BRAINS & BEHAVIOR
and the CASA
PRESENT

Going the Distance 2.0 End-of-Summer Poster Symposium

August 2, 2021

2:00 - 4:00 PM

CASA
Center for the Advancement of Students and Alumni

IMSD

MARC

Program Administration

Going the Distance 2.0 Program Administration

Center for the Advancement of Students & Alumni

Kyle Frantz, PhD, CASA Director

Sneh Patel, PhD, Program Coordinator

Sherri Briggs, PhD, Team Leader

Christopher Aguillon, BS, Program Coordinator/GRA

Karen Hudson, Project Coordinator

Brains & Behavior

Elizabeth Weaver, MS, B&B Associate Director

Chloe L. West, Graduate Assistant

Undergraduate Scholars

Brains & Behavior Scholars and Mentors

Chloe Benjamin / Nancy Forger, PhD

Jesse Bosonetto / Andrey Shilnikov, PhD

Samuel Core / Gennady Cymbalyuk, PhD

Charlotte Dennison / Martin Norgaard, PhD

Ryan Garland / Page Anderson, PhD

Mycah Howell / Erin Tone, PhD

Kharli Major / Nancy Forger, PhD

Chinkuli Munkombwe / Vonetta Dotson, PhD

Malika Pandit / Anne Murphy, PhD

Maria Parrilla / Tricia King, Ph.D.

Nidhi Patel/ Jessica Turner, PhD

Heather Patton / Page Anderson, PhD

Ishaan Sharma / Marise Parent, PhD

Emma Stacey / Martin Norgaard, PhD

Zoi Suddreth / Feng Yang, PhD

Benoit Tete / Dan Cox, PhD

Anukruthi Venukadasula / Aras Petrulis, PhD

Beckman Scholar and Mentor

Veda Balaji / Erin Tone, PhD

Undergraduate Scholars

IMSD Scholars and Mentors

Keairra Brown / Christopher Aguillon & Sherri Briggs, PhD

Neami Tedla / Tricia King, PhD

MARC Scholars and Mentors

Raihaanah Bint Abdullah Muslim / Marise Parent, PhD

Jordan Guffie / Robin Morris, PhD

Sydney Howard / Gangli Wang, PhD

Sakinah Muhammad-Worsham / Kang Sang Moo, PhD

Maria Peraltilla / Page Anderson, PhD

Ruwaida Rajna / Cynthia Cornelissen, PhD

Karla Ruiz / Kang Sang Moo, PhD

Emily Wilde / Dan Cox, PhD

Constance Wilson / Erin Tully, PhD

Undergraduate Scholars

Perimeter Research Assistants and Mentors

Corianne Cowan / Tricia King, PhD

Jirielle Mwamba / Laura Shannonhouse, PhD

Douglas Ruano / Javier Stern, MD, PhD

Kumara Harsha Vardhan Thottempudi / Jungyu Liu, PhD

Schedule of Events

2:00 - 2:05 PM
Welcoming Remarks

2:05 - 2:50 PM
Poster Session

2:50 - 3:20 PM
Keynote Address
Shawn Dotson, PhD

3:20 - 3:30 PM
Awards Ceremony and Accolades

3:30 - 4:00 PM
Goodbyes and
End-of-Summer Survey (***students only***)

Poster Titles and Lead Authors

#	*Poster title* / **Student Author**
A1	Associations between anxiety vulnerability and negative outgroup biases / **Veda Balaji**
A2	Effects of birth on brain development / **Chloe Benjamin**
B7	Acute disruption of the intermediate hippocampus does not affect spatial, temporal, or emotional memory in male rats / **Raihaanah Bint Abdullah Muslim**
A3	Explorations of the Dendronotus Iris swim central pattern generator / **Jesse Bosonetto**
A4	The Future to Sustainable Water: Electrochemical Mediated Water Desalination / **Keairra Brown**
A5	Role of the Na+/K+ pump in neuromodulation of leech heart interneurons. / **Samuel Core**
A6	There is hope: changing the trajectory of outcomes for children with brain tumors / **Corianne Cowan**
A7	Developing and refining a method for rating student jazz improvisations / **Charlotte Dennison**
A9	Exploring fear of flying treatment with Artificial Neural Networks / **Ryan Garland**
B1	Artificial Intelligence Literacy / **Jordan Guffie**
B2	Active manipulation and measurement of a single nucleation-crystal growth system / **Sydney Howard**
B3	Fight club: Motivational conflict between the insula and striatum during social approach-avoidance decision-making / **Mycah Howell**
B4	Neurodevelopmental implications of maternal and fetal inflammation in MyD88 deficient mice at birth / **Kharli Major**

#	*Poster title* / **Student Author**
B5	Supplementation with Conserved M2 Ectodomains and Neuraminidase VLPs Enhances Cross Protective Efficacy of Influenza Vaccines / **Sakinah Muhammad-Worsham**
B6	Exploring white matter hyperintensities & Alzheimer's Disease biomarker relationships across racial groups / **Chinkuli Munkombwe**
B8	The effect religious coping has on trauma recovery amongst refugees / **Jirielle Mwamba**
B9	Early Life Pain Alters Fever Response to Immune Challenge in Adult Male and Female Rats / **Malika Pandit**
C1	Sleep quality and executive function in a diverse sample of healthy college students / **Maria Parrilla**
C2	Does the Right Dorsolateral Prefrontal Cortex Exhibit Enhance Communication with the Rest of the Brain when Processing Feedback during the Prisoner's Dilemma / **Nidhi Patel**
C3	Assessing trends in messages students absorb about mental illness and treatment / **Heather Patton**
C4	Spanish translation of the attitudes towards psychological online interventions (APOI) / **Maria Peraltilla**
C5	Analysis of Fur-dependent gene regulation of the gonococcal TonB-dependent transport proteins involved in zinc acquisition / **Ruwaida Rajna**
C6	Methods used to study function and morphology of astrocytes in the brain that help understand impact of altered function / **Douglas Ruano**

Poster Titles and Lead Authors

#	*Poster title* **/ Student Author**
A8	Investigation of cross protective properties of vaccines supplemented with M2 ectodomain **/ Karla Ruiz**
C7	Acute disruption of the intermediate hippocampus does not affect spatial, temporal, or emotional memory in male rats **/ Ishaan Sharma**
C8	Applying dynamic functional connectivity network analysis to task-based paradigms **/ Emma Stacey**
C9	Perturbation training reducing falls in people with multiple sclerosis **/ Zoi Suddreth**
D1	White matter pathways associated with empathy: A DTI investigation **/ Neami Tedla**
D2	Investigation of Huntington's in *Drosophila* Dendrites **/ Benoit Tete**
D3	Investigating the influence factors of cognition and mental health outcomes during adolescence **/ Kumara Harsha Vardhan Thottempudi**
D4	The sex different effects of social experience in mice **/ Anukruthi Venukadasula**
D5	Race differences in depression in early and middle childhood **/ Constance Wilson**

Abstracts

Poster A1

Associations between anxiety vulnerability and negative outgroup biases

V. Balaji, K. Murphy, M. Rattinger, E. Tone

Beckman Scholar: Veda Balaji
Research Team of Erin Tone, PhD, Georgia State University
Daily Mentors: Katie Murphy, Michelle Rattinger, BS

