Undergraduate Scholarly Showcase 2023 Guide to Posters

Contents

MORNING POSTER SESSION

Category A: Sensing, Perception and Sensor Technology

A-01: Two-Photon Absorbing Iridium Complexes for Use in Infrared Light Driven Photocatalysis

Atrium
Sean Sostaric, Chemistry
Project Advisor: Dr. Yujie Sun

Abstract
Many complexes break down when exposed to light, a concept known as photocatalysis. Most of the research in photocatalysis focuses on shorter wavelegnth light in the visible and UV region of the light spectra. The longer wavelength end of the spectra (>700 nm) where infrared light resides is studied much less, but it has it's advantages. The longer wavelength allows for more penetration, allowing reactions to be completed with more selectivity and less energy needed. Synthesis of the Iridium complex and aborption under near-infrared light radiation was completed to determine the extent of photocatalysis. Under photocattalysis, these complexes become catalysts for organic reactions such as electron transfer and energy transfer reactions.

A-02: Synthesis and Analysis of Biologically-Inspired Photoactive Metal Complexes

Atrium
Ashlyn Williams, Chemistry and Biological Sciences
Project Advisor: Dr. Michael Baldwin

Abstract
Microorganisms, such as bacteria or fungi, use iron-chelating molecules known as siderophores to uptake iron from the environment to use in important biochemical processes. Some of these iron-binding molecules exhibit photoactive properties, meaning that they are capable of reacting to light, due to oxidation/reduction reactions that occur. To mimic the functional group in siderophores, we synthesize alpha-hydroxy acids to use as the ligand for our metal complexes. In our research, we are exploring other metal ions, not just iron, that can be used for these reactions and expanding on applications for these molecules due to their photoactive properties.

A-03: Urban Adaptation and Human Preference Impact the Thermal Tolerance in Aedes aegypti Mosquito Eggs

Atrium
Emily Zigmond, Biological Sciences
Project Advisor: Dr. Josh Benoit

Abstract

Future Aedes mosquito distribution and their ability to serve as disease vectors will be affected by climate change, specifically with the predictions of increasing heat waves. Importantly, 'urban heat island' is likely to increase heat even more so in areas with higher human populations, suggesting that mosquitoes that become specialized to live near humans are likely to be more tolerant to higher temperature levels. In specific, mosquito eggs are stationary and must survive the temperature stress where laid, as such eggs are the most important life stage for survival in a specific habitat. The purpose of this study is to examine the thermal physiology of Aedes eggs. We found that mosquitoes collected habitats with dense human populations had higher viability rates following heat stress. Moreover, we compared the hatching response and thermal preference with the host preference and found increased thermal preferences is linked to human preference. Unlike eggs, thermal tolerance among adult males and females showed no correlation with human preference or other factors. Overall, our studies will be critical for understanding the effects of climate change on Aedes mosquitoes in relation to vector competence and their distribution.

A-04: Task-Related Brain Activity Measured With Functional Near-Infrared Spectroscopy

Atrium

Zakaria Bodiford, Health Sciences
Project Advisor: Dr. Pierce Boyne

Abstract

If the participant is going through a trial that has an unknown duration would have an increased oxygenated hemoglobin (HbO2) response in the superior frontal gyrus medial area 9 (SFG9m) region of the cerebrum. The purpose is to utilize short-duration cycling trials to determine if SFG9m's effort is connected to the motivation during the trial. Single-visit cycling experiment comprised 14 randomized trials of known vs unknown (10,20,30 seconds) bursts of maximal cycling speed. HbO2 response was measured by functional near-infrared spectroscopy (fNIRS) to focus on specific brain regions with an emphasis on SFG9m. Subject number: 25 healthy participants. Sfg9m significantly upregulated for the unknown duration 20-second trials – 10 and 30 sec no significant diff in upregulation between groups. Sfg9m only brain region significantly upregulated, though others were measured. A significant difference in power output (W) during 10s trials, but not in 20 or 30s. No significant difference in Heart Rate (HR) was observed across 10, 20, or 30s trials.

A-05: Promoting Positive Recovery in Traumatic Brain Injury Patients Through a Stimulatory Environment

Atrium

Lauren Spangler, Nursing
Rachel Gessler, Nursing
Anna Schultz, Nursing
Project Advisor: Dr. Fuad Alhorani

Abstract

In the Neuroscience Intensive Care Unit (NSICU), a stimulatory environment is not a maintained area of practice for patients in a Traumatic-Brain-Injury (TBI) induced coma. The purpose of this project is to potentially improve traumatic-brain-injury-related coma patients' consciousness levels (Glasgow Coma Scale) by educating the NSICU nurses on the positive effects of a stimulatory environment for these patients. CINAHL, MEDLINE, EBSCO, and PubMed databases were utilized to obtain research-based evidence that studied the progression of the GCS score for a stimulatory and control environment during patients' recovery process. A slideshow presentation was utilized to provide educational material for the NSICU nurses. Pamphlets were also offered that emphasized key points to the audience. A pre-and post-education test was offered to obtain baseline data and measure the NSICU nurses' knowledge improvement about the topic. The results show that the education was effective and applicable. The learners had rated an improvement in knowledge after the education. Before the education, the average score for knowledge of TBI patients was 71%. In the post-test, the average was 80%. When evaluating the understanding of the GCS, the average score increased from 87% to 90%. Understanding the effect of environmental stimuli on comatose patients showed an increase from 66% to 79%. Limitations include that though a scale was used to determine the effectiveness of education, observation of the implementation and effects of this over the recovery period is unable to be completed. In conclusion, educating nurses on a stimulatory environment may improve outcomes for comatose patients.

A-06: Traumatic Brain injury in Mice Leads to Peripheral Inflammatory Response
Atrium

Samantha Lingo, Biological Sciences
Project Advisor: Dr. Nathan Evanson

Abstract
Approximately 2.5 million people sustain a traumatic brain injury (TBI) annually in the United States. In addition to other deficits, TBIs can lead to vison impairment via indirect or direct eye, nerve, or brain injury. When injury affects the optic nerve, it is termed Traumatic Optic Neuropathy (TON). Studies show that TON triggers an inflammatory response at the injury site, causing secondary damage to the optic nerve, which leads to axon degeneration. It is unknown whether treatments that reduce the peripheral inflammatory response would reduce local inflammation reducing damage to the optic tract. We hypothesized that blocking peripheral cytokine pathways would improve degeneration in the optic tract. Using a closed-head, weight-drop TBI model in adult male mice, we collected tail blood 6 hours post-TBI to assess inflammatory cytokine levels. 24 hours post-TBI, mice were injected intraperitoneally with an inhibitor of one of three cytokines (anti-Il6, anti-IL1B, and anti-TNFα) known for their pro-inflammatory responses or control. Brain tissue was collected seven days post injury to identify degenerating axons. TBI led to significant increases in IL6 and ILβ inflammatory pathways; and, unexpectedly, a decrease in TNFα. However, decreased TNFα did not reduce degeneration. Instead, only inhibition of IL6 led to less degeneration in the optic tract. Overall, it is likely that an "ideal balance" of cytokines is needed to reduce damage rather than targeting one. Although we show a relationship between peripheral inflammation and TON, more research is needed to find the perfect balance of cytokine signaling.

A-07: Understanding the Origins of Hypersensitivity an a Mouse Model of Duchenne's Muscular Dystrophy

Atrium

Abigail Krempa, Neuroscience
Project Advisor: Dr. Michael Jankowski

Abstract

Duchenne's muscular dystrophy (DMD) is a recessive X-linked muscle disease that is rare, but fatal; most patients live until their late 20s or early 30s. DMD causes increasing muscle weakness and eventual loss of use starting from early childhood that stems from alterations to the protein, dystrophin. Though treatments have allotted more time to patients, they do not treat some common symptoms associated with DMD such as pain. The pain associated with DMD significantly decreases the patient's quality of life and often occurs early in disease progression. It is therefore important to understand how pain develops in DMD in order to develop better treatments. We therefore utilized a mouse model of DMD (mdx mouse) which is mutant at the dystrophin gene. We hypothesized that MDX mice will display sensory impairments prior to muscle wasting. We tested various behavioral measures, such as paw guarding, mechanical withdrawal, Rotorod, grip strength, and exercise pressor reflexes (EPR) to assess hypersensitivity over time. We also compared these results to gene expression patterns in the dorsal root ganglia (DRG) of mdx and wildtype (WT) controls. Preliminary results indicate that mdx mice display *[sic]*

A-08: Automatic Segmentation of Heart Slices to Rapidly Analyze Treatments for Ischemia-Reperfusion Injury

Atrium

Israa Malik, Medical Sciences
Project Advisor: Dr. Kevin Haworth

Abstract

Ischemia-reperfusion injury is a common outcome associated with cardiovascular disease, the leading cause of death in the world, and many potential therapies are being developed. The Langendorff ex vivo heart preparation allows for testing cardioprotective therapies in a controlled environment. After conducting the experiments, the hearts are sliced, scanned, and analyzed to determine the effectiveness of the treatment by differentiating viable and infarct tissue. The first step of the process is manual segmentation to identify which pixels correspond to heart tissue versus background. However, the process is time consuming and prone to human inconsistency. Therefore, we are exploring an automatic segmentation technique that can improve the speed and consistency of the analysis. We are investigating whether a particular color channel (red, green, or blue) can be used to identify whether the pixels in the scanned images are part of heart tissue or background in an image. A receiver operator characteristic (ROC) analysis is used to determine how well each color channel differentiates background versus heart tissue which is done for both black and white backgrounds. The gold standard was the manual segmentation method. We have collected data on the effectiveness of these methods by comparing 96 images (6 slices for 16 different hearts). The outcome of this study can improve the speed of the analysis process, while providing an understanding of the accuracy relative to a gold standard.

Automating the process of determining viable tissue from infarct tissue will reduce the potential for inconsistency between different individuals manually performing segmentation.

A-09: Integrating Unmanned Aerial Vehicles with Sensors to Monitor the Harmful Algal Blooms in the Ohio River

Atrium
Catherine Gottsacker, Chemical Engineering
Project Advisor: Dr. Dongmei Feng

Abstract
Harmful algae blooms (HAB) in surface waters are a global environmental concern, threatening both human and environmental health. To control their impact, HABs must be monitored in a timely manner. While continuous monitoring of surface water is possible using monitoring stations equipped to measure chlorophyll concentration, establishing and maintaining the stations is a costly and labor-intensive endeavor. Chlorophyll data can also be detected in the field using sensors or by collecting water samples, but these methods are time consuming and require direct access to the water. The methods become dangerous and impractical in areas surrounded by cliffs or wetlands.   In this project, a flexible, efficient, and cost-effective approach for monitoring surface water quality is developed using Unmanned Aerial Vehicles (UAV) and sensors. A UAV platform is created to allow direct monitoring of chlorophyll concentration using a sonde carried through the water, allowing monitoring of otherwise inaccessible water bodies. In future research, this platform will be deployed in tandem with a second UAV carrying a multispectral camera, to develop a concentration-reflectance rating curve for Chlorophyll as an indicator of HABs. The reflectance readings from the multispectral-carrying UAV alone can then be used to remotely collect water quality data on any surface water with high spatial and temporal resolution.

A-10: Archeaen Paleontology as an Analog for Possible Martian Life

Atrium
Abby George, Geology
Project Advisor: Dr. Andrew Czaja

Abstract
Archean paleontology seeks to locate evidence of life in 2.5 to 4 billion-year-old rock. Documenting the morphology and fossilization of microfossil-bearing facies sheds insight into the search for extraterrestrial life. Carbonate rocks located around the rim of Jezero crater, a 3.5 billion-year-old lake on Mars, resemble fossiliferous deposits of Earth's Archean era. Microbialites, which are formations similar to what could be found on Mars, are any rocks formed through microbial processes. Though carbonate microbialites tend not to preserve individual microfossils, they display structures created by the bacterial colonies that formed them. Orbital imaging and spectroscopy of Jezero crater shows evidence of carbonates near ancient deltaic channels and erosional features. However promising the Martian landscape is, research must be done on Earth to establish what features definitively indicate a rock is of biological origin. We use 3D models derived from the serial imaging of Archean age

microbialites from the Gamohaan formation in South Africa to establish overall colonial morphology. Raman spectroscopy is also used to observe signatures indicative of organic life. We show that ancient microorganisms formed complex, web-like structures within the texture of the rock, forming recognizable "peak" or "circus-tent" structures. Fossilized organic material can also be reliably detected through Raman spectroscopy due to its characteristic spectrum. The Perseverance rover performs Raman spectroscopy on Mars, allowing comparison with positive controls from Earth. This methodology may one day allow the discovery and study of potential extraterrestrial life in carbonates far from Earth's surface.

A-11: Development of an IntroSat for Control System Education in Aerospace

Atrium
Tri Nguyen, Aerospace Engineering
Project Advisor: Dr. Donghoon Kim

Abstract
Autonomous systems and control are popular and have a wide range of applications to regulate devices' behaviors. In the aerospace area, control system is a robust tool to help airplanes and spacecrafts carry out precise maneuvers and maintain their stability. This makes education on control systems and projects to practice modeling and implementing controllers essential in the area. Projects such as inverted pendulums or robotic arms are ideal dynamic systems for learners to develop and apply controlling algorithms. However, it is not too obvious for such physical systems to be seen as an aerospace application of control systems. Therefore, a more aerospace-related project with the implemented control system is necessary. In this study, a self-balancing and self-bouncing cube, named IntroSat, is developed as educational equipment to support studies and demonstration of the attitude control mechanism on satellites. The IntroSat acts as a 3D inverted pendulum that is oriented by the torques generated by 3 integrated reaction wheels. This self-orienting mechanism mimics that of space systems. A quick change in acceleration of the reaction wheels creates a large amount of torque and causes the system to stand up. Stability around the edges and corners requires sensors to measure the cubes' orientation and an algorithm to drive motors to produce the torques needed based on the sensor's inputs. As reaction wheel is an attitude control technique that is widely used by satellites and CubeSats, IntroSat is a promising aerospace-related project to apply control theory and investigate space systems.

A-12: The Impact of Immersion on Postural Sway Using Virtual Reality in College Students

Atrium
Evan Frieling, Health Science
Saldin Sharaydeh, Health Science
Project Advisor: Dr. Mike Riley

Abstract
Virtual reality Immersions (VRI) have the potential to alter postural control systems, which in turn influence a person's ability to keep their balance and recover from imbalance. When comparing post-

immersion to pre-immersion results, most young adults have demonstrated increased control over their posture. Although some studies have compared posture control with other cognitive tasks, very few have used VRI with this age group. Therefore, this study aimed to analyze subjects' levels of postural control, as measured on a force plate, prior to and following their participation in a VRI experience. Participants were healthy, college aged individuals who were asked to complete a 10-minute VR immersion task called Adventure Climb VR. Participants wore a VIVE Focus 3 headset throughout the duration of the task. In the Adventure Climb VR task participants participated in virtual climbing, belaying, navigating rock falls and other obstacles, and so forth which mimicked real-life rock climbing. Immediately prior to the VRI the participant was asked to complete a one-minute pre-test postural assessment of shoeless quiet standing. The same postural assessment test was completed immediately after the VRI task. Postural data, in the form of sway deviation in the anterior/postural and lateral directions and total sway, was compared between the pre-and post-immersion tests. The findings of this project will contribute to a greater understanding of how immersion in virtual reality can help improve posture control.

