

UNDERGRADUATE RESEARCH SYMPOSIUM SPRING 2024

Emory Student Center

Friday, April 19th, 10AM-12PM

A celebration of research and scholarship



EMORY

Undergraduate
Research Programs
Pathways Center



SCHEDULE OF EVENTS

APRIL • 19 • 2024

ORAL SESSION 1
POSTER SESSION 1

10:00 AM - 11:00 AM

ORAL SESSION 2
POSTER SESSION 2

11:00 AM - 12:00 PM

RECEPTION CEREMONY
KEYNOTE BY DR. VINCENT WILLIS

12:15 PM - 1:15 PM



ORAL AND POSTER SESSIONS

ORAL SESSION 1
10AM - 11AM
MULTIPURPOSE ROOM 3

Time	Presenter	Title
10:05	Montana Jackson	Understanding the T-Follicular Helper Cell Response in a Murine Model of Hemophilia A
10:15	Moshen Hu	Approximate Solution to Image Deblurring
10:25	Julia Kwak	Making Fashion Green: Sustainability Innovations and Initiatives in the Fashion Industry
10:35	Nayana Sah	Qualitative Findings Regarding Parent-Child Relationships from the Change Starts at Home Intervention Study

ORAL SESSION 2
11AM - 12PM
MULTIPURPOSE ROOM 3

Time	Presenter	Title
11:05	Xu Fei	Recruitment and enrollment of pregnant women with substance abuse and the newborn
11:15	Gillian Feinglass	Composting for a Cleaner Future: Improving Emory's Waste Management Practices
11:25	Madeleine Koenig	Validating a 3D Cell Model Utilizing Mouse-Passaged Primary Human Hepatocytes
11:35	Ethan Issenberg	Correlation and Awareness of Anxiety/Depression symptoms among individuals with a Fragile X premutation



POSTER PRESENTATIONS

POSTER SESSION 1
10AM - 11AM
MULTIPURPOSE ROOM 3

Poster #	Presenter	Title
1	Sohan Bellam	Automated Hiring
2	Clara Conry	Sensor Accuracy and the Urban Heat Island Effect on Emorys Campus
3	Elaine Feller	Investigating the Relationship Between Electrode Surface Area and Voltage Harvested Across Muscle Tissue
4	Kevin Gunawardana	Comparison of Postoperative Complications Among Inlay, Hybrid, and Onlay Humeral Stems in Reverse Shoulder Arthroplasty Patients
5	Sarah Solano	Quantification of Left Ventricular Myocardial Strain by Means of Novel PET-Derived Algorithms. Preliminary Validation with Cardiac MR.
6	Isabel Staton	Diversity at the Farmers Market: Perceptions on the Impact of Identity on Quality of Life and Economic Viability for Managers

POSTER SESSION 1
10AM - 11AM
MULTIPURPOSE ROOM 3

Poster #	Presenter	Title
7	James Pena	Evaluating Seasonal and Social Influences on Fur Rubbing behavior in White-faced Capuchins
8	Akash Puvvala	Heterologous Viral Vectors and Protein Immunizations: Pioneering Approaches to Elicit Durable Immune Responses Against SHIV
9	Isabel Velez	Who Leads? Intersectionality in State Legislative Leadership Roles and Institutions

POSTER SESSION 2
11AM - 12PM
MULTIPURPOSE ROOM 3

Poster #	Presenter	Title
1	Niels Armbruster	Predicting Cryptocurrency Ownership in the United States of America
2	Claire Bae	Automated Home-Based Motor Rehabilitation with Noninvasive Vagus Nerve Stimulation: A Low-Cost Solution for Movement Disorders
3	Ariana Castro	Use of a Budding Yeast Model to Explore the Functional Consequences of Oncohistones
4	Benjamin Chiok	Progress Towards the Total Synthesis of 4-hydroxy-2-pyridones
5	Isabella Clarke	Emory Health Equity Alliance (HEAL)
6	Nicole Cobb	Towards measuring individual differences in learning adaptive mental behaviors
7	Yutong Hu	Automated News Integration for Emora Information Bot
8	Anya Hung	SYNCRIP in Neural Stimulus-Response

POSTER SESSION 2
11AM - 12PM
MULTIPURPOSE ROOM 3

Poster #	Presenter	Title
9	Jasmine Liu	Evaluation of Bias in the 2022 COVIDx Challenge Winning Model
10	Anna Perry	Role of 2nd Order Projection Neurons in Drosophila Feeding
11	Eleonora Sheppard	Standardizing Protocol for Locating Warmth-Insensitive Fields in Thermosensation
12	Elizabeth Shin	A Longitudinal Study Exploring the Influence of Genetics and Environment on Adult Development in Twins
13	Anushri Sonawala	What are the Roles and Benefits of Mangroves as a Means of Coastal Defense in Singapore
14	Robert Steingass	Commune Environmentalism: Reality or False Remembrance?
15	Wesley Tsai	Assessing the effects of commercial wearable technology in preventing, diagnosing, and treating mental health disorders – A scoping review.
16	Tristyn Watson	Effective and Accessible Scientific Communication in Community-Engaged Research
17	Vivian Yang	Studying the interactive effects of real-world positive and negative affective states on adolescent and young adult substance use



ABSTRACTS

PREDICTING CRYPTOCURRENCY OWNERSHIP IN THE UNITED STATES OF AMERICA

PRESENTER: NIELS ARMRBUSTER

CONTRIBUTING AUTHORS: ARMBRUSTER, NIELS; JACHO-CHAVEZ, DAVID

This study explores the prevalence of cryptocurrency ownership in the United States of America. The data used comes from the Understanding America Study, a panel of households that represents the entire United States. First, descriptive statistics are computed for the demographic variables. Then, heat maps for cryptocurrency ownership in the United States are generated using Python. Lastly, a weighted regression is computed using different configurations of demographic variables to predict ownership of cryptocurrency. We find that adoption of a debit card, PayPal, and mobile payment system along with household income are significantly positively correlated with cryptocurrency ownership. On the other hand, we find that being a woman, being of Hawaiian or Pacific Islander descent, and being older are significantly negatively correlated with cryptocurrency ownership.

AUTOMATED HOME-BASED MOTOR REHABILITATION WITH NONINVASIVE VAGUS NERVE STIMULATION: A LOW-COST SOLUTION FOR MOVEMENT DISORDERS

PRESENTER: CLAIRE BAE

CONTRIBUTING AUTHORS: SHINOHARA, MINORU; MOHAN, ARYA; TRAJKOVA, MILKA; GREEN, NATHANIEL; POSEN, JOSHUA N.; YEO, WOON-HONG; KWON, HYEOKHYEN; REDDY, LAUHITYA; BAE, CLAIRE

Low-cost instrumentation of motor rehabilitation that can be deployed in a home environment can significantly improve the physical function of patients living with movement disorders, like Parkinson's Disease or Stroke. Previously, stimulating the vagus nerve directly after successful movement during rehabilitative training was found to facilitate motor recovery in animals with neuromotor impairment. Translating this vagus nerve stimulation (VNS) to human motor rehabilitation requires an invasive procedure that poses risks and comes at a high cost. Dr. Minoru Shinohara, an Associate Professor from the School of Biological Sciences at Georgia Institute of Technology, recently developed a noninvasive, low-cost transcutaneous Vagus Nerve Stimulation (tVNS) that only needs to be attached to human skin, but still requires a physical rehabilitation expert. This project aims to integrate a low-cost and automated movement quality assessment system with tVNS for home-based physical rehabilitation. The system uses markerless motion capture and machine learning to classify movement quality in real-time. Our preliminary work applied this to Tango dance therapy for Parkinson's patients. While subjects performed backward tango steps, our system could identify successful movements in lower limbs with balanced backward steps with an F1-score of 81.3%. The project now aims to expand this system for upper limb rehabilitation tasks for Stroke patients, using public benchmark video datasets capturing various upper limb rehabilitation tasks. We expect our model to continuously recognize successful upper limb movements with a 75+ F1-score. Overall, at the end of this project, we expect to develop and validate a real-time and accessible video analysis system that can assess both upper and lower limb movements in varying conditions including Parkinson's Disease and Stroke. This will be a significant step towards an automated, home-based motor rehabilitation system integrated with tVNS, improving the quality of life for patients with movement disorders.

A LACCASE-MEDIATED OXIDATIVE COUPLING OF ANILINE AND α -METHYLSTYRENE

PRESENTER: SOPHIA BARTHEL

CONTRIBUTING AUTHORS: BARTHEL, SOPHIA; BIEGASIEWICZ, KYLE

Enzymes as biocatalysts for chemical synthesis provide an attractive alternative to traditional catalysts which typically require harsh conditions or produce excess waste. Recently, laccase enzymes have been applied in synthetic contexts as they can catalyze single-electron transfer reactions and perform radical-driven oxidation without the need for additional cofactors. This study examines the new-to-nature and new-to-chemistry oxidative coupling of alkenes and amines, catalyzed by a laccase from *Aspergillus*. The introduction of small molecules containing alkene and amine functionality to laccase led to the formation of a coupling product only in the presence of enzyme. Based on current data, we predict the formation of an α -amino alcohol. Hence, this biocatalytic method could serve as a sustainable pathway for the generation of a chemical moiety with crucial applications in medicinal and pharmaceutical targets.



