THE LOUISVILLE CHAPTER

SOCIETY for NEUROSCIENCE

33rd Annual Neuroscience Day

Thursday, April 10, 2025

Senses and Sensibilities: the neural circuitry of taste and temperament

Presenting Guest Speakers

Alfredo Fontanini, MD, PhD
Department Chair Neurobiology and Behavior, Stony Brook University

Kelly Bijanki, PhD
Director of Intracranial Monitoring Research, Baylor College of Medicine

Program of Events

09:30 – 10:15 Welcome and Program Introduction

10:15 – 10:55 DATA DASH • preview of selected posters: 3 slides, 3 minutes total

Does Resuming Antithrombotic Agents Impact Chronic Subdural Hematoma Outcomes After MMA Embolization With Or Without Surgery? A Systematic Review And Meta-analysis
Dr. Rahim Abo Kasem • UofL, Department of Neurological Surgery

Alzheimer's Disease and Related Dementia in Dual Diagnosis of Traumatic Brain Injury and Spinal Cord Injury compared to Spinal Cord Injury alone: A 22-year Analysis Using a Large Claims Database
Dr. Else Alvarez-Madrid • UofL, Department of Neurological Surgery, KSCIRC

The effect of offspring exercise on locomotor activity following developmental exposure to benzo[a]pyrene
Leah Bishop • Northern Kentucky University, Biological Sciences

Insurance Disparities in Rehabilitation Utilization after Initial Primary Malignant Brain Tumor Resection
Dr. Kristin Geczi • UofL, Department of Neurological Surgery, Kentucky Spinal Cord Injury Research Center, PM&R

Features of adaptive gait during step-up task following thoracic hemisection in Yucatan minipigs
Landry Konan • UofL, Department of Anatomical Sciences and Neurobiology, Department of Neurological Surgery, KSCIRC

Role of AI and Genomics in Early and Accurate Identification of Autism Spectrum Disorders: A Brief Review
Yathreb Mohamed • UofL, Department of Public Health and Information Science

RecuNet: A Novel, Low-Cost, & Automated Pipeline for the Spatiotemporal Prediction of Brain Tumor Recurrence
Gopalaniket Tadinada • North Oldham High School

Investigating Taste Bud Cell Lifespan: In Vivo Imaging of Taste Bud Cell Maturation and Turnover
Brittany Walters • UofL, Department of Anatomical Sciences and Neurobiology

10:55 – 11:15 LOCAL SPOTLIGHT I

Microglia specific circuit defects in Repetitive behaviors and neurodevelopmental disorders
Naveen Nagarajan, PhD • University of Louisville, Department of Pediatric Neurology, UofL Health

11:15 – 12:15 PLENARY LECTURE I

Unlocking affective neurobiology through intracranial recording and stimulation
Kelly Bijanki, PhD • Baylor College of Medicine, Director of Intracranial Monitoring Research

12:15 – 1:45 LUNCH AND POSTER SESSION

1:45 – 2:05 LOCAL SPOTLIGHT II

Therapeutic utility of focused ultrasound neuromodulation of the peripheral nervous system to treat disease
Damian Shin, PhD • University of Louisville, Professor and Chair of the Department of Anatomical Sciences and Neurobiology

2:15 – 3:15 PLENARY LECTURE II

Understanding the role of the gustatory cortex: tasting the past, present and future
Alfredo Fontanini, MD, PhD • Stony Brook University, Chair of Department of Neurobiology and Behavior

3:15 – 3:45 BUSINESS MEETING AND BOARD ELECTION

3:45 AWARDS

Learn more about the Louisville Chapter of the Society for Neuroscience at: www.sfnlouisville.org • Questions, email us: SFNChap@louisville.edu

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About The Speakers

Dr. Kelly Bijanki is a prominent neuroscientist specializing in the neural mechanisms underlying emotional processing. She earned her PhD in Neuroscience in 2011 from the University of Iowa. Her doctoral research was conducted in the Psychiatric Iowa Neuroimaging Consortium under Dr. David Moser. Following her graduate studies, she completed postdoctoral fellowships at the University of Iowa in psychiatric neuromodulation, and at Emory University under Dr. Helen Mayberg and Dr. Jon Willie, studying neural mechanisms underlying deep brain stimulation for depression. In 2019, she joined Baylor College of Medicine in Houston, where she is an Associate Professor in the Department of Neurosurgery and serves as the Director of the Translational Neuromodulation Laboratory.

Dr. Bijanki research focuses on how the brain integrates affective, interoceptive, cognitive, and social processes. Her lab investigates the role of the Affective Salience Network (Anterior Cingulate, Amygdala, Prefrontal, and Insular cortices and related subcortical areas) in mediating emotional behaviors. Utilizing intracranial and extracranial electrophysiology, direct electrical stimulation, neuroimaging, peripheral nervous system quantification, anatomy, and computational methods, her work aims to elucidate the neural circuits underlying processing and translate those findings into novel therapeutics for psychiatric disorders.

Dr. Bijanki has been recognized with prestigious awards and honors, including the Somerfield-Ziskind Award for best paper of the year in 2024 for the journal Biological Psychiatry, and having her work highlighted in the NIH Director's Blog and across public media. Dr. Bijanki's work has significantly advanced our understanding of how emotional experiences are represented and processed in the brain.

Dr. Alfredo Fontanini is a distinguished neuroscientist specializing in the neural mechanisms underlying taste perception and processing. He earned his MD in 1998 and PhD in Neuroscience in 2003 from the University of Brescia, Italy. His doctoral research was conducted at the California Institute of Technology (Caltech) under Dr. James Bower. Following his graduate studies, he completed postdoctoral fellowships at Brandeis University from 2002 to 2008, working with Drs. Sacha Nelson and Don Katz. In 2008, he joined Stony Brook University, where he serves as Professor and Chair of the Department of Neurobiology and Behavior.

Dr. Fontanini's research focuses on how the brain integrates sensory, motor, physiological, affective, and cognitive processes during eating. His lab investigates the role of the insular cortex and related subcortical areas in mediating food-related behaviors that involve decision-making, anticipation, and perception. Utilizing techniques such as electrophysiology, optical imaging, pharmacology, molecular tools, anatomy, and computational methods, his work aims to elucidate the neural circuits that govern taste and reward processing.

Dr. Fontanini has been recognized with several prestigious awards, including the Sloan-Swartz Fellowship for Theoretical Neurobiology, the Klingenstein Fellowship, the Ajinomoto Award for Young Investigators in Gustation, and the Presidential Early Career Award for Scientists and Engineers.

Dr. Fontanini's extensive body of work includes numerous peer-reviewed publications that have significantly advanced our understanding of gustatory processing and its neural underpinnings, for example how sensory experiences like taste are represented and processed in the brain.

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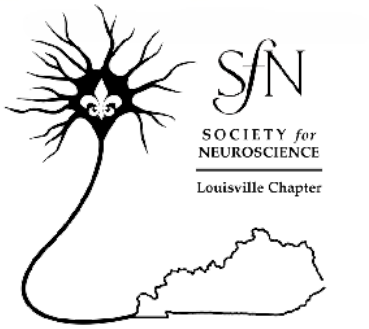
the neural circuitry of taste and temperament



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Special Thanks

Lesley Roberson Laura Edwins All Poster Judges

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Classical & Modern Languages
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Abstracts

UNDERGRADUATE STUDENTS

ABSTRACT # 1

Depression Phenotypes in adolescents with spinal cord injury and impact on healthcare utilization and cost: Analysis using a large claims database

Aleea E[1], Alvarez E[1], Boakye M[1,2], Singh G1[2,3], Behrman A[1,2], Ugiliweneza B[1,4]

[1]Kentucky Spinal Cord Injury Research Center
[2]Department of Neurological Surgery, UofL
[3]Kosair Charities School of Physical Therapy, Spalding
[4]Department of Anatomical Sciences and Neurobiology, UofL

Spinal cord injury (SCI) significantly impacts adolescent health, quality of life, and mental well-being, with depression being a common but underrecognized complication. However, the incidence, risk factors, and healthcare burden of depression phenotypes (DP) in adolescents with SCI remain poorly understood. This study aims to quantify the incidence of DP in adolescents with SCI and evaluate their impact on healthcare utilization and costs. A retrospective cohort study was conducted using MarketScan data (2000-2022) to identify adolescents aged 10-17 years with SCI. DP was classified using international classification of Disease (ICD) codes and prescription drug data into major depressive disorder MDD), other depression, antidepressant use for psychiatric conditions, and antidepressant use for non-psychiatric conditions. Logistic regression identified DP risk factors, while generalized linear models assessed differences in hospital length of stay, healthcare utilization, and cost over two-year post injury. The sample consisted of 482 adolescents with SCI (62% males, 63% without comorbidities, and 61% with commercial insurance). The majority had incomplete injuries (46% cervical, 17% thoracic). Within 2 years post injury, 23% developed a DP, including 6% with MDD, 4% with other depression, 7% prescribed antidepressants for psychiatric conditions, and 5% for non-psychiatric conditions. Risk factors associated with having a DP were older age with 21% higher odds for each year older, comorbidities with 2-5-fold higher odds compared to no comorbidities, and cervical complete insult with over 3 times higher odds compared to cervical and thoracic incomplete. Adolescents who have depressive phenotypes had significantly longer stays, higher payments at the time of injury. Two years post-injury, they had higher emergency room (ER) visits, hospital admissions, outpatient services, medication refills and overall payments. Adolescents with SCI face a high risk of depression, particularly those with older age, Medicaid insurance, comorbidities, and complete SCI. DP is linked to greater higher healthcare utilization and costs, emphasizing the need for proactive mental health screening and early interventions to improve psychosocial well-being and reduce long term health care burden.