Implicit bias, a tendency to hold varying attitudes automatically and unintentionally toward people, can affect our judgments of and interactions with saliently different individuals. Evidence (e.g., Stephan, 2002) suggests that anxiety focused on interactions with people outside of one's own race is associated with negative implicit racial biases as determined by the Implicit Attribution Test (IAT; REF). This finding, however, could simply reflect a tendency for people generally vulnerable to anxiety to hold negative implicit biases about outgroup members. We examined associations between Black and White people's self-reported tendency to experience anxiety and their implicit biases about racial ingroup and outgroup members. Our central question was whether people more vulnerable to anxiety show stronger negative outgroup biases than people less vulnerable to anxiety. We hypothesized that individuals dispositionally vulnerable to anxiety (i.e., endorse more trait anxiety) would show stronger negative biases toward outgroup members. Participants comprised 174 18–34-year-olds (M = 20.18; 67% Black, 33% White). All participants completed a self-report measure of state and trait anxiety as well as a race IAT. Mean IAT scores indicated a slight implicit preference for Black relative to White faces among Black participants (M = -0.13; SD = 0.39) and a slight implicit preference for White relative to Black faces among White participants (M = .30; SD = 0.47). For the sample as a whole, state anxiety and implicit bias score were positively associated (r = .17, p=.026), such that more anxious participants showed stronger implicit preferences for White faces. No other correlations yielded significant results. Contrary to predictions, trait anxiety did not show significant associations with negative racial outgroup biases. Although data for the entire sample yielded a significant correlation between state anxiety and implicit bias, no correlations were significant for analyses of data from Black and White participants separately.

Poster A2

Effects of birth on brain development

C. Benjamin, A. Castillo-Ruiz, T. Hite, D. Yakout, T. Rosen, M. Mosley, A. Jacobs, Y. Hoffiz, M. Hall, J. Gray, C. Cisternas, L. Cortes & N. Forger

Brain and Behavior Scholar: Chloe Benjamin
Research Team of Nancy Forger, PhD, Georgia State University

Birth has inflammatory effects and cesarean births have been associated with various health consequences including autism, metabolic diseases, and immune challenges. This poster will review three studies from the Forger lab that were conducted to determine if birth affects factors involved in brain development including neuronal cell death, a neuroendocrine response, and behavioral changes. To study whether birth affects the timing of cell death, researchers quantified the cell death marker, activated caspase-3, in the CA1 oriens and nucleus accumbens of neonatal mice born "on time", early, or late. Advancing birth advanced the timing of cell death, suggesting that birth can trigger cell death, but a delayed birth did not alter the timing of cell death (Castillo-Ruiz et al., 2020). Birth timing also impacted the magnitude of cell death because advancing birth decreased cell death in the nucleus accumbens and delaying birth increased cell death in the nucleus accumbens (Castillo-Ruiz et al., 2020). In addition, Castillo-Ruiz et al. (2018) stated birth mode alters perinatal cell death in the brain and may affect behavior. There was an acute decrease in neonatal cell death in vaginal births and either no change or an increase in cell death after cesarean births; then, cesarean-birthed neonates had softer vocalization patterns after maternal separation (Castillo-Ruiz et al, 2018). Hoffiz et al. (2021) then showed that vasopressin levels were lower in cesarean births compared to vaginal births, which may be functionally significant. The neuroprotective properties of vasopressin may have decreased neuronal cell death after a vaginal birth (Hoffiz et al., 2021). In addition, vasopressin may have decreased the plasma osmolality in vaginal births since it increases water retention (Hoffiz et al., 2021). There were limitations of the studies. Therefore, further research would be required to help identify the mechanisms by which birth affects neurodevelopment.

Abstracts

Poster B7

Acute disruption of the intermediate hippocampus does not affect spatial, temporal, or emotional memory in male rats

R. Bint Abdullah Muslim, I. Sharma, K. Whitley, S.B. Briggs, & M.B. Parent

MARC Scholar: Raihaanah Bint Abdullah Muslim
Research Team of Marise Parent, PhD, Georgia State University
Daily Mentors: Kathryn Whitley, MS, Sherri Briggs, PhD

In rodents, the hippocampus is functionally divided along its longitudinal axis into dorsal and ventral poles. Generally, dorsal hippocampal (dHC) neurons are necessary for episodic and spatial memory, whereas ventral hippocampal (vHC) neurons are essential for affective and motivational processes and emotional memory. dHC and vHC have different anatomical connections, cellular and circuit properties, and patterns of gene expression that likely contribute to the different functions that they serve. Compared to dHC and vHC, relatively little is known regarding the function of the intermediate region of the hippocampus (iHC). Gene expression and anatomical connections in iHC do not overlap completely with those of dHC and vHC, suggesting that iHC may have functions that differ from dHC and vHC. In support, other researchers have shown that permanent lesions of iHC, but not dHC or vHC, impair rapid place learning in the water maze. The goal of the current project was to determine whether reversibly inactivating iHC would impair memory that is known to be dependent on dHC or vHC (spontaneous alternation, SA [dHC]; inhibitory avoidance, IA [dHC & vHC]). Male Sprague-Dawley rats were implanted with bilateral cannulae aimed at iHC. After at least 1 week of recovery, one cohort (n = 8) was given infusions of muscimol (0.5 ug/ul) 15 min prior to SA testing and IA training (at least 48 hrs between tests; infusions counterbalanced across behavioral tests). Our preliminary data indicate that reversible inactivation of iHC does not appear to affect memory in dHC and vHC-dependent memory tasks. These findings support the possibility that iHC plays a distinct role in memory that is different from dHC and vHC.

Poster A3

Explorations of the Dendronotus Iris swim central pattern generator

J. Bosonetto, J. Scully, and A. Shilnikov

Brains and Behavior Scholar: Jesse Bosonetto
Research Team of Andrey Shilnikov, PhD, Georgia State University
Daily Mentor: Jack Scully

While The general firing behavior of single neurons is fairly well understood, the circuit-level behavior that regulates firing patterns in many neural networks is not, due to the complexity of network organization and limits in experimental methods and data. This lab is using data previously obtained from *Dendronotus Iris* brains to attempt to accurately recreate their swimming behavior. This is done by simulating the brains' central pattern generator (CPG) circuits using the Plant neural model. Various parameters and data processing methods are used to systematically increase the system's accuracy. Once an accurate system is produced, it could be used to learn more about the intrinsic properties of individual neurons and circuit-level dynamic characteristics. The study of Rythmogenesis and identifying oscillatory patterns in neural systems are highly useful in the pursuit of finding a remedy for neurological disorders such as schizophrenia and seizures.

Poster A4

The future to sustainable water: electrochemical-mediated water desalination

K. Brown; A. Suresh; K. Knust; D.Liu; C. Zhang

IMSD Program Scholar: Keairra Brown
Daily Mentors: Christopher Aguillon, Dr. Sherri Briggs, PhD

As a result of rapid population growth, climate change, urbanization, and contamination of available fresh water, the demand for potable drinking water has increased exponentially. The world is facing a global challenge to supply clean, pollutant-free, and salt-free water. At the present one in three people worldwide lack access to clean drinking water, while two in five are even deprived of a basic hand-washing facility with soap and water, and thirty- five percent of third world residents die from water-borne illness. The global COVID-19 pandemic has further exemplified the vital need for clean water regarding combating the virus with sanitation. Here in this study, we develop a general theoretical framework to evaluate non-faradaic and faradaic electrochemically mediated deionization techniques, capacitive deionization (CDI) and hybrid capacitive deionization (HCDI), respectively as a potential strategy and solution for pollutant precursor removal in water. The model more specifically addresses how electrochemically mediated deionization strategies can help address the need for potable drinking water. With the potential of CDI and HCDI on reducing the presence of contaminates in drinking water and increasing the efforts to prevent associated health risks from contaminated water, we propose these technologies can be considered as a potential technology for pollutant control in drinking water.