AUTOMATED HIRING

PRESENTER: SOHAN BELLAM

CONTRIBUTING AUTHORS: BELLAM, SOHAN; AJUNWA, IFEOMA

Automated tools are an inevitable feature of daily life. Their prevalence is widespread, structuring personal decision making, business strategy, governance, and more. Research on the past, present, and future of automated hiring systems let me gain insight into the trends developing within the field. Recent federal equal opportunity regulations further define evolving guidance, aimed at reducing bias not only within automated hiring but across automated governance. Through analysis of the literature base, development of original code, use of statistical methods, and persistent attention to constantly updating guidelines, I bring to craft the foundations for an automated hiring system designed to minimize bias, ensuring a more just and sustainable future of work. The status-quo ethical, legal, and technical states calls for increased auditing, data collection and protection, transparency, and intentional bias-reduction efforts to transform automated hiring tools from reproducing bias to equitable hiring.

USE OF A BUDDING YEAST MODEL TO EXPLORE THE FUNCTIONAL CONSEQUENCES OF ONCOHISTONES

PRESENTER: ARIANA CASTRO

CONTRIBUTING AUTHORS: CASTRO, ARIANA; LEUNG, SARA; JONES, CELINA; CORBETT, ANITA

DNA is tightly packaged around histone proteins, forming chromatin in all eukaryotes. These histone proteins play a crucial role in regulating processes that depend on access to DNA, such as gene transcription and DNA repair. However, a minor alteration that changes a single amino acid of a histone can transform these essential proteins into oncohistones, which can promote uncontrolled cell division and ultimately lead to cancer. Such missense mutations often disrupt posttranslational modifications in histones, influencing gene expression patterns. As all histone proteins are highly conserved across species, but humans contain clusters of histone genes, making genetic manipulation challenging. Due to the genetic simplicity of only containing two genes encoding each histone, budding yeast is a convenient model for studying the consequences of oncohistones. Although budding yeast cells do not develop cancer, budding yeast cells can be readily engineered to express an oncohistone as the sole copy of a histone protein so that the functional consequences of the single amino acid change can be analyzed. In our research, we will focus on investigating four specific missense mutations at position H3G34 known to be oncogenic: W, L, R, and V. These mutants exhibit sensitivity to DNA damaging agents, suggesting the involvement of DNA repair mechanisms in their pathological effects. In particular, H3G34V, which causes high-grade gliomas and giant cell tumors on the bone, is sensitive to induced double-strand breaks in both *S.pombe* and *S.cerevisiae*, suggesting an evolutionarily conserved disruption to double-strand break repair. To provide insight into how H3G34V disrupts growth patterns, the lab employed a high copy suppressor screen (HCSS) using phleomycin, a compound that induces DNA double-strand breaks, on cells expressing H3G34V as the sole copy of histone H3. We performed optimization of the DSM-indicated growth defects. Initial screening has identified various genes of interest, which are linked to chromatin and DNA repair. Through this screening approach, we aim to identify potential suppressors of growth defects to identify potential therapeutic targets for cancers caused by H3G34V.

ASSESSING THE IMPLEMENTATION POTENTIAL OF CONSUMER HEALTH WEARABLES IN CLINICAL SETTINGS

PRESENTER: BERAL CHEN

CONTRIBUTING AUTHORS: POZZO, NICOLE; CHEN, BERAL; KAPLAN, DEANNA

BACKGROUND: The post-acute sequelae of SARS CoV-2 (PASC or “Long COVID”) condition is often accompanied with chronic debilitating symptoms that require constant management, individualized medical treatment, and referrals to specialists. While consumer health wearables have been recommended to patients to collect psychophysiological data for the treatment of Long COVID, little research has been conducted on the perspectives of providers in implementing these wearables in a healthcare setting.

OBJECTIVE: The purpose of this research project was to conduct preliminary research analysis on providers’ perspectives on the acceptability, appropriateness, and feasibility of using consumer health wearables for PASC symptom tracking and management within a healthcare setting.

METHODS: Previously collected data from provider interviews was used to conduct rapid qualitative data analysis. An inductive approach was used in the development of a coding system following the Health Equity Implementation Framework model.

RESULTS: Out of 18 interviews, six primary codes were established: frequency of treating Long COVID, treatment plans and procedure, cross-clinical support, consumer health wearables, and patient-provider relationship. Subcodes were established for further clarification and detail.

DISCUSSION: The treatment of Long COVID requires a holistic, individualized approach that often involves collaboration with medical specialists, management of comorbidities, and detailed patient reports. While the use of consumer health wearables may provide assistance in the monitoring of symptoms, challenges in feasibility arise in the areas of provider familiarity, convenience of use, validity of data, and accessibility to patients.

KEYWORDS: Post-acute sequelae of SARS CoV-2, Long COVID, consumer health wearables, qualitative analysis

PROGRESS TOWARDS THE TOTAL SYNTHESIS OF 4-HYDROXY-2-PYRIDONES

PRESENTER: BENJAMIN CHIOK

CONTRIBUTING AUTHORS: CHIOK, BENJAMIN; CRUZ, RICARDO; WUEST, BILL

Fungal infections caused by *Candida auris* and *Aspergillus fumigatus* have fatal/life-altering potential due to their resistance to contemporary antifungal medicine. Even newly developed antifungal compounds neglect to test efficacy against these strains. However, naturally occurring molecules like Oxysporidinone, Septoriamycin A, and Sambutoxin, classified as 4-hydroxy-2-pyridones chemical structures, have shown activity against fungal pathogens to both efficiently stop infections and evade resistance. Our group has pursued a promising synthetic route for these three natural products via a short synthesis to a common intermediate molecule and an accessible synthesis route from that intermediate to the three natural products, which would allow for the efficient manufacture of either one. We have made great steps toward pushing the synthesis route to completion using minimally expensive laboratory equipment and cheap/accessible chemical reagents, utilizing cross-coupling reactions to create carbon-carbon bonds that piece together the “skeleton” of the final product. We hope that this study will help catalog the activity of these natural products against *C. auris* and *A. fumigatus* while creating a basis to continue the drug development of these three compounds.

Keywords: Total synthesis, drug resistance, natural products, pyridones, fungal infection

EMORY HEALTH EQUITY ALLIANCE (HEAL)

PRESENTER: ISABELLA CLARKE

CONTRIBUTING AUTHORS: HALL-CLIFFORD, RACHEL; CLIFFORD, GARI; CLARKE, ISABELLA; THAKKAR, VRUSHALI; MURTHY, NEHA; STEGMAN, ARIELLE

Health equity is a broad, often misunderstood term, and our goal is to provide a more comprehensive learning platform to provide clarity and completeness to what is a not-well-understood area. The political, economic, and social forces that thwart efforts toward true health equity will shape students' capacity to address present and future challenges in the health equity field. Emory is recognized as a leader on a global scale in the fields of ethics, global health, and data sciences. We suggest utilizing our knowledge in these areas to create a comprehensive teaching and learning tool to aid in the advancement of health fairness. The Emory HEAL platform would rely on the expertise of Emory faculty members and their global networks for the creation and curation of digital training content for health equity. In its initial phases, the Emory HEAL (Health Equity Alliance) will: 1) Do a landscape analysis across the University to comprehend our current resources that are included in existing curricula; 2) create a board of advisors to oversee curriculum mapping and choose the most important content areas for Emory HEAL; 3) select and include additional public domain or publicly accessible, high-quality resources for the teaching of health equity in addition to developing materials for the core curriculum areas; and 4) start Emory HEAL with learning modules that can be applied to all units and courses at Emory. Currently populating literary and video content for the module list. Emory can create a much-needed resource for our community and support the growth of health equity work worldwide.

