional study, approved by the Ethics Committee (CAAE 67960623.8.0000.5537), was conducted in two full-time public high schools in Natal, Brazil with 95 students (38 males; 57 females) from the 1st (n=50) and 3rd (n=45) years. Data included psychometric measures of empathy, school satisfaction, and family support, as well as salivary cortisol as a physiological stress marker. Structural Equation Modeling (SEM) analysis was used to evaluate the associations between studied variables, to $p < 0.05$. Results: Burnout syndrome was identified in 28.4% of students, following the tridimensional criterion: high emotional exhaustion, high cynicism, and low professional efficacy. Emotional exhaustion (88.4%) and cynicism (68.4%) were especially prevalent, while 41.1% showed low professional efficacy. SEM analysis revealed that family support exerted a moderate, significant negative effect on burnout, confirming it as the strongest protective factor. However, most students reported low or moderately low perceptions across emotional support (77.9%), adaptability (71.6%), and autonomy (71.6%). Regarding burnout components, cynicism showed a strong positive effect ($\beta = 0.749$), and professional efficacy presented a negative effect ($\beta = –0.369$; $p = 0.012$). Third-year students exhibited significantly higher cortisol levels, which were associated with increased emotional exhaustion, suggesting elevated allostatic load related to academic pressure. The variable sex did not have any effect on the data. Although total empathy was not directly linked to burnout, high scores were observed in perspective-taking (66.3%), altruism (33.7%), and affective sensitivity (75.8%). Discussion: Findings reinforce the central role of family support in protecting adolescents against burnout. Despite positive school relationships, family dynamics proved more influential. Elevated cortisol among third-year students points to greater physiological stress driven by exam pressure. These results highlight the need for interventions involving families and students to strengthen emotional support, reduce burnout, and promote academic retention

and well-being.

P41 - In silico evaluation of sevoflurane inhibitory action in layer 5 pyramidal cells

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The volatile anesthetic sevoflurane is known to inhibit neuronal excitability in the brain, yet the precise ionic conductances underlying its effect remain difficult to isolate purely through pharmacological approaches. While electrophysiological recordings of auditory Layer 5 Type A and Type B pyramidal cells demonstrate different responses to sevoflurane, a quantitative explanation of the effect on specific channel conductances benefits from a computational deconstruction. To identify specific ion channel modulation by the small molecule anesthetic sevoflurane, we performed in silico experiments using a biophysically compartmental model of a Type A pyramidal neuron. The model was adjusted to match ex vivo conditions, and an Evolutionary algorithm with elitism was implemented to find the conductances that successfully replicated individual firing properties from whole-cell recordings. Specifically, the algorithm works by evolving a parameter space of the conductance from the neuronal model. For the model evaluation, a rigorous fitness function was used to minimize errors. This approach allowed us to predict the necessary conductances to represent voltage traces across two different pharmacological conditions (sevoflurane alone or in combination with tityustoxin-kappa alpha (a specific Kv1.2 channel blocker). We found that the computational optimization successfully generated solutions that could reproduce complex firing patterns observed in biological data. The model could capture the changes in conductances showing the effect of sevoflurane on persistent potassium currents (I_Kp) and also showed modulation by the mall-conductance calcium-activated potassium current (I_SK). The computational findings provide strong evidence that sevoflurane modulates excitability in layer 5 pyramidal neurons by significantly increasing the maximal conductance (ḡ) of both I_Kp and I_SK. This work validates a dual potassium channel modulation by sevoflurane and establishes a powerful in silico framework for prediction not only anesthetical effect but also other pharmacological approaches.

P42 - Optimization of PyMice Tracking for automated neuroethology using pose estimation and inverse reinforcement learning (IRL)

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Behavioral analysis suffers from limitations due to human analytical subjectivity and the simplicity of conventional tracking metrics. PyMice Tracking is a tool developed in Python designed for the precise identification and trajectory analysis of rodents. Unlike traditional approaches, PyMice integrates neural network training for robustness in animal identification, aiming at four central functionalities: (1) To serve as a recording platform adaptable to different setups, featuring online and real-time recording, analysis, and identification; (2) To perform tracking with automatic rodent recognition and easy determination of ROIs (Regions of Interest); (3) To characterize pre-defined patterns based on pose estimation; and (4) To serve as an Inverse Reinforcement Learning (IRL) platform. The neural network was trained using a dataset with over 5,000 manual annotations sourced from internal laboratory databases and external datasets (such as DeepLabCut), yielding satisfactory results regarding animal recognition for tracking purposes. The current validation phase consisted of the manual analysis of 48 test videos in the Open Field (OF) and Elevated Plus Maze (EPM) tasks. Tinnitus-exposed animals (C57BL/6 mice, both sexes; n=12) and controls (n=12) were compared to standardize eight pre-defined behaviors, which are currently being used to train the AI for automatic quantification. Consequently, the project proves effective in reducing analytical noise and distinguishing artifacts (such as visual interferences and reflections), establishing PyMice Tracking as a promising platform that reduces human bias and has direct applicability in the neuroethological investigation of tinnitus. Ultimately, the project aims to produce robust software to assist in the identification, quantification, and differentiation of behaviors in animals exposed to tinnitus.