Poster A5

Role of the Na+/K+ pump in neuromodulation of leech heart interneurons.

S. Core, R.J. Erazo-Toscano, R.L. Calabrese, G.S. Cymbalyuk

Brains and Behavior Scholar: Samuel Core
Laboratory of Gennady S. Cymbalyuk; PhD, Georgia State University
Daily Mentors: Ricardo Erazo-Toscano, Gennady S. Cymbalyuk, PhD

Central pattern generators (CPGs) are oscillatory neural networks that control rhythmic motor functions in animals. Neuromodulators modify CPG rhythms by regulating ionic currents adjusting bursting dynamics for environmental changes or behavioral goals. In the leech heartbeat interneuron (HN), multiple ionic currents, including the Na+/K+ pump current (I_{Pump}), are co-regulated by neuromodulators (Ellington et al., 2021). I_{Pump} is a unique target of modulation because of its dependence on intracellular Na+ concentration ($[Na]_i$) and independence from membrane potential. Previous studies have found that activating I_{Pump} by monensin, which increases ([Na]i), dramatically speeds up the rhythm of the CPG due to faster termination of bursts by I_{Pump} and I_{Pump} interaction with hyperpolarization-activated current (Kueh et al., 2016). However, the possible mechanisms based on interactions of I_{Pump} with other ionic currents in CPGs are not fully understood. We hypothesize that interaction with persistent Na+ current (I_P) also generates a mechanism that supports functional bursting behaviors. I_{Pump} is a major source of Na+ efflux, and I_P is a major source of Na+ influx. I applied a computational modeling approach to explain results of experiments that use a combination of electrophysiology and dynamic clamp methods. My co-authors show that increasing I_{Pump} speeds up HN rhythms by reducing burst duration (BD) and inter-burst interval (IBI). We developed a two-dimensional model with state variables: membrane potential (V_m) and $[Na]_i$, to characterize the interaction of I_{Pump} and I_P. Using an evolutionary algorithm, I fit the model to match the experimentally measured bursting envelope. I fit individual experiments and estimate distinction between neurons from preparation to preparation in terms of their basic biophysical parameters. Simulated BD and IBI are within one standard deviation of experimental averages. These results suggest that the mechanism of the interaction of I_{Pump} and I_P could bring robustness to generation of bursting patterns in CPGs.

Poster A6

There is hope: changing the trajectory of outcomes for children with brain tumors

C. Cowan, O. Haller, T. King

Perimeter Summer Research Scholar: Corianne Cowan
Laboratory of Tricia Z. King, PhD, Georgia State University
Daily Mentors: Olivia Haller, Sneh Pravinkumar Patel, PhD

Pediatric brain tumors are the most prevalent solid cancer in children (Pollack, 2019). Challenges for survivors may include neuropsychological complications: including long-term outcomes, dependent on therapy choice and other treatment characteristics (King, 2017). Proton therapy is one such treatment that utilizes beams of high energy to treat tumors. This method is especially beneficial as the beams directly address the tumors without damaging significant amounts of surrounding brain tissue. Therefore, this literature review will discuss recent studies about proton therapy: comparing the treatment to x-ray and photon therapy based on the differences in cognitive outcomes for pediatric patients. Proton therapy is synonymous with advantageous outcomes compared to X-ray radiotherapy among pediatric patients with tumors located in the posterior fossa, midline, or supratentorial areas (Gross, 2019). Patients treated with proton therapy performed better on full-scale intelligence quotients (96.0 v 88.6) and processing speed index (87.1 v 80.0) than those treated with X-ray radiotherapy. A review of current literature shows proton therapy as promising, whether used alone or in combination with other therapy treatments. However, to confidently promote proton therapy as the preferred therapy treatment, additional clinical studies are needed. Future studies of proton therapy should include larger numbers of participants: while significantly lengthening follow-up periods for patients, assessing behavioral and cognitive outcomes.

Poster A7

Developing and refining a method for rating student jazz improvisations

C. Dennison, J. Deocampo, M. Norgaard

Brains and Behavior Scholar: Charlotte Dennison
Laboratory of Joanna Deocampo, PhD, and Martin Norgaard, PhD, Georgia State University
Daily Mentor: Elizabeth Weaver

In this ongoing study, the effects of musical improvisation training on visual auditory statistical learning in early adolescence are examined. Musical improvisation, unlike other forms of musical performance, requires the player to create new material under given musical constraints, which are related to syntactic rules: a crucial aspect of statistical learning (Daltrozzo et al., 2017; Pressing, 1988). Middle school students (N=17) were enrolled in a university-sponsored jazz improvisation after-school program. Before and after the program, students completed statistical learning (SL) tasks and musical improvisation achievement tasks. The students completed four SL tasks while electroencephalography (EEG) measures were collected. For the musical improvisation achievement task, participants improvised short melodic responses to 12 melodies that varied in pitch and rhythm. In the past two years, two previous attempts at evaluating these improvisations using expert raters were made, but both resulted in unacceptable inter-rater reliability. In the first attempt, each of the 12 solos were transcribed into notation and converted to MIDI files, to control for bias against technical playing quality. The second attempt had the raters give one rating per recording of 12 tracks based on a multifaceted rubric. Here we developed a new, simpler, rubric for analyzing the improvisations by adapting a rating scheme from Brophy (2005). The 12 improvisations from each session were divided into individual audio files and presented in random order to the evaluator, who rated creativity of performance based on a 5-point scale. One point was given for melodic motives, rhythmic motives, phrase-like structure, antecedent-consequent structures, and pulse adherence. A month later, the raters completed a second round of ratings with 10% of the same material, allowing the calculation of intra-rater reliability. Initial findings suggest high inter-rater reliability as evidenced by a Cronbach's alpha of 0.97. Full results will be available by at the proposed poster presentation.

Poster A9

Exploring fear of flying treatment with Artificial Neural Networks

R. Garland, L. Su, and P. Anderson

Brains and Behavior Scholar: Ryan Garland
Research Team of Page Anderson, PhD, Georgia State University
Daily Mentor: Langting Su, MA

Artificial Neural Networks (ANN) is a data mining technique used to find and predict trends in a dataset. The ANN's supervised approach is a method that clusters data with the most similarities in order to identify a pattern based on the features each data point exhibits. This study will explore potential patterns in participants' self-reported fear levels for different flying situations in a treatment efficacy study on fear of flying (FOF). Participants (N= 115) were randomly assigned to and completed treatment for FOF using 8 sessions of either virtual reality exposure therapy (VRE) or standard exposure therapy (SE) prior to September 11, 2001. Participants were asked to complete two questionnaires - the Fear of Flying Inventory (FFI) and The Questionnaire on Attitudes Toward Flying (QAF) - at pre-treatment, posttreatment, and post–September 11, and an item on self-reported impact of September 11 on their recovery. The ANN will be trained to identify potential patterns between the questionnaire responses and which treatment group each participant was assigned to. Next, the model will identify which participants reported the most improvement in fear ratings after treatment and which questionnaire items changed the most post-treatment and post-September 11. Upon completion, the model will be able to identify differences in fear rating improvements between treatment groups, both per questionnaire and per item. These models have the potential to increase predictive accuracy if combined with data from other treatment studies on FOF. Identifying item-level differences in participant responses can help inform the development of future treatments for FOF.