ABSTRACT # 2

Obstacle Negotiation in Yucatán Minipigs: A Preclinical Model for Skilled Gait Analysis

Alrefai R[1,2], Konan LM1[2,3], Overley C[1,2], Usmani D[1,2], O'Steen WA[1,2], Howland DR[1,2,3]

[1]Kentucky Spinal Cord Injury Research Center
[2]Department of Neurological Surgery, UofL
[3]Department of Anatomical Sciences and Neurobiology, UofL

Background: Yucatán minipigs (YMP) provide a relevant preclinical model for biomedical research, yet our understanding of their gait control and capabilities remains underexplored. We evaluate their suitability as a preclinical, translational model for skilled gait by assessing obstacle negotiation, which requires sensorimotor integration and modulation. Our goal is to characterize and establish measurable adaptations and clearance strategy baselines for use in studies of neurodegenerative conditions. Methodology: Female YMP (n=8) were conditioned to cross a 15 cm high bar. Hindlimb (HL) movement was tracked using reflective markers and movement trajectories and joint angles calculated using the Vicon Nexus 3D motion capture system. Eight −14 trials per pig were used to determine clearance performance and leading HL tendencies, while 4−5 trials per pig were analyzed to assess spatiotemporal parameters and angular kinematics. All procedures were approved by the University of Louisville Institutional Animal Care and Use Committee. Results: A Kruskal-Wallis test showed no differences in leading limb preference across subjects ($p = 0.3823$), supporting the absence of a dominant HL pattern for this task. Four clearance categories were used: complete clearance, clearance with contact, hit, and stumble correction. Most trials showed complete clearances, with only a few contact, hit, or stumble correction responses. Paired t-tests revealed no differences between leading limb and any clearance type: complete clearance ($p = 0.0561$; clearance with contact ($p = 0.1142$; hit, $p = 0.5393$; stumble correction, $p = 0.1977$), suggesting that neither limb was more prone to errors. Preliminary joint angle kinematics suggest differences in maximum angular yield at the knee and ankle during approach and landing, reflecting kinematic adaptations during the negotiation. Conclusion: YMP exhibit sufficient motor control to negotiate a 15cm high bar requiring limb adjustments in response to visual and proprioceptive cues. The task is scaled to require HL adjustments, while permitting a high success rate in intact YMP. The results provide a baseline for assessment of trauma, disease states and therapies to enhance motor recovery in YMP. Future work will anatomically assess descending motor tracts likely to be involved in obstacle negotiation. Acknowledgements: Craig H. Neilsen Foundation, Rebecca F Hammond Endowment, KSCHIRT, Bucks for Brains, KSCIRC core

ABSTRACT # 3

In vivo utilization of ion manipulation to reduce periaxonal swellings after contusive SCI

Ames SO[1], Brooks J[1], Cortez-Thomas F[12], Stirling DP[134]

[1]Kentucky Spinal Cord Injury Research Center
[2]Department of Bioengineering, UofL
[3]Department of Anatomical Sciences and Neurobiology, UofL
[4]Department of Neurological Surgery, UofL

The development of periaxonal swellings post-contusive spinal cord injury (SCI) have been shown to be prominent and associated to the secondary degeneration of myelinated axons in the acute phase post-SCI. Here we show with intravital imaging of Thy1YFP+ axons and myelin labeled with Nile red, 3h delayed treatment with intravenous (5 uL/g) 3% or 5% hypertonic saline is significantly protective by reducing periaxonal swellings 24h post-SCI and increasing axon survival post-SCI (T13, 30 kdyn, Infinite Horizons Impactor) compared to normal saline control (Two-way ANOVA, $F(2,23) = 25.498$, $p < 0.001$; Bonferroni post-hoc test, both $p < 0.05$; $n = 3$-5/ group). Given the periaxonal space's role in buffering potassium in baseline conditions we hypothesized that post-SCI this function may be interrupted leading to an accumulation of K+ within the periaxonal space yielding the periaxonal swelling phenotype. To further elucidate the pathophysiology of periaxonal swelling development we injected (35 mg/kg, IP) the natural flavonoid luteolin at 1h and 4h post-SCI (T13, 50 kdyn) to activate inwardly rectifying potassium channel 4.1 (Kir4.1) to increase K+ buffering. 24h post-SCI imaging reveled that luteolin significantly decreased the density of periaxonal swellings at the epicenter of injury compared to vehicle control (Mann Whitney U test, $p = 0.004$, $n = 6$/ group). Collectively these data suggest that periaxonal swellings are an acutely targetable consequence of SCI that when reduced are coincident with increased axon survival.

ABSTRACT # 4

The effect of offspring exercise on locomotor activity following developmental exposure to benzo[a]pyrene

Bishop L, King L, Easton A, Fox D, Gogzheyan C, Pham D, Feltner M, Currran CP

Department of Biological Sciences, Northern Kentucky University

INTRODUCTION: Polycyclic aromatic hydrocarbons (PAHs) are widespread pollutants produced by burning fossil fuels, cooking foods at high temperature, and during wildfires. Prospective studies children exposed to PAHs during early brain development found persistent adverse effects on behavior. Benzo[a]pyrene is one of the most well-characterized PAHs, and its metabolism is well characterized. We use a mouse model with genetic differences in BaP metabolism to identify those at highest risk. Our prior studies found greater susceptibility in mice lacking the enzyme CYP1A2. The follow-up studies reported here were designed to see if offspring exercise could mitigate some of the adverse neurological effects. HYPOTHESIS/GOAL: We hypothesized that BaP-exposed mice receiving regular exercise would resemble control mice compared with BaP-exposed mice that did not exercise. METHODS AND RESULTS: Pregnant dams were treated with 10mg/kg/day BaP in corn oil-soaked food from mid-gestation to weaning at postnatal day 25. The exercise group had free access to running wheels for 1h/day from P30-P60 when behavioral testing began. We assessed open field locomotor activity and rearing using a square plexiglass chamber (41 cm × 41 cm) for 60 min and a Photobeam Activity System (San Diego Instruments). There was a significant treatment x sex x exercise interaction ($P = 0.035$) with BaP-exposed females that exercised having higher activity levels and more time spent in the open central region compared with BaP-exposed females that did not exercise. The opposite trend was seen for BaP-exposed males with non-exercised males showing hyperactivity compared with all other groups. The opposite trend was also seen in corn oil-treated females. The exercised females were significantly less active than the non-exercised controls. DISCUSSION AND CONCLUSIONS: Our data indicate that females exposed to BaP benefitted the most from regular exercise, because their activity patterns most closely matched the control behavior. This project was supported by grants P20GM103436-24 (KY INBRE) from the National Institute of General Medical Sciences, and R15ES020053, R15ES030541 and R03ES035480 from the National Institute of Environmental Health Sciences (Curran).

ABSTRACT # 5

Flavor experience shapes odor concentration preference

Ferreira DN, White CJ, Samuelsen CL

Department of Anatomical Sciences and Neurobiology, UofL

Taste concentration plays a crucial role in palatability. For instance, higher concentrations of sucrose are generally preferred, while stronger concentrations of citric acid are avoided. However, consummatory preference is shaped by more than taste alone. Flavor perception emerges from the interaction of taste and smell, where repeated exposure to an odor-taste mixture forms strong associations between an odor and a taste's value. However, the impact of odor concentration, independent of taste, on preference is not well understood. Additionally, it is unclear how odor-taste mixture experience influences these preferences. To investigate this, we used a 2-bottle brief-access task, giving female rats a choice between two concentrations of isoamyl acetate (low 0.01% and high 0.1%). After initial preference was tested, one group experienced both odor concentrations paired with a fixed concentration of sucrose (100 mM), while another group experienced pairings with citric acid (30 mM). Across all conditions, rats consistently preferred the low odor concentration. However, the group that had the sucrose pairing increased their consumption of the high odor concentration relative to before mixture experience, while those that had the citric acid pairing consumed even more of the low concentration. These findings demonstrate how odor concentration influences consummatory choice and that odor-taste mixture experience shifts initial preferences. Lower odor concentrations are generally favored, but experience with a palatable taste enhances the higher concentration, while experience with an unpalatable taste reinforces its avoidance. This aligns with other multisensory research demonstrating that more salient stimuli facilitate stronger odor-taste associations.

ABSTRACT # 6

The Effect of Maternal and Offspring Exercise in Mitigating Motor Deficits Following Exposure to Developmental

Fox D, Bishop L, Feltner M, Abbaraju K, Easybuck T, Easton A, Gogzheyan C, King L, Pham D, White A, Curran CP

Department of Biological Sciences, Northern Kentucky University

Pregnant women and their fetuses can be exposed to neurotoxic polycyclic aromatic hydrocarbons (PAHs) through air pollution and by eating food cooked at high temperatures. Exercise is known to improve brain function, but little is known about how exercise during pregnancy and early life can affect the developing brain. In this study, we wanted to find out if exercise could protect against exposure to the model PAH benzo[a]pyrene. We compared Cyp1a2(-/-) knockout and Cyp1a2(+/+) wild type mice, because our previous studies showed the knockouts were more susceptible to developmental BaP exposure. Dams were exercised for two weeks prior to meeting and until gestational day 10 (GD10). Offspring exercised from postnatal day 30 to 60 when behavioral testing began. Both groups received 1h daily of voluntary exercise on running wheels. We used the Rotarod test to see if exercise had an impact on motor function and motor memory. We found significant main effects of genotype and exercise, but no interaction. Cyp1a2(-/-) knockout mice had significantly impaired performance compared with wild type Cyp1a2(+/+) mice ($P < 0.01$). Offspring that exercised prior to behavioral testing performed significantly better that mice that did not exercise ($P < 0.05$). We replicated our previous findings by showing that Cyp1a2(-/-) knockout mice have motor deficits regardless of treatment. This indicates the gene has a normal function in brain development or function. CYP1A2 is expressed in the cerebellum, so it is biologically plausible that the knockouts have a cerebellar defect. We also found that all mice benefited from regular exercise. This is encouraging, because it suggests even BaP-exposed mice

ABSTRACT # 7

Can Exercise Mitigate Benzo[a]pyrene Developmental Neurotoxicity in Cyp1a2 Knockout and Wild Type Mice?

King L, Gogzheyan C,Bishop L, Fox D, Easybuck T, Allie Easton A, Pham D, Feltner M, Curran CP

Department of Biological Sciences, Northern Kentucky University

Rationale: Benzo[a]pyrene (BaP) is a carcinogen and neurotoxicant found in grilled foods, cigarette smoke, vehicle exhaust, and other sources of air pollution. Evidence is accumulating that exposure to BaP and related chemicals have adverse effects on children exposed during pregnancy and early life, so we designed experiments to determine if exercise could mitigate those adverse effects. We previously showed that both maternal and offspring exercise increased levels of brain-derived neurotrophic factor (BDNF) in the offspring. BDNF is essential to normal neuronal development and function. Experimental procedures: We examined the effect of both maternal and offspring exercise using 1h of daily, voluntary running on exercise wheels. Dams exercised two weeks prior to mating and from gestational day 0-10 (G0-G10). Offspring exercised from postnatal day 30 (P30-P60). Dams were treated with 10mg/kg/day of BaP in corn oil-soaked cereal or the corn oil vehicle as controls. We used novel object recognition and Morris water maze to test hippocampal dependent learning and memory. Results: In our preliminary analysis, we found BaP-exposed offspring that exercised performed better in the Morris water maze. Differences were only significant on one day of testing for each of the three hidden platform phases; however, we have three cohorts of mice still be to be tested. Conclusion: Our preliminary results indicate that offspring exercise has positive benefits on hippocampal dependent learning and memory.

ABSTRACT # 8

Optimising the Well-Being of Residents Diagnosed with Dementia: An Activities Calendar and Guide for Cognitive and

Monteagudo Parra K, Ulanowski, E

Rubel School of Business, Bellarmine University

This thesis explores the critical role of structured activities in enhancing the cognitive, emotional, and physical well-being of individuals with dementia. Drawing on evidence-based research and practical experience as an Activities Assistant, it emphasizes how engaging, person-centered activities can mitigate symptoms, improve quality of life, and promote social interaction across the stages of disease progression. The research culminates in the development of an ideal activities calendar tailored to patients with dementia, accompanied by a comprehensive guide detailing activity benefits, implementation strategies, and required resources. This framework addresses the unique challenges of dementia care, offering practical tools for caregivers to adapt activities based on individual needs and progression levels. By bridging research and practice, this work aims to advance dementia care methodologies, supporting caregivers in fostering meaningful engagement and improving outcomes for individuals with dementia.