Category B: Mental Health and Human Behavior

B-01: The Effects of Mindfulness Based Interventions on Burnout in Nurses

Atrium
Jillian Allaben , Nursing
Maggie Martin, Nursing
Grace Morman, Nursing
Project Advisor: Dr. Caroline Morrison

Abstract
Bedside nurses are particularly susceptible to experiencing symptoms of emotional fatigue, depersonalization, and low personal accomplishment, otherwise known as burnout. According to the American Nurses Association, 62% of nurses have reported symptoms of burnout. Ways to help reduce these symptoms can be challenging, but this project's purpose is to collect and evaluate literature on various mindfulness based interventions and techniques, assessing its influence on burnout symptoms in nurses and implementing it into an education plan for current inpatient nurses. The question we are aiming to answer is if the education plan is effective at improving knowledge of the techniques and utilization of mindfulness based interventions. A group of Cardiopulmonary Step Down bedside nurses at The Christ Hospital were evaluated for symptoms of burnout and received a presentation discussing Mindfulness Based Interventions and the benefits of these interventions when combating professional burnout. Burnout amongst these individuals was assessed using the Burnout Survey adapted by Michelle Post. Results are pending, but we anticipate disclosing the results of the nurses who are experiencing burnout as well as their educational development regarding mindfulness based interventions based on a pre and post test and a short reflection that allows participants a chance to provide criticism and any opinions regarding the presentation. We anticipate the outcome will further advance the nurses's

knowledge on ways to implement mindfulness practices within their daily lives, improving overall personal and professional wellbeing and reducing symptoms of professional burnout.

B-02: The Association between Mindfulness Practices and Diet Quality and Physical Activity Behaviors in Adults during COVID-19

Atrium

Alivia Terry, Pre-Physical Therapy
Project Advisor: Dr. Sarah Couch

Abstract

The purpose of this research is to examine whether engagement in mindfulness practices was positively related to healthful dietary intake and lifestyle behaviors among adults during the Covid-19 pandemic.The quantitative data gathered from this study will be used as the foundation for further research to be conducted examining other parts of the pandemic the literature may also have a gap in. If we find that a high level of engagement in mindfulness practices during the Covid-19 pandemic is positively associated with the intake of higher quality diets and increased physical activity levels in adults, then people will be able to incorporate more mindful activities into their everyday life in order to maintain or even improve their health.

B-03: Developing a Multi-method Framework to Improve Clinicians' Well-being: A Case Study of a Rehabilitation Team in an Adult Academic Hospital

Atrium

Advika Sumit, Medical Sciences
Project Advisor: Dr. Danny Wu

Abstract

Well-being is multifaceted and is impacted by a plethora of factors including physical, emotional, mental, social, and spiritual factors that interact together. Such factors also account for the presence of burnout seen within healthcare workplaces. Clinician burnout influences medical mistakes and field turnover, which reduces patient care quality and raises the expense associated with medical mistakes, harming the overall healthcare system. Thus, a variety of methods are required to fully assess the well-being of clinicians and acknowledge all the corresponding factors. A methodology was created using a pre-post-study design to evaluate and improve the variables causing physician burnout. Preliminary findings from the multi-method framework's implementation across clinical teams in a teaching hospital in the US indicated that a lack of autonomy and control was the primary cause of low well-being. This finding was further explored through a mapping activity, and appropriate interventions were developed, which led to a decline in burnout levels.

B-04: Message Banking Journal for ALS Patients

Atrium

Michelle Bruce, Speech Language Hearing Sciences

Cami Lenhart, Speech Language Hearing Sciences
Project Advisor: Dr. Amanda Simmons

Abstract
A primary change that occurs with Amyotrophic Lateral Sclerosis (ALS) is the loss of an individual's ability to speak. Technology provides a variety of ways to capture or 'save' the voice of a patient with ALS (pALS). There are two methods pALS use to preserve their voice, voice banking and message banking. Voice banking is when the individual records numerous predetermined messages which are used to create a synthetic voice that sounds like their natural voice. The synthetic voice is flexible and can be used to produce any message the pALS want to communicate. While voice banking is beneficial, it cannot convey the emotion behind a pALS' voice and may still sound robotic. Because of this, there are certain messages that we encourage pALS to record in their own natural voice. This process is called message banking and includes the individual recording phrases which can, if needed, be used with an alternative communication device later. However, knowing what to record can be overwhelming for pALS. To overcome this barrier, we have created a message banking journal for pALS. In this journal the patient will have one or more prompts to record per day over the course of thirty days. The process and purpose of message banking can be a tall order for pALS, cognitively and emotionally. Our hope is that our journal will make this process easier for everyone involved and result in an improved quality of life for pALS.

B-05: Association Between Visitation Complications and Symptomatic Depression Rates Within Nursing Homes

Atrium
Sheila McManus, Social Work
Project Advisor: Dr. Gary Dick

Abstract
Transitioning to Nursing Homes can cause a significant amount of stress upon individuals. With that being said, research shows that depression symptoms aren't uncommon either. To be more specific, visitation complaints have increased significantly throughout time (lack of visitation, visitation policies, etc.). There is credible information linking older adults, depression symptoms, and visitation complications together as one common thread. Investigating Nursing Homes with numerous visitation complaints, and studying the depression symptoms statistics linked with these specific Nursing Homes have shown valuable insightful. This data is important to any and all individuals within society. Aging is a process that we all experience at some point so it's vital for us to recognize toxic patterns, and then insert beneficial tactics in response.

B-06: Educating Mental Health Professionals on Various Complementary and Alternative Therapies for Treating Post-Traumatic Stress Disorder Symptoms

Atrium
Georgia Barry , Nursing

Maya Sanchez, Nursing
Ryan Duritsch, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
Thirteen million Americans had post-traumatic stress disorder (PTSD) in 2020. While traditional cognitive behavioral therapy and eye movement desensitization and reprocessing are efficacious therapies for treating PTSD, the dropout rates for these treatments are as high as 54% and the nonresponse rates are as high as 44%. Complementary and alternative therapies are increasingly gaining interest as a possible alternative and adjunct therapy to conventional treatment- many of which are currently being evaluated as methods to improve PTSD symptoms. This project aims to answer the question: In adults with PTSD, what is the effect of complementary and alternative therapies versus treatment as usual on PTSD symptoms? The purpose of this educational project is to present complementary and alternative therapies for PTSD treatment to mental health professionals who can implement the therapies in practice. After a literature search consisting of systematic reviews for complementary and alternative therapies for PTSD, we created an education plan to present to the mental health specialists at the Ikron Mental Health Group which consisted of a PowerPoint presentation and diagrams of the complementary and alternative therapies. We will highlight the efficacy of each practice and a brief description of how the therapy can be implemented in treatment. Pre/Post tests will be given to determine the knowledge gained from the presentation. The outcome of the project will further practice as a supplement to standard PTSD treatments, as some are simple to include in treatment plans. Results pending.

B-07: Twelve vs Eight hours: Shift Length Effect on Nursing

Atrium
Madalyn Cherry, Nursing
Lakyn Cefalu, Nursing
Stacey Keating, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
In intensive care nursing settings, the substantial workload and high acuity care patients increase nursing fatigue and exhaustion. A cross sectional study found that 69% of a sample of critical care nurses were experiencing burnout, high levels of stress, and exhaustion when working 12 hour shifts. The purpose of our education session is to teach intensive care nurses and managers about the effects that shift length has on nurses' employment experience, including fatigue, job satisfaction, health, and burnout prevalence. We found ten peer-reviewed articles through PubMed and Google Scholar that discussed the nurses' job experience related to twelve and eight hour shifts. The question that our project is answering is: In intensive care nursing, what is the effect of the implementation of eight hour shift lengths compared to twelve hour shift lengths on a nurse's employment experience? We will deliver an educational session to a group of critical care nurses at Mercy Health Western Hills through a Powerpoint and educational handouts. We will illustrate the risks of twelve hour shifts on nursing fatigue, the influence of burnout, the prevalence of stress and exhaustion, and the benefits of eight

hour shifts. The outcome of our educational session will be measured through a pre and post test given to the attendees to assess their knowledge. Results are pending.

B-08: The Influence of Psychiatric Illness On Complication Rates in an Outpatient Setting

Atrium
Anshya Tewari, Neuroscience
Project Advisor: Dr. Deepak Krishnan

Abstract
Introduction: Little is known about the association between psychiatric illness and the risk for postoperative complications following outpatient oral and maxillofacial surgery treatment. Psychiatric diseases can significantly burden a patient's diagnosis, treatment, and prognosis compared to a patient without a psychiatric condition. Moreover, poor mental health has been associated with poor oral health and adverse dental symptoms. Pre-existing psychiatric comorbidities have been found to have deleterious effects on the morbidity and mortality in post-surgical patients across multiple disciplines. The purpose of this study was to examine the significance of the presence of psychiatric illness on postoperative complications. The investigators hypothesized that diagnosing a psychiatric disorder would impact the frequency of complications seen with these patients' undergoing procedures in an outpatient setting.
Materials and Methods: After conducting a retrospective cohort study, appropriate descriptive statistics and vicariate logistic regression results were presented. Statistical significance was set at p-value < 0.05.
Results and Conclusion: With post-operative complications as an outcome variable, it was found that there was no statistically significant correlation between psychiatric illness and post-operative complications. However, women were 1.5 times more likely to have post-operative complications than men. The complications associated with local procedures were significantly lower than those under general anesthesia, and simple extractions were related to lower complications than third molar extractions, biopsies, and other procedures. Further understanding of this topic is crucial to treating patients with mental disorders and adapting treatment accordingly for better pain management and surgical outcomes.

B-09: Impact of Patient-Specific Alarm Customization on Alarm Fatigue

Atrium
Breckyn O'Shea, Nursing
Cameron Peluso, Nursing
Kyle Quallen, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
Intensive care unit (ICU) nurses experience an extensive number of alarms on an average day, some experiencing as many as 45.5 alarms per patient, per hour. As a result of this continual exposure to frequent alarming, 72.4% of nurses report experiencing alarm fatigue. The research question of focus is as follows: Among nurses working in ICUs, how does patient-specific alarm customization as compared

to current practice reduce alarm fatigue? Research identified utilization of customized alarm parameters based on individualized patient characteristics as a promising solution to the issue of alarm fatigue but recognized inconsistent practice of alarm customization. The objectives were to increase awareness of alarm fatigue, its potential effects on nurses and patients, and emphasize the importance of utilizing patient-specific alarm customization in a more uniform way in hopes of decreasing alarm fatigue. An educational intervention was implemented for University of Cincinnati Medical Center Medical ICU nurses involving a verbal presentation with a supplemental brochure outlining what alarm fatigue is, its prevalence, how it affects nursing, the importance of implementing patient-specific alarm customization, and recommendations for change. Results pending.

B-10: Educating Neonatal Intensive Care Unit (NICU) Nurses on the Effects of Postpartum Depression (PPD) in NICU Mothers to Increase Screening Rates and Decrease Untreated PPD

Atrium
Rachael Wheeler, Nursing
Anne Ryan, Nursing
Caroline Sanders, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
Postpartum depression (PPD) is a medical condition that affects 14-15% of mothers without an infant in the Neonatal Intensive Care Unit (NICU) and 28-40% of those that do. Despite nearly 2 out of 5 NICU mothers experiencing PPD, screening and referral guidelines remain unclear. When explored, research suggests the use of screening tools increases the use of mental health resources among NICU mothers. One study found that among NICU mothers who screened positive for PPD, 93% then accessed treatment resources. The objective of this project is to educate NICU nurses on how to improve screening for PPD among NICU mothers to identify mothers at risk. Education initiatives included the definition, signs and symptoms, risk factors, and prevalence of PPD as well as offered screening tool education and next steps to take in decreasing the rate of PPD in NICU mothers. The material was presented via a Powerpoint presentation with an introductory video and handouts. Surveys were administered to the NICU nurses before and after the presentation to assess prior and gained knowledge. Results pending. The outcome of this project will determine if education initiatives for NICU nurses can positively impact the rate at which NICU mothers are screened for PPD.

B-11: Impact of Non-Pharmacological Interventions in Treating Neonatal Abstinence Syndrome Babies

Atrium
Kylie Duggins, Nursing
Haley Hall, Nursing
Audrey McCoy, Nursing
Project Advisor: Dr. Paul Lewis

Abstract

According to the CDC, one newborn is diagnosed with Neonatal Abstinence Syndrome (NAS) every 19 minutes in the United States. Nursing units often do not have a standard of care in place for the use of non-pharmacological treatment for NAS. Infants are often treated with morphine as the first-line treatment when not needed. The aim of this project is to educate NICU staff on the benefits of non-pharmacological interventions for infants with NAS. NICU nurses at the University of Cincinnati Medical Center received education through a presentation and were given educational brochures which describe NAS, the signs of a baby in distress, and possible non-pharmacological interventions that the nurses can implement in their care plans. Pre- and post-educational tests were administered to assess the knowledge of healthcare personnel before and after viewing the PowerPoint. Results pending. Limitations included the use of different scoring systems by different hospitals and lack of sites available to present our project.

B-12: Correlation Between Mental Illness and Babies Born Addicted to Drugs

Atrium

Logan Benson, Social Work

Project Advisor: Dr. Gary Dick

Abstract

Mothers that give birth to children born addicted to drugs might have underlying mental health issues that trigger substance abuse. Untreated mental health issues might be a direct cause for the amount of newborn babies each year being born addicted to illegal drugs.This study could possibly help child welfare workers when interacting with this specific population. Being able to understand the correlation, if any, between mental health and using illegal substances during pregnancy could lower the rate of children being taken into state custody and/or reunification. It also can help social workers understand individuals in these situations and be able to provide resources that will actually help the client.

B-13: Does Parental Involvement Influence Treatment Outcomes of Children with Behavioral Issues?

Atrium

Alex Goldstein, Social Work

Project Advisor: Dr. Gary Dick

Abstract

Treatment outcomes for children with behavioral issues tend to be inconsistent. The inconsistency of outcome may be related to inconsistent parental involvement in the treatment program. For example, in some programs, parents are required to complete training; in others they are not. In this study I observe data from the agency and compare the families who complete the parental trainings provided by the behavioral service agency to those who have not and examine the progress of treatment for their children to determine the importance of parental involvement in the treatment process and the

effectiveness of the parental training provided by the behavior service agency. Results of this study can be used to inform best practices for treatment programs for children with behavioral problems.

B-14: The Effect of Acute Low-Intensity Exercise on Short-Term Memory

Atrium
Donae Carter, Health Sciences
Emma Gamstetter, Health Sciences
Shaylin Neal, Health Sciences
Project Advisor: Dr. Susan Kotowski

Abstract
Research has demonstrated that a positive relationship exists between exercise and memory. Based on previous findings, acute exercise has been shown to improve short-term memory function by up to 48% when exercise was performed for less than 30 minutes. Research has also shown that exercising before memory tests yields higher outcomes compared to exercising after exposure. Although aerobic and anaerobic exercise both exhibit a positive influence on working memory, research exploring the benefits of short bouts of acute exercise on short-term memory is lacking. Therefore, the purpose of this project was to investigate the effects of aerobic versus anaerobic exercise on a free recall memory test. Participants included healthy adults ages 18-25. The participants performed a cardiovascular based task (e.g., stair climbing) or a strength training task (e.g., calf raises) prior to completing a recall test, with the order of the exercise tasks randomized between participants. The memory test consisted of a PowerPoint slide containing a set of 15 words. Subjects studied the slide for two minutes, then completed the five-minute exercise task. Following the five-minute exercise task participants had one minute to recall as many of the words they saw prior to exercising. Data was evaluated to compare the difference in percentage accuracy found between both groups on the memory tests to determine if one type of exercise improved recall better than the other. This results of this project provide some insight on how different types of acute exercise impact working memory and recall duration.

Category C: Digital Futures

C-01: Extended Reality 3D Model Application in Space Exploration and Planetary Habitation

Great Hall
Mikhail Nikolaenko, Computer Science
Project Advisor: Dr. Ming Tang

Abstract
This proposed project will incorporate the use of data science, artificial intelligence, astronomy, and XR to create a visually interactive learning tool for students, academics, enthusiasts, and professionals alike to learn about areas of space exploration that will be easily accessible to anyone with mobile phone AR.

The application will include an accurate mapping of different celestial bodies such as planets, stars, planetary systems, and nebulae, and the model will be fully interactable through functions such as scaling, rotation, and highlighting. The uses of this proposed application range from basic elementary applications (e.g. learning about our solar system in astronomy courses) to astronomical data research (e.g. viewing habitability of possible exoplanets based on numerous factors with the help of artificial intelligence).