Poster B1

Artificial intelligence literacy

J. Guffie, M.P. Lengua, R. Morris

MARC Scholar: Jordan Guffie
Research Team of Robin Morris PhD, Georgia State University

Background: The differences in general knowledge and understanding of the benefits and dangers regarding artificial intelligence are becoming a topic of discussion in the field of technology. These key differences in understanding could influence how people trust and interact with AI. The use and perception of technology today are topics of discussion which vary across populations of people. Given one's background, their perspective on technology, and specifically the use of artificial intelligence (AI), can be limited or very biased in a specific direction on the spectrum. Some factors that may affect an individual's views include their cultural background, gender, race, and language in how someone may perceive AI. At the same time, one should consider how AI perceives humans, how it learns about humans, and what biases are a part of that learning algorithm.

Method: This research study will evaluate potential differences in levels of AI knowledge and trust among different populations. There will be a particular focus on those populations who may have very different levels of knowledge and/or trust based on their race, culture, and gender. The study will utilize and evaluate an online questionnaire being designed to evaluate a person's AI literacy and trust. This survey will be piloted using GSU undergraduate psychology student's pool. The aim of this study is to understand the relationship between one's knowledge about AI and one's trust towards AI, which will provide a framework for increasing the awareness of the benefits and dangers of AI in society. It is hypothesized that there will be an inverse linear relationship between the two variables; as a person's general knowledge about AI increases, their trust will decrease

Results and Future Directions: The survey is currently under review, and we will be distributed for further analysis. However, future directions with this project will contribute to the present research on AI ethics in literature and the development of more equitable technologies free of bias.

Poster B2

Active manipulation and measurement of a single nucleation-crystal growth system

S. Howard, B. Xu, G. Wang

MARC Scholar: Sydney Howard
Laboratory of Gangli Wang, PhD, Georgia State University
Daily Mentor: Bin Xu, PhD

Nucleation and crystal growth are fundamental techniques within varied sciences and technological fields prominently in environmental science and pharmaceutical drug design just to name a few. Commonly used heterogenous nucleation does not have any methods which can regulate and monitor the dynamics of the process. In addition, typically nucleation is a two subsequent system however it results in various materials unable to crystallize, crystals that are formed with poor quality, and limited applications. However, recently research has found that using a single nucleation-crystal growth system enables nucleation and crystal growth to be measurable and manipulated to specification of a given experiment. The manipulation of this single entity and its individual phase transitions is enabled by seeding through the direct control of nanometer scale mass transport (nanoAC) by way of nanopipettes using an insulin solution and acid precipitant. I propose that instead of an insulin or protein solution with an acid precipitant, use an egg phosphatidylcholine mixture with NaOH and HCl. This will allow us to determine whether after separating out our target component within the mixture if the nanoAC method is an efficient method when handling mixtures and targeting certain substances within them. This work would be helpful aid the analysis of illegal drugs within forensic laboratories. The research would solve problem of identifying drugs in microcrystalline tests using crude crystals. Is the nanoAC method applicable to mixtures and not just protein solutions?

Poster B3

Fight club: motivational conflict between the insula and striatum during social approach-avoidance decision-making

M. Howell, M. Schlund & E. Tone

Brains and Behavior Scholar: Mycah Howell
Laboratory of Erin Tone PhD Georgia State University
Daily Mentors: Michael Schlund, PhD

Many everyday decisions involve balancing reward pursuit against threat avoidance. Yet we know little about how the neural systems for reward pursuit and threat avoidance interact in the human brain when we make a decision. Many published human imaging studies on reward processing show the presentation of cues associated with money delivery activates the ventral striatum. There are also many human images studies on aversion and threat processing that show presentations of threatening cues activates the anterior insula. Findings from these reward and threat studies suggest that when reward is constant and threat escalates, reward signals in the striatum should remain constant while threat signals in the insula should increase. The central aim of this investigation was to use functional magnetic resonance imaging (fMRI) to examine how escalating threat of social aggression modulates striatal and insula activation during approach-avoidance decision-making. We hypothesized that escalating threat of social aggression would 1) motivate a transition from social approach to social avoidance, and 2) increase insula and striatal activation. Participants were 83 healthy adults (53 females, 30 males, mean age 21.6 years (SD 8.19), mean IQ = 107 (SD = 16.99). The methods involved social-defeat learning in which adults learned to associate nine 'aggressive' virtual peers with an increasing probability of aggression (money loss). Additionally, one virtual peer was 'friendly' and associated with giving money to participants. Next, during an approach-avoidance task one of the nine aggressive peers was presented alongside the friendly peer. Approaching peers produced money gain unless the aggressive peer acted to take money. Avoiding peers also prevented exposure to aggression/loss (but also forfeited money gain). Results were consistent with our hypotheses and showed that escalating threat produced a switch from approach to avoidance and activation in the striatum and insula increased until the transition, and then decreased. These findings reveal that escalating threat influences reward signals during approach decision-making, but not during avoidant decision-making.

Poster B4

Neurodevelopmental implications of maternal and fetal inflammation in MyD88 deficient mice at birth

K. Major, J. Gray, A. Castillo-Ruiz, and N. Forger

Brains and Behavior Scholar: Kharli Major
Research Team of Nancy Forger, PhD, Georgia State University
Daily Mentor: Jennifer Gray, MS

Birth is an incredibly inflammatory event that sparks a chain of reactions to occur in the immune systems of both mother and baby. Recently, our lab showed that neuronal cell death in the nucleus accumbens (NAcc) and CA1 Oriens (CA1or) of the hippocampus significantly increased while microglial density decreased immediately following parturition, possibly due to the rapid changes in pro and anti-inflammatory cytokines at birth (Castillo-Ruiz et al., 2020). However, there is little research on the multiplicitous roles of maternal and fetal cytokine production on brain development in the newborn. Toll-like receptors (TLRs) are transmembrane receptors present on most immune reactive cells and mediate inflammatory responses in the body. Most TLRs require the signaling protein Myeloid differentiation factor 88 (MyD88) to function, so we utilized MyD88 global knockout mice to examine the effects of both maternal and fetal immune signaling on neonatal brain development. We conducted histological analysis for Iba1, a marker of microglia, to assess how microglial density in neonatal brains is impacted by intact (MyD88 heterozygous) vs. impaired (MyD88 KO) immune signaling from both dams and pups. We observed a significant decrease in microglial density (Iba1+ cells) in pups born to MyD88 heterozygous dams regardless of pup genotype (P=0.000). Interestingly, there was a significant decrease in microglial labeling in the paraventricular nucleus of the hypothalamus (PVN) of MyD88 KO pups (P=0.028), but no significant main effect of maternal genotype. These findings indicate that different regions of the brain respond differently to both maternal and endogenous immune signals at the time of birth. Both maternal and fetal inflammatory signals play a key role in perinatal immune reactivity and seem to be crucial in orchestrating neonatal neurodevelopment.