TOWARDS MEASURING INDIVIDUAL DIFFERENCES IN LEARNING ADAPTIVE MENTAL BEHAVIORS

PRESENTER: NICOLE COBB

CONTRIBUTING AUTHORS: HITCHCOCK, PETER; CHANG, MINA;
COBB, NICOLE

Adapting thoughts to be more conducive to well-being may pose greater challenges compared to modifying behaviors. However, Cognitive Behavioral Therapy (CBT) employs a unified approach to addressing both cognitive and behavioral patterns. While learning adaptive behaviors often relies on understanding the direct consequences of actions, cultivating healthy mental habits, such as positive thinking, can be more complex due to the less tangible nature of their outcomes compared to physical actions like exercise. This research aims to investigate disparities in the learning processes of mental versus overt behaviors using a reinforcement learning task. In this study, participants will engage in a novel variant of a cognitive actions task where they must learn optimal cognitive actions (such as adding or subtracting number pairings) or motor actions (selecting the top or bottom letter pairings) for various visual stimuli by receiving feedback (reward or no reward) that is administered at probabilistic frequencies in both a learning and retention phase. Additionally, we will explore participants' working memory capacity and their inclination towards cognitive engagement as plausible explanations of individual task performance. We hypothesize that participants will exhibit better performance in the overt condition than in the cognitive condition. These findings could implicate a need for enhancements to the cognitive change approach in CBT, ultimately leading to improved mental health outcomes for individuals with conditions such as depression.

Keywords: reinforcement learning, behavior modification, computational modeling, perseverative thinking, cognitive behavioral therapy



SENSOR ACCURACY AND THE URBAN HEAT ISLAND EFFECT ON EMORYS CAMPUS

PRESENTER: CLARA CONRY

CONTRIBUTING AUTHORS: CONRY, CLARA; SAIKAWA, ERI; LAURENCIN, CHELSEY

As the impact of human-driven climate change has developed, we have seen extreme heat events intensify and become more common. Urban areas, due to increased concrete and larger populations, have been more adversely affected by heat waves. The Atlanta Urban Heat Island study is an attempt to understand what areas will be most prone to extreme heat in Atlanta. This study will attempt to map what neighborhoods will be most significantly impacted by creating a high-resolution heat map of Atlanta throughout the year. Due to time and resource constraints, this study will start by testing sensors on the Emory campus. This will help inform future studies methods for using the sensors by testing the sensors accuracy. This data will then be transformed into a series of maps for each month using ArcGIS Pro. In the future these tools will help develop an understanding of risk prone communities and how urban planning can affect heat exposure risks.

COMPOSTING FOR A CLEANER FUTURE: IMPROVING EMORY'S WASTE MANAGEMENT PRACTICES

PRESENTER: GILLIAN FEINGLASS

CONTRIBUTING AUTHORS: FEINGLASS, GILLIAN

"Composting for a Cleaner Future: Improving Emory's Waste Management Practices" is a comprehensive study aimed at enhancing Emory University's waste management strategies, specifically focusing on improving Emory's existing composting initiatives. This capstone project will function as a comprehensive assessment of Emory's current composting program to foster a more sustainable campus environment.

Drawing on a multi-faceted research approach, including ethnographic studies, online surveys, and consultations with key stakeholders such as the Sustainability Office, Emory Dining services, and Goodr (Emory's waste management provider), this study evaluates the effectiveness of existing waste separation practices and identifies areas for improvement.

The research explores student perceptions and behaviors regarding waste management, investigates challenges in waste separation, and examines the impact of contamination on composting processes. Insights leveraged from these analyses will inform actionable recommendations for optimizing Emory's composting program and promoting student engagement in sustainable practices.

This study will synthesize findings from previous studies on successful waste management initiatives, offering valuable insights into best practices and innovative strategies for waste reduction and composting.

By integrating empirical research, stakeholder perspectives, and theoretical frameworks, this capstone contributes to the ongoing efforts to cultivate a culture of sustainability at Emory University. The proposed enhancements to the composting program aim to mitigate environmental impacts, reduce waste generation, and inspire a collective commitment to a greener future.



INVESTIGATING THE RELATIONSHIP BETWEEN ELECTRODE SURFACE AREA AND VOLTAGE HARVESTED ACROSS MUSCLE TISSUE

PRESENTER: ELAINE FELLER

CONTRIBUTING AUTHORS: FELLER, ELAINE; GHANIM, RAMY; AYGUN, DILAY; PINNAKA, NIHANTH

The Abramson lab is developing an “in-body communication system” involving delivering and sensing electric signals as they travel through the body. The device may perform a number of different tasks, such as stimulating a nerve fiber or administering a lifesaving medication.

My current research is focused on optimizing the electrodes to be used in the device – in particular, their surface area. However, further experiments will be necessary before reliable conclusions about the optimal electrode dimensions can be made, as several different factors complicate the results. First, tissue electrical properties are being characterized. Methods of improving signal readout are also being investigated. Findings will inform the design of the eventual medical device.

COMPARISON OF POSTOPERATIVE COMPLICATIONS AMONG INLAY, HYBRID, AND ONLAY HUMERAL STEMS IN REVERSE SHOULDER ARTHROPLASTY PATIENTS

PRESENTER: KEVIN GUNAWARDANA

CONTRIBUTING AUTHORS: GUNAWARDANA, KEVIN; COOKE, HAYDEN; SINHA, MAYA; GULZAR, MUSAB; GOTTSCHALK, MICHAEL; WAGNER, ERIC

The selection of humeral stem design in reverse shoulder arthroplasty (RSA) remains a debated topic, particularly concerning its impact on postoperative complications. This study specifically aims to investigate the incidence of acromial fractures across different humeral stem designs: inlay, hybrid, and onlay. Conducting a retrospective review, we analyzed RSA patients from 2019 to 2022, categorizing them according to the humeral stem design employed. Our methodology focused on a detailed examination of postoperative X-rays and surgical documentation to identify occurrences of acromial fractures. Preliminary findings, pending statistical analysis, seek to clarify the relationship between humeral stem design and fracture incidence in reverse shoulder arthroplasty patients. This research contributes to ongoing debates in RSA, offering insights to inform both clinical decision-making and future studies.

Keywords: Reverse shoulder arthroplasty, humeral stem fixation, inlay, hybrid, onlay, postoperative complications

AUTOMATED NEWS INTEGRATION FOR EMORA INFORMATION BOT

PRESENTER: YUTONG HU

CONTRIBUTING AUTHORS: HU, YUTONG; NI, DARREN; ZAIMAN, AARON; CHOI, JINHO

Given all kinds of questions about college life by Emory students, Emora Information bot, a comprehensive information systems, strives to provide students with direct access to precise and factual answers. However, the current browser and chatbots still need improvements. To achieve this, the system employs a proactive approach, generating answers to potential questions based on its database. During conversation, Emora Information Bot selects the most relevant answer by comparing user queries with its database and outputting the response with the highest similarity. The research aims to build up an automatic extractor, which will take information from Emory news webpages, as well as a generator, which will generate paired questions and answers, for Emory News so that the corresponding database for Emora Information Bot can stay up to date. The selenium webdriver, which can control browsers, will constantly check the update on the Emory News website by detecting if there are links outside the current url database. If there is any update, those new articles will be scraped in html format. Based on parsed down contents, Chatgpt will generate possible questions as well as the corresponding answer. This project is expected to largely enhance the chatbot's efficiency and timeliness: rather than relying on manual scraping, only periodic supervision is required to ensure the system captures new information. This frees up resources to concentrate on enhancing the chatbot's conversational skills and specialization, such as the establishment of the chat history system and the ability to ask follow-up questions. We hope Emory Information Bot, by helping Emory students connect to Emory resources, can enhance their college experience and eventually compose a more energetic Emory community.

APPROXIMATE SOLUTION TO IMAGE DEBLURRING

PRESENTER: MOSHEN HU

CONTRIBUTING AUTHORS: STUDENT: HU, MOSHEN;
MENTOR: ONISK, LUCAS

This presentation explores the challenge of image deblurring, a critical issue in fields ranging from photography to medical imaging. Starting with an introduction to how images are represented and the common causes of blurring, we delve into the mathematical formulation of the problem using linear equations. Initial naive attempts at deblurring, which involve inverting the blurring operator, are shown to be flawed due to the amplification of noise and the potential ill-conditioned nature of the operator. To address these challenges, we explore the application of Singular Value Decomposition (SVD) and its variant, Truncated SVD (T-SVD), which offers a more robust solution by discarding noise-associated high-frequency components. The presentation compares various deblurring strategies, highlighting the effectiveness of T-SVD in minimizing reconstruction errors and providing practical insights into achieving optimal image restoration. The work is supported by references from leading texts in the field and acknowledges the guidance and support of Dr. Lucas Onisk and the Emory SIRE program.