C-02: Developing a Machine Learning Model to Predict 30-day Readmissionsin Patients with Traumatic Brain Injury (TBI)

Great Hall
Abraham Kim, Medical Science
Project Advisor: Dr. Danny Wu

Abstract
Traumatic brain injury (TBI) readmissions contribute significantly to both hospital and patient costs. There are currently few studies predicting 30-day readmission in patients with TBI. In this study, we utilized significant predictive variables of 30-day readmission from the literature to develop a well-performing predictive model using machine learning (ML) techniques. The results of this study have important implications in predicting 30-day TBI readmissions to improve patient outcomes and reduce overall costs.

C-03: Investigating Long Range Signaling in HSP104 Using Molecular Dynamics Simulations and Machine Learning

Great Hall
Ariel Salmon, Chemistry
Project Advisor: Dr. George Stan

Abstract
Proteins often undergo misfolding during the life of the cell due to several factors such as stress conditions, mutations, and heat shock. This results in cellular disfunction and the accumulation of aberrant or abnormal proteins, leading to various neurodegenerative diseases. Hsp100 are conserved members of the AAA+ family (ATPases associated with diverse cellular activities) which are responsible for protein quality control by unfolding toxic proteins. These nanomachines make use of the chemical energy generated by ATP hydrolysis to perform their function. We study the Saccharomyces cerevisiae HSP104 nanomachine, which mediates the separation of amorphous protein aggregates as well as stable protein aggregates. It is still unclear how this protein performs the disaggregation of substrate proteins. Combining machine learning with molecular dynamic simulations has emerged as a promising approach to gain insight into the behavior of complex molecular systems. We conducted all-atom molecular dynamics simulations based on two cryo-EM structures to identify the key features that distinguish between the different binding states of HSP104. We extracted biologically relevant descriptors of the protein, at the domain level, based on literature and computational studies. In this study, we utilized multi-class classification in conjunction with SHAP (SHapley Additive exPlanations) analysis to discern the

significant structural features and their respective significance in the characterization of the different allosteric states of HSP104.

C-04: Where We are in VR: Preliminary Findings on the Viability & Use of Virtual Reality Training in the Criminal Justice field

Great Hall
Jackson Lindsay, Criminal Justice
Project Advisor: Dr. Clay Driscoll

Abstract
My project, a condensed scholarly literature review regarding interactive virtual reality trainings, exists to provide insight on how these trainings are administered and tested as well as highlight trends within the evolution of vr trainings over the course of six years for the furtherance of vr trainings in the criminal justice field.

C-05: Assessing the Readability of Online Health Information: Review of Current Measures and Their Effectiveness

Great Hall
Himaja Chintalapalli, Medical Sciences
Project Advisor: Dr. Danny Wu

Abstract
When it comes to online health information, readability assessments can provide valuable information on how the materials are, aiding patients in making informed healthcare decisions. However, the use of traditional readability measures may not be optimal for health-related materials. This is due to the fact that many important text features are overlooked by traditional readability measures when attempting to comprehend readability. New readability methods include a deeper analysis of text features by including text features such as semantic and discourse analysis. The results of this review can be used to inform future development and dissemination of models to analyze readability of online health information to improve online text.

C-06: User-Centered Design and Formative Evaluation of a Web Application to Collect Real-time Clinician Well-being Levels

Great Hall
Somya Pandey, Medical Sciences
Project Advisor: Dr. Danny Wu

Abstract
Well-being is influenced by physical, emotional, mental, social, and spiritual factors that interact within one's environment. This study aimed to create a web application to collect clinical well-being levels and provide real-time feedback to clinicians and administrators. A Well-being Check app was developed in a

user-centered manner containing a customizable survey and interactive visualization. With enough accumulated data, large-scale analyses will be conducted with connections to the electronic health records to help inform organizational interventions to improve well-being and burnout.

C-07: Improving the Understandability and Actionability of Clinical Notes to Support Self-Care in Patients with a Chronic Disease: A Pilot Study

Great Hall

Tripura Vithala, Medical Sciences
Project Advisor: Dr. Danny Wu

Abstract

Medical systems have prioritized access to electronic health records, but its effectiveness depends on closing gaps in health literacy. Three clinical notes from patients with diabetes were gathered, edited, and evaluated by researchers using the PEMAT-P to increase their readability and effectiveness. The amended clinic notes were shown to be more therapeutically beneficial than the original ones, especially in terms of their comprehension rather than their applicability, which may help patients manage their health better.

C-08: Developing a Machine Learning Model to Predict 30-day Readmissions in Spine Surgery

Great Hall

Taran Ghuman, Medical Sciences
Project Advisor: Dr. Danny Wu

Abstract

The 30-day readmission is an important outcome measure in spine surgery, reflecting the quality of treatment and care given to patients. Furthermore, readmission can be costly to both patients and hospitals alike. Applying machine learning (ML) on electronic health records (EHRs) may accurately predict 30-day readmissions in spine surgery, but there is limited research. This pilot study aims to summarize significant risk factors in the literature and develop a predictive model using gathered risk factors, ML, and EHR data.

C-09: User-centered Design and Evaluation of a Research Project Management System in a Pediatric Health Institute

Great Hall

Aniruddhan Ramesh, Computer Science
Project Advisor: Dr. Danny Wu

Abstract

Research project management is a crucial discipline that employs a systemic approach to completing research projects. This is especially crucial in academic hospitals which are involved in extensive research and are provided very limited resources. HIRC Portal is a project management website that is

built in collaboration with the Cincinnati Children's Hospital Heart Institute. The study aimed to develop the HIRC portal by adopting a user-centric design approach and agile software development principles and assess its usability through structured testing. Participants of the study were recruited to use mockups of the portal and provide their feedback regarding its usability and fill out a System Usability Scale (SUS) survey for the portal. The average SUS score for the survey was calculated to be 88.4, indicating good usability (SUS>68 is considered above average). From the results of the user testing, 126 usability issues of varying severity were recognized and addressed. The HIRC Portal was then designed to implement the HIRC workflow with the expected outcome of improving their efficiency and increasing overall service capacity. The HIRC portal is made adaptable to the user needs and continuous support would be provided for any issues and further enhancements. The study emphasizes the importance of research project management in clinical research and the importance of implementing a user-centered design approach in developing research project management applications.

C-10: Image Processing-based Method for Automatic Design of Patient-Specific Cranial Implant for Additive Manufacturing

Great Hall
Demiah Lockett, Health Sciences
Project Advisor: Dr. Jonathan Forbes

Abstract
Patients undergo a decompressive craniectomy, due to elevated intracranial pressure after an accident resulting in trauma to the head. Part of the skull is removed to alleviate intracranial pressure. Once pressure has been alleviated the patient will undergo a cranioplasty. A cranioplasty is the repair of the defect in the skull from surgery or trauma to the head via the skull flap or an artificial cranial implant. Artificial cranial implants have been proven to be superior due to long-term benefits and fewer complications. In order to get an artificial implant, the U.S. uses third-party vendors to create a specialized implant. In developing countries, neurosurgeons will manually mold the implant using titanium mesh or polymethyl methacrylate. Our objective is to develop a software or algorithm that decodes DICOM information from a CT scan and outputs an STL file, for the creation of a patient-specific cranial implant that is cost-effective and matches the quality and precision of a third-party vendor for neurosurgeons in developing countries.

Category D: Electrical, Chemical and Cellular Worlds

D-01: Lightweight Copper-Carbon Nanotube Composite Fibers for Power Cable Applications

Great Hall
Brett Karsten, Chemistry
Project Advisor: Dr. Vesselin Shanov

Abstract
The substitution of traditional copper power cables with lightweight copper-carbon nanotube (Cu-CNT) composite fibers is critical for reducing the weight, fuel consumption, and CO_2 emission in automobiles

and aircrafts. Such a replacement also will allow for lowering power loss in copper cables resulting in a decrease in coal and gas consumption and ultimately diminishing the carbon footprint. In this work, we created a lightweight Cu-CNT composite fiber through a multistep scalable process. Carbon nanotube (CNT) fibers were spun from CNT arrays grown in a chemical vapor deposition (CVD) process. The fibers then underwent subsequent processing that included the following: densification, functionalization, and double-layer copper deposition. The characterization and testing of the fabricated fiber included surface structure, electrical conductivity, mechanical strength, crystallinity, and current density. The resultant composite fiber displayed excellent electrical conductivity, current density and high mechanical strength. In addition to its low-density and lightweight nature, these findings suggest that Cu-CNTs show great potential in future applications as power transmission cables.

D-02: Advances in Green Chemistry: Alcohols Produced by a Solvent-free Carboxylic Acid Reduction

Great Hall
McKenna Pietrowski, Chemistry
Project Advisor: Dr. James Mack

Abstract
Traditional chemistry uses solvents as dissolution media for various organic reagents. The continuous use of solvents in different organic processes produces tons of solvent waste. Most of these solvent wastes have environmental impacts and work hazards. However, these well-established solvent-based approaches produce chemical products which are essential in many industrial processes, such as the agriculture and pharmaceutical industries. So, finding a solvent-free method for producing these chemicals is essential to reduce solvent waste and environmental hazards. Green Chemistry uses principles to reduce or eliminate the use or generation of hazardous substances in the design, manufacture, and application of chemical properties. This particular project focuses on reducing solvent waste. Mechanochemistry is a method to reduce solvent waste using High-Speed Ball Milling. Mechanochemistry involves using shaker mills to forcibly shake reactants at high speed with metal balls under specified temperatures. Our project aims to evaluate High Speed Ball Milling as a method for reducing carboxylic acids into their corresponding alcohols. The reduced alcohols are used extensively in various industrial processes like agriculture and pharmaceutical industries. Carboxylic acid reduction usually requires extreme conditions like high hydrogen gas pressure or excess harmful reducing agents. The outcome of developing solvent-free reduction of carboxylic acid will decrease the production of solvent wastes and enhance process safety by reducing the use of hazardous solvents.

D-03: Environmentally Friendly Reduction of Carboxylic Acids into Alcohols through High-Speed Ball Milling

Great Hall
Leon Azirbayev, Chemistry
Project Advisor: Dr. James Mack

Abstract

The goal of this is to produce environmentally friendly reductions of Carboxylic acids into alcohols through high-speed ball milling. Over the years, the chemical community has been concerned with green chemistry due to large amounts of chemical waste sources known as volatile organic compounds (VOCs). The consequences of keeping reactions involving VOCs are a large consumption of hazardous chemicals, high toxicity and overall not being eco-friendly. As a result, there has been an increase in interest in reducing chemical waste. That led to Green Chemistry, reactions that minimize the use of hazardous substances. Throughout the project, carboxylic acids have been placed in steel vials that are sealed and placed into a high-speed mill for several hours to be reduced into an alcohol substance. We use carboxylic acids because they are widely found in nature and play important roles in many biological processes. By adding the acids with other substances, we want to see how much they are reduced with a minimal amount of chemical waste. Normally, each mill is processed with a temperature of 40°C but we are also interested in high-speed milling the reactant at higher temperatures. The outcome of the work will hopefully have an impact in the environment with little to no solvent waste.

D-04: Could a Chemical Found in a Local Tree Species be Used to Fight Herbaceous Invasives?

Great Hall
Anna Gooding, Biology
Project Advisor: Dr. Kenneth Petren

Abstract
The Tree of Heaven (Ailanthus altissima) is an invasive tree species that can be found here in Cincinnati. It releases a chemical, ailanthone, that has strong allelopathic abilities. Allelopathy refers to the chemical inhibition of growth or germination of one plant by another. The chemical is released into the soil by the degradation of leaves, bark, and the roots of Ailanthus altissima. Previous literature on the allelopathic effects of Ailanthus altissima showed that it could be used on herbaceous plants as an effective herbicide in a lab setting. Since the tree is readily available in the area, we extracted the chemical in order to determine whether the herbicide could withstand field settings, and if so, whether it was effective against local invasive species. By using patches of Lesser Celandine (Ficaria verna) and Winter Creeper (Euonymus fortunei) found in Burnet Woods, we tested the effect of this herbicide by determining percent coverage before and after treatment. The outcome of this research will help further understanding on the effects of Ailanthus altissima for potential commercial use.

D-05: Allelopathic Herbicide of Tree of Heaven Used Against Honeysuckle

Great Hall
Kristin Elchynski, Bachelor of Science in Biology
Project Advisor: Dr. Ken Petren

Abstract
Can a chemical that is found in our local tree species be used to fight the Amur Honeysuckle? The Tree of Heaven (Ailanthus altissima) is an invasive tree species. It can be found in many of our Cincinnati parks. It releases a chemical that can stunt the growth and in some cases even kill the native species that it is outcompeting. This is called allelopathy, the chemical inhibition of germination or growth of one

plant by another. The allelopathic chemical is released into the soil by means of the bark, leaves, and roots of the Ailanthus plant. Previous literature on the allelopathic effects of Ailanthus proved that, in a lab setting, it could be used as an effective herbicide on herbaceous invasive plants. Since we had access to this particular species of tree we extracted the allelopathic chemical in order to see if it could withstand field settings. If so, we wanted to know if it was effective against our local invasive species. The literature covered herbaceous species and was successful, in a lab setting, but we wanted to see if we could use it on Amur Honeysuckle, a woody invasive species. By using honeysuckle that we found at the UC Center for Field Research, we tested the effectiveness of this herbicide by how many new sprouts we had on our cut honeysuckle. The outcome of our research will help us further understand the effects of the Ailanthus plant and its potential for a more sustainable commercial herbicide.

D-06: A Comparative Analysis of Transfer RNA Gene Abundance in Arthropods
Great Hall
Lucas Klaus, Biological Sciences
Project Advisor: Dr. Josh Benoit

Abstract

Arthropods are a diverse group of organisms that range from spiders to insects. The observable diversity amongst these groups indicates there are likely different types of proteins utilized in their biology. Transfer RNA (tRNA) are critical components of protein synthesis. In specific, tRNAs are amino acid carrying molecules that translate messenger RNA (mRNA) codons into proteins. tRNA is encoded into the genome as various genes and their numbers vary significantly between organisms. It has been shown previously that the number of tRNA genes is correlated with the amount of tRNA produced for protein synthesis. Furthermore, tRNA types are related to the codons in mRNA. This study seeks to expand on correlational trends between tRNA genes in arthropods, a group with previously little known on tRNA. Upon analysis of tRNA genes in arthropods, the results indicate 1. The number of tRNA genes correlates with genome size and 2. There is a significant difference in the total number of tRNA genes between the orders of Diptera, Hemiptera, Hymenoptera, and Ixodida. For example, Ixodida had a larger amount of tRNA genes compared to the other orders. A significant portion of Ixodida tRNA genes encoded serine. In summary, differences in tRNA gene numbers could indicate possibly different responses to stress and protein composition, which are likely to vary between arthropod species.

D-07: Long-distance Communication within the HSP104 AAA+ Protein Disaggregation Nanomachine
Great Hall
Jacob Bolam, Chemistry
Project Advisor: Dr. George Stan

Abstract

Newly synthesized proteins or already folded proteins may get damaged due to assorted reasons such as mutations, heat shock, or stress, leading to neurodegeneration and various other diseases. The enzyme HSP104 AAA+ mediates protein quality control via protein degradation or disaggregation.

Proteins belonging to the AAA+ family (enzymes associated with diverse cellular activities) play a crucial role in preserving protein stability. The heat-shock protein HSP104 enzymes from Saccharomyces cerevisiae are members of the AAA+ family that support protein quality control by unfolding aberrant or toxic proteins. HSP104 consists of six identical subunits (protomers) to form its hexameric structure. The hexameric nanomachines of HSP104 are well known to disassemble both amyloids and aggregates. It has been shown that substrate interactions are mediated by translocating polypeptide chains along the axial channel in the presence of ATP hydrolysis. Though we have identified the purpose of this enzyme, how this protein performs disaggregation is still unclear. This study is focused on probing the allostery of the protein which refers to the regulation of the protein's activity by binding of a molecule at a site on the protein other than its active site using machine-learning approaches by performing all-atom molecular dynamic simulations for two distinct states, termed closed and extended. We performed Markov State Modeling which allowed us to predict long time-scale changes, which are important for the allosteric regulations, from short time-scale changes. We extracted features at the domain level that determine functions of the protein, identified by literature and computational studies, and extracted biochemically relevant descriptors which would allow us to identify the binding and shape patterns within HSP104 and employed supervised Machine Learning to understand the key features that contribute to the allosteric regulation of HSP104.