Poster B5

Supplementation with conserved M2 ectodomains and neuraminidase VLPs enhances cross protective efficacy of influenza vaccines

S. Muhammad-Worsham, J. Raha, N. Bhatnagar, S. Kang

MARC Scholar: Sakinah Muhammad-Worsham
Research Team of Sang-Moo Kang, PhD, Georgia State University
Daily Mentors: Jannatul Ruhan Raha and Noopur Bhatnagar

Due to changes and mutations in the influenza virus, a new vaccine is needed almost every season to combat the emerging strains. The purpose of this research is to target two conserved elements of the influenza virus, the M2 ectodomain (M2e) and neuraminidase (NA), in order to achieve cross protection when on its own or combined with a current influenza split vaccine. In this study, 6-week-old female Balb/c mice will be vaccinated with a bivalent H1N1 and H3N2 split vaccine supplemented with a multi-neuraminidase virus-like particles (Multi-NA VLP) vaccine, which consists of M2e tandem repeat M2e5x, consensus N1 NA, consensus N2 NA, and consensus Flu B NA, and then challenged with various homologous or heterosubtypic influenza strains, H3N2, H1N1, or rgH5N1. One group of mice will be vaccinated with the Multi-NA VLP vaccine alone, and another group will be vaccinated with only the bivalent split vaccine without supplementation with the Multi-NA VLP vaccine. All groups of vaccinated mice will be compared to those with no vaccine (naïve). Based on previous studies that tested M2e5x VLP and N1 NA VLP vaccines separately, the group immunized with the split vaccine supplemented with the Multi-NA VLP vaccine is expected to show stronger immune responses and higher levels of virus-specific IgG antibodies than the other groups. This group is also expected to show a lower percentage of body weight loss, indicating cross protection, and lower lung viral titers compared to the other groups. If the predicted results are observed, the findings would suggest that the supplementation of influenza split vaccine with Multi-NA VLP vaccine will be effective in providing improved cross protection and could be utilized alongside current influenza vaccines.

Abstracts

Poster B6

Exploring white matter hyperintensities & Alzheimer's Disease biomarker relationships across racial groups

C. Munkombwe, K. Igwe, M. Misiura, W. Wharton, W. Hu, A. Brickman, V. Dotson

Brains and Behavior Scholar: Chinkuli Munkombwe
Research team of Vonetta Dotson, PhD, Georgia State University
Daily Mentor: Maria Misiura, PhD

There is a higher incidence of Alzheimer's Disease in Black Americans (BAs) than in Nonhispanic Whites (NHWs). However, the specific causes of these disparities have yet to be elucidated. One explanation could be the higher prevalence of AD risk factors in BAs. For example, BAs are more likely to develop vascular disease and, by extension, vascular dementia, which manifests as higher WMH volumes compared to their white counterparts. Additionally, in studies with a general focus on AD biomarkers and WMH, tau and Aβ42 were shown to be related to total WMH volumes in the brain. Given this information, we hypothesized that there might be race-associated differences between lobe-specific WMH volumes and AD biomarker relationships. Our analysis involved a cohort of cognitively normal individuals, including 16 BAs and 43 NHWs. Fluid Attenuated Inversion Recovery scans and cerebrospinal fluid (CSF) were collected at Emory University and obtained CSF amyloid beta and CSF total tau levels. FLAIR data was analyzed using a code developed by the Brickman lab at Columbia University. Briefly, voxels containing WMHs were then overlaid onto a lobar atlas to derive lobe-specific WMH volumes (temporal, frontal, occipital, parietal, cerebellar). We constructed linear models and included WMH volume as our outcome variable, race and gender as fixed factors, CSF tau and CSF Aβ42 as independent variables, and Age and gender as covariates. We also included race X tau and race X Aβ42 interaction terms. We found t.tau and Aβ42 levels and WMH volumes were more closely related in the parietal and temporal lobes of BAs than in NHWs (B= -0.003, t= -4.688, p< .001 This disparity was observed in a cohort of cognitively normal controls. Though we cannot make strong causal inferences, the results of our analysis provide support for further investigation into WMH as a possible contributor to racial disparities in Alzheimer's Disease.

Poster B8

The effect religious coping has on trauma recovery amongst refugees

J. Mwamba. L. Shannonhouse

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Countless refugees narrowly escape dangerous environments and seek refuge annually. For many of these individuals, their faith and religion serve as the foundations of their ability to cope in a foreign land. Some refugee populations experience displacement due to unforeseen natural disasters, while others are are victims of wars, corrupt governments, and even torture. Analyzing religious meaning making is important because churches and faith-based non-governmental organizations are responsible for over 70% of refugee resettlement in the United States (Eby, Iverson, Smyers, & Kekic, 2011). It is necessary for the refugee groups that have gone through traumatic experiences to receive aid that does not conflict with a refugee's native faith and mental wellbeing. Studying meaning making is also important because many researchers that have studied post-migration living found evidence of grief and mental disorders. However, despite the regional disparities amongst refugees, their religion and spirituality remains as the source of strength for several. Many of these individuals exhibit evidence of resilience, which is a process where a positive recovery is seen despite an adverse life experience.

Abstracts

Poster B9

Early life pain alters fever response to immune challenge in adult male and female rats

M. Pandit, M. Gomez, C. Searles, L. Hanus, A. Murphy

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Daily Mentors: Morgan Gomez, Chris Searles, Anne Murphy

Infants born before 37 weeks gestation are more likely to be admitted to Neonatal Intensive Care Unit (NICU) where they will experience an average of 10-18 invasive procedures per day without anesthesia or analgesia for pain management. Clinical studies have shown that the long-term effects of early exposure to pain disrupts CNS development. The present study explores the impact of neonatal injury on the immune system's response to a bacterial challenge in adulthood. On the day of birth (P1), male and female rat pups receive an intraplantar injection of 1% carrageenan (CGN) to induce short-term inflammation. As adults (P60-P90), these rats are implanted with Thermochron iButtons to monitor core body temperature. After a 14 day recovery they are administered lipopolysaccharide (LPS) to induce an immune response. Rats were sacrificed at either 24 hours post-injection or at peak fever point. Brain tissue was extracted and processed for immunohistochemical analysis of C-Fos and \within the median preoptic area of the hypothalamus (MnPO), a critical CNS site for the fever response. Fever analysis revealed a trend in both sexes such that the rats exposed too early life pain had higher peak fever response than controls. Immunohistological analysis of MnPO tissue revealed a sex and treatment difference in cellular activation. This data reveals a potential mechanism through which children experiencing unresolved pain during the perinatal period show an increased severity of sickness behavior and attenuated immune signaling.

Poster C1

Sleep quality and executive function in a diverse sample of healthy college students

M. Parrilla, R. Kautiainen, and T. King

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Existing research highlights the importance of sleep for cognitive abilities in college students, but few studies examine the relationship between sleep and executive function, especially in a diverse population. Our research aims to fill this gap by analyzing how sleep quality affects working memory and executive function in a diverse sample of twenty-nine healthy college students (nine African American, eight Asian, eight Caucasian/non-Hispanic, and four Caucasian/Hispanic). Using the Pittsburgh Sleep Quality Index (PSQI) we divided our sample into two groups based on cut-off criteria (score >5= poor sleep): good sleep quality (n=11) and poor sleep quality (n=18). Students were on average 20.86 years old. There were no significant differences between groups based on age or GPA. Informants rated participants' executive functioning and working memory using the Frontal Systems Behavior Scale (FrSBe) and Behavior Rating Inventory of Executive Function (BRIEF): Our results showed that individuals in the poor sleep quality group were reported as having significantly worse executive function on the FrSBe Dysexecutive scale ($p=0.005$), which indicates problems with sustained attention, working memory, and mental flexibility. On the BRIEF, individuals in the poor sleep group had significantly worse informant-reported working memory scores ($p=0.003$). There were no significant differences between groups on the FrSBe Disinhibition, BRIEF Inhibition, and FrSBe Apathy Scales. Previous research shows a link between worse cognitive functioning (working memory and inhibition on performance tasks) and poor sleep, which is in line with our findings of worse informant-rated cognitive abilities. Poor sleeping habits in college students are associated with adverse effects on working memory and executive function. Considering that maintaining a healthy sleep schedule is a struggle for many young adults, this study raises awareness about how it might affect their cognitive abilities and is generalizable across race and ethnicities.