ABSTRACT # 9

An Exploration of Behavioral Gender Differences Due to a Parkinsonian Gene, pdr-1, in C. elegans

Mulet Miranda A, Kiser P, Kroetz M

Department of Biology, Bellarmine University

Parkinson's disease is a debilitating neurodegenerative disease of the central nervous system classified by the loss of dopaminergic neurons. Males and females exhibit different symptoms however the cause remains unknown. Through the use of a model organism, C. elegans, we will investigate an ortholog of a Parkinsonian gene, pdr-1, to explore whether or not there are statistical differences between the hermaphrodites and males through known behavioral assays such as Swimming Induced Paralysis and Basal Slowing Rate. In order to compare gender differences, we successfully conducted CRISPR, where we inserted the him-8 mutation resulting in an increased population of males from less than 1% up to about 37%.To synchronize worm development, we have modified a procedure and methods from Kudumala et. al (2019) and have had consistent and accurate results. This procedure allows us to have C. elegans of the same age to eliminate age as a factor during behavioral assays. For the behavioral assays, we have been working with the Computer Science department to develop software to analyze and track the worms. However, our preliminary results are not congruent with expected values. We are currently uncertain whether or not they are due to issues with the new software. We are conducting more experiments to further gather and analyze data. Further experimentation needs and will continue to occur, but if there are differences present between the hermaphrodite and male worms, then it could ultimately reveal gender differences in humans being attributed to genetic reasons, which could allow for better and more personalized treatment options.

ABSTRACT # 10

Hindlimb ROM, accuracy, and the effect of speed during skilled locomotion in the Yucatan Mini Pig

Overley CM[1,2], Konan LM[1,2,3], Alrefai R[1,2], Usmani D[1,2], O'Steen WA[1,2], Howland DR[1,2,3]

[1]Kentucky Spinal Cord Injury Research Center, UofL
[2]Department of Neurological Surgery, UofL
[3]Department of Anatomical Sciences and Neurobiology, UofL

Introduction: Based on size and physiological similarities to humans, Yucatan Mini Pigs (YMP) are a valuable model in multiple areas of medical research. Because spinal cord injury (SCI) disrupts motor function, including gait, understanding gait features in YMP is crucial for evaluating recovery post-SCI and developing therapies. Yet, few studies have explored detailed features of YMP gait. We are investigating the impact of velocity on skilled gait in intact YMP. Methods: Studies were approved by the UofL IACUC. Eight female YMP were trained 5 days/wk, for 8 wks. Training included level surface overground walking, agility ladder crossing (rung height 3cm), obstacle negotiation (bar height 15 cm), and a step-up/down task (stage height 12 cm). Reflective markers placed on multiple hindlimb (HL) landmarks were captured using Nexus Vicon. Data were analyzed with GraphPad Prism v9. Average velocity was recorded for each pig, task and trial. For ladder crossings, HL hoof placement accuracy was recorded as the percentage of steps/trial in which the hoof was cleanly placed between the rungs. For obstacle negotiation, accurate clearance was measured as the percentage of times the HL traversed the obstacle without touching it/total trials. Data were analyzed for angular range of motion (ROM) across HL joints, as well as the effect of speed on accuracy for both the ladder and obstacle negotiation tasks. Results/Discussion: YMP show good right-left symmetry in skilled tasks with respect to HL joint ROM, stepping speeds and instantaneous velocities. Comfortable gait speeds for the ladder were slower (0.75-1.25 m/s) than for the obstacle task (1.3-2.5 m/s). Separation into low and high speed ranges for the ladder showed that the greatest ROM was seen in the distal HL joints regardless of speed. This also was true for obstacle negotiation. YMPs showed hoof trajectory and placement accuracies between ~80-100% on each task. This accuracy was not speed-related within the ranges evaluated. These two tasks are appropriately up scaled for YMP and will provide a consistent performance baseline for use in studies assessing the effects of trauma, disease and potential therapeutics. Next steps involve further kinematic data analyses and anatomical identification in YMP of descending motor pathways likely modulating their expression based upon other species. Acknowledgements: CHNF, RF Hammond Endowment, KSCHIRTF, Bucks for Brains, KSCIRC core

ABSTRACT # 11

The effects of maternal exercise on motor functions in neonatal mice

Reed R, Gogzheyan C, Fox D, Easybuck T, Pham D. Feltner M, Good A, King L, Easton A, White A and Curran CP

Department of Biological Sciences, Northern Kentucky University

Benzo[a]pyrene or BaP is a carcinogen found in cigarette smoke, grilled foods, car exhaust and more. Recent studies that monitored pregnant women and their children with high exposure to air pollutants such as BaP found adverse effects in brain development from infancy to adolescence. To determine if exercise could mitigate the adverse effects, we compared offspring of mice that either exercised daily on running wheels or did not receive supplemental exercise. We dosed pregnant mice with either corn oil or 10mg/kg/day BaP on cereal from gestational day 10 until pup weaning on postnatal day 25 (P25). We tested the pup's righting reflexes on P5, P7 and P10. We also tested negative geotaxis on P7, P10 and P14. Cyp1a2(-/-) offspring had significantly slower latencies on P5 ($P < 0.01$), but significantly faster latencies at P7 and P10 ($P< 0.001$). There was a similar trend in the negative geotaxis test; however, the differences were only significant at P10 ($P < 0.05$). We found a significant gene x exercise interaction in the righting reflex test at P10 with wild type Cyp1a2(+/+) offspring of exercising dams having significantly shorter latency than offspring of control dams ($P < 0.01$). We found the same pattern on the last day of negative geotaxis testing (P14). Wild type Cyp1a2(+/+) offspring from exercising dams had significantly shorter latency than offspring of control dams ($P < 0.05$).

ABSTRACT # 12

Developmental benzo[a]pyrene exposure impairs motor function in male mice of two genotypes

Shakya M, Perry J, Feltner M, Easton A, Easybuck T, Berling K, Pham D, Abbaraju K and Curran CP

Department of Biological Sciences, Northern Kentucky University

Benzo[a]pyrene (BaP) is a polycyclic aromatic hydrocarbon and ranked in the top ten of the U.S. Government's Priority Pollutant List. It is a known carcinogen, but more recently, has been associated with developmental neurotoxicity. Our previous work to identify genes that increase susceptibility to developmental BaP exposure uncovered sex differences as well as genetic differences. The studies reported here compared Cyp1b1(+/+) wild type mice and Cyp1b1(-/-) knockout mice, because CYP1B1 is one of three enzymes known to metabolize BaP in both humans and mice. We hypothesized that Cyp1b1(-/-) knockout mice would be more susceptible, because they had reduced capacity to metabolize and clear BaP. We treated pregnant dams with 10mg/kg/day of BaP in corn oil-soaked cereal or the corn oil vehicle from gestational day 10 (GD 10) to postnatal day 25 (P25) when pups were weaned. Motor function was tested in young adults over 5 days on a Rotarod. We found a gene x treatment x sex interaction on Days 2 and 3 of testing ($P < 0.05$), a treatment x sex interaction on Day 4 ($P < 0.05$), and a sex difference on Day 5 ($P < 0.05$). There were no differences between corn oil-treated wild type males and females; however, females out-performed males in all other groups. Unexpectedly, BaP-exposed Cyp1b1(+/+) wild type males showed the greatest impairments compared with all other groups. Cyp1b1(-/-) knockout males showed impaired performance compared with Cyp1b1(-/-) females regardless of treatment. Unlike our previous findings in Cyp1a2(-/-) knockout mice, there were no effects of genotype. Further work is needed to clarify if the motor deficits are related to changes in the cerebellum or nigro-striatal pathways, since both are important in motor function.

ABSTRACT # 13

RecuNet: A Novel, Low-Cost, & Automated Pipeline for the Spatiotemporal Prediction of Brain Tumor Recurrence

Tadinada, G

North Oldham High School

Gliomas affect 90,000 people annually in the United States and have 5-year survival rates as low as 7%, largely due to 1-year recurrence rates of 52-62%. Current MRI relies on contrast enhancement (CE) to visualize the glioma, which has several limitations: (1) tumor infiltration often extends far beyond CE margins; (2) After surgery, non-contrast enhancing tumor grows undetected & appears as “recurrence” in follow-up scans. Blood Oxygen Level-Dependent (BOLD) fMRI measures blood flow, which can be disrupted by the tumor microenvironment. Therefore, BOLD, combined with current imaging, could detect real-time tumor progression prior to radiologic “recurrence”, defined by CE. This project, RecuNet, aims to (1) establish a link between BOLD, non-contrast enhancing tumor, and recurrence, and use deep learning to (2) detect the non-contrast enhancing tumor and (3) spatiotemporally predict tumor recurrence. Both algorithms take standard (T1 + FLAIR) scans and BOLD fMRI as inputs. The detection algorithm uses a 3D-UNet Architecture with optimized loss functions and Attention Gated Networks (AGNs). The Prediction Model is a CNN that uses temporal-spatial convolutional layers and AGNs to extract features in peritumoral regions. Preliminary detection results show an IoU of 94.1%, accurately detecting non-contrast enhancing tumor portions. The prediction algorithm has a 94.52% location accuracy and a mean average error of 5.3 days from recorded recurrence time, significantly outperforming current methods. RecuNet nearly eliminates recurrence risk by visualizing the entire, exact tumor and accurately predicting areas with a high risk of developing tumor growth, saving money, resources, and lives.

ABSTRACT # 14

Analyzing EEG recording datasets from Alzheimer’s and Frontotemporal Dementia patients using Python and training

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In this study, we delve into the analysis of Electroencephalogram (EEG) datasets from subjects with Alzheimer's and Frontotemporal Dementia, utilizing Python programming. Our primary goal is to explore, visualize, and analyze these neurophysiological datasets, providing insights into the distinct patterns and anomalies associated with these dementia types. Furthermore, we aim to train a Large Language Model (LLM) on these EEG datasets, with the potential to enhance the accuracy and speed of dementia detection in future subjects. By leveraging the power of LLMs, we seek to develop a tool that could significantly advance early diagnosis and intervention strategies for dementia patients. The central research question guiding this project is: How can we effectively train Large Language Models using EEG datasets from Alzheimer’s, Frontotemporal Dementia, and healthy subjects to expedite the detection process for potential dementia patients?

ABSTRACT # 15

Developmental Benzo[a]pyrene Exposure Alters Stress Hormones, Neurotransmitters and Behavioral Responses of Mice Dependent on Cyp1 Genotype

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Rationale: Benzo[a]pyrene (BaP) is a widespread polycyclic aromatic hydrocarbon (PAH) produced during combustion processes and when grilling foods. Epidemiological studies indicate exposure to PAHs during pregnancy lead to learning and memory deficits as well as behavioral problems that persist into adolescence. Studies in rodents and zebrafish have frequently reported anxiolytic effects of BaP exposure in adult animals and in developmental studies. We used a mouse model to look for genetic differences in CYP1 enzymes, which are common to both mice and humans. Experimental design: We compared Cyp1a1(-/-) and Cyp1b1(-/-) knockout mice with wild type C57BL/6J mice. We treated pregnant dams from gestational day 10 to postnatal day 25 (P25) with BaP in corn oil-soaked cereal or the corn oil vehicle and tested one male and one female offspring beginning at P60. We used standard tests of anxiety-like and depressive-like behavior. We measured stress hormone levels using an ELISA kit and used HPLC to measure neurotransmitters in the hypothalamus. Results: We found increased exploratory behavior in the elevated zero maze for Cyp1a1(-/-) knockout mice, but no significant differences in Cyp1b1(-/-) knockouts. In contrast, Cyp1b1(-/-) knockout mice buried fewer marbles in a second test of anxiety-like behavior. There were no significant differences when Cyp1a1(-/-) knockout mice were tested. BaP decreased immobility time in Cyp1a1(-/-) knockouts in the forced swim test, but increased immobility time in wild type and Cyp1b1(-/-) knockout mice. BaP exposure increased corticosterone in wild type mice, but decreased it in Cyp1a1(-/-) knockout mice. Both BaP-exposed and corn oil control Cyp1b1(-/-) knockout mice had higher corticosterone levels compared with wild type mice. Dopamine and serotonin signaling were altered in the hypothalamus dependent on genotype, treatment and sex. Conclusions: Our data suggest that both CYP1A1 and CYP1B1 have a normal role in brain functioning or development, and that CYP1 genotype alters the response to developmental BaP exposure in behavioral and biochemical tests related to stress, anxiety and depression.