D-08: Exploring Allostery in the ClpB Biological Nanomachine Using Molecular Dynamics Simulations and Machine Learning Classification

Great Hall
Ryan Cox, Chemistry
Project Advisor: Dr. George Stan

Abstract
Protein quality control comprises essential cellular processes that ensure proper folding, assembly, and degradation of proteins, thereby maintaining cellular homeostasis. The degradation and disaggregation pathways involve the modulation of protein structure, which is facilitated by AAA+ (ATPases Associated with diverse cellular Activities) motor proteins. The conversion of chemical energy to mechanical energy is achieved by these AAA+ motor proteins through ATP hydrolysis. Misfolded substrate proteins or aggregates are disassembled through the repetitive application of mechanical force by these machines, which enables translocation of the polypeptide chain via a narrow pore. The ClpB disaggregation nanomachine, comprising a double ring hexameric structure, is an AAA+ motor protein that contains two nucleotide binding domains per protomer. Allosteric regulation of ClpB remains an open question. To better understand the role of allostery in ClpB, we utilized advanced computational techniques, such as machine learning classification algorithms, to analyze atomistic molecular dynamics simulations of ClpB, in conjunction with the states obtained through Markov State Modeling. By combining these methodologies, we were able to gain a more comprehensive understanding of the functional significance of allostery in ClpB. Through this approach, we were able to identify key features of the system that contribute to its allosteric behavior, providing new insights into the molecular mechanisms at play in this important protein.

D-09: Investigating the Molecular Dynamics of ClpB, an ATP-dependent Protein Disaggregase Nanomachine

Great Hall

Jiacheng Zhang, Chemistry
Project Advisor: Dr. George Stan

Abstract

Misfolded and aggregated proteins can negatively impact cellular function, making the presence of protein disaggregates critical. ClpB plays a key role in protein disaggregation in the human body. This study utilizes high-resolution ClpB structures to conduct equilibration and production simulations, with a focus on investigating the SMOG2 force field parameters via molecular dynamics simulations using computational models such as SMOG2 and OpenSMOG. The research yields new insights into the structure, function, and dynamics of ClpB, with potential implications for understanding various biological processes across disciplines.

D-10: Developing a High Parameter Flow Cytometry Panel to Identify Specific Immune Cell Phenotypes Key to the Pathogenesis of Systemic Juvenile Idiopathic Arthritis

Great Hall

Noel Gibson, Medical Laboratory Sciences
Project Advisor: Dr. Sherry Thornton

Abstract

Systemic Juvenile Idiopathic Arthritis (SJIA) is a rare and severe subtype of arthritis that affects 10% to 15% of children with juvenile idiopathic arthritis. For SJIA, 40% of children with this pathology develop a deadly phenotype known as macrophage activation syndrome (MAS). SJIA is often more severe and challenging to treat than other types of juvenile idiopathic arthritis as its origin is unknown and no specific test to diagnose disease exists. The aim of this study was to develop a full spectral cytometry immunophenotyping panel, using known cell markers for patients with SJIA, to determine the immunophenotypic profiles of cells found in patients with SJIA and MAS. Such an immunophenotyping panel may lend to later discovering the pathogenesis of these diseases and creation of a diagnostic or prognostic test. To create the panel, generic peripheral blood mononuclear cells (PBMCs) were stained with various immune cell markers and specific fluorochromes and analyzed using full spectral cytometry. Choosing the fluorochromes to use was dependent upon the amount of the corresponding cell marker present within the sample. By slowly adding new markers with specific fluorophores to the panel, we were able to control overlap in fluorochrome emissions limiting interference that may affect analysis. The future goal of this study is to optimize the immunophenotyping panel, which would then allow for analysis of SJIA and MAS patient samples. With this, we can hopefully identify new immune cell populations potentially driving the disease and discover pathways to target for novel therapeutics.

D-11: Investigating Gene Expression in N. gruberi amoeba to Search for Potential Treatment Targets in Amoeba-Caused Meningitis

Great Hall

Aerin Hamons, Biochemistry
Project Advisor: Dr. Yoshi Odaka

Abstract
The amoeba Naegleria fowleri, also known as "the brain eating amoeba," is known to cause a rare brain infection called Primary Amebic Meningoencephalitis (PAM) which is fatal in over 90% of cases. As precious little is known about how N. fowleri attacks human brain tissue, we seek to expand this understanding by working with similar proteins found in nonpathogenic Naegleria gruberi. We began our search with human integrins – a group of proteins that function as an α/β pair on the outside of the cell and allow cells to communicate with the connective tissue around them. We compared these integrin proteins by BLAST homolog search (a genetics/protein database) against Naegleria and found no good candidates among the α-integrins but identified several among the β-integrins, ultimately narrowing these down to two N. gruberi proteins as experimental candidates. | One is a partially annotated (identified) integrin-like serine/threonine kinase – a protein that may be involved in cellular communication and regulating cellular reproduction, programmed cell death, and differentiation into different types of cells in human cells. The other integrin-like protein possibly carries seven-transmembrane helical structures, like G protein-coupled receptors (GPCR). GPCRs are a hugely diverse group of receptor proteins with functions such as in nervous and endocrine (hormonal) systems, and about half of drugs on the market target GPCR receptors. The two proteins of interest in Naegleria may participate in cellular functions such as foraging behavior or adhesion to material in its environment. Our current project is to see if the messenger RNA (mRNA) to produce these proteins is expressed in different experimental conditions.

D-12: Analysis of possible essential proteins in the Chagas disease parasite

Great Hall
Holland Tolliver, Biological Sciences
Project Advisor: Dr. Noelia Lander

Abstract
The parasite of focus in the Lander Lab is Trypanosoma cruzi, which is the causative agent of Chagas disease. Chagas disease is one of Latin America's leading causes of heart disease. There is no effective treatment for Chagas disease, so through the study of signal transduction pathways/genes and more, hopefully, more information can be obtained to help with treatments. The main goal of my project was to analyze two proteins, CARP4 and CARP1 to determine if they are essential for parasite survival. CARP stands for cyclic AMP response protein. Cyclic AMP is a second messenger which plays a role in several biological processes of T. cruzi, but little is known about its mechanism of action. To determine the essentiality of these proteins, we used multiple techniques to modulate their abundance in the parasite. Our approach was to delete, overexpress, and tag the genes that encode these proteins. We used different methods such as PCR, gel electrophoresis, cell counting, bacteria transformation, parasite transfection, and microscopy. After the selection of mutant parasites, we analyzed their phenotype. We are currently performing the phenotype analysis therefore, we have yet to make a definitive conclusion on the essentiality of these genes. Our results will be crucial to understand the role of CARPs and their effects on the parasite life cycle, which can further aid in the development of alternative treatments for Chagas disease.

D-13: Study of the location and effect of generating an excess amount of an important cellular component (RDK2) in the etiological agent of Chagas disease

Great Hall
Jessica Huckleberry, Biological Sciences - Biomedical Studies Concentration
Project Advisor: Dr. Miguel Chiurillo Siervo

Abstract
Protein kinases (PK) are important components of all kind of cells that plays key biological processes for the life of a cell. The focus of the research in our laboratory is the microscopic parasite Trypanosoma cruzi (T. cruzi), which is the cause of the potentially life-threatening disease named as Chagas disease. We aimed to study the role in the survival of T. cruzi of a specific PK known as RDK2, using an experimental approach, commonly referred to as reverse genetics, that enables researchers to elucidate gene function by examining observable changes in the cells caused by manipulating their DNA. By modifying the DNA of this organism, we observed that RDK2 is found in the cytosol of the cell. Additionally, we performed an experiment where we programmed the cell to make too many copies of the RDK2 protein, which caused the cell to die. We then generated a molecular system that allowed for the RDK2 gene to only be switched on when we added a certain antibiotic (Tetracycline). We observed that when we give above 0.1 mg/ml tetracycline to these cells the amount of RDK2 increases affecting the parasite vitality and proliferation. We are currently performing an analysis of how generating too much RDK2 protein can affect the ability of this parasite to infect human cells. This antibiotic "switch" system has the potential to be used in future experiments to evaluate the possibility of testing RDK2 for the design of new treatment options for Chagas disease.

D-14: Extracellular vesicle isolation and characterization in patients undergoing catheter-based valve intervention

Great Hall
Makayla Williams, Biological Sciences
Grace Tremmel, Medical Sciences
Project Advisor: Dr. Donald Lynch

Abstract
Valvular heart disease (VHD) is a leading cause of morbidity and mortality among the aging population. Over the last 14 years, percutaneous minimally invasive heart surgeries with catheter-based techniques have become increasingly available as options for treatment of patients with symptomatic severe VHD. Our lab has recently demonstrated inflammation driven by dynamic platelet transcriptomic alterations following catheter intervention which may impact outcomes. Pathway analysis demonstrated an enrichment in genes involved in endosomes, which control traffic of proteins inside a cell, and exosomes, which are extracellular vesicles (EVs) released from the cell that carry proteins. The objective of this study is to profile EVs in plasma following minimally invasive procedures, such as transcatheter valve interventions (TVI). EVs were isolated from stored plasma samples from patients who underwent transcatheter aortic valve replacement (TAVR) or transcatheter mitral valve repair with the Mitraclip.

We compared isolation of EVs using ultracentrifugation (EC) and size exclusion chromatography (SEC) and characterization was performed using Nanoparticle tracking analysis along with Nanoflow cytometry. Isolation of EVs using with SEC recovered more EVs than UC from plasma cells. Among patients undergoing Mitraclip, there were significantly lower levels of CD63+ and CD41+ EV antigens ($P < 0.05$) post-procedure. However, there were no significant differences noted in plasma EVs following TAVR. Our study demonstrated lower levels of plasma EVs among patients undergoing Mitraclip than TAVR, which may indicate dysfunctional exosome release and may be a potential new therapeutic target.

Category E: Educational Interventions

E-01: Literacy Implementation and Engagement in Elementary Aged Students

Great Hall
Annie Welage , Speech Language Hearing Sciences
Lauren Daily, Speech Language Hearing Sciences
Brooke Avance, Speech Language Hearing Sciences
Project Advisor: Dr. Nancy Creaghead

Abstract
The scope of practice for speech-language pathologists includes writing, spelling, and reading (ASHA, 2016). Children with speech and/or language disorders commonly also struggle with learning to read and write (ASHA, 2016). Thus, it is important for speech-language pathology students to learn to support student child literacy. This service-learning project addressed ways to improve literacy engagement in elementary-aged children. The literature review included articles that highlighted the strategies to use when working with students that may have a disorder of written language that involves impairment in fluent word reading, reading comprehension, written spelling, and/or written expression (ASHA, n.d.). Thirteen undergraduate students from the Department of Communication Sciences and Disorders volunteered weekly at two local elementary schools in Cincinnati to learn and apply engagement strategies for improving literacy skills. Strategies used included dialogic reading, student mentorship, and catering to each student's diverse needs. Project members presented various writing, reading, and decoding exercises to students in kindergarten and first grade. Through facilitation and ongoing encouragement of students' literacy skills, students demonstrated growth in their literacy skills. The project resulted in the volunteers expanding their knowledge of supporting student literacy to prepare them to support literacy in their future careers as speech-language pathologists. The poster will describe the service project and provide evidence-based strategies for supporting children's literacy development.

E-02: Does self-assessment improve learning in children? A Literature Review Spanning 2020 – 2023

Great Hall
Hannah Libby, Psychology
Zach Streit, Psychology

Komal Dhillion, Psychology
Project Advisor: Dr. Heidi Kloos

Abstract
Self-assessment is a popular pedagogical tool that encourages learners to evaluate the quality of their performance. However, findings are mixed on whether this tool is effective in improving children's learning. Recent theoretical work on self-assessment suggests that the method of self-assessment matters: if children evaluate themselves in a summative way (e.g., to determine the grade they deserve for produce), learning is hampered. In contrast, if children evaluate themselves in a formative way (e.g., to determine what kind of learning opportunities need to be sought out), learning improves. In the current study, we seek to evaluate evidence that may support this theoretical claim via a literature review. We focused primarily on children grades K-6, as these children might first learn the concepts of self-evaluation. We curated a list of relevant sources that we filtered through from the list of articles that cited Heidi Andrade's "A Critical Review of Research on Student Self-Assessment" (2019) which is one of the current leading references for formative assessment in the field of self-assessment. We then sorted through over those 300 articles that cited her by using a list of specific criteria we established to contribute to our literature review. Preliminary results suggest that formative self-assessments are a more accurate mechanism for gauging students' self-efficacy than the alternative summative versions.

E-03: Technology and Math Learning: Contrasting Two Practice Apps Using Solution-based Research

Great Hall
Caleb Bagley, Psychology
Josh Nelson, Neuroscience
Leila Morgan, Psychology
Project Advisor: Dr. Heidi Kloos

Abstract
Children from economically disadvantaged neighborhoods have remarkably low math competency scores. Consequently, external intervention is necessary in order to ensure that their fundamental math proficiency is on par with that of students in more economically-advantaged communities. This study utilizes solution-based research to examine a program that uses two types of software designed to encourage children to exert more control over their educational experiences in order to better stimulate cognitive engagement, hence improving their academic performance. We seek to answer one research question considering available data: was the math instruction software (math-instruction software; MIS) or math-practice software (math-practice software; MPS) better for showing cognitive engagement and choice? Obtaining a conclusion allows for the cultivation of stability in a testing population where it is often deficient, by eliminating researcher bias and considering participant interest and autonomy in education to ascertain valuable insights pertinent to math-learning that can be generally applied. Participants spent an average 18.50 minutes (SD = 5.79) out of a 40-minute session engaged and on-task. Choice of software was not significantly correlated with the participants' degree of learning, though children were twice as likely to use MPS than MIS, spending more than half of their total time on

the software (M = 0.61, SD = 0.21). MPS requires more interactivity and engagement from the user, and selecting it as opposed to MIS functions as an indicator of greater engagement. This indicates that the MPS was the software that best encouraged cognitive engagement and choice.

E-04: What's Your Stance on Math? The Effects of Posture on Cognition

Great Hall
Fia Price, Health Science
Hailey Coulehan, Health Science
Meni Dwomo, Health Science
Project Advisor: Dr. Mike Riley

Abstract
The ability to perform cognitive tasks is important in daily life. Maintaining an upright position requires the coordination of many body systems dealing with cognition, vision, and balance. In many older adults completing a task while also maintaining an upright posture may be difficult, as cognitive and physical abilities deteriorate with age. Previous research has suggested that cognitive ability differs in upright vs. sitting positions, and that cognition can impact posture, but there has not been as much research on how cognition is affected by standing postures. The purpose of our study was to investigate the impact of standing posture on cognition. The methods of the study involved using a timed arithmetic based cognitive test to quantify cognition under different postural conditions. Participants were asked to complete an oral arithmetic test in four postures (eyes open normal stance, eyes shut normal stance, eyes open tandem Romberg stance, eyes shut tandem Romberg stance). The order of the arithmetic tests and postures were randomized. Data was collected and analyzed to determine average time spent on the task in each posture and average percent of questions answered correctly in each posture. The values were compared across conditions. Our results give insight into how people should be positioned during cognitive work.

E-05: Investigating the Optimal Amount of Resources in Undergraduate Biology Labs

Great Hall
Grace Stegman, Biological Sciences
Project Advisor: Dr. Brent Stoffer

Abstract
Educators walk a fine line when figuring out how much guidance to provide their students with to generate most successful learning and retention. Students must be challenged enough that their critical thinking skills are activated and memorization techniques are not used that result in lack of complete understanding. In undergraduate biology labs, we investigated the optimal amount of resources provided to students for learning about genetic inheritance patterns. Sections of students were randomly assigned to one of three different treatment groups. Students were given (1) a handout (containing completed Punnett squares), a handout and a worksheet that students completed, or neither. All treatment groups then completed an in-class assignment and an exam pertaining to genetic inheritance patterns. Overall, student performance on the worksheet and the exam was generally

similar across treatment groups, though there was significant variation across lab sections. However, a subset of questions on the exam demonstrated that a handout alone was sufficient to have students have significantly higher scores. It remains plausible that a moderate amount of resources is ideal for student success and retention of knowledge, though more research needs to be conducted to disentangle the effects of instructor feedback and resources available.