THE RIPPLE EFFECT OF HOSPITAL CLOSURE ON ADJACENT HOSPITALS: EVIDENCE OF INFLUXES OF PATIENTS FROM RURAL GEORGIA

PRESENTER: JINGZHOU HUANG

CONTRIBUTING AUTHORS: HUANG, JINGZHOU

The closure of hospitals has long been a source of concern, particularly due to its adverse effects on both the efficiency of the medical system and patient well-being. Over the past decade, an increasing number of hospitals across the nation, notably in rural areas, have been recognized as being at high risk of closure, and a large volume of suffering and complaints from patients has been reported. While the closure of a hospital directly impacts patients and medical infrastructure locally, there are also concerns regarding its ripple effects on nearby hospitals due to a potential influx of patients into adjacent regions. This study investigates the existence and magnitude of the influxes, analyzing inpatient and outpatient data from Southwest Georgia Medical Center, a community hospital that permanently closed operations on October 22, 2020, and a larger hospital in Albany, GA. The study explores the preference hierarchy of patients among different hospitals in the region and utilizes the fact that the closure of the hospital alters the preference, which subsequently induces redistribution of patients, to determine and the treatment and control group. Applying the Difference-in-Differences (DiD) model, the study reveals a significant increase in both the proportion and log-odds of patients from the affected counties admitted by or visiting the adjacent hospital. This underscores the substantial impact of hospital closures on patient flow patterns, the need for strategic healthcare planning to mitigate such disruptions, and projects future research focus on the potential consequences of such an influx of patients.

SYNCRIP IN NEURAL STIMULUS-RESPONSE

PRESENTER: ANYA HUNG

CONTRIBUTING AUTHORS: HUNG, ANYA; KOSTI, ADAM; BASSELL, GARY

Fragile X Syndrome (FXS), caused by a mutation in the FMR1 gene, is one of the most common causes of intellectual disability. Individuals with FXS lack Fragile X Messenger Ribonucleoprotein (FMRP) which causes altered synaptic function and neuronal hyperexcitability. After stimulation, immediate-early genes (IEG) are the first to be expressed and produce transcription factors in mammalian neurons. Synaptotagmin-binding, cytoplasmic RNA-interacting protein (SYNCRIP) has been found to play a role in mRNA degradation, specifically in those of IEGs. To explore the role of SYNCRIP in neural stimulus response, a time-course experiment was performed in which cultured N2a cells were stimulated with serum and collected after certain time points. The protein levels at each time point following serum stimulation were measured, revealing that SYNCRIP levels increase up to 240 minutes after serum stimulation. Interestingly, another protein of lower molecular weight was also identified, indicating potential alternative splicing. Additionally, the mRNA levels of various protein factors that associate with the Coding Region Determinant (CRD), including SYNCRIP, were measured at each time point following serum stimulation. This revealed that mRNA levels of these proteins tended to decrease between 60 and 120 minutes after stimulation and increase between 120 and 240 minutes after stimulation. These findings on the role and regulation of SYNCRIP and other proteins within the CRD-mediated mRNA stability complex beg further questions about the mechanisms of the neural stimulus-response and expand upon our current knowledge on the molecular underpinnings of neuronal hyperexcitability, characteristic of FXS.



CORRELATION AND AWARENESS OF ANXIETY/DEPRESSION SYMPTOMS AMONG INDIVIDUALS WITH A FRAGILE X PREMUTATION

PRESENTER: ETHAN ISSENBERG

CONTRIBUTING AUTHORS: ISSENBERG, ETHAN; ALLEN, EMILY; SHUBECK, LISA; EIPSTEIN, MICHAEL

Fragile X-associated conditions are caused by gene expansion repeats in the FMR1 gene on the X-chromosome. The premutation form of the gene, defined as 55-200 repeats, has been linked to an increased likelihood of anxiety and depression symptoms among women and men. The analysis here is to see if individuals with a premutation are at increased risk for these symptoms. Data of 246 men and women with a Fragile-X premutation who partook in surveys through Emory University in 2019 were analyzed for their self-reported symptoms and medical diagnosis. These individuals also all provided a biological sample for whole genome sequencing. Among these individuals, there is a significant correlation with symptoms of depression and anxiety. This data is important for the awareness of Fragile X-associated conditions in the medical field, as often individuals are misdiagnosed and untreated due to the lack of understanding and awareness of healthcare providers.

UNDERSTANDING THE T-FOLLICULAR HELPER CELL RESPONSE IN A MURINE MODEL OF HEMOPHILIA A

PRESENTER: MONTANA JACKSON

CONTRIBUTING AUTHORS: JACKSON, MONTANA; MCCOY, JAMES; BAAFI, DEBORAH; KIM, SUNGWOO; ZERRA, PATRICIA

Hemophilia A is a rare blood disorder characterized by the absence of coagulation factor VIII (FVIII) that prevents clot formation, leading to severe complications. Treatment includes FVIII replacement therapy; however, 20-40% of patients with severe hemophilia A develop antibodies (inhibitors), that neutralize FVIII therapy resulting in increased morbidity and mortality. This research project examines the role of T-follicular helper (TFH) cells in FVIII inhibitor formation, to increase understanding of the underlying immune events and identify targets for inhibitor prevention.

To assess these immune events, we created a constitutive CD4 TFH cell knock-out (TFH KO) mouse model and have shown that when exposed to FVIII, these mice do not form anti-FVIII antibodies compared to control mice, who form a robust immune response. We next developed a tamoxifen-inducible TFH KO mouse model to examine the precise timing of the TFH response to FVIII. For five consecutive days, experimental and control mice were injected with tamoxifen to induce the specific recombination of exons 7-9 on chromosome 16 to deplete Bcl6 (a critical component in making germinal centers (GCs) for the immune response). To test if the depletion was complete, sheep red blood cells (SRBCs) were injected to stimulate a GC response. Flow Cytometry was used to evaluate the presence or absence of GC. Our results show that our tamoxifen injection schedule results in both decreased TFH cells and decreased GC formation following SRBC transfusion. We next aim to examine the timing of the requirement of TFH cells in FVIII inhibitor formation by using this novel inducible mouse model, which is more comparable to a human immune system than the prior constitutive KO mouse model.

VALIDATING A 3D CELL MODEL UTILIZING MOUSE-PASSAGED PRIMARY HUMAN HEPATOCYTES

PRESENTER: MADELEINE KOENIG

CONTRIBUTING AUTHORS: KOENIG, MADELEINE; JONES, CHRISTOPHER; MICHAILIDIS, LEFTERIS

HBV is a chronic and deadly viral causative agent whose underlying mechanisms of infection are still largely undefined. To investigate the specific mechanisms of the virus, we must utilize appropriate techniques that simulate the physiological environment. This study aims to advance HBV research by developing 3D cell culture methods. Specifically, we detail the production of mouse-passaged primary human hepatocytes (mpPHH) spheroids, a 3D accumulation of cells, which better imitate the physiological environment of the body compared to traditional 2D monolayer cultures typically employed in viral research. The mpPHH spheroids were seeded at three variable densities: 20,000, 50,000, and 80,000 cells. Evaluation of the spheroid's viability was conducted by monitoring albumin protein concentration using ELISA assays and western blots, proving the extended longevity of the spheroids. In addition to producing mpPHH spheroids, we created spheroids composed of HBV-infected cells to investigate the virus's virulence and infectivity during spheroid formation. Validation of the HBV-mpPHH spheroids was achieved by assessing cellular health and hepatocyte marker expression utilizing qRT-PCR assays. Additionally, quantification of the HBsAg protein after HBV-mpPHH spheroid formation indicates high virality, justifying this technique as a method to conduct viral research. By validating both mpPHH and HBV-mpPHH spheroid formations, this study provides an insightful lens into potential applications of spheroid methodologies in future viral research endeavors.

MAKING FASHION GREEN: SUSTAINABILITY INNOVATIONS AND INITIATIVES IN THE FASHION INDUSTRY

PRESENTER: JULIA KWAK

CONTRIBUTING AUTHORS: KWAK, JULIA; LONGHOFER, WESLEY

Sustainability is increasingly becoming relevant for businesses (D'Itra and Aus 2023, 1). As more and more consumers pressure businesses to address the company's environmental impact and expect businesses to operate socially and environmentally responsibly, sustainability becomes an important factor in determining a company's reputation (D'Itra and Aus 2023, 1; Rattalino 2018, 747; Curtis and Hansson 2019, 1). Many businesses have historically followed a linear system that encourages endless growth, depletes resources and, in turn, prevents a sustainable model for economic prosperity (Fischer and Pascucci 2017, 1). Of these businesses is the fashion industry, whose environmental impact ranges from the water-intensive processes and the extraction of raw materials to the production and disposal of fabrics, especially with the advent of fast fashion. Yet as the pressure to integrate and demonstrate sustainability across a company increased, many fashion companies have taken the initiative to make their practices more sustainable. Through analyzing company websites and reviewing literature on sustainable fashion practices, this research provides an overview of the various sustainable innovations and strategies that five fashion companies have undertaken, each of which represents a sector of the fashion industry: Nike (large apparel), Mud Jeans (small company), Stella McCartney (luxury brand), H&M (fast fashion), and Shein (fast fashion). Specifically, I ask "what kinds of sustainability strategies and innovations have different kinds of fashion companies implemented?" The sustainable strategies and innovations founded can broadly be categorized into three groups: 1) partnerships (H&M, Stella McCartney, Shein), 2) sustainable sourcing of materials (Nike, Stella McCartney, Mud Jeans), and 3) post-consumer engagement (Nike, H&M, Shein, Stella McCartney, Mud Jeans).