Abstracts

GRADUATE STUDENTS

ABSTRACT # 16

Implementing Virtual Reality (VR) as a Tool for Learning Neurophysiology

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Virtual reality (VR) is a technology that creates an immersive, and interactive computer-generated environments. VR is an established active learning tool for education and immersive clinical interactions with virtual patients in various biomedical disciplines. However, the development of VR for physiology is in its infancy. A new VR application for neurophysiology from iXRLabs has been recently developed. The aim of this study was to assess the effectiveness and students' perception of virtual reality for neurophysiology education. Objective We wanted to investigate whether students would retain neurophysiology information better if they interacted with the subject using virtual reality. Methods We created ten multiple-choice questions for each student to take during and after completing the study. Before beginning the study, students were given five multiple-choice questions. Participants were asked to wear the virtual reality headset, which was already preset to the nervous system lecture using iXRLabs. Participants then went through different lectures related to neurophysiology. Participants spent forty-five minutes to an hour going through the lectures. Afterward, the participants took a five-question quiz, which was the same as the pre-virtual reality quiz. Results The aim of this study was to analyze if using virtual reality would create more interactive learning to help students better retain information learned. Students took five pre- and post-questions to assess if they retained the information. The results show that, on average, students perform better on the post-quiz versus the pre-quiz. Upon completing the study, some students wanted to come back to do another session because they found the use of virtual reality to be helpful and a fun way to interact with the neurophysiological subjects. Conclusion Studies have shown that virtual reality is a helpful tool for hands-on learning. According to the participants' results, using virtual reality (VR) to learn neurophysiology can help retain information better and create a more interactive learning experience. In the future, VR should be used as a learning tool to understand complex subjects such as neurophysiology.

ABSTRACT # 17

Structural and Functional Impact of Spinal Cord Stimulation in Diabetic Peripheral Neuropathy

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Diabetic peripheral neuropathy (DPN) affects millions worldwide, and its progression to painful diabetic neuropathy (PDN) severely diminishes quality of life due to chronic pain, motor dysfunction, and vascular complications. Persistent hyperglycemia drives complex neural, inflammatory, and vascular alterations, leading to axonal degeneration, microglial activation, and impaired nerve conduction. This review synthesizes current literature on the structural and functional changes within the peripheral and central nervous systems associated with DPN. Specifically, we highlight imaging modalities, neurophysiological assessments, and biochemical markers such as nerve conduction studies, intra-epidermal nerve fiber density, and corneal confocal microscopy and the impact of neuromodulation on attenuating these parameters. Recent advances in neuromodulation, particularly spinal cord stimulation (SCS), offer promising therapeutic avenues. SCS has demonstrated efficacy in modulating neuroinflammatory pathways, restoring synaptic plasticity, and improving microvascular circulation, thereby providing significant pain relief and functional improvement. Emerging evidence suggests that SCS not only alleviates pain but may also enhance neurovascular integrity, reducing hypoxia-induced endothelial remodeling in the spinal cord. Functional imaging studies highlight SCS-mediated modulation of supraspinal structures, including the periaqueductal gray, thalamus, and somatosensory cortex, further underscoring its role in central pain modulation. This review characterizes the neurophysiological biomarkers of DPN and evaluates the impact of SCS and related neuroprosthetic interventions on reversing structural and functional deficits, offering a promising avenue for PDN management.

ABSTRACT # 18

Lower urinary tract response to spinal cord epidural stimulation with peripheral neurectomy in spinally injured rats

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Spinal cord injury (SCI) often leads to severe impairment of multiple body systems, greatly impacting quality of life. While the urinary bladder is initially areflexic during spinal shock following SCI, reflexive voiding usually develops within 2-12 weeks in humans and 1-2 weeks in the rat. However, voiding post-SCI is often disordered and may display detrusor-sphincter dyssynergia (DSD), which is characterized by uncoordinated bladder and external urethral sphincter (EUS) contractions, causing inefficient emptying and smooth muscle hypertrophy. Likewise, the frequency of bladder contractions may increase and contribute to dangerously high intravesical pressures and storage dysfunction in a condition known as neurogenic detrusor overactivity (NDO). Spinal cord epidural stimulation (scES) is a novel therapy that has been shown to improve lower urinary tract (LUT) function in both humans and pre-clinical experimental models post-SCI. It is hypothesized that the improvements in LUT function seen with scES result from modulation of the neural networks which project to the bladder or EUS that are located within these sites of stimulation. To gain insight into the neural mechanisms behind scES-induced effects on the LUT, the Hubscher laboratory has developed a model combining thoracolumbar or lumbosacral scES with a neurectomy of either the pelvic, hypogastric, or pudendal motor nerves in female rats with moderate-severe SCI (215 kdyn) during urethane-anesthetized cystometry-electromyography at 7-, 14-, or 28-days post-injury. Early data indicate a reduction in scES-induced LUT improvements following peripheral neurectomy, implicating their role as a functional target of neuromodulation.

ABSTRACT # 19

Characterizing glutamatergic projections from the mouse pretectum to the rostral pulvinar nucleus

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The mouse pulvinar nucleus (PUL) can be divided into a caudal zone (cPUL) that receives input from the superior colliculus (SC) and a rostral zone (rPUL) that receives input from layer 5 (L5) of primary visual cortex (V1; Bennet et al. Neuron, 2019. 102(2): 477-492). Silencing the SC or V1, using optogenetic/chemogenetic methods results in a marked decrease in activity in their respective recipient zones, character of "driving" inputs. We have found that the mouse rPUL receives dense input from parvalbumin-containing (PV) neurons in the pretectum (PT), which are largely glutamatergic. We used electron microscopy to examine the ultrastructure of mouse PV PT projections to the PUL, and found the PT-PUL projecting neurons are primarily glutamatergic, consistent to what we have previously found in the cat; whereas GABAergic neurons in the feline PT primarily project to the dorsal Lateral Geniculate Nucleus (dLGN). We used dual-opsin optogenetics and in vitro patch clamp recordings to investigate PT and L5V1 inputs to the rPUL. We administered a cre-dependent adeno-associated virus (AAV) to selectively induce the expression of ChrimsonR (pAAV-syn-FLEX-rc[ChrimsonR-tdTomato]) in PT and a non-cre-dependent AAV to induce the expression of Channelrhodopsin-2 (pAAV-hSyn-hChR2(H134R)-EYFP) in V1 of PV-Cre mice. Then, to verify L5V1 projections to the mouse PUL, we alternated the viral injections in Npr3-Cre mice, which selectively express Cre in L5V1. We used an occlusion protocol to independently activate either ChrimsonR- and/or ChR2-expressing terminals in rPUL and found that many neurons receive convergent input from both PT and L5V1. Photoactivation of PT and V1 terminals caused frequency-dependent depression in rPUL neurons, a physiological property associated with "driving" inputs (Kirchgessner et al. Curr Biol. 2021. 31(23):5121-5137). These data suggest that at least within the visual thalamus, many neurons receive convergent input from two or more "driver-like" inputs, and their collective activity may be used to provide the context needed to distinguish between self-generated and external visual motion (Roth et al., Nature Neurosci 2016 19(2):299-307). Moreover, our preliminary data suggests that GABAergic and glutamatergic PT cells are innervated by distinct types of retinal ganglion cells.

ABSTRACT # 20

Evaluating Hypertonic Saline's Impact on Spinal Cord Injury Recovery: A Real-Time Imaging and Behavioral Study

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Contusive and compressive spinal cord injury (SCI) induces pathological changes to spinal cord white matter (WM) including periaxonal swelling and resultant disruption of the axomyelinic interface, axonal swelling/spheroid formation, and secondary axonal transection. To further our knowledge of the role of vascular edema in these pathological changes to WM, we designed, and three-dimensional (3D) printed a dual-compartment imaging chamber separated by a semipermeable membrane to mimic and manipulate interstitial and vascular fluid compartments in real time. We hypothesized that hypertonic saline (HTS) applied to the "vascular" chamber would osmotically shift fluid out of the periaxonal space and preserve myelinated fibers after SCI. Adult male and female 6- to 8-week-old Thy1YFP+ transgenic mice underwent a C5 contusive SCIR in vivo, and their spinal cords were harvested for ex vivo imaging. Utilizing longitudinal two-photon excitation microscopy (2PE), we imaged both myelin (Nile red) and axons (YFP+) simultaneously up to 4 h after SCI to track dynamic changes in axons and myelin in real time acutely after SCI. We assessed three different clinically relevant HTS concentrations versus normal saline (NS) to determine their effectiveness in mitigating periaxonal swelling and axonal spheroid formation following a cervical SCI in real time. Following the identification of the most effective HTS concentration in the ex vivo setting, we administered the treatment in vivo via IV injections starting 6 h post-SCI and continuing daily for 7 days to evaluate its impact on functional recovery over 6 weeks. Behavioral studies were conducted using 10-week-old female C57BL/BJ mice with a T9 contusion and assessed using horizontal ladder, BMS/BMS subscore, and MoSeq. BMS subscores revealed that 3% HTS improved subtle locomotor recovery aspects between 2- and 14-day post-SCI. Motion sequencing (MoSeq) analysis further assessed locomotor activity by identifying behavioral motifs and computing scalar descriptors (e.g., position, height, velocity). A mid-rear behavior showed that 3% HTS-treated mice exhibited significantly greater average height by 6 weeks post-SCI, while a running behavior showed that 3% HTS-treated mice had increased running duration by 6 weeks post-SCI compared to NS.

ABSTRACT # 21

SDF-1α Mediates Primary Tumor Escape in Glioblastoma Through Activation of Mesenchymal Transitions

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Glioblastoma (GBM), a highly aggressive primary brain tumor originating in glial cells, poses a significant challenge due to its rapid growth and invasive nature within healthy brain tissue. Current treatments involve surgical resection, chemotherapy, and radiation. These treatments alone are not enough to cure this disease, however better understanding the mechanics of the tumor micro-environment This research focuses on understanding the tumor microenvironment's impact, specifically investigating the role of stromal cell-derived factor 1 (SDF-1) mechanics on GBM aggressiveness. SDF-1 is known to facilitate disease progression by facilitating chemotaxis toward the sub-ventricular zone (SVZ). GBM cells reaching this area of the brain represents a major event that when prevented stands to significantly increase the survival of the patient. The presence of SDF-1 together confer GBM cells the ability to transition into a mesenchymal state. This pro-neural to mesenchymal transition (PMT) is known to be a marker of a more aggressive tumor phenotype. Preliminary experiments explore SDF-1 effects on gene expression over five days, utilizing western blot quantification. The overall project has elucidated mechanisms driving GBM's invasive behavior, showing that gene products such as ZEB-1 which are known to facilitate PMT are unregulated in the presence of SDF-1. These preliminary and future experiments have provided valuable insights for developing targeted therapeutic strategies.