Poster C2

Does the right dorsolateral prefrontal cortex exhibit enhance communication with the rest of the brain when processing feedback during the Prisoner's Dilemma

N. Patel, K. Thompson, J. Turner, and E. Tone

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The right dorsolateral prefrontal cortex (rdlPFC) is a region of the brain's frontal lobe associated with executive functions, including working memory, social decision-making, emotion regulation, and response inhibition. The iterated Prisoner's Dilemma (iPD) task, an economic-exchange game used to illustrate how people achieve stable cooperation over repeated interactions, provides a framework for examining the various epochs that constitute the reciprocal exchange (Thompson et al., 2018). The purpose of this study was to investigate whether the rdlPFC exhibited enhanced communication with the rest of the brain when processing social feedback during the iPD task. 31 adult volunteers were recruited to participate against a computerized confederate in the iPD task. fMRI data for each participant was collected, preprocessed, and analyze using SPM12. Psychophysiological interaction analysis was utilized to detect task-specific connectivity changes between the rdlPFC and other brain regions. Using PPI analysis, we focused on the feedback phase to understand whether the rdlPFC exhibited communication with the rest of the brain during that specific period of the task. There was a trend-like increase in connectivity between the rdlPFC and the right temporoparietal junction $t(29)=3.30$, $p<0.05$ uncorrected, $k=62$ and between the rdlPFC and the orbitofrontal cortex $t(29)=3.16$, $p<0.05$ uncorrected, $k=56$. These results did not reach significance based on the statistical standards of fMRI data analysis (family-wise error correction). The rTPJ is involved in the function of mentalizing or trying to determine the thoughts and feelings of others, thus impacting social interaction. The OFC is involved with socioemotional sensory integration, building and evaluating expectations, and subjective valuation. The OFC is particularly important in signaling the expected rewards/punishments of action given its situational context and significance. In the future, to make stronger deductions about our observed results, we will need to recruit a larger subject pool to establish clear statistically significant connections among brain regions.

Poster C3

Assessing trends in messages students absorb about mental illness and treatment

H. Patton and P. Anderson

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Research Team of: Page L Anderson, PhD, ABPP, Georgia State University
Daily Mentor: Page L Anderson, PhD, ABPP

Many studies have explored the relationship between religiosity and spirituality (R/S) and mental health – some showing that R/S offer positive coping mechanisms and others connect R/S to mental health stigma and treatment avoidance. Most research on the topic has asked adults about their current experiences and perspectives. This research has also primarily used quantitative measures to evaluate R/S and attitudes toward mental health illness/treatment. This study reviews 131 Georgia State University undergraduate students' answers to the questions: "Growing up, what messages about mental illness did you absorb (could be from your family, religious group, media)? In your opinion, what messages contribute to mental health stigmas? What might be other reasons people don't seek help for psychological struggles?" Students had no limitations on the discussion, giving them freedom to discuss whatever felt most relevant. Of the 131 respondents, 60 individuals (45.8%) mentioned religious or spiritual concepts. Each response was coded manually for keywords or phrases, identifying language regarding religious group, and connotation of the response toward religion and spirituality (positive or negative). Of the 60, 53 mentioned *personal* religious or spiritual experiences connected to mental health stigma. Within those 53, 43 reported a negative connotation, six mixed, and four positive. Fifteen of the 53 identified as Christian or Catholic, one as Hindu, three as Muslim, one as spiritual, and 33 as unknown. Our final presentation will include insight into key extracted themes and feature direct quotes to highlight each identified theme. This examination makes a valuable contribution to the literature by examining qualitative data that details how religious and spiritual upbringing may relate to current perspectives on mental health illness and treatments.

Poster C4

Spanish translation of the attitudes towards psychological online interventions (APOI)

M. Peraltilla Alfaro, D. Ellis, C. Delbasso, P. Anderson, and G. Kuperminc

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Daily Mentors: Donovan Ellis and Claudia Delbasso

Digital online psychological interventions (OPI) have great potential to improve accessibility of mental health resources, especially among underserved communities. Unfortunately, people do not view OPIs positively. There is virtually no research on attitudes towards OPI by Hispanics. The purpose of my thesis is to translate the Attitudes toward Psychological Online Interventions Scale (APOI) into Spanish. This translation will promote cultural competence in understanding and assessing Hispanics' attitudes towards OPIs. The Spanish-language adaptation will be performed by a bilingual and bicultural team using a forward and backward translation protocol. Participants will be adults who self-identify as Hispanics that are monolingual or bilingual Spanish speakers. Participants will be recruited through the university participant pool (Sona) and public areas. Participants will take a 10-15 minute survey that contains the APOI Spanish version and other Spanish language measures of demographics and mental health symptomatology. The analysis of the study will consist of evaluating the means, standard deviations, and internal consistency of the translated version to the English version. This translation will allow inclusion of Spanish-speakers in psychological research and create a resource that researchers and clinicians may use to mitigate the gap in unmet mental health needs among Hispanics through the use of OPIs.

Poster C5

Analysis of Fur-dependent gene regulation of the gonococcal TonB-dependent transport proteins involved in zinc acquisition

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Neisseria gonorrhoeae (Ngo) is the causative agent of the sexually transmitted infection gonorrhea that affects men and women worldwide. Gonococcal infection can lead to serious sequelae including infertility in both men and women and has been shown to be asymptomatic in women primarily. Treatment options are limited as the bacterium has gained high levels of resistance. There is an urgent need for the development of a vaccine; however, vaccine development has been challenging owing to the high frequency phase and antigenic variation of the most common bacterial outer membrane vaccine targets. From previous research, it is known that TonB-dependent transport proteins (TdTs) on the outer membrane of the bacterium work against the body's nutritional immunity to acquire essential metals. Since TdTs are conserved among gonococcal isolates and they are important for infection, they may be ideal vaccine candidates. TdfJ is a TdT that acquires zinc within low zinc environments. *tdfJ* expression is induced in high iron and low zinc environments. Thus, it was hypothesized that the Ferric Uptake Regulator (Fur) acts as an activator for the induction of *tdfJ* in Ngo. Fur is thought to sit on the DNA upstream of the *tdfJ* promoter and allow the RNA polymerase to activate the expression of *tdfJ*. The current study focuses on expression and purification of Fur to analyze this interaction. First, the *fur* gene from Ngo will be amplified and ligated into a linearized over-expression plasmid and then transformed into *Escherichia coli* cells. After confirming the appropriate *fur* sequence, I will induce protein expression and begin purification using a Nickel-NTA column. Finally, the purified protein will be subjected to Electrophoresis Mobility Shift Assays to study the DNA-protein interaction. These results will inform if Fur interacts with the *tdfJ* promoter region to induce expression and aid in zinc uptake by TdfJ.