ANALYSIS OF THE CREDIT SURFACE DYNAMICS IN THE US MORTGAGE MARKET AMIDST MONETARY POLICY TIGHTENING

PRESENTER: JIHAN LEE

CONTRIBUTING AUTHORS: LEE, JIHAN; HANSMAN, CHRISTOPHER

This study investigates the pass-through efficiency of recent aggressive monetary policy changes on the credit market, particularly focusing on the disparity in interest rate transmission across various levels of leverage in the US mortgage market. The study is motivated by the largest policy rate increase in the past decade, from 0-0.25% to 4.25-4.5% by the end of 2022, representing a 425 basis points escalation. We examine the differential impact of these changes using the Home Mortgage Disclosure Act (HMDA) data from 2021 and 2022. Our analysis employs a simplified two-dimensional credit surface, considering interest rates against the loan-to-value ratio (LTV). Specifically, the study delves into the average interest rates and the volume of loans originated across varying LTV levels, with a particular emphasis on nonconforming (jumbo) loans due to their market-driven nature, as opposed to conforming loans which are substantially influenced by Government-Sponsored Enterprises (GSEs) like Fannie Mae and Freddie Mac. Preliminary findings indicate no significant evidence to support the hypothesis that monetary policy tightening are passed through disproportionately across the credit surface. This research contributes to the understanding of monetary policy transmission in the mortgage market and implies a nuanced interaction between policy rates and the credit sector.

EVALUATION OF BIAS IN THE 2022 COVIDX CHALLENGE WINNING MODEL

PRESENTER: JASMINE LIU

CONTRIBUTING AUTHORS: LIU, JASMINE; DAPAMEDE, THEO; LI, FRANK; GICHOYA, JUDY WAWIRA

Introduction and Purpose:

In 2022, The Medical Imaging and Data Resource Center (MIDRC) hosted its first COVIDx Grand Challenge. This challenge aims to train an AI/machine learning model in the task of distinguishing between test negative and positive patients using chest radiographs (CXRs) from the MIDRC dataset. Model bias is characterized by systematic errors in machine learning algorithms learning the wrong signals from data and produces inaccurate output. My research utilizes a pre-built fairness assessment model to evaluate the potential demographic bias in the winning model's inference result. This project aims to provide a better understanding of AI bias and promote fair AI modeling specifically in the application of medical AI imaging.

Methods:

During the data collection and pre-processing phase, I used the winning model to process 81,000 Digital Imaging and Communications in Medicine (DICOM) images to generate inference outcomes. These outcomes were then integrated with the MIDRC database via patient IDs to incorporate patient demographic information. Various adjustments were made to prepare the data for the fairness assessment model. Specifically, the fairness assessment model required the inference variable to be binary for most of its evaluation metrics. The inference result represented the probability of a patient testing positive for COVID-19 based on their chest radiograph, requiring a threshold for positive/negative classification. Three thresholds – 0.5, 0.3, and 0.2 – were tested based on the distribution of the inference result.

Results and Discussion:

There are four key metrics in the assessment model: mean difference, normalized mean difference, impact ratio, and odds ratio. After evaluation, the mean difference metric was omitted due to its incomparable values across different variables and its redundancy with the normalized mean difference metric. My findings indicated that gender exhibited no statistically significant bias in predictions across normalized mean difference, impact ratio, and odds ratio for all three thresholds. This suggests that the winning model demonstrated insufficient indication of gender bias. However, when applied to different demographic variables – age, race, and ethnicity – a statistical difference was observed across each demographic group within these variables, indicating a tendency of the model to predict a higher probability of a positive test result for these demographic groups. Nonetheless, these differences may be attributed to smaller sample sizes within specific demographic groups. An important limitation of the assessment model is its failure to consider the ground truth of patient test results, which means the bias evaluation only measures the model's behavior without consideration of its performance.

Conclusion:

While model bias remains a complex and challenging issue, an intentional and continuous effort to address model bias is necessary. This research establishes a pipeline for evaluating bias and contributes to the advancement of fair AI modeling in clinical research. It serves as a foundational step towards building more equitable and unbiased AI models for future medical applications. A further comprehensive evaluation is needed to fully assess where the disparities among demographic variables stem from.

ROLE OF 2ND ORDER PROJECTION NEURONS IN DROSOPHILA FEEDING

PRESENTER: ANNA PERRY

CONTRIBUTING AUTHORS: PERRY, ANNA; DEVINENI, ANITA

This study uses *Drosophila* (fruit flies) as a model organism to understand the taste circuit and its integration with behavior. During feeding, the brain must integrate various signals to produce the most appropriate behavior. Across organisms, feeding generally depends on internal nutritional needs, food quality, and the ability to detect potentially toxic foods. *Drosophila* is an ideal model system for this study, due to access to a fly brain connectome and genetic manipulations. The neurons with connections to gustatory receptor neurons are fully mapped within the brain, however many of their roles within the taste circuit are unclear. This study focuses on three sets of 2nd order projection neurons, which receive input from gustatory receptor neurons and project to higher-order brain regions. To characterize their roles, the neurons were optogenetically activated in a feeding setup that had two identical food choices, with only one food choice paired with light. This was done to determine whether activation of these neurons caused a preference, aversion, or neither towards the light-paired channel. Of the three neurons, one neuron was identified in which optogenetic activation resulted in a preference for the light-paired channel, suggesting it may play a role in appetitive feeding behavior.

HETEROLOGOUS VIRAL VECTORS AND PROTEIN IMMUNIZATIONS: PIONEERING APPROACHES TO ELICIT DURABLE IMMUNE RESPONSES AGAINST SHIV

PRESENTER: AKASH PUVVALA

CONTRIBUTING AUTHORS: PUVVALA, AKASH; AMARA, RAMA RAO;
JAKKALA, KISHOR

The central research problem addressed in this study is the development of an effective vaccine for HIV, a global health priority. The quest for an HIV vaccine has been particularly challenging due to the virus's high mutation rate and genetic diversity, which have historically hindered vaccine development. In this context, we explore a novel vaccination regimen that utilizes heterologous viral vectors in conjunction with escalating doses of protein immunization against simian-human immunodeficiency virus (SHIV) infection. Our primary objective is to investigate the innate and tissue resident memory immune responses elicited by this vaccination strategy. Understanding these responses is critical as they play a pivotal role in generating a durable and broad immune defense capable of countering the virus's ability to mutate and escape existing immunological defenses. Previous work in this area has predominantly focused on various vaccine candidates and delivery methods aimed at inducing protective immune responses against HIV. However, despite significant efforts, the development of a safe and effective HIV vaccine remains elusive. Existing approaches have encountered challenges such as inadequate induction of durable immune responses and limited efficacy against diverse HIV strains.

QUALITATIVE FINDINGS REGARDING PARENT-CHILD RELATIONSHIPS FROM THE CHANGE STARTS AT HOME INTERVENTION STUDY

PRESENTER: NAYANA SAH

CONTRIBUTING AUTHORS: SAH, NAYANA; SHERVINSKIE, ABBIE; NEGI, JYOTSNA; BHANDARI, ANUSKA; THAPA, ARADHANA; BHANDARI, ANISH; GURUNG, RAJYALAXMI; CLARK, CARI JO

Background. An estimated 28% of partnered women aged 15-49 have experienced some form of intimate partner violence (IPV). The impact of such violence extends to children. Change Starts at Home is a multi-faceted intervention strategy created to address the prevalence of IPV through media, interactive voice response platforms, and weekly group meetings. This study is a preliminary analysis assessing the role Change Starts at Home has in reducing violence and enhancing parent-child relationships.

Methods. Select couples (n=20) were interviewed in a quasi-experimental study conducted in the Binayi Tribeni and Hupsekot municipalities of Nawalpur, Nepal. They were selected from a pool of couples participating in the program's Listening and Discussion Groups (n=200). Qualitatively, couples were interviewed at the end of the program curriculum (midline; August 2022) and the end of the diffusion component (endline; May 2023). Quantitatively, 1181 married men and women and members of their social network (N=813) were surveyed before intervention deployment (baseline; September 2021) in addition to midline and endline.

Results. Several parents reported an improvement in the treatment of their children due to programming. Regarding the quality of parent-child relationships, there was no significant change from midline to endline, however, several fathers expressed a desire to improve their relationships with their children. Most notably, several couples reported an improvement in their household atmosphere (increased affection, fewer disagreements, etc.) during qualitative data collection at endline. This indicates improvement in parent-child relationships. Quantitative results, however, seem to indicate worsening closeness and conflict scores for mothers.

Conclusion. Parent-child relationships remained stable with small improvements from midline to endline. Worsening closeness and conflict scores for mothers may be due to the nature of their role as primary disciplinarians.