E-06: Pediatric Nurses' Knowledge of Procedural Distraction Techniques

Great Hall
Anna Miller, Nursing
Kennedy Grime, Nursing
Katrina Loxterkamp, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
Providing medical care and implementing procedures on pediatric patients can be difficult for nurses and anxiety producing for the patients they are caring for. Close to 83% of young children aged 2.5-6 years, 51% of children aged 7-12 years, and 28% of adolescents have high levels of anxiety during painful procedures. The aim of this project is to educate pediatric operating room nurses on the different procedural distraction techniques they can implement into practice that can assist in reducing pain and anxiety levels in their patients. The question this project addresses is whether or not teaching about distraction techniques increases pediatric nurses' knowledge and willingness to adopt these techniques during stressful medical interventions. A group of selected pediatric nurses at Cincinnati Children's Hospital received an educational powerpoint along with demonstrations and examples of procedural distraction techniques. A pre and post test were administered to allow for the analysis of their knowledge acquired and willingness to adopt the techniques after the educational presentation. The results are pending. The outcome of the work will allow for pediatric nurses to obtain more knowledge to utilize while providing care to their specific population of patients, as well as motivate them to use this knowledge.

E-07: Educating Nurses on the Benefits of Acupuncture for Pediatric Pain Control

Great Hall
Matthew Heckart, Nursing
Ashley Gabhart, Nursing
Abby Deitering, Nursing
Project Advisor: Dr. Caroline Morrison

Abstract
Pain management is a major issue in the United States and is often not treated appropriately. It is especially prevalent in the pediatric population, and it can be very difficult to treat due to the difficulty of communicating pain and the reality that everyone experiences pain differently. The overall goal of our educational project is to review the literature associated with acupuncture used for pediatric pain management and educate pediatric nurses about acupuncture pain control and symptom management.

The literature found will help answer the following question; how does acupuncture differ from traditional pharmacological management in pain control? Using the literature, an interactive presentation was developed which was presented to nurses at Cincinnati Children's Hospital. Our main point of emphasis during the presentation was to consider the inclusion of acupuncture into pain management treatment. To gauge the learning and overall impression of the nurses that attended the presentation, a pre-test and post-test will be administered. This allowed us to evaluate our presentation and understand how well acupuncture would be accepted into current practice. The results of the presentation are pending, and it is anticipated that there will be an improvement in nurses' knowledge of acupuncture as a method of pain management. By educating nurses on the value of acupuncture for pain relief, pediatric pain management will be greatly improved.

E-08: The Importance of Annual Seizure Education for Practicing Pediatric Registered Nurses

Great Hall
Gabrielle Ross, Nursing
Lucy Ross, Nursing
Madelyn Pittman, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
Seizures in the pediatric population require immediate intervention and continuous observation. According to a study conducted in 2019, only 39.3% of pediatric nurses felt confident when treating seizure patients. Pediatric nurses need to be equipped with the confidence and competency in order to effectively treat these patients. The CDC reports that about 470,000 children experience a seizure each year. The purpose of our project is to provide non-neurology facing pediatric registered nurses' education on the proper care and protection of pediatric patients who experience a seizure.The education will be provided through a lecture, hands on demonstration, and an educational pamphlet that describes the role of the nurse during a seizure. We will assess medical surgical pediatric registered nurses with a pre and post test to determine their knowledge level, and confidence level, when preparing for a seizure patient. Findings pending.

E-09: Educating Intensive Care Units on the Effectiveness of Targeted Temperature Management after a Cardiac Arrest

Great Hall
Christina Snyder, Nursing
Breanne Hodapp, Nursing
Dylan Pirc, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
In the United States, the survivability after a cardiac arrest has occurred is statistically poor, with only 9%-36% of patients surviving the event. Targeted Temperature Management (TTM) is a therapy currently being researched to improve the outcomes of these patients. Our PICOT question is, "in

patients who have experienced a cardiac arrest, does implementing targeted temperature management improve the patient's outcome compared to those who did not receive targeted temperature management after a cardiac arrest?" The aim of this project is to present the findings of our literature review regarding the effectiveness of TTM on post-cardiac arrest patients to nurses working with this patient population. A comprehensive article search was performed and found that the American Heart Association recommends TTM for adults who have suffered cardiac arrest. An educational session was formulated to provide a basic understanding of TTM, its effectiveness, areas for further research, and the nursing implications of patients undergoing TTM. This will be presented to nurses working in critical care. A didactic pamphlet will be provided to summarize and present our findings and reinforce understanding. A pre-test and post-test will be administered to determine if nurses understood the given information and if this new information will be implemented into their future practices. Results are still pending, however, it is anticipated that the nurses will demonstrate an expanded knowledge of TTM and its effectiveness. Through educating nurses about TTM, it is hoped patients post-cardiac arrest will experience improved outcomes, despite the longstanding history of poor outcomes.

E-10: Effects of Care Bundles on Decreasing the Mortality Rates of Hospital Acquired Infections and Sepsis

Great Hall

Kennedy Craig, Nursing
Emily Plummer, Nursing
Alex Nagel, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
The purpose of this project is to identify effective strategies on reducing mortality rates in sepsis patients and those with hospital acquired infections (HAIs). The question for the project is, in the inpatient hospital setting, how does the use of sepsis bundles compared to usual daily hygiene practices positively influence health outcomes for patients who are at a high risk for sepsis? When conducting research for this topic, the following search criteria was used to find articles published within the last seven years: "sepsis bundles, HAIs, hygiene practices, mortality rates, peer reviews articles, and meta-analysis." Education for the topic will include a presentation to nursing students by using pre/posttests to gauge knowledge and understanding of the topic. Results are still pending, but it can be inferred that effective learning will take place. The implications for practice would be providing education to nursing students currently preparing to enter the nursing field. The intent of this education will allow nurses to have the skillset to identify signs and symptoms of sepsis in patients at risk or that have HAIS and the effects of sepsis bundles on mortality rates. By having this understanding, nurses will be more vigilant on providing care on patients to prevent HAIs and sepsis.

E-11: Improving Nurses' Confidence in Diffusing Workplace Violence in the Pediatric Populations through the Use of In-person Education and Simulation-based Training

Great Hall

Marissa Kearns, Nursing

Kenzie Casto, Nursing
Maggie Kroeger, Nursing
Project Advisor: Dr. Caroline Morrison

Abstract
Many nurses feel underprepared for instances involving workplace violence. On average, 57 nurses are assaulted per day in hospitals across the United States - that's 2 nurses every hour. The purpose of this project is to understand literature focused on the improvement of de-escalation of violence in the workplace, and then to present this knowledge to hospital staff to increase feelings of confidence within said situations. Will this type of simulation-based education increase the staff knowledge and confidence in de-escalating violent situations in the workplace? This project provided education on recognizing the signs and behaviors of an escalating situation, identifying and utilizing de-escalation techniques, how to report WPV, and gaining more confidence in handling violent situations. This was achieved through an in-person presentation on the aforementioned objectives, followed by a short participant involved simulation on a WPV situation. This will be evaluated by a pre-test and post-test at the time of presentation. Findings from this project are pending but increased knowledge and confidence in WPV de-escalation techniques is anticipated. Providing nurses with this education and a chance to use their de-escalation techniques will hopefully increase their confidence in WPV situations and decrease incidence of workplace injury.

E-12: Educating Direct Care Givers on Recovery Impact of Patients' Early Return-to-Walking after Major Surgery

Great Hall
Sadie Baker, Nursing
David Towell, Nursing
Cami Madar, Nursing
Project Advisor: Dr. Fuad Alhorani

Abstract
Thoracoabdominal surgery is an invasive, complex procedure that comes with post-operative complications that may impact gastrointestinal, cardiovascular, and respiratory systems. One method to improve patient outcomes is by "early ambulation" in the post-operative period, i.e., getting them up and walking as soon as it is medically safe to do so. Although early ambulation is a widely accepted best practice, delayed ambulation was standard practice through the 20th century and is still practiced in some facilities. With nurses being at the forefront of post-operative care, it is important that they are aware of the latest research on post-operative care. Therefore, we developed education material for nurses at the University of Cincinnati Medical Center that would evaluate perceptions of early-versus-delayed ambulation, train them on best practices, and evaluate changes in perception. The training program was informed by peer-reviewed articles including randomized control trials, systematic reviews, quasi experiments, and case studies from the past seven years. To gauge nurses' understanding of the topic, pre-and-post-tests are to be administered and assessed. The outcome of this program may inform the need for additional training for nurses on this topic.

Category F: Mitigating and Curing Cancer

F-01: Investigation of Potential Corresponding Human Proteins in Naegleria Amoeba
Great Hall
Eric Kniffen, Medical Laboratory Sciences
Project Advisor: Dr. Yoshi Odaka

Abstract
When humans contract Primary Amebic Meningoencephalitis (PAM) from freshwater amoeba Naegleria fowleri, death is almost always imminent. From 1962 to 2021, only 2.60% of people in the United States survived the infection, in part because there is no established mechanism to manage or cure PAM. In quest of potential drug targets to treat this disease, we have conducted a protein comparison search and identified CFTR (cystic fibrosis transmembrane conductance regulator)-like and BRCA2 (breast cancer susceptibility gene 2)-like genes in N. fowleri and Naegleria gruberi, a species of amoeba that does not lead to disease. In humans, a mutation in the CFTR protein results in cystic fibrosis, while a mutation in BRCA2 increases the risk of developing different cancers including breast and ovarian cancer. Due to safety reasons, N. gruberi was used for further experiments. Protein sequence comparisons revealed that human CFTR has 29.53% and 31.35% identities with the CFTR-like protein in N. gruberi and N. fowleri, respectively, and human BRCA2, on the other hand, has 29.66% and 27.27% identities with N. gruberi and N. fowleri, respectively. With this level of variation between the proteins in humans and the amoeba, eventual targeting of these gene products may have fewer adverse effects in humans. Importantly, our other data show the CFTR-like protein in both Naegleria species is phosphorylated at a different site from the human CFTR. Currently, we are investigating different gene expressions of CFTR-like and BRCA2-like gene transcripts in N. gruberi by a method called quantitative PCR.

F-02: Negative Surface Charge Effect on Surface-Enhanced Raman Scattering (SERS) Substrates for Cancer Biomarker Detection
Great Hall
Rachel Klare, Chemistry
Project Advisor: Dr. Pietro Strobbia

Abstract
Cancer detection is currently done in the form of biopsies. This is a technique that is normally for patients that are showing symptoms of cancer. Although this is a reliable way to detect cancer, current biopsies are invasive, and may be completed too late in the progression of the cancer. An alternative is the switch to liquid biopsies (blood or saliva samples), which are less invasive. Also, they could be done more easily and frequently for patients at risk but not showing any symptoms. By screening, we can have early diagnoses and find more effective treatment.Surface-enhanced Raman scattering (SERS) is a potential candidate to detect cancer in liquid biopsies from Raman-active cancer biomarkers. These biomarkers are present at low concentration in liquid biopsies, but they can be detected with sensitive SERS substrates. Therefore, SERS could be a less invasive alternative to tissue biopsies. In our lab, we are

testing this hypothesis by developing SERS substrates with gold nanostars coated with silver for plasmonic enhancement.In this work, we are determining what surface charge on the substrate helps our biomarker give the highest intensity. We tested substrates bare (no surface charge), with 6-mercapto-1-hexanol (neutral), and with 4-mercaptobenzoic acid (negative). For testing purposes, liposomes, an extracellular vesicle (EV), will be used in place of cancerous exosomes, a blood EV biomarker, because liposomes' Raman profile are well-known. Once the best surface charge is determined, substrates will be tested with exosomes, then clinical samples.

F-03: Fabrication and Characterization of SERS (Substrate-Enhanced Raman Scattering) Substrates for Cancer Biomarker Detection
Great Hall
Emily Kennedy, Chemistry
Project Advisor: Dr. Pietro Strobbia

Abstract
Surface Enhanced Raman Spectroscopy (SERS) proposes a less invasive solution to current diagnostics involving the detection of cancer. Using this technique to examine and perform liquid biopsies allows for more sample abundance and therefore a cheaper alternative to current methods. SERS is a sensitive technique that is able to detect very low concentrations and amplify the intensity to be examined. This is achieved by the preparation of gold nanostar substrates. These nanostars have a strong plasmonic enhancement which allowed for the observed peaks to appear high and intense. In addition to the nanostars, specific raman active chemicals are added to the substrate to examine the different peaks and intensities. This research is demonstrating how the surface charge of the substrate affects the response of the liposome. The specific chemicals and their charges being studied are that of 6-mercapto-1-hexanonal (neutral charge), cysteamine (positive charge) and a bare surface (no charge). To observe the effects of these charges, SERS is being used to detect and compare the specific peaks as well as the intensities of the differentially charged substrates.

F-04: Monitoring Reactive Oxygen Species from Sonodynamic Therapy Using Nuclear Magnetic Resonance
Great Hall
Ben Krieg, Biochemistry
Project Advisor: Dr. Peng Zhang

Abstract
There are many benefits to monitoring reactive oxygen species, one of which is cancer treatment. During cancer treatment the goal is to increase the levels of reactive oxygen species to kill the tumor cells. Sonodynamic therapy is a method used in cancer treatment which involves sending ultrasound to the tumor cells. The ultrasound interacts with photosynthesizers and causes the reactive oxygen species to react in one of two different ways. To observe the effects a reactive fluorine-containing compound was added to solution to serve as a probe for 19 fluorine nuclear magnetic resonance. The reactive oxygen species reaction was monitored over different amounts of time to gauge the progress of the

reaction. The results showed that after the ultrasound was applied over time, there was a detectable reaction. To verify these results, different photosynthesizers were used and other possible fluorine compounds. The deliverance method of the ultrasound was also measured by using different mediums such as glass, plastic, and direct contact. This work demonstrates the effectiveness of 19 fluorine nuclear magnetic resonance in monitoring reactive oxygen species.

F-05: Precise Enumeration of Microbiome for Imaging and Bacteriotherapy Using BactoBox
Great Hall
Nupur Mallick, Biological Sciences
Project Advisor: Dr. Nalinikanth Kotagiri

Abstract
The purposeful reengineering of bacteria or their products for treating an illness is often referred to as bacteriotherapy. Forms of bacteriotherapy include the use of probiotics, fecal matter transplants, and intestinal bacterial transplants to restore healthy microbiota. The rapid development of genetic technologies has enabled the engineering of intelligent microbial delivery systems for therapeutic applications. Furthermore, synthetic biology has generated numerous exemplary circuits controlling bacterial growth and gene expression. A multitude of studies on cancer has shown that systemic administration of bacteria results in the selective colonization of tumors providing a convenient opportunity for tumor drug delivery. With the converging advancement in immunotherapy and synthetic biology, probiotic bacteria have been engineered and harnessed for the local and controlled release of therapeutics. However, due to the safety and acceptability, it is paramount to precisely formulate the bacterial doses. Although bacteria are routinely utilized for these treatments, there's no convenient technique apart from laborious, time-consuming, and semi-accurate plate count technique for measuring bacteria. Thus, it is difficult to formulate therapeutic bacterial doses with precise reproducibility. We have evaluated and optimized a time- efficient technique for precise enumeration of intact cells for in vitro and in vivo samples using an instrument, BactoBox. It utilizes a cultivation-independent method based upon impedance flow cytometry principle, that achieves an efficient process without compromising quality. Due to its fast measurements, the chance of contamination is negligible. We developed this workflow aiming to utilize it for all the downstream projects in our laboratory, where we routinely use engineered bacteria.