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ABSTRACT # 22

When Brainwaves Collide: sEEG and Conflict Control

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The motor system is trained through feedback shaping behavior. With motor conflict, response time increases, likely due to the heightened processing demands associated with detecting and decoding conflicting stimuli. Event-related potentials (ERPs) have been utilized to identify active brain regions involved in task performance. This study aims to enhance understanding of how conflict is detected and decoded. Preliminary data from nine participants (N = 9) with pharmacoresistant epilepsy, who were implanted with stereotactic or grid electrodes (8 sEEG, 1 grid), were collected in the Epilepsy Monitoring Unit (EMU) to localize seizures using the NATUS system. After recovery, the Simon task, a conflict paradigm requiring a directional response to a spatially lateralized stimulus feature (color), was administered. We hypothesized that conflict-related modulations of ERPs would occur at both cortical and subcortical recording sites. The data includes recordings from the orbital frontal cortex (8 patients), amygdala (7 patients), hippocampus (6 patients), insula and cingulate (5 patients), and frontal and temporal poles (2 patients). Preliminary analysis reveals an increase in the event-related negativity (ERN) during conflict trials across multiple brain regions. This ERN does not solely reflect error processing but broadly signals the need for adaptive response evaluation, initiating additional cognitive processing steps. In this context, the ERN signifies the need to assert control over behavior, suppressing the prepotent response. Future analyses will explore the timing of and interaction between brain regions (network oscillations) which will contribute to the understanding of neural mechanisms of conflict control and potentially aid in the development of biomarkers for control deficiencies. Data collection is ongoing, and analyses are currently limited by the small sample size.

ABSTRACT # 23

Analysis of center of pressure derived outcomes to quantify standing balance and postural control in individuals with motor complete thoracic spinal cord injury

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Motor complete thoracic spinal cord injury (SCI) affects the ability to stand unassisted. Spinal cord epidural stimulation (scES) has promoted the recovery of bilateral leg extension during standing; however, individuals still rely on assistive devices for balance and stability. Several factors can affect postural control including stability of assistive devices, manual assistance by trainers to maintain proper joint kinematics, and proprioceptive feedback. Hence, we studied the role of visual feedback and external assistance on center of pressure (COP) derived outcomes in 3 implanted individuals with motor complete SCI (age 35.7±12.3 years; injury levels T2-T3; AIS A) during recovery of standing ability. Standing postural control was assessed at two timepoints: after 80, and 160 sessions of alternate stand and step training with scES. In each assessment, they performed 1-minute stand attempts in four conditions: walker-eyes open, walker-eyes closed, handheld-eyes open and handheld-eyes closed. Trainers provided assistance for trunk, hips, and bilateral knee extension, if needed. Postural control was assessed using COP data acquired via force platform. All participants reported varying trends in COP derived outcomes. The COP excursion of participant A247, in the first assessment, during walker assist tended to be 45.1% lower than during handheld assist. In the second assessment, during walker-eyes open condition, they had 22.5% higher excursion than handheld-eyes open. For participants A247 and A248, their excursion during eyes open condition tended to be 40.3% larger than eyes closed. Participant A277 had frequent independence shifts during walker-eyes open condition in both assessments and during handheld-eyes open condition in the second assessment. Their COP excursion during walker assist, and eyes closed conditions tended to be 96.6%, and 85.9% larger than during handheld assist, and eyes closed conditions respectively in the first assessment, while the trends reversed (16.8%, and 39.6% lower) in the second assessment. The results suggest that postural control responses to change in assistance or change in sensory (visual) feedback were non-uniform among the 3 participants. Their level of independence was also different, with one participant needing frequent assistance level changes during certain attempts. These results enhance our understanding of factors that can affect standing postural control in individuals with motor and sensory complete SCI.

ABSTRACT # 24

Geographic Disparities in Mortality Outcomes Among Meningioma Patients: A National Cancer Database Analysis of Metropolitan and Urban/Rural Populations

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Introduction: Disparities in geographic location may impact mortality outcomes for neurosurgical patients with meningioma. This study examines differences in 30-day and 90-day mortality between rural/urban versus metropolitan meningioma patients in the United States, utilizing data from the National Cancer Database (NCDB). Methods: We conducted a retrospective cohort analysis of meningioma patients from the NCDB (2021), classified by rural/urban and metropolitan status using the United States Department of Agriculture (USDA)'s classification. Mortality outcomes included 30-day and 90-day mortality rates. Statistical analyses were performed using Brown-Mood test for continuous variables and Chi-Square test for categorical variables. Outcomes found statistically significant in these bivariate analyses were then analyzed with multivariable logistic regression analysis adjusted for demographic, socioeconomic, and clinical factors to account for potential confounders affecting mortality outcomes. Results: The study included 111,492 meningioma patients, of which 17,014 (15.3%) were categorized as rural/urban and 94,478 (84.7%) were categorized as metropolitan. The bivariate analysis showed no significant difference in 30-day mortality between rural (1.9%) and urban (1.7%) patients (p = 0.0633). However, rural patients had significantly higher 90-day mortality (3.0%) compared to urban patients (2.7%) (p = 0.0186). This difference did not hold in multivariate analysis of 90-day mortality (OR=1.04, 95% CI: 0.93-1.17, P = 0.4917). Conclusion: This analysis reveals significant disparities in 90-day mortality among rural and urban meningioma patients, suggesting a need for targeted interventions to improve outcomes in rural populations. The nonsignificance in 30-day mortality suggests that early postoperative care may be adequate across geographic settings. Furthermore, the findings in 90-day mortality underscore the importance of addressing long-term follow-up care and rehabilitation accessibility for rural populations because the disparities in documentation in association with demographics, socioeconomics, and comorbidities highlight the need for consistent reporting standards to ensure equitable healthcare for all meningioma patients.

ABSTRACT # 25

Changes in Electrodermal Activity Could Indicate Treatment Direction for People on the Anorexia Nervosa Spectrum

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Anorexia nervosa spectrum includes anorexia nervosa (AN) and atypical anorexia nervosa (AAN) (differing only by Body Mass Index, otherwise, the diagnostic criteria are the same) and is a deadly disease second only to opioid abuse in mortality rates. Electrodermal activity is a reliable measure of mental stress. Participants on the AN spectrum from a large ongoing study (current n = 10, anticipated n = 230), wore the Empatica Embrace Plus physiological wrist band, which measures electrodermal activity (among other indices) while participants rated 20 eating disorder behavior symptoms from 0-100 in severity (0 being "I do not feel that way at all", 100 being "I feel that way completely, more than I ever have before.") five times a day for 21 days via ecological momentary assessment surveys. Participant Demographics: nine female, one male, age 29±6, height in inches: 65±2, weight in pounds: 147±30, one Black or African American, nine white, none Hispanic or Latino, five AN, five AAN. The most important three eating disorder symptoms of each participant were assessed from surveys, concurrent with the largest interquartile range hour of electrodermal activity during the entire measurement period. Periods of sleep or exercise (determined through assessment of steps and accelerometry data) were excluded from analysis. Out of 20 eating disorder symptom questions on the survey, all ten participants had the same three highest rated symptoms during the highest IQR in

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ABSTRACT # 26

Features of adaptive gait during step-up task following thoracic hemisection in Yucatan minipigs

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Background: Gait in individuals with spinal cord injuries (SCI) is particularly challenging on uneven terrain, such as curbs or stairs. These skilled tasks require precise motor planning guided by visual cues to ensure successful foot clearance. To replicate this real-world scenario, we trained Yucatan minipigs (YMPs) to step-up onto an elevated platform. Our objective is to characterize gait recovery and compensation following spinal cord hemisection (Hx). Methods: This study was approved by the UoL IACUC. Three YMPs were conditioned to cross a platform (12 cm high, 80 cm wide) 5 days/wk for 8 wks. Reflective markers were placed over hindlimb (HL) landmarks and tracked using a Vicon motion capture system. A custom script generated the knee angle. After a T9-10 Hx, data were assessed pre-injury and at 2 and 4 weeks (wks) post-Hx. We assessed PTIBS scores, success rates (complete clearance, hit, or failure), initial HL placement, step-up velocity during swing ascent, placing HL stance time, maximum joint flexion, and joint angle excursions during ascent swing phase. Data were analyzed in GraphPad Prism v9 using non-parametric tests, with results expressed as median and interquartile range. Statistical significance was set at $p \leq 0.05$. Results: PTIBS was decreased at 1 wk post-Hx, followed by gradual improvement that remained below baseline at 4 wks. Step-up success rates were decreased at 2 wks post-Hx, with partial improvement at 4 wks, though still below baseline. Post-Hx, YMP often failed to place their ipsilesional HL correctly as ascending onto the platform. Step-up velocity during the ascending HL's swing decreased, while placing HL stance time increased, indicating greater difficulty with the task. Increased knee and ankle flexion during the E2 phase of the placing HL suggested impaired weight support. Ipsilesional hip angle excursion remained stable, while knee and ankle excursions decreased. Although to a lesser degree, impairments also were seen in the contralesional limb. Conclusion: Hx greatly impairs step-up performance, prompting compensatory reliance on the contralesional hindlimb. Despite partial recovery, kinematic and weight acceptance deficits persisted, underscoring the challenges post-SCI. These findings offer insights into loss of function, recovery mechanisms and are informative for rehabilitation strategies for uneven terrain navigation in SCI patients. Recognition: CHNF, RF Hammond Endowment, KSCHIRTF, Bucks for Brains, KSCIRC core.

ABSTRACT # 27

Convergence of parabigeminal and superior colliculus terminals in the mouse dorsal lateral geniculate nucleus

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The dorsal lateral geniculate nucleus (dLGN) is innervated by two regions that are considered cholinergic: the parabigeminal nucleus (PBG) and the pedunculopontine tegmentum (PPT). The PBG is considered a visual nucleus due to its reciprocal connections with the superior colliculus (SC) and responses to moving visual stimuli, while the PPT is considered to play a non-modality specific role in controlling the firing mode of dLGN neurons. The PBG and PPT express choline acetyl transferase (ChAT) and contain Cre-recombinase in ChAT-Cre mice. However, PPT neurons express the vesicular acetylcholine transporter (VAChT), while PBG neurons express the type 2 vesicular glutamate transporter (vGLUT2) and are not stained with antibodies against VAChT. To visualize projections from the PBG to dLGN, we placed virus injections in the dLGN of BLK6 mice to express Cre-recombinase within retrogradely labeled PBG-dLGN neurons followed by Cre-dependent virus injections in the opposite PBG of the same mouse to induce the expression of TdTomato in Cre-expressing PBG-dLGN neurons. This labeled PBG projections in the optic tract to the contralateral dLGN, rostral SC, pretectum, and the medial, caudal SC. Tissue containing PBG-dLGN terminals was additionally stained with antibodies against VAChT and no double-labeled terminals were identified, confirming that PPT terminals can be specifically identified using antibodies against VAChT. Measurement of synaptic terminal populations in the dLGN labeled via virus injections or antibodies and imaged using electron microscopy revealed that PBG terminals are larger than SC terminals and cortical terminals but smaller than the overall population of retinal terminals, while PPT terminals are larger than cortical terminals but smaller than SC, PBG and retinal terminals. To further examine the ultrastructure and convergence patterns of dLGN inputs from the PBG, and SC, we placed Cre-dependent virus injections in the PBG of ChAT-Cre mice to express peroxidase and Cre-independent virus injections in the opposite SC to express peroxidase in mitochondria. Preliminary electron microscopic analysis indicates that terminals originating from the contralateral PBG and ipsilateral SC terminals converge to innervate single dLGN dendrites. This convergence may provide stereoscopic motion information to accurately calculate the trajectory of moving visual targets.