Key Words: intimate partner violence; parent-child relationship; prevention

CHARACTERIZATION OF LRH-1 LIGAND BINDING

PRESENTER: AIDAN SETO

CONTRIBUTING AUTHORS: ANAMIKA, PATEL; SETO, AIDAN;
MALLICK, RICKTA

The human nuclear receptor liver receptor homolog 1 (LRH-1) is a protein that plays a significant role in the transcription of several genes responsible for maintaining several metabolic pathways in the human body, such as blood sugar levels and cholesterol. This research aims to image and characterize how LRH-1 binds and interacts with different ligands, in the hopes of synthesizing ligands capable of controlling LRH-1's regulational properties. This can lead to drug development that will combat common diseases such as diabetes. Molecular cloning and protein expression through B(DE3) competent E. Coli cells will be used to synthesize LRH-1 protein in complex with a larger protein, SHP megabody. This protein complex will be imaged with cryo-EM to allow visualization of the structure of LRH-1 and its bound ligand.

STANDARDIZING PROTOCOL FOR LOCATING WARMTH- INSENSITIVE FIELDS IN THERMOSENSATION

PRESENTER: ELEONORA SHEPPARD

CONTRIBUTING AUTHORS: SHEPPARD, ELEONORA; CHARAN,
MAYURI; HARPER, DANIEL

The Specificity Theory postulates that each somatosensory modality (e.g. pain, warmth, etc.) has dedicated receptors and neuronal pathways specific to that sensation. Within thermosensation, there are both unmyelinated C fibers and thinly myelinated A- δ fibers; however, very few of them respond selectively to innocuous warming. In 1998, researchers Green and Cruz were able to localize fairly large (~4cm²) regions of skin that were devoid of warm fibers, and they categorized these regions as WIFs, warmth-insensitive fields. WIFs are important for the understanding of thermosensation since they allow researchers to study the activation patterns of low-threshold (warmth) and nociceptive (heat pain) thermoreceptors in isolation. However, WIFs remain understudied due to the lack of a standardized procedure for locating them. In our initial study, WIFs were only successfully found in half of participants. Thus, this project aims to optimize a standard protocol of finding WIFs to ensure reproducibility in future studies. The current procedure stencils a grid on the subject's non-dominant arm where a 40°C (innocuous warm) thermode is placed on each square and the subject is asked to rate their thermosensation from 0-100 (0 being none, 100 being the most severe imaginable). Our experimental procedures involve replicating this process several times for the same subject as well as experimenting with different thermode sizes and various locations on the body. The expected result is an enhanced and replicable protocol for locating WIFs that can be implemented across laboratories. Standardizing this protocol has significant clinical implications, particularly for chronic pain, since temperature sensitivity is a prevalent symptom across various pain disorders. Researching WIFs can provide insights regarding how temperature sensation differs among healthy individuals and those with chronic pain which, in turn, could pave the way for more efficient patient treatments and foster advancement in the broader field of pain research.



A LONGITUDINAL STUDY EXPLORING THE INFLUENCE OF GENETICS AND ENVIRONMENT ON ADULT DEVELOPMENT IN TWINS

PRESENTER: ELIZABETH SHIN

CONTRIBUTING AUTHORS: SHIN, ELIZABETH; WALDMAN, IRWIN

Many factors influence an individual's development from childhood to adulthood, and mental health problems that arise during childhood often have a large impact on shaping an individual's adult adjustment. Through twin studies, we can gain insight into understanding the genetic and environmental influences that contribute to traits or disorders.

Therefore, this longitudinal study investigates the various aspects of personality and behavior problems in childhood and adolescence, examining their relation with aspects of adult adjustment, including personality, psychopathology, and substance use. The sample was first studied as children in 1980-1991, in which 883 twin pairs (average age = 8.5 years) were studied using an Emory Combined Rating Scale (ECRS) that assessed externalizing behavior problems and other forms of psychopathology and personality characteristics. Quantitative Genetic Models were used to examine genetic and environmental influences on externalizing symptoms. We are conducting a follow-up study on these twin participants who are now adults in which they will complete an online survey to help us understand the genetic and environmental influences on aspects of their adult development and its continuities and changes from their childhood characteristics.

QUANTIFICATION OF LEFT VENTRICULAR MYOCARDIAL STRAIN BY MEANS OF NOVEL PET-DERIVED ALGORITHMS. PRELIMINARY VALIDATION WITH CARDIAC MR.

PRESENTER: SARAH SOLANO

CONTRIBUTING AUTHORS: SOLANO, SARAH; FOLKS, RUSSEL; MONCAYO, VALERIA; PICCINELLI, MARINA; MIRIC, SINISA

Myocardial strains (MS) are percent changes in myocardial fiber length (deformations) within the cardiac muscle during each cardiac cycle. It is widely accepted that their quantification has strong diagnostic and prognostic value, and abnormal strain is an early marker of myocardial disease. These deformations are usually measured with cardiac magnetic resonance (CMR) imaging and echocardiography. We are currently working on the development of novel algorithms for MS quantification by means of gated positron emission tomography (PET) images. PET-derived MS could provide an additional diagnostic tool to assess myocardial health. Rest/stress Rubidium-82 PET/CT studies acquired during a 6-month period at EUH were screened for the creation of a database of patients with normal myocardial function and strain. Among the image-derived parameters used for patients' selection were ejection fraction (EF), myocardial blood flow (MBF) and flow reserve (MFR), and relative myocardial perfusion scores (SSS, SRS), all indexes routinely measured with PET. Patients' medical histories were further examined and subjects with a history of cardiac-related pathologies removed. In the context of an ongoing pilot study, subjects previously screened were enrolled to receive a CMR study in addition to PET/CT. MR-derived MS quantifications were performed with the Medviso Segment software and used as gold standard for the validation of PET MS. A database of n=87 subjects was created, PET-derived MS calculated, and patients' data grouped based on gender, age, race, and presence of cardiovascular risk factors such as diabetes, hypertension, and hyperlipidemia. Preliminary investigations showed consistently higher myocardial strains at resting vs hyperemic conditions and higher resting global longitudinal strains in female vs male as evidenced by other imaging modalities. Direct comparisons between PET-derived and CMR-derived MS in n=2 cases showed variable degree of agreement. While preliminary results are promising, extensive validation of the PET algorithms is necessary.

WHAT ARE THE ROLES AND BENEFITS OF MANGROVES AS A MEANS OF COASTAL DEFENSE IN SINGAPORE

PRESENTER: ANUSHRI SONAWALA

CONTRIBUTING AUTHORS: SONAWALA, ANUSHRI; SITTER, JOHN

Singapore, a densely populated island city-state situated on the equator, faces imminent threats from rising sea levels due to climate change. With 30% of its landmass lying below 5 meters above sea level, Singapore is particularly vulnerable to the impacts of sea level rise, which is projected to increase by up to 1 meter by 2100. This paper explores the critical role and benefits of mangroves as a means of coastal defense in Singapore, considering the unique challenges posed by its tropical location and low-lying geography.

Mangroves serve as natural barriers against erosion, storm surges, and tsunamis, absorbing wave energy and reducing water velocity. Singapore has incorporated mangroves into its coastal protection strategies through initiatives like the Sungei Buloh Wetland Reserve and Chek Jawa Wetlands, alongside restoration and protection efforts for mangrove habitats.

In addition to natural solutions, engineered coastal protection measures such as seawalls, revetments, and breakwaters have been implemented. However, these solutions can be expensive, disruptive, and may impact natural coastal processes and marine habitats.

This research aims to comprehensively analyze the effectiveness of mangroves for Singapore's coastal defense, considering the associated costs and benefits. By balancing natural and engineered solutions, the study seeks to identify strategies for achieving effective coastal protection while maximizing ecosystem benefits and minimizing negative environmental impacts. Through this analysis, insights can be gained into the potential of mangroves as a sustainable and resilient solution for safeguarding Singapore's coastlines against the escalating impacts of climate change.



DIVERSITY AT THE FARMERS MARKET: PERCEPTIONS ON THE IMPACT OF IDENTITY ON QUALITY OF LIFE AND ECONOMIC VIABILITY FOR MANAGERS

PRESENTER: ISABEL STATON

CONTRIBUTING AUTHORS: STATON, ISABEL; KING, HILARY

Increasing equity and diversity has been a focus of the sustainable food movement for decades. Increasing the diversity of customers at farmers markets, particularly socioeconomically, has often been the priority of farmers market managers, and the focus of academic research on the topic for years.

In recent years, market organizations have developed toolkits to foster antiracist market practices and conducted assessments to uncover barriers to market access for diverse culture groups. However, less attention has focused on the ways that diverse identities shape the experiences of market farmers and managers. Even less is known about the initiatives undertaken by farmers market managers related to diversity, equity and inclusion among vendors.