F-06: The Benefits of Acceptance and Commitment Therapy (ACT) on Adult Oncology Patients with Cancer-Related Trauma
Great Hall
Kaitlyn Smith, Nursing
Kevin Bisbing, Nursing
Taylor Moran, Nursing
Project Advisor: Dr. Paul Lewis

Abstract

According to the American Cancer Society, there are nearly 2 million new cancer diagnoses each year and up to 80% of cancer survivors report some degree of negative psychological symptoms related to their diagnosis. These symptoms commonly manifest as anxiety, depression, and fear of recurrence and can be more difficult for patients long-term than the physical effects. The purpose of this project is to educate nurses on how to promote healthy coping mechanisms in adult oncology patients through the framework of Acceptance and Commitment Therapy (ACT). ACT is designed to promote psychological flexibility and reduce maladaptive coping in the face of life's challenges; accepting circumstances and living mindfully. A group of adult oncology nurses received education and training via PowerPoint on the basics of ACT and strategies on how to implement it into their practice. A handout was also provided for reference and distribution to their unit. A pre- and post-test were administered to gauge the level of learning achieved and evaluate the likelihood of utilization of ACT strategies in that care setting. [Results pending]

F-07: Monitoring the Effects of Cholesteatoma Treatment Utilizing Auditory Brainstem Response Testing

Great Hall
Katelyn Mitchell, Speech Language Hearing Sciences
Project Advisor: Dr. Brian Earl

Abstract
Cholesteatomas are cyst-like growths in the middle ear that result in hearing loss, ear drainage, facial nerve paralysis, and meningitis. Surgery is the standard treatment for patients that are diagnosed with these growths. Virotherapy is currently being investigated as a non-surgical treatment for reducing the size of cholesteatomas and extend the quality of life. Previous research has shown promising results that virotherapy may eradicate malignant melanoma, prostate cancer, and sarcomas. The treatment is performed by presenting a series of injections to reduce the size of the cholesteatoma. When surgical procedures are utilized for treatment, the reduction in size contributes to greater results in removal of the cholesteatoma. In this model, researchers have detected a significant change in size of cholesteatoma. The treatment can be used in combination with surgical intervention to reduce the recurrence of cholesteatomas. In this study, the gerbil model is utilized to explore the impact of cholesteatoma and long-term treatment with virotherapy on the inner ear. A technique called auditory evoked potentials via bone conduction is used to bypass the ear canal and middle ear to assess the inner ear directly. This procedure involving stimulation of the skull with vibratory energy was used to evoke verifiable responses from the inner ears of five gerbils. Gerbils were selected as the test subject due to the similarities in anatomy to humans. Ultimately, the purpose of the study is to extend a clinical technique for assessment of inner ear acuity in an animal model of cholesteatoma receiving virotherapy.

F-08: Treatment of Chemotherapy Induced Nausea and Vomiting

Great Hall
Hailey Jenkins, Nursing
Anna Koenig, Nursing
Meg Merchant, Nursing

Project Advisor: Dr. Paul Lewis

Abstract
Nausea and vomiting are one of the most feared and common side effects that chemotherapy patients endure during their treatment. Not only does nausea and vomiting affect a person's physical health, but it is also associated with decreased mental health and it is known to be one of the most prominent side effects to diminish one's quality of life. The purpose of this project is to present information regarding chemotherapy induced nausea to registered nurses working on an adult oncology floor. We conducted a literature search to better understand interventions that are used in current practice to reduce chemotherapy induced nausea and vomiting. We will present our findings to the nurse educator and bedside nurses on an adult oncology floor through an educational pamphlet and powerpoint presentation explaining the positive effects of complementary therapy in nausea treatment. A pretest and posttest will be administered to determine the knowledge change. Will education on complementary therapy for chemotherapy induced nausea and vomiting improve nurses knowledge? Results pending, but a positive knowledge change regarding current practice guidelines for the treatment of nausea in cancer patients is anticipated. Evidence based literature suggests that a combination of alternative therapies and medications to prevent nausea provide the best results for treating chemotherapy induced nausea and vomiting in adult cancer patients. It is important to control nausea and vomiting in cancer patients because it raises their quality of life.

F-09: Early Palliative Care in Cancer Patients

Great Hall

Emily Blosser, Nursing
Dana Godsey, Nursing
Hannah Olmsted, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
Palliative care provides comprehensive symptom management and psychosocial, spiritual, and emotional support to cancer patients and their families from the time of diagnosis to advanced disease onward. This type of care is only found in 61% of hospitals with over 50 beds according to the Center of Advanced Palliative Care. The purpose of this project is to evaluate the literature related to early palliative care interventions and educate oncology nurses to answer the following question. Does educating oncology nurses enhance their knowledge about early palliative care implementation? The literature dictates that the expansion of palliative care programs and the implementation of early interventions, in comparison to end of life care, has the potential to improve patient outcomes with regards to emotional coping, symptom management, and acceptance of prognosis. This information was presented to a group of specialized cancer nurses at University of Cincinnati Medical Center, who were provided with a PowerPoint education session regarding the material. A pre- and post-test was administered to evaluate knowledge after the educational presentation. Resources specific to UCMC were discussed to best equip nurses and staff members with ways to incorporate early palliative care. The outcome of the intervention is pending, but we anticipate increased knowledge about palliative care implementation. Educating nurses on the importance of early palliative care can enhance patient quality of life and improve oncological nursing practice.

F-10: Using Fabricated Electrochemical Biosensors in the Detection of Damaged DNA

Great Hall
Sylmira Andrew, Chemistry
Project Advisor: Dr. Ryan White

Abstract
DNA damage can lead to genome instability, altered cell behavior or cell death. DNA damage such as double- and single-stranded breaks can be the result of exposure to chemotherapy, DNA replication stress, UV radiation, and even tobacco smoking (Paquim, Brett, 2021). Knowing how damage to DNA affects the productivity of the inner workings of the cell, it is important that the method of detection and quantification of the DNA damage is effective. Some methods that have been employed in the detection and quantification of damaged DNA are high-performance liquid chromatography with electrochemical detection, HPLC along with Mass Spectrometry and gas chromatography-mass spectrometry. Electrochemical sensing with modified electrode surfaces gained popularity in the sensing of DNA damage because of their low detection limit, high sensitivity and selectivity, and easy miniaturization capabilities (Paquim, Brett, 2021). The need for rapid, easy, and low-cost detection methods are needed for complex samples such as urine, blood, and tissue samples. The electrodes that'll be used in this research are aptamer-modified electrodes. Aptamers are sequences of nucleic acid or peptides from a random sequence pool. Nucleic acid aptamers are highly structured DNA/RNA sequences (Paquim, Brett, 2021). Aptamers have great molecular recognition by modifying their structure once bound to the surface of the electrode (Paquim, Brett, 2021). Electroanalytical methods show promise in the detection and quantification of DNA damage and in this project the detection of specific amounts of damaged DNA and the behavior of the damaged DNA at the electrode surface will be studied.

Category G: Health and Body

G-01: Early Identification of Urinary Tract Infections utilizing McGeers Criteria within Long-Term Care Facilities

Great Hall
Alicia Shepard, Nursing
Sarah Fissel, Nursing
Jenna Borellis, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
Urinary tract infections (UTIs) are microbial invasions of the urinary system and are the leading cause of infection in long-term care facilities (LTCFs.). UTIs present with various signs and symptoms like fever, chills, and mental or functional status changes, etc. Another related issue faced by LTCFs is the differentiation between UTIs and asymptomatic bacteriuria (ASB.) ASB is the presence of bacteria in a urinary sample without UTI symptoms; which rarely requires treatment. ASB is problematic when

inappropriate antibiotic treatment, causes opportunistic infections, antibiotic-resistant organisms and superinfections for patients like Clostridioides difficile colitis. Healthcare personnel in LTCFs have utilized the McGeer Criteria to identify early signs of UTIs. The PICOt question used was "Are long-term care residents whose nursing staff uses the McGeer criteria diagnosed earlier compared with those with standard practice of clinical nursing assessment without a formalized tool over one week?" The aim of this project is to evaluate the effectiveness of an educational intervention on the use of the McGeer criteria as an early identification tool of UTIs. The LTCF staff was given a week to view a recorded video of an educational intervention introducing McGeer UTI Criteria, which was preceded by a pretest and succeeded by a posttest to evaluate its effectiveness.The outcome will help LTCF staff with early identification of UTI and differentiation from ASB to prevent the overprescribing of antibiotics, improving patient outcomes overall. The expected outcome is that staff will become more competent at identifying UTIs and communicating with healthcare providers.

G-02: Preventing Nurse Injuries Related to Direct Patient Care

Great Hall

Shannon Cavanaugh, Nursing
Emily Rives, Nursing
Lili Steller, Nursing
Project Advisor: Dr. Paul \Lewis

Abstract

Bedside nurses are at an increased risk of musculoskeletal injury resulting from patient handling and lifting. The prevalence of work-related musculoskeletal disorders (WRMSDs) among nurses was reported as being 73%. This negatively impacts patient outcomes, staffing due to injury time off, and potentially leads to chronic pain issues. The question the project is seeking to answer is, does education on assistive devices, body movements and exercises decrease nurse musculoskeletal injury. The purpose of our project is to educate nurses on the use of assistive devices, muscle strengthening exercises, and proper lifting techniques to decrease the risk of musculoskeletal injury for bedside nurses. We created an education session, after completing an extensive literature search, to present to registered nurses at Bethesda North. An information handout was created and lecture slides were used to present the information. The nurse's knowledge was assessed through the use of a pre and post test to determine the effectiveness of teaching. The education session should result in improved knowledge among nurses on lifting techniques and proper body mechanics. The outcome of the work will decrease nurse musculoskeletal injury leading to better patient outcomes and decreased nurse burnout.

G-03: A More Efficient Way of Managing Glycemic Control in Diabetic People

Great Hall

Susan Dorrell, Nursing
Kennedy Matejka, Nursing
Mariah Brumer, Nursing
Project Advisor: Dr. Paul Lewis

Abstract

Hemoglobin A1c is currently the "gold standard" used to assess long term glycemic control in diabetics. Time in range (TIR) is an alternative, more reliable method used to assess glycemic control by determining the percentage of time spent in the target glucose range (70-180 mg/dL). TIR is measured via continuous glucose monitoring (CGM) and offers benefits that Hemoglobin A1c lacks such as convenience, improved accuracy, and the ability to assess hypoglycemia. The purpose of our capstone project is to educate Type 1 diabetic families using CGM about the benefits of using TIR vs Hemoglobin A1c, therefore, advocating to utilize TIR at home to manage the chronic disease rather than the traditional use of Hemoglobin A1c. Our project sought out the evidence through a thorough literature search. Using this evidence, we developed an educational seminar to present to families of Type 1 diabetics with a powerpoint presentation and an educational brochure. Our pretest and posttest will measure knowledge gained and willingness of patients to change their own practice. Our outcomes are pending as we await to present our research findings. As a group, we have learned to be more in touch with issues that do not directly affect us, but affect our loved ones. We, too, can use our voices and education to advocate for changes that will benefit diabetics, including our fellow group member Annabelle Gonnella.

G-04: Using Multiple Education Styles to Decrease the Rates of Bloodstream Related Infections on Pediatric Intensive Care Units

Great Hall
Libby Rismiller, Nursing
Jessica Rocha Torres, Nursing
Kelsie Ayers, Nursing
Project Advisor: Dr. Fuad Alhorani

Abstract

Being up to date on education is an important skill that nurses must practice. If a nurse falls behind on their education, this can put patients at an increased risk for injury, infection, or even death. Specifically, the lack of proper teaching for the care of centrally located intravenous lines can increase a patients risk for possible fatal infections. A central line is an intravenous line that brings medication straight to a patient's heart. If this line gets infected, this can drastically affect a patient's overall health and their healing process. Our project's purpose is to expand on the various learning styles that can be used for care of central lines with the goal of decreasing the rate of infections within the pediatric intensive care unit setting. A literature review was conducted on the number of central line associated bloodstream infections, otherwise called CLABSI's, within a pediatric ICU setting and how increased education compliance can reduce those numbers. After literary evidence was gathered, an education session was created for pediatric ICU nurses, utilizing audio, visual, and tactile teaching methods to reach all audiences. The session included a poster presentation, as well as training mannequins for hands-on practice, with the intention of finding the best learning style to improve compliance with central line care standards. A pretest-posttest method was used to determine the understanding of the nurses participating in the session. Results are still pending, but the information gathered will help further the understanding of the goal of this project to learn if the use of multiple education styles increases compliance and helps decrease the rate of CLABSIs for pediatric patients with central lines.

G-05: Effects of Antibiotics in Early Life on Lung Immune Cells in Mice

Great Hall
Cameron Willey, Biological Sciences
Project Advisor: Dr. Hitesh Deshmukh

Abstract
Antibiotics are commonly prescribed to both pregnant women and newborns to prevent life-threatening infections. However, antibiotics can have negative effects on lung health. In newborns, early-life commensal bacteria (microbiome) help shape the immune response in the lungs. Antibiotic exposure can disrupt this early-life microbiome. Of the several immune cells within lungs, the focus of this study is on alveolar and interstitial macrophages. These macrophages defend the lung tissue against pathogens, and remove debris when needed. Antibiotics affect macrophages by driving them towards an inflammatory response, however, the underlying mechanisms for this are not completely understood. In response to infection, macrophages are known to release chemicals that alert the immune system to invasion of foreign molecules (example being TNF-alpha). In order to detect how antibiotics affect production of these alert chemicals, macrophages were obtained from an established mouse model. The model consisted of pregnant mice exposed to an antibiotic cocktail (vancomycin, gentamicin, and ampicillin). Lungs from antibiotic-exposed and control mice were harvested at post-natal day 5 or adult (>28 weeks) time points for subsequent macrophage isolation. An ELISA was used to quantify the release of TNF-alpha. It is hoped that the findings will provide a clearer indication of how antibiotics affect alveolar and interstitial macrophage function, as indicated by TNF-alpha release and overall cell number. While antibiotic administration is an intervention that cannot be dismissed, the aim of the study is to better understand how these cells are impacted, and how these impacts could be addressed by better interventions moving forward.

G-06: Effectiveness of Various Performance Drinks During a Timed Running Task

Great Hall
Rory Koehl, Health Science
Jeffrey Tuttle, Health Science
Jingyuan Tan, Health Sciences
Project Advisor: Dr. Susan Kotowski

Abstract
It is well known that proper hydration is a key component to exercise performance and recovery. With numerous performance drink options available off-the-shelf, many consumers are left to wonder which is best given there is a wide variation in terms of carbohydrates, electrolytes, and other components contained in each. This project aimed to evaluate the effectiveness of different performance drinks on performance during a running task. Participants were 5 females and 5 males age 20-25 who exercised regularly. Participants consumed either water, Powerade orange, or Gatorade Perform 02 series orange prior to each trial. Running trials were performed on an indoor track for consistency. Each test was performed with a minimum 5-day rest before the next trial. Participants began by warming up on an

exercise bike for 10 minutes then rested for 30 minutes. The specified beverage was consumed during the first 5 minutes of the rest period. Each subject was also given an RPE questionnaire to assess their exhaustion level after the warm-up bike ride. Each patient then completed a 10-minute run on the indoor track with the goal to complete as many laps as possible within that time frame. All runners started at the same starting point and were instructed to stop once the 10 minutes expired. The number of laps completed was recorded along with a final RPE rating. The outcomes of this project may help provide some insight into the most effective type of hydration during a cardio-based task in a young adult population.

G-07: Effects of Abdominal and Back Muscle Fatigue on Balance and Core Stability

Great Hall
Barath Vrishabhendra, Health Science
Chase Flora, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract
From the articles we have studied, core strength has improved from activities that work your lower back. Working the muscles in the lower back showed significant improvement to core stability when the muscles were focused on. Muscle regulation showed very great improvement when working with the lower back and had very great improvements on core stability. The articles found for core stability were about abdominal fatigue or back muscles fatigue, rather than combining the two together. The purpose of this project was to evaluate both abdominal back muscle fatigue, and testing how long it lasts between trials. The methods of this study included measuring balance as a quantitative factor, and having participants rate their individual RPE, fatigue, stability, and difficulty of the task as the qualitative factors. Participants were healthy college-aged individuals with no health conditions that would prevent them from completing the exercises, no current pain, and no history of balance issues. Participants were asked to perform a timed plank and supported back lifts until fatigue. Then the participants were to do six tests: a functional reach with both dominant and nondominant foot, a toe touch with dominant and nondominant foot, two eyes open force plate balance tests (one with foam), and two eyes closed force plate balance tests (one with foam). The functional reach and toe touch are performed twice, and the others are performed once. Participants then rate the difficulty from 1-10 and their stability 1-10. The results of this project will help better understand back versatility.