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ABSTRACT # 28

Role of AI and Genomics in Early and Accurate Identification of Autism Spectrum Disorders: A Brief Review

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Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition with a strong genetic component, affecting millions worldwide. Early diagnosis is critical for effective intervention, yet the heterogeneity of ASD poses significant challenges. Several studies have been investigated the role of genomic markers and artificial intelligence (AI) in early diagnosis of ASD with no definitive conclusion. Therefore, this study aims to explore several research questions to fill the gap and open the door for future researchers. First, what are the optimal genomic markers associated with ASD? Second, which AI tools are commonly used and can provide effective diagnosis for ASD? Last, does the combination of genomics and AI offers an added diagnostic value? Hence, we conducted a systematic review to find all the related studies published in the last decade. After searching well known databases including, scholar Google, PubMed, Scopus, IEEE explore, and Research Gate, using Keywords such as "genomics," "AI," "Autism", and "machine learning" to identify relevant studies, 46 studies focusing on genomics alone or in combination withAI in ASD diagnosis were identified. A PRISMA chart was employed to ensure transparency, and inclusion/exclusion criteria were applied to obtain these studies. The analysis showed that several genomic markers, including NBEA, HOXB3, HERC1, NR2F2, and MID2, are strongly associated with ASD. These markers are linked to chromatin remodeling, neuronal signaling, and synaptic function, highlighting their potential as diagnostic biomarkers. In terms of AI tools, methods like convolutional neural networks (CNNs), gradient boosted trees, and random forests demonstrated high diagnostic accuracy, with some models achieving AUC-ROC values up to 0.955 and accuracy rates exceeding 88%. Studies utilizing AI in combination with genomics consistently outperformed those relying only on genomics without using AI. The integration of both approaches offers a more robust and accurate diagnostic tool, paving the way for personalized and early intervention strategies. Future research should explore radio genomics as a non-invasive diagnostic direction, leveraging imaging and genomic data to further refine ASD diagnosis and understanding.

ABSTRACT # 29

Predicting Complications, World Health Organization Grade, and Discharge Type in Meningioma Surgery: Development of Machine Learning Models via A Comprehensive Approach

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Background: Meningiomas pose a challenge in terms of predicting patient outcomes due to their diverse clinical presentations and biological behaviors. Traditional prediction models often rely heavily on imaging data, which, while informative, may not capture the full spectrum of factors influencing patient prognosis. This study aims to develop a novel machine learning algorithm that integrates clinical, lab, radiographic, and pathological data to predict patient pathological features and functional outcomes. Methods: We conducted a retrospective analysis of 61 patients diagnosed with meningioma at the University of Louisville between January 2020 and March 2024. Collected variables included patient demographics, clinical data (comorbidities, monocyte count, platelet to lymphocyte ratio, neurological status), radiographic characteristics (tumor size, location, and imaging findings), and pathological features (Ki67 index, brain invasion, World Health Organization (WHO) grade). This data was then used to train and validate three Random Forest machine learning models. Results: Preliminary testing of the first model included 18 surgeries with no complications and 17 surgeries with any complications, in which the model successfully identified 17 surgeries with no complications and 16 surgeries with any complications for a 94% accuracy overall. Preliminary testing of the second model included 13 WHO Grade 1 meningiomas and 13 WHO grade 2 meningiomas, in which the model successfully identified 12 WHO grade 1 meningiomas and 12 WHO grade 2 meningiomas for a 92% accuracy overall. Preliminary testing of the third model included 55 patients across four discharge types (Home or Home Health, Rehabilitation, Long-term Care, or Death), in which the model successfully identified the correct discharge type with an overall accuracy of 85%. Conclusions: Three machine learning models for complications, WHO Grade, and discharge type in meningioma surgery were created that demonstrated overall accuracies of 94%, 92%, and 85% respectively when tested. These models should continue to improve with additional data inputs.

ABSTRACT # 30

Effects of chronicity, severity, and location on bowel function after spinal contusion in male rats

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Spinal cord injury (SCI) disrupts neural pathways between the central and peripheral nervous system impacting many body systems including the bowel. The high occurrence of bowel-related issues often leads to rehospitalization, affecting morbidity and quality of life of individuals with SCI. In humans, SCI leads to various functional changes that collectively disrupt the ability of the gastrointestinal tract to store and evacuate efficiently. The mechanisms behind these deficits, however, are not well understood. In the present study, a clinically relevant rodent T9 or T3 contusion model with graded injury severities (mild, moderate, and severe) at different timepoints post-injury (acute, sub-acute, chronic) was utilized to examine SCI induced bowel dysfunction. Outcome measures included both external anal sphincter electromyography (EAS-EMG) and anorectal manometry, which is used in clinical settings to assess colonic dysfunction in individuals with SCI. Significant differences were found in EAS response latency and/or duration of contractile activity in terms of chronicity and severity of SCI. Frequency of giant contractions in contrast was quite variable across individual animals within groups. The findings to date illustrate unique changes in bowel function following incomplete SCI in a preclinical model, providing insights for developing improved clinical strategies, and further validating rodents as a model for SCI induced bowel dysfunction.

ABSTRACT # 31

Socio-Economic Status and Follow-Up in Meningioma Patients: A MarketScan Database Analysis

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Background: The impact of select socioeconomic status (SES) factors on follow-up in patients with meningioma are unknown. Methods: The MarketScan database was queried using the International Classification of Diseases-Clinical Modification, Tenth revision, in conjunction with Z codes from chapter 21 denoted as Factors influencing Health Status and Contact with Health Services (Z00-Z99) from 2016-2022. Z codes were introduced in 2015, so we included adult patients aged 18 or older diagnosed with meningioma from 2016-2022 then refined our analysis to include patients with at least 12 months of pre-diagnosis data and a minimum of 2 years of follow-up post-diagnosis. We excluded patients without meningioma-related claims in the year leading to the index date. Results: Among 25,960 meningioma patients, 45% received follow-up MRI. Patients with SES problems related to housing and economic factors had a significantly lower follow-up MRI rate (33%, p = 0.0039) compared to those without SES issues (45%). Similarly, patients with at least one SES-related problem had a reduced follow-up MRI rate (37%, p = 0.0163). The median follow-up duration was similar across groups, with no significant differences observed (range: 0-24 months). Overall, 2-year payment varied significantly by SES status, with patients facing at least one SES issue having lower median payments [$17,577; interquartile range (IQR): $947-$57,970, p = 0.0332], while those related to the social environment also showed lower median payments [$9,696; IQR: $148-$49,971, p = 0.0324]. Conclusions: Socio-economic status factors significantly influence follow-up care and healthcare costs among meningioma patients. Patients with housing and economic issues or at least one SES-related factor were less likely to receive follow-up MRI. Additionally, these patients incurred lower overall healthcare payments over two years. These findings underscore the need for improved SES documentation and targeted interventions to address barriers in care continuity and resource utilization..

ABSTRACT # 32

No evidence of persistent cellular senescence after contusive SCI.

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After spinal cord injury, surviving cells are exposed to wide spectrum of damaging stimuli. As a consequence, injury-induced proliferation may be associated with increased risk of DNA damage. To prevent amplification of DNA damage, proliferative cells can undergo cell cycle arrest and, in some cases, this can lead to a permanent arrest known as cellular senescence. While the potential role of cell cycle arrest after SCI is unclear, this study aimed to examine expression of two major cell cycle arrest mediators that promote cellular senescence: p16/Cdkn2a and p21/Cdkn1a. Female C57Bl6 mice were given a moderate contusive SCI (50 kdyn, IH, T9) and expression analyses at the epicenter of the injury were performed. Transcript levels were increased for p21 subacutely (3-7 days) and subchronically (8 weeks) after SCI as determined by analyzing RNASeq data and performing qPCR. While upregulation trends were visible for p16 mRNA, they did not reach consistent significance in RNASeq and qPCR studies. Also, p16 transcript was expressed at very low levels. Paradoxically, the prolonged upregulation of p21 mRNA was at odds with a transient increase of p21 protein at 3 days post injury. Such upregulation coincided with increased levels of the DNA damage response mediator p53. Immunofluorescence analysis showed nuclear p21 in the glial scar region bordering the injury epicenter. Some of p21-positive cells were identified as reactive, GFAP-positive astrocytes. Such a transient induction of nuclear p21 suggests DNA damage-induced cell cycle arrest followed by successful DNA repair. Alternatively, some of the p21-positive cells may represent a senescent cell population that undergoes rapid clearance after SCI. Whether p21 induction is beneficial or detrimental for post-SCI recovery could be explored in future studies.

ABSTRACT # 33

Role of the integrated stress response kinase HRI/EIF2AK1 in macrophage response to spinal cord tissue remains

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Traumatic spinal cord injury (SCI) is associated with rapid destruction of both gray and white matter tissue. As a consequence, lipid-laden foamy macrophages accumulate in injured area enhancing secondary tissue loss and limiting functional recovery. HRI/EIF2AK1 is the integrated stress response (ISR) mediator whose deficiency reduces accumulation of foamy macrophages and improves recovery after SCI. Therefore, we set out to analyze effects of Hri deficiency on foamy macrophage formation. Using cultured bone marrow derived macrophages (BMDM) from wild type mice we show robust intracellular accumulation of myelin after a challenge with spinal cord homogenates that models the environment of the injured spinal cord. Interestingly, our preliminary data suggest reduced myelin accumulation in BMDM cultures from Hri-/- mice. Therefore, promoting phagocytosis of tissue debris may be a mechanism by which HRI promotes the cytotoxic neuroinflammation after SCI. Such a deleterious activity could be potentially targeted to modulate post-injury inflammation and improve functional recovery after SCI.

ABSTRACT # 34

Decoding Conflict Processing in the GPi: Insights from Single-Unit Recordings

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The globus pallidus internus (GPi) is a key deep brain stimulation (DBS) target for Parkinson's disease (PD), serving as an alternative to the subthalamic nucleus (STN). While GPi's role in motor control and cognition is well established, its involvement in conflict processing remains unclear. Local field potentials (LFPs) provide insight into large-scale neural activity but lack the spatial resolution to examine precise neuronal firing patterns. Single-unit recordings allow for a more detailed investigation of GPi activity during cognitive tasks. This study examines GPi's role in conflict processing and response adjustments using intraoperative single-unit recordings in PD patients performing the Simon task. We test two hypotheses: (1) conflict-related trials exhibit increased GPi firing, reflecting conflict modulation via heightened inhibition, or (2) GPi activity remains unchanged during conflict but increases post-response, suggesting a role in motor adaptation (Navid et al., 2022; Ruiz et al., 2014). Neural signals are recorded using microelectrodes, and single units are isolated via Plexon Offline Sorter with manual and automated spike sorting. Spike rasters are aligned to stimulus onset and movement execution to assess task-related firing patterns. Statistical analyses, including Z-score normalization and permutation testing, are planned to compare firing rates across conditions. Data collection is ongoing, with subjects selected based on signal quality and task performance. Preliminary analyses reveal variability in GPi firing across trials and conditions. Some neurons exhibit differences between conflict and non-conflict trials, but a consistent conflict-related modulation pattern has not been established. Response-locked analyses do not show clear post-response firing changes at this stage. Further statistical validation is needed to determine the significance of these findings. These results will clarify GPi's role in cognitive-motor interactions, contributing to a deeper understanding of its function in action regulation and conflict processing. This research may refine DBS targeting strategies and enhance our understanding of the basal ganglia's role in decision-making and motor control.