P43 - Impact of the Acoustic Environment on Auditory Development: Evidence from the Neonatal ICU and ABR Studies in Mice

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This work presents two parallel studies that converge on the investigation and monitoring of auditory function in both clinical and experimental contexts. The first study describes the development of computational devices based on microcontrollers and digital signal processing, designed for the acquisition and analysis of auditory brainstem responses (ABR) in mice. The proposed platform enables controlled experimentation, precise recording of evoked potentials, and flexibility for neurophysiological research in animal models. The second study focuses on the application of microelectronic systems for continuous monitoring of sound pressure levels in Neonatal Intensive Care Units (NICU), aiming to

characterize the acoustic environment and identify exposure patterns potentially harmful to newborns' auditory development. Together, these studies illustrate how the integration of neuroscience, electronics, and computing can provide accessible and effective solutions for auditory assessment in both experimental models and sensitive clinical environments.

P44 - Entrainment Dynamics in Early Visual Processing

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Precise timing in neuronal responses has been proposed as an encoding mechanism in the visual system (Meister, 2025). In the retina, this mechanism has been linked to gamma-band oscillations, but these rhythms critically depend on the level and type of anesthesia, particularly halothane and isoflurane (Neuenschwander et al., J. Neurosci., 2023). Here, we investigate how the entrainment of neuronal responses to periodic visual stimulation reveals underlying synchronization phenomena in the retina and lateral geniculate nucleus (LGN) of the anaesthetised cat. We developed a custom visual stimulation system based on a concentrically arranged LED array, organized into independently addressable groups, allowing precise control of flicker frequency, luminance amplitude, phase, and duty cycle. We developed a custom concentric LED stimulation system consisting of a central element surrounded by independently controllable annular sectors, each enabling precise control of flicker frequency, luminance amplitude, phase, and duty cycle. Using this system, we found robust entrainment of responses to periodic inputs under ketamine and propofol. This entrainment shares key properties with intrinsic gamma oscillations, including dependence on stimulus size and intensity. The peak frequencies of intrinsic rhythms (3 cats, 60 recording sites; mean 80 Hz, maximum 118 Hz) and entrained rhythms (tested up to 120 Hz) reached values far above the temporal resolution of X- and Y-cells in the cat LGN (12 and 20 cycles/s, respectively; Lehmkuhle et al., J. Neurophysiol., 1980). Interrupting radial stimulus continuity, whether through spatial or temporal discontinuities or through phase rotations in surround and peripheral flickering stimuli, disrupts entrainment. These results suggest that entrainment of retinal ganglion cell responses relies on an active population-synchronization mechanism and may follow the same principles as visual binding. The implication, at the retinal level, it is not oscillations themselves but the synchronization of neuronal activity that is functionally significant. indicating that, at the retinal level, it is not oscillations per se but their synchronization that is functionally significant. These findings indicate that entrainment of retinal/LGN neurons depends on an active population-synchronization mechanism, potentially operating according to

principles similar to those proposed for visual binding. The implication is that, at the retinal level, functional significance arises not from oscillations themselves, but from the precise synchronization of neuronal activity.