Abstracts

Poster C6

Methods used to study function and morphology of astrocytes in the brain that help understand impact of altered function

D. Ruano, F. Althammer, J. Stern

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Daily Mentors: Ferdinand Ludwig Althammer

Astrocytes make up an important part of the nervous system. Unlike neurons, astrocytes are not electrically excitable which impedes them from participating in the transmission and transport of signals. Instead, they serve other functions, which are equally crucial. They play a vital role in the development of the nervous system by forming the synaptic pathways that connect neurons together as well as the regulation of the release of neurotransmitters. Astrocytes are essentially the supervisors of brain homeostatic as they are in charge of regulating levels of water, certain ions and the neurotransmitter glutamate in the brain. In subjects with heart failure disease, it has been shown that a factor that is common to the mortality of the disease is a neurohumoral activation, which is a release of chemicals into synapses in the sympathetic nervous system. Increased glutamate in heart failure is well known, however, the mechanism that makes it possible is what is currently the main focus of this research.

Poster A8

Investigation of cross protective properties of vaccines supplemented with M2 ectodomain

K. Ruiz Garcia, J. Oh, J. Subbiah, and S.M. Kang

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Daily Mentor: Judy Oh, BS

While current flu vaccines can provide strain-specific protection, the antigenic diversity of influenza A viruses requires annual vaccination because broad cross protection is not effective. Due to the various hemagglutinin (HA) and neuraminidase (NA) subtypes in influenza A virus, providing complete protection to all the subtypes is challenging by the continuous emergence of antigenic shifts and antigenic drifts. To overcome the limitation and enhance cross-protection, this study tests the efficacy of different vaccine combinations that have been supplemented with the conserved M2 ectodomain (M2e) of influenza A virus. Intramuscular vaccination with inactivated PR8 virus vaccine (A/Puerto Rico/8/34, H1N1) that has been supplemented with a tandem repeat of M2e virus-like particles (M2e5x VLP), or proteins (M2e-B stem, M2e Aichi stem, and M2e.P (3,3'-dithiobis(sulfosuccinimidyl propionate)) (DTSSP) induced IgG antibody production. Other vaccines that also induced antigen specific immune response include: M2e-B stem, Aichi-M2e stem, M2e5x VLP, and iPR8 alone. Furthermore, results with PR8 virus and M2e peptide used as ELISA coating antigens showed that groups of mice that were immunized with either inactivated virus vaccine of PR8 (iPR8)+M2e-B stem, iPR8+Aichi-M2e stem, iPR8+5XM2e VLP, and 5xM2e VLP had high immunogenicity, and induced both M2e and pr8 virus specific IgG antibody, after prime or boost-immunization of mouse animals. Results from this study confirm that supplementing vaccines with the highly conserved M2e is a promising vaccination strategy for inducing IgG antibodies recognizing virus variable HA antigens as well as conserved M2e and stem epitopes potentially conferring broad cross protection.

Poster C7

Acute disruption of the intermediate hippocampus does not affect spatial, temporal, or emotional memory in male rats

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In rodents, the hippocampus is functionally divided along its longitudinal axis into dorsal and ventral poles. Generally, dorsal hippocampal (dHC) neurons are necessary for episodic and spatial memory, whereas ventral hippocampal (vHC) neurons are essential for affective and motivational processes and emotional memory. dHC and vHC have different anatomical connections, cellular and circuit properties, and patterns of gene expression that likely contribute to the different functions that they serve. Compared to dHC and vHC, relatively little is known regarding the function of the intermediate region of the hippocampus (iHC). Gene expression and anatomical connections in iHC do not overlap completely with those of dHC and vHC, suggesting that iHC may have functions that differ from dHC and vHC. In support, other researchers have shown that permanent lesions of iHC, but not dHC or vHC, impair rapid place learning in the water maze. The goal of the current project was to determine whether reversibly inactivating iHC would impair memory that is known to be dependent on dHC or vHC (spontaneous alternation, SA [dHC]; inhibitory avoidance, IA [dHC & vHC]). Male Sprague-Dawley rats were implanted with bilateral cannulae aimed at iHC. After at least 1 week of recovery, one cohort (n = 8) was given infusions of muscimol (0.5 ug/ul) 15 min prior to SA testing and IA training (at least 48 hrs between tests; infusions counterbalanced across behavioral tests). Our preliminary data indicate that reversible inactivation of iHC does not appear to affect memory in dHC and vHC-dependent memory tasks. These findings support the possibility that iHC plays a distinct role in memory that is different from dHC and vHC.

Poster C8

Applying dynamic functional connectivity network analysis to task-based paradigms

E. Stacey and M. Norgaard

Brains and Behavior Scholar: Emma Stacey
Laboratory of Martin Norgaard, PhD, Georgia State University

Functional connectivity (FC) is a major area of current research. Here I focus on connectivity between already acknowledged networks, many of which have been identified through resting state, such as the default mode and executive control network. We are looking at studies that explore how the connectivity among those networks changes during tasks. This type of analysis is referred to as functional network connectivity (FNC). The current background of literature about this topic is overwhelmingly on analysis of data collected from participants in resting state and is examined under the assumption that FC does not change during the data collection period, a condition called static connectivity. As the number of task-based studies have increased in which network connectivity has been analyzed, methods have become a primary area of interest. We are seeing a shift towards adapting methods to account for changes between and within task conditions. In light of this, dynamic functional connectivity (dFC) has replaced static connectivity as a more common principle of analysis. This shift in methods has been computationally challenging to the point that many studies are being dedicated to finding the most accurate and efficient way of using algorithms to represent dFC analysis. Recent literature has even begun to emphasize intra-network fluctuations and time varying spatial patterns-a step past dFC. This review explores methods of analysis for dFC as well as the relationship between resting state and task-based analysis. Here I analyzed five recent studies from 2020 and 2021 that focus on dFC and spatial dynamics in task-based paradigms. The overall finding is that these dynamic changes are related to the task.

Abstracts

Poster C9

Perturbation training reducing falls in people with multiple sclerosis

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Daily Mentor: Feng Yang, PhD

Individuals with Multiple Sclerosis (MS) are at a high risk of falls. Perturbation training has been adopted as a fall prevention paradigm for reducing falls in various populations, such as older adults and people with stroke. This paradigm exercises motor adaption and learning through intentionally- and externally-induced repeated perturbations, such as gait-slips, to promote new motor skills needed for preventing falls. This study investigated whether people with MS can acquire the necessary motor skills for avoiding a fall and adapt to large-scale slip perturbations. We hypothesized that individuals with MS could reduce the rate of falls responding to repeated slips after a single session of perturbation training. During the study, thirteen individuals with MS underwent five repeated and unexpected gait-slips while walking on a treadmill under the protection of a safety harness. The primary outcome measure was the slip outcome: fall or recovery. Results showed a reduced rate of slip-fall in our participants throughout the five repeated slips. Starting with 92.3% of participants (12 out of 13) falling on the first slip, participants exhibited a significant reduction in the fall rate of 30.8% (4 out of 13) on the fifth induced slip ($p < 0.01$). The decrease in the fall rate could be attributed to their adaptive changes to the body posture, such as the shortened step, flexed knee joint, and forward-lean trunk. The results support our hypothesis that people with MS can quickly acquire skills to prevent slip-falls from repeated external perturbations, in particular slips. Perturbation training could be an effective program to prevent falls for this population. Future directions may include studies concerning the retention of the learned motor skills from perturbation training and the optimal dosage of perturbation training for people with MS.