ABSTRACT # 35

Optimized Cough Techniques for Enhancing Airway Clearance in Individuals with Spinal Cord Injury

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Cough impairment due to inspiratory and expiratory muscle paresis is a common consequence of spinal cord injury (SCI), increasing the risk of pneumonia—the leading cause of mortality in this population. Expiratory peak flow (EPF) below 4.5 L/s has been associated with a higher likelihood of pulmonary complications. This study aimed to identify the most effective cough maneuver for maximizing EPF while minimizing muscle exertion in individuals with chronic SCI using three distinct coached cough techniques. SCI (n=2) and non-SCI (n=2) participants data has been included for analysis. We assessed inspiratory peak flow (IPF), EPF, inspiratory phase rise time (IPRT), expiratory phase rise time (EPRT), and the time from IPF to EPF. Additionally, surface electromyography (sEMG) recorded the activation of accessory inspiratory and expiratory muscles. Among the tested techniques, the time-coached cough demonstrated significantly higher IPF and EPF compared to other maneuvers. This technique also resulted in shorter IPRT, EPRT, and IPF-to-EPF transition times. Notably, peak EMG activity of the intercostal and oblique muscles was highest in the super-coached cough, while the time-coached cough activated a broader range of muscle groups, including the paraspinals, obliques, intercostals, and rectus abdominis. Furthermore, the time-coached cough achieved peak sEMG amplitudes more rapidly during the compression and expiratory phases, suggesting greater efficiency in airway clearance. These findings highlight the potential of the time-coached cough technique as an effective strategy for optimizing airway clearance in SCI. Future studies should investigate the influence of lung volume on the efficacy of these cough maneuvers.

ABSTRACT # 36

Investigating Taste Bud Cell Lifespan: In Vivo Imaging of Taste Bud Cell Maturation and Turnover

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The dynamic nature of taste buds, characterized by continuous taste bud cell turnover, was first identified through studies of postmortem tissue using tritiated thymidine or nuclear analogs to label the proliferative stem cell population. These studies report a population-level average lifespan of 3-6 days for postmitotic precursor cells, an average half-life of 8 days for Type II taste bud cells, and an average half-life of 22 days for Type III taste bud cells. A more complete representation of taste bud cell lifespan can be achieved by tracking the same taste bud in vivo to capture individual cell variability. This approach allows for capturing lifespan data for individual taste bud cell types (Sonic Hedgehog (SHH+) postmitotic precursor cells, Type II taste bud cells, and Type III taste bud cells) and determining how long individual cells spend in each stage of their life cycle. We hypothesize that the timing of SHH+ postmitotic precursor cell differentiation into Type II or Type III taste bud cells varies, and that mature Type II and Type III taste bud cells have distinct lifespans, each with short-lived and long-lived subpopulations. The goal of this study is to measure the time to differentiation of SHH+ postmitotic precursor cells into mature Type II and Type III taste bud cells, and the lifespan of mature Type II and III taste bud cells using in vivo two-photon microscopy. T1R3GFP mice are used to label the Type II taste bud cell population, and GAD67GFP mice are used to label the Type III taste bud cell population. To study SHH+ postmitotic precursor cell development into Type II or Type III taste bud cells, ShhCreERT2 mice, which label the postmitotic precursor cell population, are crossed with either T1R3GFP or GAD67GFP mice. Our observations indicate that SHH+ postmitotic precursor cells begin differentiating into Type II taste bud cells by day 3 and into Type III taste bud cells by day 4 post-entry into the taste bud. Furthermore, preliminary data indicate that a subset of mature Type II and III taste bud cells remain in the taste bud for 2 days or less, while others persist for 22 days or more. These findings reveal that differences in time spent in earlier life cycle stages by SHH+ postmitotic precursor cells may be a contributing factor underlying the significant variability observed in mature Type II and III taste bud cell lifespans.

ABSTRACT # 37

Unimodal and Multimodal Signals in the Gustatory Cortex are Modulated by Posterior Piriform Cortex Photosuppression

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The integration of gustatory and olfactory signals is necessary for the perception of flavor, likely driven by the interactions between the chemosensory cortices. Our recent findings demonstrate that neurons in the gustatory cortex (GC) encode odor-taste mixtures as distinct from their unimodal components, suggesting a key role in processing complex chemosensory information. To examine how network dynamics contribute to intraoral chemosensory representations, we selectively inhibited excitatory neurons in the posterior piriform cortex (pPC), a key multisensory region of the olfactory cortex, using viral expression of an inhibitory opsin (AAV-CAMKII-ArchT-GFP). In six behaving female rats, we recorded activity from 266 GC neurons during intraoral presentations of two odors (isoamyl acetate; ethyl butyrate), two tastes (sucrose; citric acid), and their two specific mixtures (IAS; EBCA) with and without pPC inhibition. Preliminary results indicate that pPC suppression affects the neural representation of these mixtures and their components differently, with decoding analyses showing a delayed classification onset for the isoamyl acetate-sucrose mixture and its components (0.25–0.5 seconds) and a later disruption for the ethyl butyrate-citric acid mixture and its components (0.5–1 second). Additionally, the majority of neurons within the chemoresponsive population exhibited significant modulation of at least one stimulus response following pPC photosuppression. Future investigations will explore whether distinct subpopulations of GC neurons contribute to these stimulus- and time-dependent differences, providing further insight into how chemosensory cortical interactions shape the neural representations of flavor integration.

ABSTRACT # 38

GABAergic projections from the pretectum boost retinogeniculate signal transfer via disinhibition

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The transfer of retinal signals from the dorsal lateral geniculate nucleus (dLGN) to the primary visual cortex (V1) is modulated by a variety of extraretinal inputs, including extrinsic connections formed by GABAergic neurons in the pretectum (PT) and visual sector of the thalamic reticular nucleus (vTRN), as well as the intrinsic connections of GABAergic dLGN interneurons. In the current study, we determined how GABAergic PT projections to the dLGN and vTRN can influence retinogeniculate transfer using a variety of viral tracing techniques, electron microscopy, in vitro physiological recordings, and optogenetics in male and female mice. We found that the PT provides over 75% of the GABAergic, and over 30% of the total synaptic input to the vTRN. Optogenetic activation of PT terminals reduced the firing frequency of vTRN neurons as well as the amplitudes of their postsynaptic responses to V1 input. In the dLGN, synaptic terminals originating from the PT targeted interneurons more frequently than thalamocortical (relay) cells, and optogenetic activation of PT input had a greater impact on interneuron firing frequency compared to relay cells. This cell type specific impact of PT input to the dLGN resulted in the disinhibition of relay cells and an increase in the amplitude of their postsynaptic responses to retinal input. Taken together, our results indicate that GABAergic PT projections to the visual thalamus serve to boost retinogeniculate transfer via two types of disinhibition, potentially enhancing the flow of visual information to V1 following gaze shifts.

Abstracts

POSTDOCS, STAFF & RESIDENTS

ABSTRACT # 39

Does Resuming Antithrombotic Agents Impact Chronic Subdural Hematoma Outcomes After MMA Embolization

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Background: Middle meningeal artery embolization (MMAE) reduces chronic subdural hematoma (cSDH) recurrence, whether alone or with surgery. However, the impact of resuming antithrombotic (AT) therapy after MMAE remains unclear. Methods: A systematic review and meta-analysis were conducted following PRISMA guidelines. Searches of PubMed, Web of Science, Embase, and Scopus through February 28, 2025, identified English-language studies on cSDH treated by MMAE (with or without surgery) reporting AT resumption outcomes. The risk of bias was assessed using the Newcastle-Ottawa Scale (NOS). Primary outcomes included recurrence and radiographic measures. Data were pooled using a random-effects model in R software. Results: Of 514 articles, 3 retrospective studies (233 patients) were included. Among these, 78 resumed AT therapy. Random-effects meta-analysis revealed no significant differences in recurrence (OR 1.64, 95% CI 0.45-6.00, P=0.45), final SDH thickness (MD: 0.27, 95% CI: -0.91, 1.44, P=0.66), or reduction in SDH thickness (MD: -0.60, 95% CI: -2.15, 0.96, P =0.45). Subgroup analyses (antiplatelet vs. anticoagulant, MMAE alone vs. MMAE + surgery, early resumption;"1-3 days from embolization") also revealed no significant differences. Sensitivity analyses confirmed consistent results. All included studies were moderate-to-high quality. Conclusion: In conclusion, resuming AT therapy after cSDH management with MMAE alone or combined with surgery appears not to affect recurrence rates or hematoma resolution. Preliminary findings support the safety of anticoagulants and antiplatelet agents and early resumption. However, larger prospective studies remain essential for confirming these observations and establishing best practices.

ABSTRACT # 40

Investigating the effects of saccharin and sucrose on sensory-specific satiety

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Sweeteners play a key role in shaping our flavor preferences and modulating satiety. When we eat, we form lasting odor-taste associations, linking specific odors with the hedonic properties of tastes. Sensory-specific satiety is an adaptive process by which consuming a specific flavor (odor-taste mixture) to satiety reduces its palatability and intake relative to other flavors. Although sensory-specific satiety is often studied in the context of learning and memory, it remains unclear how sweeteners differing in caloric content—such as the non-caloric sweetener saccharin and the caloric sweetener sucrose—modulate its strength. To investigate this, water-regulated female Long-Evans rats (n = 5) were first sated to one of two non-caloric odor-sweetener mixtures (0.01% isoamyl acetate-0.1% saccharin or 0.01% benzaldehyde-0.1% saccharin). Immediately after satiation, rats were tested in a two-bottle brief-access task for preference between these two mixtures. In separate sessions, rats were similarly sated on a caloric mixture (0.01% isoamyl acetate-0.1 M sucrose) and tested for preference against an alternative caloric mixture (0.01% benzaldehyde-0.1 M sucrose). Our preliminary findings suggest sucrose increases motivation to consume, potentially enhancing sensory-specific satiety. These data support the hypothesis that caloric feedback amplifies satiety effects, influencing flavor preferences.