P45 - Ethology as a tool to understand the multidimension of chronic pain

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Pain is often mistaken for merely an unpleasant physical sensation, but it extends far beyond this. It affects emotional, cognitive, social, and nociceptive aspects of the individual experiencing it. So why do we predominantly treat only the latter? It is logical that medications for chronic pain target the inhibition of pain stimuli, closing "the gate" and preventing pain information from reaching supraspinal levels for processing. However, these medications (such as opioids, gabapentinoids, and tricyclic antidepressants) are effective for only 30%-40% of patients suffering from chronic pain, leaving the majority without adequate assistance or effective options for symptom relief. Furthermore, in pre-clinical models for studying pain pathologies, the gold standards rely exclusively on nociceptive metrics, and even when researchers include experiments to observe emotional comorbidities, these are typically conducted in different animals, making data integration and correlation more difficult and, consequently, hindering translation to the clinic. In this scenario, the ethological approach emerges as a valuable tool for studying pain in all its aspects, integrating nociceptive metrics—such as mechanical and thermal hyperalgesia—with emotional, social, cognitive, and well-being parameters. In this study, we propose a new model to investigate C57BL/6 mice behavior throughout the chronification of neuropathic pain, induced by chronic constriction injury of the right sciatic nerve. After monitoring the animals for three weeks and collecting data on 13 different parameters, classified as sensory-discriminative, socio-emotional, cognitive, and general state, we applied comparative analyses between the injury and control groups, drew correlations between parameters, and subsequently applied principal component analysis to identify which components are most relevant in pain assessment. The main objective of this project is to better characterize the manifestation of neuropathic pain to optimize the development of new therapies targeting multiple aspects of pain, while also optimizing the use of animals in experimentation. This involves reducing the number of experimental subjects by applying multiple tests to a single animal and decreasing human intervention in test application—many of the parameters analyzed are derived from continuous recordings of animals in their housing cages, which reduces animal stress and better approximates the experimental environment and behavioral responses to natural pain manifestations, facilitating clinical translation.

P46 - Influence of Zika virus infection on the maturation of the cerebral GABAergic system

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Patients affected by the Congenital Zika Virus Syndrome (CZVS) often experience epileptic seizures that tend to increase over time and are resistant to medication. During embryonic development, the main inhibitory neurotransmitter, gamma-aminobutyric acid (GABA), excites immature neurons due to the higher expression of the chloride ion importer NKCC1 compared to the exporter KCC2, leading to a high intracellular concentration of chloride ions (Cl^-). After birth in rodents, there is a decrease in NKCC1 expression and an increase in KCC2, causing an inversion of the intracellular Cl^- potential. This inversion causes Cl- influx uponGABAA receptor opening. However, developmental disturbances, as the treatment with valproic acid, X-fragile syndrome or maternal immune activation, can inhibit Cl^- potential inversion. Here, we test the hypothesis that Zika virus (ZIKV) infection maintains a high intracellular Cl^- concentration, thereby decreasing the effectiveness of anticonvulsant drugs. We tested whether the postnatal infection of the developing brain by ZIKV prevents the inversion of intracellular Cl^- concentration in C57BL/6 mice and whether pharmacological inhibition of NKCC1 with bumetanide (BUM) attenuates the resulting neurological symptoms. On the first postnatal day (P1), we injected 1 µL of 0.9% saline solution (CTRL) or a solution containing 1,000 plaque-forming units (PFU) of ZIKV into the right lateral ventricle of mice. Animals were weighed daily, and reflexes tested from the sixth day post-infection (6 dpi), showed behavioral decline together with weight loss from 11 dpi. Treatment at 10 dpi, with BUM generated milder reflex deficits, better weight maintenance, and higher survival rates, suggesting attenuation of ZIKV severity. In order to test the effect of ZIKV on the excitability of hippocampal granule neurons (P7, P13 and P15), we conducted current-clamp experiments to evaluate basic firing properties. We also applied isoguvacine 10µM, a GABAA agonist, to test whether GABAergic transmission in that circuit resulted in inhibition or excitation. Our preliminary data indicate that, after 15 dpiisoguvacine reduced the number of action potentials, in controls, while slightly depolarized cells and allowed firing of action potentials with weaker stimuli in ZIKV animals. Preliminary results also indicate a more hyperpolarized resting membrane potential before isoguvacine application and distinct responses to subsequent stimuli. Future experiments will further study the effects of isoguvacine and diazepam, an allosteric modulator of GABAA, to elucidate the effects of ZIKV on GABAergic neurotransmission.

P47 - A smart camera for automatic respiration and reflex estimation in neonates

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Physiological and behavioral parameters, including respiratory rate variability and neonatal reflex responses, serve as critical biomarkers for the early detection of neurological abnormalities in newborns. Traditional monitoring in NICUs relies heavily on contact-based sensors and direct clinical observation, which can cause skin irritation, increase false-alarm rates, and introduce subjectivity into clinical assessments. Advances in computer vision, such as the YOLO pose-estimation framework and the Eulerian Video Magnification (EVM) technique for motion and color amplification, offer promising avenues for non-invasive, real-time physiological monitoring. We propose a smart-camera platform integrated with the incubator's native imaging system, designed to automatically detect respiratory dynamics and quantify both primitive and non-primitive neonatal reflexes using video data alone. This contact-free approach aims to standardize monitoring practices, reduce dependency on sensor-based measurements, and enhance the precision of early clinical detection. The proposed system has the potential to overcome limitations of conventional methods, improve diagnostic accuracy, and support more effective decision-making in neonatal care.