G-08: Consequences of Lower Extremity Fatigue on Balance in Young Adults

Great Hall
Erika Myrwold, Health Science
Anna Fenker, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract
Muscle fatigue is a common risk factor for falls and slips. Literature has shown that muscle fatigue directly affects movement response, increasing the likelihood of delay. There have also been findings

between fatigue and dynamic balance, which displays that muscle fatigue decreases stability in balance. Based on the literature, further investigation into muscular fatigue and static balance is needed. This study's aim was to evaluate balance before and after cycle training, recovery and balance. The methods of the research included quantitative measurements of balance, time, strength and qualitative evaluation of RPE and fatigue. Participants were healthy college students aged 18-25. This study was composed of 10 female and 10 male students. Participants were asked to rate their RPE 1-10 and fatigue 1-6 throughout the study as each student performed balance trials on a force plate, timed up-and-go, and rode a bike with resistance correlated to their weight. Data will be evaluated to compare population differences, balance before and after bike performance, and recovery time performance. The results of this project will help to better understand the relationships between balance, recovery, and fatigue. When these relationships are understood, this study can be applied to larger populations beyond the scope of college students, such as adult populations and the geriatric population. Older populations are at the highest risk for falls and slips, but with comprehension of muscle fatigue, injuries and accidents may be prevented.

G-09: The Effect of Local Application of Cooling Devices on the Core Muscle Activation in Young Adults

Great Hall

Christina Soriano, Health Science
Luke Frondorf, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract

Previously, it has been found that lowering core temperature via external cooling enhances overall exercise performance during aerobic exercise more than anaerobic exercise. Additionally, it has been found that lowering core temperature via external cooling influenced EMG amplitude of wrist muscles while performing isometric exercises. Core muscle activation is another important component of exercise performance, and research on how cooling affects EMG amplitude of this muscle group is lacking. Therefore, the objective of this study was to investigate the relationship between core temperature and core muscle activation. Activity of the bilateral rectus abdominus and erector spinae muscle groups were measured via surface EMG during a treadmill walking task. Three incline positions were tested - flat, 5% grade, and 10% grade. Two different skin temperature conditions were tested - normal and cooled. The cooled skin temperature condition was achieved by placing ice packs on the front and back of the trunk for five minutes prior to the exercise task. Muscle activity was evaluated during the walking task as was a Rating of Perceived Exertion. The order in which the three walking tasks were completed was randomized, while the uncooled condition was always completed first, followed by the cooled condition. Muscle activity was calculated as a %MVC (maximum voluntary contraction) and muscle activity and RPE ratings were compared between conditions to determine if there were differences between groups. The results of this study will contribute to a better understanding of ideal conditions for maximizing core muscle activation in performance and rehabilitation settings.

G-10: The Impact of Physical Fitness Level on Heart Rate Recovery

Great Hall
Alexis Sampson, Health Science
Georgia Laird, Health Science
Katherine Connolly, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract
It is well established in the literature that exercise, whether resistance training or cardio focused, is an effective method of improving cardiovascular health. Improved cardiovascular health can lead to increased lifespan and reduced incidences of health issues including high blood pressure, stroke, diabetes, and certain cancers. However, it is unknown what level of physical fitness is required to improve cardiovascular health. One simple measure used to evaluate cardiovascular health is heart rate recovery, or how quickly the heart rate returns to resting state after exercise. So, the purpose of this project was to evaluate how physical fitness level impacts heart rate recovery. Participants were healthy college aged individuals. Resting heart rate was obtained while the participant was seated, and max heart rate was calculated using a gender adjusted equation. Participants began by walking on a treadmill at an initial speed of 3mph at a 2% grade. The speed and grade were increased by 1mph and 1%, respectively, each minute. This continued until the participant reached their max heart rate at which time the subject also gave a Rating of Perceived Exertion (RPE). Immediately after the completion of the trial the subject was seated and heart rate was monitored until it returned to resting level. Data will be evaluated to compare the difference between various physical activity levels on heart rate recovery time. The results of this project will help to better understand how to improve cardiovascular health through exercise training.

G-11: The Effectiveness of Static vs. Dynamic Stretching on Counter Movement Jump Height

Great Hall
Todd Pilkington, Health Science
Tucker Ayers, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract
Previous studies have shown that regardless of age, gender, or training status, pre-exercise static stretching causes acute decreases in some muscular performance parameters such as maximal muscle strength and explosive muscular performance. It has also been found that the negative acute effects seem to diminish with shorter stretch durations. However, the effects of pre-exercise dynamic stretching on muscular performance parameters have mixed results in the literature. Based on previous research, further investigation is needed to compare shorter pre-exercise static stretching durations and pre-exercise dynamic stretching on muscular performance. Therefore, the purpose of this project was to examine the effects of shorter pre-exercise static stretching protocols vs. pre-exercise dynamic static stretching protocols on countermovement jump height (CMJ) in healthy young adults. The methods used included quantitative measurement of CMJ height (inches), and qualitative measurements of fatigue. A baseline jump was recorded for each subject at onset of the study. Participants were asked to

go through both a series of static stretching protocols twice, holding each stretch for 15 seconds, and a dynamic stretching series twice for 10 repetitions each on separate days. After each stretching protocol, subjects completed 3 CMJ on a jump mat which calculated height in inches, and height was measured in inches. After the last trial of the entire experiment, qualitative questions were asked. Data was evaluated to assess the difference between the pre-exercise stretching protocols on vertical jump performance. The results will help better understand how to make more effective jumping workouts.

G-12: What is the Relationship Between Dynamic Balance, Ankle Mobility, Grip Strength and Cognition in Healthy, Older Adults?

Great Hall

Jacob Oney, Health Science
Mike Vannest, Health Science
Ellen Moss, Health Science
Project Advisor: Dr. Rachel Gleason

Abstract
Introduction: It is well documented the older adults have an increased risk for falls and falls in the older adult can have detrimental impact on function, quality of life and morbidity. Literature has shown a relationship between balance, cognitive function and dual tasks. In particular, the Four-Square Step test has been correlated with the Trail-Making Test in patients with Parkinson's Disease. Understanding the relationship between balance and cognitive function is important for healthcare providers in identifying increased fall risk in older adults.Purpose: This project's purpose was to determine the link between dynamic balance, ankle mobility, grip strength and cognitive ability in heathy community dwelling older adults. Methods: Subjects in this project were healthy, older adults aged 50 and older. Participants completed several outcome measures including the Trail-Making Test (TMT) Parts A & B, the Four-Square Step Test (FSST) with and without a dual cognitive task, and an obstacle course. Additionally, ankle range of motion (ROM) and grip strength were assessed. Discussion: Project limitations include small sample size and age of subjects. Other considerations to be addressed in future studies include assessing subjects for previous injury, determining current medications, and fall history. Further research into this topic can help health care professionals have a better understanding of the relationship between cognitive and physical function to help identify fall risk.

Category H: Ecosystems and Biodiversity

H-01: Botanical Remains from a Mayan City Suggest Plant Domestication and Forest Management

Great Hall

Will Broomhead, Biological Sciences
Project Advisor: Dr. David Lentz

Abstract

An increased understanding of humanity's rich and diverse cultural heritage can cultivate an appreciation for those who came before us and a desire to preserve the knowledge they developed. The Mayan city Aventura existed in current Belize from approximately 250 – 1697 CE. This study aims to better understand how residents of Aventura grew their food and utilized plants in their everyday life. The site analysis utilizes two main botanical sample types: charcoal and float samples. The charcoal was imaged using a scanning electron microscope that allowed for the analysis of microscopic anatomical features of charcoal and allowed us to identify the family, genus, and species of plants present. Images were then cross-referenced with the InsideWood database and reference samples collected previously. The float samples yielded seeds and other plant remains which allowed for species identification for the area. The species at this site suggest the cultivation of domesticated species and the management of forest ecosystems by the Maya inhabitants at Aventura. Understanding these interactions allows us to better understand Maya subsistence strategies and how the city of Aventura operated.

H-02: Rain Gardens: Bringing Urban Solutions to Suburban Residents

Great Hall
Abigail Rathers, Environmental Studies
Katie Kissner, Environmental Studies
Sean Pettit, Environmental Studies
Project Advisor: Dr. Teri Jacobs

Abstract
This project reviews foundational knowledge relating to rain gardens to assess best practice methods and produce an instructional guide on their design for homeowners. The review was organized around rain gardens, their function as a low impact development method (LID), soil composition, plant selection, and community outreach. Additionally, a rain garden at the University of Cincinnati Center for Field Studies was used as a site to assess, redesign, and eventually update based on knowledge gained from the literature review. Implementing the resulting design would allow for better rain garden functioning at the field studies center and become an example for homeowners wanting to adopt a LID of their own.

H-03: Does the Addition of Oyster Mushrooms to Soil Regulate PH?

Great Hall
Elise Brown, Biological Sciences
Project Advisor: Dr. Danielle Winget

Abstract
The effect of Pleurotus ostreatus (oyster mushrooms) on soil pH was studied in a soil compost mixture in lab as well as in the field. In lab, the mixture was autoclaved before beginning. The study consisted of three parts. Firstly, 12 pots with fungi and 12 pots without fungi were divided and watered at pHs 6.1,7.4, and 8.4 with soil pH to be observed. Initially as well as Mondays, Wednesdays, and Fridays each pot was given 50mL of water at pH accordance. Next, soil pH was measured in natural habitat at the Cincinnati Nature Center. Five fungal sites were chosen, and soil pH was collected within 5 meters.

Finally, 16 pots with fungi and 16 pots without fungi were divided and given soil manipulations to view any change in soil pH at inclusion of Pleurotus ostreatus (oyster mushrooms) in the lab. Initially as well as Mondays, Wednesdays, and Fridays each pot was given 50mL of watering.

H-04: Gene Expression Analyses of Kissing Bugs during Mite Infestation

Great Hall
Alina Cemal, Biological Sciences - Cell & Molecular Biology Concentration
Project Advisor: Dr. Joshua Benoit

Abstract
Triatomine insects, also known as kissing bugs, serve as hosts for American trypanosomes, resulting in significant disease burden in vertebrates. Parasitic mites will target insect hosts, where mites feed on the arthropod to sustain their nutrient reserves and provide resources for mite reproduction. This feeding, while necessary for the mite's survival, likely occurs at the expense of their insect host. We examined the gene expression of Triatoma gerstaeckeri infested with mites (Pimeliaphilus sp.) and an unaffected group using Illumina-based RNA-seq analyses, which was followed by targeted measurement of nutritional reserves between the two groups. We analyzed Nf-kB genes, which are responsible for regulating inflammatory responses. These genes were chosen to analyze effects of altered immune function. Our results show increased expression of inhibitors of NF-kB proteins and those that underlie processes involving protein and nitrogen metabolism during mite infestation. In addition, a decreased expression of genes associated with microtubule activity and NF-kB genes was observed. The results from the RNA-seq analyses conducted are supported by a decline in protein levels for infected mites, suggesting a distinct nutrient reserve reduction in mite infested kissing bugs. These studies can provide critical information on the potential use of mites to impact kissing bugs to alleviate transmission of vector-borne diseases.

H-05: Intraspecies Differences in Sleep and Activity Profiles in the Yellow Fever Mosquito, Aedes aegypti

Great Hall
Evan Smith, Biological Sciences
Project Advisor: Dr. Josh Benoit

Abstract
Behavioral and postural analyses have shown evidence for sleep-like states in mosquitoes, similar to what has been reported in other arthropods. Specifically, sleep restriction impairs blood-feeding propensity and host landing in this disease-causing vector. Prior studies reveal that differences exist in the amounts of activity and sleep among different mosquito species. However, no study has evaluated the differences in sleep and activity profiles that might occur within population of the same species. In this study, we quantified the activity levels and sleep profiles of multiple lines (N=17 populations) of Aedes aegypti, collected from different geographical origins. Sleep and activity profiles among lineages were evaluated in relation to aspects of mosquito biology, such as host preference, that could explain variations among these lines. Our studies reveal differences amongst the lines in daytime activity,

nighttime activity, daytime sleep, and nighttime sleep, as well as the number and duration of sleep bouts. However, host preferences or other biological parameters failed to explain the differences reported among the lines. These studies provide evidence for intraspecific differences concerning sleep/activity profiles for mosquitoes, and factors such as geographical origin could directly impact these behaviors.

H-06: A Citizen-Science Approach: Testing the Effect of Native and Non-Native Milkweed Species on Monarch (Danaus plexippus) Development in the Midwestern United States
Great Hall
Kaitlyn Reimer, Biological Sciences and Environmental Studies
Project Advisor: Dr. Theresa Culley

Abstract
In recent decades, the North American Monarch Butterfly (Danaus plexippus) population has faced a major decline. This is mainly a result of the decline of Milkweed (American Asclepias), which Monarchs rely on for their spring breeding. Thus, the restoration of native milkweed is vital for the survival of Monarch populations. Many conservation groups have run to the aid of this species, and the movement to save the butterflies has easily caught traction, thanks to the species' iconic reputation. The citizen science approach has been leading the fight to preserve Monarch populations in the Midwest, through both the restoration of the native milkweed populations and the indoor raising and eventual release of Monarchs. This study aimed to mimic the conditions that these citizen scientists rear their monarchs in and compare the effects of different milkweed species on the growth and survival of the butterflies. The host plant species examined consisted of swamp milkweed (Asclepias incarnata L.), common milkweed (A. syriaca L.), butterfly weed (A. tuberosa L.), honeyvine (Cynanchum laeve [Michx.] Pers.), and non-native tropical milkweed (A. curassavica L.). Monarchs raised on swamp and tropical milkweed had the best growth and survival rates during each life stage, compared to the other plant host species. However, it is important to note that tropical milkweed is not native to the Midwestern United States and may create an ecological trap for Monarch migration patterns. Therefore, the species Asclepias incarnata L. is deemed uniquely fit for Monarch rearing and release in the Midwest.

H-07: Characterizing the Physical Differences between Urban and Non-urban Orange Sulphur Butterflies (Colias eurytheme)
Great Hall
Michael Giannuzzi, Biological Sciences and Environmental Studies
Project Advisor: Dr. Patrick Guerra

Abstract
We tested the hypothesis that butterflies will differ between urban and non-urban environments. Specifically, we predicted that butterflies in urban environments will be smaller than butterflies in non-urban environments, given the potential lack of resources for growth and development in urban environments relative to non-urban environments because of urbanization. To test our prediction, we examined the body size of orange sulphur butterflies (Colias eurytheme) caught in an urban

environment (Burnet Woods, Cincinnati, OH) versus those caught in a rural environment (University of Cincinnati Center for Field Studies, Harrison, OH). We used the thorax of butterflies (length, width, and height) as our metric for butterfly body size. We found that butterflies (both males and females) collected from the urban habitat were smaller than the butterflies from the rural habitat. Although we are unsure of the provenance of the monarchs examined in our study, our results do suggest that butterflies in urban environments are smaller than those from non-urban areas.

H-08: Influence of Reproductive State on Travel Distance in Female Wolf Spiders
Great Hall
Martin Werner, Biological Sciences and Environmental Studies
Project Advisor: Dr. George Uetz

Abstract
The goal of this research is to develop a better understanding of dispersal strategies in the wolf spider Schizocosa saltatrix. Previous studies have shown that other wolf spiders influence dispersal of offspring through increased movement when carrying spiderlings. Juvenile S. saltatrix were collected from the Cincinnati Nature Center and raised to maturity under lab conditions. Four treatment groups of females, representing different reproductive states, were tested: virgin females, mated females, females with egg sacs, and females carrying spiderlings. All trials were recorded and analyzed via the activity tracking program Tracktor® for differences in total distance traveled over a 10-minute period. The results show that mated females travel the greatest distance and females carrying spiderlings travel the least. Data on weight and body condition show that mated females weigh more and are in better condition than those in other treatments. Virgin females and females bearing spiderlings weighed less and were in the poorest body condition. This suggests that mated females may be "bulking up" on energy reserves to support egg development, which may allow them to travel greater distances. Results also showed significant negative correlations between distance traveled and weight, as well as body condition, for females carrying spiderlings. This suggests that spiders with depleted energy reserves may be constrained by the weight of spiderlings. This also suggests that mothers in poorer condition may be more likely to travel to seek food or may simply have less weight to carry (fewer spiderlings).