This research used the content analysis of farmers market websites, documents and toolkits, participant observation of 18 farmers markets, and 18 semi-structured interviews of farmers market managers to assess important aspects of market management's policies towards diversity, equity, and inclusion. Documenting the perceptions of farmers market managers can help to understand the possibility of farmers markets as tools to address issues of DEI in sustainable food systems. Ultimately, this research documents the policies associated with diversity, equity, and inclusion used by farmers market management, and explores how these strategies impact the perceptions market managers have about the relationships between identity, economic success, and quality of life at farmers markets.

COMMUNE ENVIRONMENTALISM: REALITY OR FALSE REMEMBRANCE?

PRESENTER: ROBERT STEINGASS

CONTRIBUTING AUTHORS: STEINGASS, ROBERT; BUCHHOLZ, PAUL

This project investigates the commune-movement of the late 1960s and early 1970s in the USA, the UK, and West Germany to try to determine to what extent they were environmentally oriented. Through an approach involving analysis of various independent publications, newspapers, and ephemera from this time period, this study challenges the prevailing assumption that environmental concerns were the primary motivator for the establishment of communes and commune-related communities in the late 1960s and early 1970s. Preliminary findings suggest that the majority of these communal living experiments were not driven by environmental concern. Rather, our evidence supports that many of these communities were founded by societal “outsiders” searching for a place to freely express themselves socially, sexually, or spiritually. Additionally, many of these commune-members were young people searching for an escape from a heavily urbanized society. Our findings support environmental concerns being more of a minor motivation. By shedding light on the diverse motivations underlying the formation of many communes, this research contributes to a more nuanced understanding of counterculture movements in the late 20th Century, enriching our comprehension of the complex interplay between societal values and environmental consciousness during this era which can be extrapolated to better understand our present society.

LOWER EXTREMITY VENOUS INSUFFICIENCY IN PATIENTS WITH POSTURAL ORTHOSTATIC TACHYCARDIA SYNDROME

PRESENTER: SIYA THADANI

CONTRIBUTING AUTHORS: THADANI, SIYA; MCGEOCH, CATHERINE; STEINBERG, REBECCA; GARCIA, MARIANA; ALMUWAQQAT, ZAKARIA; BORTFELD, KRISTINA; ELHAGE HASSAN, MALIKA; CUTCHINS, ALEXIS

Patients with Postural Orthostatic Tachycardia Syndrome (POTS) commonly present with orthostatic symptoms, meaning an increasing heart rate and blood pressure upon changing position, and chest pain and dizziness. These patients may also present with Lower Extremity Venous Insufficiency (LEVI), a condition where leg veins do not allow blood to flow back to the heart due to blood pooling in the lower legs. We hypothesized that patients with POTS frequently had findings of LEVI on Lower Extremity Venous Doppler Ultrasounds (LEVDU). 130 patients (mean age 35 +/- 11, 89% female) with a diagnosis of POTS were screened for Lower Extremity Venous Disease with a bilateral LEVDU, looking for insufficient blood being returned to the heart, valves in veins not closing causing a back-flow of blood in the legs, and high blood pressure in veins caused by the iliac artery compressing on the iliac vein. Of the 130 screened, 53% were diagnosed with Common Femoral Vein Reflux, the back-flow of blood caused by malfunctioning valves, indicating a possible correlation between POTS and possible pelvic venous disease, the malfunctioning of valves in the pelvis. 75% of our POTS patients who had a LEVDU were diagnosed with insufficient blood returning to the heart, suggesting an association between the two diagnoses. Future investigations should account for patient characteristics, other medical conditions simultaneously presenting, and POTS progression in association with LEVDU findings. The identification of mechanisms that contribute to orthostatic intolerance may help identify therapeutic targets.

STRUCTURAL INSIGHT OF BCKDK AND SHP COMPLEX

PRESENTER: ANUJA THAKARE

CONTRIBUTING AUTHORS: THAKARE, ANUJA; JING, LIANG; LITTLE, MOLLY; ORTLUND, ERIC

A protein called “branched chain ketoacid dehydrogenase kinase” (BCKDK) is an enzyme that is involved in amino acid metabolism and the catabolism of several other pathways, making BCKDK a crucial protein with many consequences in the body. For example, it has been found that inhibition of the BCKDK complex causes the buildup of materials associated with heart failure and type 2 diabetes. Based on unpublished data that had been previously gathered by my lab, my mentor and I believe that BCKDK regulates another protein called small heterodimer protein (SHP), which is a nuclear receptor protein. Nuclear receptor proteins control the expression of other genes. SHP is also critical for regulating the metabolism of cholesterol and glucose. We wish to investigate the structure of the BCKDK-SHP complex in order to eventually learn more about the mechanism by which BCKDK regulates SHP and the function of this metabolically important complex in the body. The process of purifying BCKDK involves a transformation which places the gene that expresses BCKDK into *E. coli* cells, expressing this protein by incubating these cells in LB media, lysing the resulting biomass via sonication, purifying that sample using size-exclusion, gravity filtration, or affinity columns, and analyzing it using SDS-PAGE gel electrophoresis. This process can be repeated with SHP, and once these resulting purified samples have had the chance to interact (on an amylose column, for example), the sample can be loaded onto a negative stain grid to obtain images of the protein complex’s structure using an electron microscope. We are still in the process of replicating this procedure to gather enough data (as well as analyzing images using computer software), but we expect that these two proteins will interact to form a specific complex whose structure is vital for its function.

ASSESSING THE EFFECTS OF COMMERCIAL WEARABLE TECHNOLOGY IN PREVENTING, DIAGNOSING, AND TREATING MENTAL HEALTH DISORDERS – A SCOPING REVIEW.

PRESENTER: WESLEY TSAI

CONTRIBUTING AUTHORS: RAEDER, ROBERT; TSAI, WESLEY; PEREZ, EMA; LESLIE, SHARON; RABIN, DAVID; KRISHNAN, SHILPA

INTRODUCTION

MENTAL HEALTH DISORDERS CONTINUE TO EXERT A SIGNIFICANT BURDEN ON SOCIETY, EVIDENCED BY SUBSTANTIAL INCREASES IN DIAGNOSTIC RATES SINCE THE ONSET OF THE COVID-19 PANDEMIC. SIMULTANEOUSLY, WEARABLE TECHNOLOGIES HAVE BECOME MORE PREVALENT AND ACCEPTED IN RECENT YEARS. THIS PROVIDES AN OPPORTUNITY TO EXPLORE THE UTILITY OF PASSIVELY RECORDED BIOMETRICS IN THE DETECTION, MONITORING, AND TREATMENT OF MENTAL HEALTH DISORDERS. THIS SCOPING REVIEW THEREFORE AIMS TO INVESTIGATE THE LITERATURE ON THE USE OF COMMERCIALLY AVAILABLE WEARABLE TECHNOLOGIES FOR MONITORING, DIAGNOSING, AND TREATING MENTAL HEALTH DISORDERS.

METHODS

A SYSTEMATIC SEARCH, DEVELOPED BY AN EXPERIENCED MEDICAL LIBRARIAN FROM THE WOODRUFF HEALTH SCIENCES LIBRARY AT EMORY UNIVERSITY, WAS CONDUCTED IN 5 DATABASES: APA PSYCHINFO (EBSCOHOST), EMBASE.COM (ELSEVIER), IEEE XPLORER, PUBMED, AND WEB OF SCIENCE (CLARIVATE). TOTAL DATABASE SEARCH RESULTS (N = 2264) WERE THEN IMPORTED INTO COVIDENCE FOR ABSTRACT AND FULL-TEXT REVIEWS. COVIDENCE IS A WEB-BASED PLATFORM FOR SCREENING AND DATA EXTRACTION DURING SYSTEMATIC REVIEW.

SEARCH RESULTS WERE SCREENED FOR INCLUSION AND EXCLUSION CRITERIA. ARTICLES WERE CONSIDERED FOR INCLUSION, BASED ON THE FOLLOWING CRITERIA: (1) PARTICIPANTS \geq 21; (2) SELF-REPORTED OR CLINICALLY DIAGNOSED MENTAL HEALTH DISORDERS USING DSM-5 OR ICD-11; (3) USE OF COMMERCIALLY-AVAILABLE WEARABLE TECHNOLOGY TO DIAGNOSE, MONITOR, AND/OR TREAT MENTAL HEALTH DISORDERS; (4) REPORTED OUTCOMES OF SLEEP, HEART RATE, HEART RATE VARIABILITY, RESPIRATORY RATE, BODY TEMPERATURE, OXYGENATION LEVELS, BLOOD PRESSURE; (5) OBSERVATIONAL, EXPERIMENTAL, QUALITATIVE, AND INTERVIEW-BASED STUDY DESIGNS; (6) PEER-REVIEWED, PUBLISHED IN ENGLISH. MENTAL HEALTH SYMPTOMS WERE ALSO CONSIDERED IF SUCH DATA WAS REPORTED.