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ABSTRACT # 41

Alzheimer's Disease and Related Dementia in Dual Diagnosis of Traumatic Brain Injury and Spinal Cord Injury compared to Spinal Cord Injury alone: A 22-year Analysis Using a Large Claims Database

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Background: Spinal Cord Injury (SCI) has recently been associated with increased risk of Alzheimer's disease and related dementias (ADRD). The dual diagnosis (DD) of SCI with Traumatic Brain Injury (TBI) has been estimated at up to eighty percent of cases, yet often goes undiagnosed. Individuals with a DD have shown worse functional, cognitive, and healthcare utilization outcomes compared to matched individuals with SCI only. Given the established risk of ADRD in TBI, it is important to evaluate if the co-occurrence of TBI with SCI (DD) is associated with increased risk of ADRD in comparison to SCI alone. Objective: To compare the risk of ADRD and time of diagnosis in DD compared to SCI alone. Methods: MarketScan Database from 2000 to 2022 was used to create comparison groups; DD (TBI+SCI), and SCI alone (cervical complete, cervical incomplete, thoracic complete, thoracic incomplete, and lumbar/sacral/cauda-equina). ADRD rates and diagnosis-free time, adjusted for age, sex, insurance, cardiometabolic, and psychiatric chronic, conditions were compared between groups. Cox regression models were used to compare groups in the follow-up period after initial injury. Results: The cohort was composed of 17,602 adults; 4,225 DD, and 13,377 SCI alone. Males aged 45–65 with commercial insurance were predominant overall. Adjusted rates of ADRD were significantly higher in DD (6.3%) compared to SCI (5.3%, $p<0.0059$). Individuals with DD were more likely to have ADRD earlier (median ADRD-free time: 1.9 years) compared to SCI alone (median ADRD-free time: 2.6 years, $p<0.0009$). There was no significant difference of ADRD rates and diagnosis-free time across DD and SCI alone subgroups. Conclusion: Individuals with DD are associated with higher ADRD rates and earlier ADRD diagnosis compared to those with SCI alone. This study supports the need to update clinical guidelines for cognitive screening after SCI, especially for those at high risk for DD.

ABSTRACT # 42

Polypharmacy in Traumatic Brain Injury: A MarketScan Analysis Comparing Medical Complications and Healthcare Utilization Outcomes

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Background: Traumatic brain injury (TBI) patients are reported to have increased rates of polypharmacy, defined as the regular use of 5 or more medications simultaneously. However, polypharmacy may increase the risk for healthcare complications. Objective: To evaluate the complications, healthcare utilization, and economic burden of polypharmacy in patients with TBI. Methods: The Merative MarketScan Research Database (2000–2022) was queried to extract adults with TBI for a 2-year follow-up period. Demographics, complications, healthcare utilization, and payments were compared across individuals with (TBI-PP) and without polypharmacy (TBI-nonPP) using generalized linear regression models. Results: The study cohort consisted of 66,230 individuals with TBI: 19,174 TBI-PP; and 47,056 TBI-nonPP. Both groups were comparable in terms of age, sex, and comorbidities, but individuals with TBI-PP were more frequently commercially insured. The polypharmacy group exhibited significantly higher number of concurrent medications (7±2 vs. 1±1 TBI-nonPP), number of medication refills (48±2 vs. 3±1 TBI-nonPP), utilization of opioids (76% vs. 23% TBI-nonPP), and diagnoses of opioid use disorder (17% vs. 9% TBI-nonPP). Individuals with TBI-PP had a longer hospital stay (4±1) compared to TBI-nonPP (3±1) and were less likely to be discharged home (54% TBI-PP vs. 65% TBI-nonPP). Both at index hospitalization and at 24 months post-discharge, complications were significantly higher in patients with polypharmacy. Approximately half of individuals in the polypharmacy group experienced depression and anxiety within 24 months, a substantial increase from the 12–13% experiencing these mental health complications at index hospitalization. Importantly, adverse drug complications were significantly greater in TBI-PP (10% vs 6% TBI-nonPP). Overall healthcare utilization was significantly greater for TBI-PP, including emergency room visits (88% vs. 79% TBI-nonPP), hospital admissions (66% vs. 44% TBI-nonPP), and outpatient services (116±23 vs. 60±27 TBI-nonPP). Additionally, total payments were significantly higher for TBI-PP ($24,738±$4,162) compared TBI-nonPP ($9,035±$4,180). Conclusion: Polypharmacy in TBI was associated with higher complication rates, healthcare utilization, and total payments. Raising awareness about the prevalence of polypharmacy and its effects in TBI is important to improve patient care, prevent medical complications, and reduce costs.

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ABSTRACT # 43

Insurance Disparities in Rehabilitation Utilization after Initial Primary Malignant Brain Tumor Resection

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Background: Rehabilitation needs for patients with primary malignant brain tumors (PMBTs) can stem from the brain tumor itself, its treatments, or a combination of the tumor and treatments. It has been shown that rehabilitation interventions can assist with the functional impairments in brain tumor patients and that socioeconomic and demographic factors play a crucial role influencing rehabilitation utilization in this population. Objective: To compare rehabilitation and types of rehabilitation received within 12 months of initial surgical resection for PMBTs between commercial and Medicaid insurance Methods: Adults cases (ages 18-64) of PMBTs were extracted from MarketScan database (2000-2022). Patients who underwent surgical management of brain tumors with at least 12 months of follow-up with no additional surgeries were included and classified according to the type of insurance (commercial or Medicaid) coverage at the time of surgery. Rehabilitation utilization was evaluated and compared between insurance groups. Rehabilitation was further delineated into subtypes, including home health (HH), skilled nursing facility (SNF), inpatient rehabilitation facility (IRF), and outpatient-only. Generalized linear regressions models were used for analysis. Results: Patients with PMBT were identified as whether they had commercial insurance (n=14,738) versus Medicaid insurance (n=2,530). There was no significant difference in percentage of patients utilizing a combination of rehabilitation services for 12 months post-surgical resection of brain tumor (34.90% commercial vs 35.30% Medicaid, p = 0.7451). However, patients with Medicaid had significantly higher utilization of rehabilitation services (p<0.0001) via home health (8.8% vs 5.1%), SNF (2.9% vs 0.7%), and IRF (5.1% vs 2.1%). Commercially insured patients utilized outpatient-only rehabilitation at a higher rate (19.9% vs 12.0%, p <0.0001). Conclusion: Patients with PMBTs 18-65 years old had equivalent rehabilitation utilization over a 12-month timeframe after initial surgical resection for brain tumors when comparing insurance coverage, whether they had commercial vs Medicaid. However, the subtype of rehabilitation differed, with Medicaid insured utilizing higher inpatient and home health rehabilitation and commercially insured patients utilizing higher outpatient-only rehabilitation services.

ABSTRACT # 44

An Atypical Presentation of Man in A Barrel Syndrome with Concurrent Sensory Deprivation from Bilateral Brachial Plexopathy

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Objective: To present a unique case of Man in a Barrel Syndrome (MIBS) characterized by bilateral upper extremity weakness with concurrent sensory loss due to bilateral brachial plexopathy, highlighting the diagnostic challenges and therapeutic approach. Background: MIBS typically manifests as bilateral upper extremity motor weakness with intact cranial nerve function and preserved lower limb strength. It is caused by various central and peripheral lesions, including bilateral watershed infarcts, corticospinal tract injury, and brachial plexopathies. Sensory involvement is rare, complicating diagnosis and localization of pathology. Methods: We reviewed the clinical presentation, imaging, electrodiagnostic studies, and laboratory results of a 31-year-old male who presented with sudden onset bilateral arm weakness and sensory loss following a recent respiratory infection. Detailed neurological assessment, comprehensive imaging, and electromyography (EMG) were conducted to localize the lesion. The patient was empirically treated with intravenous immunoglobulin (IVIG) for suspected acute inflammatory demyelinating polyradiculopathy. Results: The patient exhibited asymmetric motor weakness in the upper extremities, predominantly affecting muscles supplied by the upper and middle trunks of the brachial plexus, with complete sensory loss in the same distribution. Imaging excluded central causes, and EMG revealed hyperacute brachial plexopathy with incomplete Wallerian degeneration. After five days of IVIG treatment, modest motor recovery was observed in the right shoulder muscles, but sensory loss persisted, and there was no improvement in the left upper extremity. Conclusion: This is the first reported case of MIBS with concurrent sensory deprivation due to bilateral brachial plexopathy. The case underscores the complexity of diagnosing MIBS, particularly in distinguishing between central and peripheral etiologies. Understanding the potential for sensory involvement in peripheral causes of MIBS is critical for early recognition and appropriate management.

ABSTRACT # 45

Large Changes in Electrodermal Activity Present with Minimal Heart Rate Changes in People on the Anorexia Nervosa Spectrum

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Anorexia nervosa spectrum includes anorexia nervosa (AN) and atypical anorexia nervosa (AAN) (differing only by Body Mass Index, otherwise, the diagnostic criteria are the same). AN spectrum is a deadly disease second only to opioid abuse in mortality rates. Participants on the AN spectrum from a large ongoing study (current n = 10, anticipated n = 230), wore the Empatica Embrace Plus physiological wrist band, which measures electrodermal activity (among other indices) while participants rated 20 eating disorder behavior symptoms from 0-100 in severity (0 being "I do not feel that way at all", 100 being "I feel that way completely, more than I ever have before.") five times a day for 21 days via ecological momentary assessment surveys. Participant Demographics: nine female, one male, age 29±6, height in inches: 65±2, weight in pounds: 147±30, one Black or African American, nine white, none Hispanic or Latino, five AN, five AAN. Electrodermal Activity is a reliable measure of mental stress. In neurotypical individuals, increases in electrodermal activity accompany similar increases in heart rate. Bradycardia is common in AN spectrum due to adrenergic withdrawal to conserve resources, with a consequent parasympathetic dominant phenotype. Electrodermal activity measures skin electrical conductance changes due to sympathetically induced sweat rate, which often occurs alongside sympathetically mediated vasoconstriction. The largest percent change of interquartile range of electrodermal activity during one hour from the 21 days when participants were not sleeping or exercising (determined by measuring concurrent accelerometry and steps data) was compared to the same hour's heart rate interquartile range percent change. Eight participants out of ten presented with large changes in electrodermal activity concurrent with small changes in heart rate. If high peripheral vasoconstriction occurs without an accompanying increase in heart rate, cardiovascular decline could follow, cerebral perfusion could be compromised, and alternate perfusion routes may be implemented, such as skeletal muscle activation, or anxiety to increase venous return to the heart and brain. Over exercising and anxiety are comorbidities of AN spectrum, and may be due to logical cardiovascular compensation due to reduced brain perfusion. Our findings could indicate a unique autonomic phenotype for AN spectrum. (first author Dr Saxena is a visiting scholar)

ABSTRACT # 46

Limited protective effects of the REVERB agonist SR9009 after mouse contusive spinal cord injury

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Reverb is a transcriptional repressor that regulates circadian rhythms of gene expression. In addition, Reverb plays non-circadian roles including negative regulation of inflammation. Contusive spinal cord injury (SCI) involves the primary and a secondary injury cascades mediated by multiple pathophysiological mechanisms, aggravating tissue damage and leading to greater functional loss. Given demonstrated beneficial effects of the Reverb agonist SR9009 in various models of acute CNS injury, it neuroprotective potential was tested after mouse moderate contusive SCI. On dpi 3, SR9009 treatment reduced extravasated hemoglobin and serum albumin in the injury epicenter. In addition, reduced expression of various mRNA markers of inflammation, blood-spinal cord barrier disruption and oxidative suggested acute attenuation of several secondary injury cascades. However, a chronic hind limb recovery and spared white matter remained unchanged. In conclusion, SR9009 treatment produced only transient benefits with no evidence of lasting tissue sparring or improved functional recovery. Financial support: R01NS114404