Poster D1

White matter pathways associated with empathy: A DTI investigation

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Daily Mentor: Stephanie Steinberg, MA

There is little research that focuses on the relationship between the quality of white matter (WM) pathways and empathy. A recent literature review indicated that the superior longitudinal fasciculus, inferior fronto-occipital fasciculus, and inferior longitudinal fasciculus are WM tracts involved in the process of empathy. In this study, we sought to examine the integrity of white matter pathways associated with the complex human process of empathy in healthy young adult females during the luteal phase of their menstrual cycle. Twenty-eight participants (M_{age}= 23.0 years, *SD*= +/- 2.9 years) from the Atlanta area underwent DTI. Data was processed with the FDT package in FSL. FSL's Tract-based spatial statistics (TBSS) software was used to create a mean fractional anisotropy (FA) skeleton that determined the centers of relevant WM tracts. Participants also completed the Empathy Quotient (EQ) questionnaire, a 40-item self-report survey, to assess empathy capacity. Mean FA scores for each subject were extracted and correlated with EQ scores. There was a significant negative correlation between EQ scores and FA within five clusters of WM: in the left forceps minor/body of the corpus callosum, left corticospinal tract, intraparietal sulcus/primary somatosensory cortex, superior longitudinal fasciculus, and right inferior fronto-occipital fasciculus/forceps minor. These identified clusters are consistent with the extant, but scarce, literature examining WM and empathy. It is critical to examine brain structures related to empathy to inform how healthy and clinical populations experience, understand, and respond to emotion. The negative relationship findings suggest that hormonal changes that occur during different phases of the menstrual cycle may play a key role in the relationship between WM integrity and empathy. Future research should seek to replicate these findings, and continue to examine the important role that hormones may have in modulating the relationship between WM integrity and empathy capacity.

Abstracts

Poster D2

Investigation of Huntington's in *Drosophila* dendrites

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Laboratory of: Daniel N. Cox, PhD
Daily Mentors: Erin Nicole Lottes, MS

Huntington's disease (HD) is a neurodegenerative disease that causes a mutation in the *huntingtin* gene that produces abnormal widespread cytosine-adenine-guanine (CAG) repeats in the brain. The behavioral and pathological effects of Huntingtin CAG-repeat expansion significantly degrade quality of life for those affected, as the onset of the disease may bring symptoms such as chorea, bradykinesia, and dystonia, and may have grim results such as death. At a cellular level, the mutant Huntingtin (mHTT) protein forms aberrant aggregates, and has adverse impact on transcription, translation, proteostasis, and synaptic and mitochondrial function. Chaperone Containing TCP1 (CCT) is a multi-subunit containing chaperone, responsible for folding actin and tubulin, and up to 15% of all protein in cells. Previous studies have demonstrated that CCT can function in diminishing the effects of Huntingtin aggregation *in vitro*. *Drosophila melanogaster* multidendritic (md) sensory neurons show worsening dendritic hypotrophy, where a decrease in total dendritic length is observed when mHTT with increasing abnormal CAG repeats is introduced in the neurons. In neurons with greater than 96 repeats, we identify distinct mHTT puncta in dendritic branches. Preliminary results show strong co-localization of CCT subunit-1 (CCT1) with mHTT puncta using immunohistochemistry (IHC). Interestingly, colocalization of CCT5 and mHTT puncta is sparse. Additionally, we observe that CCT5 knockdown does not alter the number of puncta, nor does it alter the distribution in the branches. These preliminary findings suggest that these two subunits may have different roles with respect to mHTT aggregation.

Poster D3

Investigating the influence factors of cognition and mental health outcomes during adolescence

K. Thottempudi, and J. Liu

Perimeter Summer Research Scholar:
Kumara Harsha Vardhan Thottempudi
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Brain structure and function undergo significant changes during adolescent neurodevelopment. The outcomes of this period are known to be influenced by behavioral and environmental variables, but these associations are not well quantified. The Adolescent Brain and Cognitive Development (ABCD) study measures multiple domains of wellbeing, biological characteristics, and demographic information of a nationally representative sample of over 11,000 participants. This major longitudinal study holds the potential to reveal novel associations concerning adolescent neurodevelopment. Previous research using ABCD data has shown associations between cognition and mental health status and independent variables like screen time, sleep, or race. In the present study, we performed a paired sample t-test on child behavior checklist (CBCL) scores to assess depressive and anxiety disorder symptoms, prodromal questionnaire scores to assess psychosis symptoms, and NIH toolbox scores to assess cognitive ability. Over a two-year period, we observed modest improvements to the sample's overall mental health status and cognitive ability. Our next steps involve isolating the groups that had significant changes in those areas and looking for sources of variance among factors like screen time, physical activity, puberty status, and demographic information. The correlates will then be quantified using a fixed effects linear regression model. Our findings from here can then be enriched with brain imaging data and be used to create a prediction model to help predict cognition and mental health trajectories using baseline information.

Poster D4

The sex different effects of social experience in mice

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Laboratory of Aras Petrulis, PhD, Georgia State University
Daily Mentor: Alexandra Selke, BA

Animals present sex-different social behaviors such as aggression and sexual behavior. Experience being aggressive and gaining sexual experience leads to the lasting acquisition of social dominance in male mice. Thus, sex differences in neural circuitry contribute to these lasting changes following social experience. One neuropeptide, Vasopressin (AVP), and its receptor, the Vasopressin 1a Receptor (V1aR), affects sex-different social behaviors in a male-biased manner. Prior research in hamsters showed that males showed increased binding in the ventromedial hypothalamus (VMH) following exposure to aggressive behavior. Additionally, socially housed males show high binding in the MPOA in comparison to females. It is still unknown how social experience could alter V1aR binding in mice in a sex-dependent way. The current research focuses on how prior social experience alters receptor binding in sex-different ways and how behavior changes across social experiences are associated with V1aR binding changes. This can be tested using receptor autoradiography to identify V1aR binding within the MPOA and the VMH. Male (n=10) and female (n=10) mice were (maintained under GSU and NIH guidelines), 5 males and 5 females were single housed to be exposed to aggression and sexual behavior, and 5 males and females were left group-housed with their siblings and socially naïve. Mice who received social experience were placed for overnight sex and tested for same-sex/aggression (10 mins), followed by sexual experience (90 mins) and same-sex/aggression again. Animals were sacrificed 3 days following their last social exposure, and brains were collected for autoradiography. I predict that increased V1aR binding will be found in the VMH and the MPOA in male mice with prior social experience. Additionally, males with previous social experience will have shorter latencies to mount and display faster attacks.

Poster D5

Race differences in depression in early and middle childhood

C. Wilson, A. Cooper, and E. Tully

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Research consistently supports higher levels of depression in Black relative to White adults and adolescents. Although research supports the presence of depression during early and middle childhood, race disparities in depression in young children has received very little attention. Findings have also supported elevated levels of depressive symptoms in adolescence in children with a history of preschool depression. This project will take a step toward understanding if disparities in depression are already present in early childhood and if they continue to be present in middle childhood. The first hypothesis is that Black children have higher levels of depression than White children during early childhood. The second hypothesis is that Black children have higher levels of depression than White children during middle childhood. At time one, seventy-five children (50% girls) aged 4 to 8 years (M=5.50 years, SD=.70) participated in this study. At time two, the original sample was supplemented with new participants who did not participate at time one, with 108 children (50% girls) aged 7 to 12 years (M=9.21 years, SD=1.13) participating. The children were given the Children's Depression Index (CDI). We tested the hypotheses with ANOVAs and found that Black children had significantly higher levels of depression than their White counterparts at time one but found that Black children did not have higher levels of depression than their White counterparts at time two. Research supports the validity of child-report of depression during early and middle childhood. However, some research suggests depression symptoms (e.g., irritability) may differ in prevalence and severity across racial groups and the CDI may misclassify Black youth as depressed when their endorsed symptoms indicate other forms of psychopathology or normative functioning.