TO ENSURE ACCURACY, TWO REVIEWERS INDEPENDENTLY REVIEWED EACH ABSTRACT AND FULL TEXT AND THE FULL TEAM RESOLVED DISAGREEMENTS VIA TEAM CONSENSUS. DATA EXTRACTION IS CURRENTLY UNDERWAY AND STATISTICAL ANALYSES ARE PLANNED TO SYNTHESIZE THE EXTRACTED DATA.

RESULTS

FINAL RESULTS WILL HOPEFULLY HELP TO ELUCIDATE WHICH WEARABLE MEASUREMENTS HAVE THE STRONGEST RELATIONSHIP WITH MENTAL HEALTH DISORDERS AND HOW THAT DATA MAY BE USEFUL IN CLINICAL SETTINGS FOR DIAGNOSING, PREVENTING, AND TREATING THESE PATHOLOGIES.

DISCUSSION

THESE RESULTS HAVE THE POTENTIAL TO POSITIVELY INFLUENCE ACCESS TO MENTAL HEALTH CARE AND HELP TO IDENTIFY KEY BIOMARKERS THAT COULD BE USED IN THE EARLY IDENTIFICATION AND MONITORING OF MENTAL HEALTH DISORDERS.

WHO LEADS? INTERSECTIONALITY IN STATE LEGISLATIVE LEADERSHIP ROLES AND INSTITUTIONS

PRESENTER: ISABEL VELEZ

CONTRIBUTING AUTHORS: REINGOLD, BETH; ARRINGTON, NANCY; WIENER, ELIZABETH; BROOKS, LAYLA; SNIPES, ALEXANDRA; VELEZ, ISABEL

While descriptive representation in American politics has greatly increased since the country's establishment, women and minorities continue to be underrepresented relative to their populations. The purpose of the "Who Leads?" project is to question whether that underrepresentation continues to be the case amongst the most powerful officeholders, and to determine the impact that race and gender play in legislative leadership selection. Rather than employing a single-axis lens, an intersectional approach offers a deeper understanding which recognizes that these identities interact with one another, and with political processes and institutions. To analyze how race and gender impacts leadership roles in state legislatures, Reingold and colleagues construct a dataset comprised of all legislators in 25 state houses, ranging from 1997-2007. As a research assistant, my role is to expand the database for the upper chambers of these states. I ensure that senator information, specifically committee chair and party leadership positions, are accurate by checking with primary sources provided by state legislatures themselves. This leads to the next component of the project, which draws attention to how state political institutions such as term limits affect leadership diversity. In focusing on how institutional features influence race-gender diversity in positions of power, we are able to gain a more comprehensive understanding of how these shape legislative behaviors and the representation of marginalized groups in state legislatures.

EFFECTIVE AND ACCESSIBLE SCIENTIFIC COMMUNICATION IN COMMUNITY-ENGAGED RESEARCH

PRESENTER: TRISTYN WATSON

CONTRIBUTING AUTHORS: WATSON, TRISTYN; SAIKAWA, ERI

Mistrust presents itself as one of the main barriers to community-engaged research and the relationship between science and society, proving a need for more intentional interaction between researchers and community members. One important method of earning trust with a community is through effective and accessible scientific communication. This approach was explored in the context of a community-engaged children's health study (CECHS) in the Westside of Atlanta that seeks to better understand children's exposure to heavy metals, metalloids, and other chemical contaminants through the estimation of children's soil ingestion rates. The primary method of soil analysis in this study is X-ray fluorescence (XRF), an analytical technique for determining the elemental composition of a given material or sample. In this project, we explore the method of community-oriented scientific communication through the topic of XRF. To explain the mechanisms of this analysis in an accessible way, even for those with little or no scientific background, we utilize simple animations, illustrations, and explanations within a video presentation. This method supplies both study participants and other community members from the Westside of Atlanta with a better understanding of the science behind the research being done. By presenting the community with accessible scientific information, researchers provide them with the chance to engage with the science that is benefiting from their involvement. Creating scientific communication with community members as the primary audience in mind is key to fostering trust and fruitful relationships between researchers and the communities they seek to impact. Community members must be recognized as priorities and allies in community-engaged research, and this must happen in the context of trust, connection, and communication.

COMPUTATIONAL APPROACH TO PREDICT N1 NEURAMINIDASE'S BINDING AFFINITY AND DRUG RESISTANCE TO OSELTAMIVIR

PRESENTER: NICHOLAS WONG

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Influenza is an infectious virus responsible for numerous pandemics from the 20th century and the 21st century. Its virology is dependent on the mechanism the NA enzyme which facilitates the release of the virus from infected cells. Although drugs such as oseltamivir have been developed to inhibit NA through direct interactions with the active site, there are accounts of drug resistance towards oseltamivir in NA. Most of drug resistance mutations in NA emerged through the N1 neuraminidase subtype because of single nucleotide substitution and such mutations were responsible for the 2009 H1N1 pandemic. Modern experimental and clinical approaches to study drug resistance are laborious and time costly. So computational predictions would help to design better drugs which are not impacted by those mutations. As such due to the prevalence of drug resistant mutations in N1, we validated our in-house computational method to predict such resistance mutations in N1 for oseltamivir. The binding sites from 3D structure of N1 complexed with osletamivir and with sialic acid were selected for the prediction each residue within the binding pocket was mutated initially through residue scanning and Prime MM-GBSA calculations. MM-GBSA calculations with decreased affinity to oseltamivir and retained or enhanced its affinity to sialic acid were studied to see if these mutations were a result of single nucleotide polymorphism. We successfully predicted three mutations that were clinically reported to have corresponded to drug resistance in oseltamivir. We also further report 28 additional mutations that have not reported yet but are predicted to correspond to drug resistance.

RECRUITMENT AND ENROLLMENT OF PREGNANT WOMEN WITH SUBSTANCE ABUSE AND THE NEWBORN

PRESENTER: FEI XU

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The HEALthy Brain and Child Development study (HBCD) is an ongoing prospective longitudinal study of approximately 7500 pregnant mothers and their newborn babies across 25 sites in the United States. The study digs deep into the assessments of the brain, evaluating the cognitive and emotional development of children from birth through the first 10 years of childhood. Twenty-five percent of the sample will include children who have a history of prenatal exposure to substances of abuse (alcohol, cigarettes, opiates, and marijuana). For a longitudinal study, research participant recruitment and retention are incredibly challenging, despite the enormous commitment of the researchers. This study aimed to deepen the knowledge on recruitment and retention of pregnant women in birth cohort studies and expand the insight into a more effective research engagement. The study evaluated the relationship between engagement efforts and participant recruitment and the amount of effort needed to recruit the participants after they showed some primary interest at one enrollment site. The amount of the researchers' engagement efforts through networking cold emails, phone calls, and texts, along with the patient recruitment amounts, are recorded on a weekly base. The time interval between the first reach-out from the researcher that addresses a potential participant and the day when the participant completes the consent form is also recorded. Up to now, the data suggests that it takes about 57.74 engagement efforts and 13 days on average for a potential participant to enroll in the study with 2.68 follow-up efforts on average from the researchers. This one-to-two-week delay in enrollment aligns well with the weekly engagement efforts by the researchers, providing a reliable and consistent prediction for the overall pattern of study enrollment. A threshold of 36.5 days indicates that further contacts are no longer necessary.

STUDYING THE INTERACTIVE EFFECTS OF REAL-WORLD POSITIVE AND NEGATIVE AFFECTIVE STATES ON ADOLESCENT AND YOUNG ADULT SUBSTANCE USE

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Substance use often begins and accelerates during adolescence. Previous studies have found that high levels of negative affect predict high levels of substance use in adolescence. Increased behavioral activation, or approach behavior linked to rewards and positive affect, is another predictor of substance use. These findings suggest that both negative and positive affect are linked to substance use behaviors. We propose that these seemingly contradictory findings may be reconciled by relating affect measured at different timescales to substance use. We examined the impact of brief (daily) positive affect and prolonged (across months) negative affect on substance use behaviors using ecological momentary assessment (EMA) in participants aged 10 to 25 without clinical diagnoses. We also examined the potential moderating effect of activity level (step counts) on this relationship. All brief measures, for affective or activity level, were collected from Fitbits and EMA surveys participants completed over five months after their first visit. We hypothesized that brief positive affect would be positively related to brief substance use, and prolonged negative affect and activity level would moderate this relationship. We would perform a secondary analysis to compare the results against a static model exploring the relationship between prolonged positive affect and substance use. Analysis of preliminary data from the completed subset of the sample didn't show a significant relationship between momentary positive affect and momentary substance use. Future analyses will illuminate whether and how real-world affective states interact to predict substance use.