H-09: Preliminary Analysis for Potential Wetland Restoration in Hamilton, Ohio
Great Hall
Luke Zoeller, Biological Sciences
Project Advisor: Dr. Ken Petren

Abstract
Before European expansion, 1/5th of Ohio was wetlands. 90% of these wetlands have been destroyed or dried out to make way for human industry like agriculture, housing, and commercial use. Before human interference, Ohio wetlands hosted amphibians like the Green Salamander, waterfowl like the Sandhill Crane, and plants like Painted Trillium in great numbers. Today, those three species and many more wetland inhabitants are threatened in the state. In Ohio, ¼ of all plant species, ½ of fish species, ⅔ of bird species, and ¾ of amphibian species listed as threatened or endangered are associated with

wetlands. Wetlands play a critical role in water control and quality; the increase of impermeable surfaces from urbanization can cause more frequent and more powerful flooding events, which can be avoided by wetland and riparian zones acting as water storage. These areas also offer ecosystem services such as carbon storage and sequestration. In Hamilton County, farmland now owned by Hamilton County Parks shows potential for wetlands restoration. A successful wetland restoration in Hamilton County would bolster biodiversity in the area, protect some of our valuable waterways, and reduce net carbon emissions. Wetlands are delineated by the presence of a high water table, hydric soil, and aquatic vegetation. To test for these qualities, we will run soil percolation tests, analyze nutrient characteristics of the soil, and conduct vegetation sampling in a known wetland area and compare that data to that taken at the potential site.

H-10: Say Cheese: Using Camera Traps to Explore Urban Park Small Mammal Composition and Human Density Relationships

Great Hall
Madison Hartman, Environmental Studies
Project Advisor: Dr. Steve Matter

Abstract
Inherent to the design of any successful experiment are the ethical obligations of researchers. Designing experiments from an ethical perspective can also steer toward compliance to ever-changing social and legal expectations. Studies comparing the effectiveness of camera-trapping vs. live-trapping in a variety of habitats yields promising results. By utilizing this non-intrusive approach, we attempted to explore further relationships between small mammals and urban environments. Bearing in mind the importance of biodiversity to ever-diminishing urban greenspace, we investigated six urban parks with the goals of comparing rodent species abundance and diversity across additional human-related factors. By exploring the effect of human population density on overall small mammal composition we tested our prediction that small mammal species diversity negatively correlated with human population density.   Cameras were deployed in six urban parks throughout Cincinnati with varying human density levels according to census data to determine the species abundance and diversity of existing small mammals. We compared our results to an extracted local species pool and explored the effects on increasing human density in hopes to extract existing patterns between small mammal species composition and human density.

H-11: Age and Size Structure of Largemouth Bass, Crappie and Bluegill in a Small Urban Impoundment

Great Hall
Katie Marx, Biological Sciences
Project Advisor: Dr. Mike Booth

Abstract
Winton Lake, an Army Corps of Engineers-operated flood control project provides valuable recreational fishing opportunities in Cincinnati, OH. Because Winton Lake is a popular recreational fishing location,

analyzing the age structure and growth trends of gamefish species can provide pertinent data for fisheries management. Our goal was to survey a variety of gamefish species, including Largemouth Bass, Black and White Crappie, and Bluegill to analyze the relationship between age, size structure and body condition of the populations within Winton Lake. Largemouth Bass were collected in the May 2022 through boat electrofishing, and Bluegill and Black and White Crappie were collected in November 2022 with fyke nets attached to the shoreline. Age data from each species was collected through extracting and aging otoliths under a microscope. Age, size structure and body condition for each species were analyzed by creating age-length keys for all aged fish in Program R, which were then used to assign ages for all sampled fish of interest. We found growth patterns typical for Largemouth Bass in this region, whereas growth functionally stopped after age 3 for Black and White Crappie. Relative weight, a measure of body condition, was healthy for Largemouth Bass, but relatively poor for Crappie and Bluegill. These data suggest that there are competitive interactions in Winton Lake limiting food availability, which could impact the success of the fishery in the future. These results will allow fisheries managers to design new strategies to foster healthy fish populations in this reservoir for recreational fishing.

Category I: Community and Cultural Connections

I-01: Access to Nature: Benefits & Barriers for Urban Youth

Great Hall
Alyssa Polito, Social Work
Project Advisor: Dr. Gary Dick

Abstract
Urban youth face disproportionate barriers in their access to the outdoors and ability to connect with nature. There are a number of physical, mental, and emotional benefits of recreating outdoors that our society is disconnecting from as the United States continues to be technology driven and focused. The questions that drove this project were "What are the benefits of having access to nature for urban youth?" and "What are the barriers preventing youth from having access to outdoor spaces?" A survey was given to youth to understand what they viewed as the benefits and barriers of spending time outside, how often they spent time outdoors, and if they felt that they had a connection with the nature. Every single youth surveyed selected at least one benefit of spending time outdoors with zero youth selecting "I do not see any benefits of spending time outdoors." More than half of the youth felt that they had a connection with the outdoors and all but one youth noted at least one barrier to spending time outside. As social workers, our purpose is to help eliminate barriers for our clients and improve their quality of life. This project will help social workers in furthering their knowledge of environmental justice, understanding the disproportionate barriers their clients face in their access to nature, and why this connection is crucial on the micro, mezzo, and macro level.

I-02: Fundraising Inventory for Resilient Communities Non-Governmental Organization

Great Hall
Shyla Hassett, Communication

Project Advisor: Dr. Michael Sharp

Abstract
Our project aims to aid the NGO Resilient Communities in streamlining the donation process and raising money for current projects. We will streamline the donation interface, create a clienteling list for future interns, and facilitate donations by creating donation request templates and reaching out to clients.

I-03: Understanding the Needs of LGBTQ+ Youth in the Child Welfare System

Great Hall
Andrew Franks, Social Work
Project Advisor: Dr. Gary Dick

Abstract
Within the United States, there is approximately 400,000 youth in the child welfare system. This study examines the LGBTQ+ youth in the child welfare system. These youth are overrepresented and their needs often go unnoticed. With the results collected, further exploration of the training and cultural competence that the social workers and caseworkers are receiving regarding this population.

I-04: The Effects of Child Abuse: Factors Resulting in Removal From the Home

Great Hall
Kimberly Noguera, Social Work
Project Advisor: Dr. Gary Dick

Abstract
Child abuse and neglect in the United States are common, with at least 1 in 7 children having experienced abuse in the past year. However, this is most likely an understatement due to the fact many cases go unreported. In the year of 2019, 1,840 children died in the United States due to abuse and neglect - according to state agencies, that's an average of five children a day. Advocating and informing parents about child abuse and its prevention will help them enhance their parenting skills to promote healthy development, as well as intervene to lessen the harm and prevent any future risks.

I-05: Breastfeeding Education: An Individualized Nursing Approach

Great Hall
Anna Fletcher, Nursing
Emma Jones, Nursing
Taylor Dorrington, Nursing
Project Advisor: Dr. Caroline Morrison

Abstract
Breastfeeding is strongly encouraged in the hospital setting through the Baby Friendly Initiative. According to the World Health Organization, breastfed infants have an increase in their overall health.

The Baby Friendly Initiative is the current policy to attempt to reach the World Health Organization's goals of at least six months of breastfeeding post-birth. Unfortunately, the CDC statistics show that goals for breastfeeding are not being met. Studies show that only 14.6% of mothers agreed that methods of breastfeeding promotion and education are currently excellent. Our purpose is to understand the literature on individualized breastfeeding education programs in order to enhance nurses' knowledge and the utilization of these techniques in their current practice. The question for this project is, how does educating nurses on breastfeeding techniques change nurses knowledge and comfort levels. We will inform nurses by presenting education techniques through a PowerPoint presentation, video media, and handout to engage different types of learners. Our results are pending, but we anticipate outcomes that reveal an increase in confidence to teach breastfeeding education. By educating nurses on individualized breastfeeding techniques, we hope to increase the number of infants that are breastfed.

I-06: Disparities of Health Care in HIV-Positive Males: Focus on the Latino Community
Great Hall
Maddie Long, Social Work
Project Advisor: Dr. Gary Dick

Abstract
When anyone in the world gets a positive HIV test it can be devastating if they have not researched treatment. Research shows that the Latino community is generally hesitant and scared to seek help from a healthcare professional. There are many research studies that show that healthcare disparities are prominent in minority communities and that there is stigma around HIV and knowing your status. This study examines the services from a program at the hospital, in the community, and free testing sites, to see what is working and what the disparities are for the Latino community. The data for the program shows how the Latino community is under-represented, as well as the disparities that they face. The outcome of the program and research study will help figure out a way to break the stigma in the Latino community and connect them to services.

I-07: The Impact of Changing Probation Officers on Probation Success in Hispanic Individuals
Great Hall
Jordan Crawley, Criminal Justice and Psychology
Project Advisor: Dr. Amber Petkus

Abstract
Past research has demonstrated the importance of frequent and supportive officer-probationer interactions in successful program completion (Jones & Kerbs, 2007). It has also affirmed that officer perception of discretionary power and the degree to which they enforce that power are both impactful forces upon supervision outcome (Ruhland & Scheibler, 2022). Probationers who are assigned to multiple officers over the course of their probation term may be more likely to have lower quality officer-probationer relationships due to the lack of established rapport with their officer, and therefore have a more likely chance to have their probation privileges terminated. This study seeks to address how assignment to more than one officer during an individual's probation term may impact successful

completion of community supervision. Administrative probation records collected in a southern Texas county for the Arnold Ventures' funded Community Corrections Fines and Fees Study (CCFF) are used for analysis. Changes to probation officer assignments are measured by the number of officers assigned to an individual during a single probation term; those with a single officer are compared to those with multiple officers. Probation success is measured as completion status (successful vs. unsuccessful) at the end of an individual's probation term. Unsuccessful probation completion is defined as 'maximum benefits,' revocation, or absconding. Individuals with active probation terms at the time of data collection are excluded from analyses. Jurisdiction, marital status, dependents, prior criminal justice involvement, offense seriousness, and offense type are also controlled for. Implications for the findings of this study will be discussed.

I-08: Black or Brown and Homeless
Great Hall
Karrington Rainey, Sociology
Project Advisor: Dr. Oneya Okuwobi

Abstract
Most minority groups, especially African Americans and Indigenous people, experience homelessness at higher rates than Whites, mainly due to long-standing historical and structural racism. The Greater Cincinnati Homeless Coalition is a unified social action agency to eradicate homelessness. Their macro-level advocacy movements focus on addressing systematic causes of homelessness to institute lasting, permanent change. The Coalition works with local officials, community groups, and individuals who have or are experiencing homelessness to prevent homelessness, fight for the rights of individuals experiencing homelessness, advocate for affordable housing, and fight against the criminalization of homelessness. However, this research project will focus on how the organization has effectively or ineffectively combated homelessness in BIPOC communities.

I-09: How Do Anti-trafficking Organizations and Victim Services Perceive Law Enforcement?
Great Hall
Valerie Suttman, Criminal Justice
Project Advisor: Dr. Valerie Anderson

Abstract
With the prevalence of human trafficking, it is important for anti-trafficking and victim service organizations to work collaboratively with local law enforcement agencies. However, prior research indicates that collaboration needed to prevent and prosecute trafficking offenders is lacking. Within law enforcement agencies there is a lack of education when it comes to human trafficking, which leads to less attention and resource allocation to address trafficking compared to other types of crime. This study aims to evaluate the relationship between law enforcement and anti-trafficking organizations/victim services and how law enforcement is perceived by anti-trafficking organizations and victim services. To better understand how anti-trafficking organizations and victim services perceive law enforcement, we will analyze data from a larger project that consists of interviews with criminal

justice actors and individuals who serve anti-trafficking agendas. The interviews will be analyzed using thematic analysis which is a qualitative analysis that examines themes within the data. The outcomes from this study may be used to help close the gaps found between law enforcement and anti-trafficking organizations and victim services.

I-10: How is Race Communicated by a Reproductive Healthcare Organization? Visual/Textual Content Analysis and Insights from a Black Woman DEI Administrator

Great Hall
Hope Johnston-Holm, Sociology
Project Advisor: Dr. Oneya Okuwobi

Abstract
Since the 2020 Black Lives Matter demonstrations, many healthcare organizations have increased their investments in Diversity, Equity, and Inclusion (DEI) initiatives to address on-going and historical race-based inequities. But what racial ideologies are these initiatives reflecting, and do they actually improve the everyday experiences of POC who are patients, healthcare professionals, or in the community surrounding a clinic? To gain insight on the matter, I did a content analysis on a Midwestern reproductive healthcare organization (RHO) for images or text regarding race from their Facebook and website. This analyzed RHO's external communications on race. I also interviewed a Black healthcare DEI administrative professional in RHO to understand internal communications on race. The outcome of my work will help shine a light on racialized experiences in healthcare to the sociological field of organizational racial ideologies. This project also furthers my understanding of nonprofit and DEI initiatives intended to address racial inequities.

AFTERNOON POSTER SESSION

Category A: Medical Frontiers

A-01: Improving Workflow Efficiency of National Registry Submissions in Pediatric Cardiology and Thoracic Surgery

Atrium
Manhar Suharwardy, Medical Sciences
Project Advisor: Dr. Danny Wu

Abstract
Medical registries are important component of learning health system. Through the use of such registries, healthcare workers can learn from previous and current practice. The use of registries has been common in pediatric cardiology field. However, submitting data to registries can be time-consuming and ineffective in terms of cost. Three studies were done focusing on the workflow when using cardiology registries in a heart institute. The registries were: IMPACT, PC4, and STS. This paper

reviewed these four previous studies (done in 2018) to pull out insights about design implications. A four-level strategy on optimization of the workflow of these registries is proposed here.

A-02: Developing a Machine Learning Model to Predict 30-day Readmissions in Neurological Intensive Care Unit (NSICU)

Atrium
Andy Gao, Medical Sciences
Project Advisor: Dr. Danny Wu

Abstract
Unplanned readmissions are costly to both the hospital and the patient. 30-day readmissions are thus an important measure for patient outcomes, especially in high-risk areas such as the neuroscience intensive care units (NSICUs). In this study, we used risk factors for 30-day NSICU readmission summarized from current literature to develop a well-performing predictive model using machine learning (ML). The results of this study have important implications in predicting 30-day NSICU readmissions to both improve NSICU patient outcomes and reduce hospital costs.

A-03: Elucidating Allosteric Regulation of Spastin through Machine Learning

Atrium
Abby Miller, Chemistry
Project Advisor: Dr. Ruxandra Dima

Abstract
Allostery broadly refers to the ability of a protein to undergo structural changes in response to ligand binding at a location other than its active site. This phenomenon regulates protein function and thus motivates the development of computational methods that can be influential in providing detailed mapping of allosteric sites. Microtubules (MT) are found in eukaryotic cells and have critical roles in various cellular functions. MT severing enzymes, such as spastin, generate internal breaks in MTs that allow for these cellular events to take place, and have been shown to cause neurodegenerative disorders when mutated. In the active severing form, spastin forms a hexamer in the presence of the ATP and tubulin carboxy-terminal tails (CTTs), but this assembly has yet to be fully understood. Here, we used molecular dynamics simulations of a spastin monomer in order to identify the allosteric responses due to ligand binding. We utilized Markov State Models to find that the allosteric mechanism of the monomer is dependent on the ligand present. Using machine learning classification approaches, we identified allosteric regions that showed significant changes in various biochemically-relevant properties due to ligand binding that matched with experimentally-known allosteric sites. Finally, we identified the monomer's preference towards initial binding of ATP and the desire for the monomer to form monomer-monomer interfaces when ligands were present.

A-04: Design and Fabrication of a Multiplexed Analytical Flow Cell: Decreasing the Costs of Neurotransmitter Research

Atrium

Nykia Caldwell, Biochemistry and Psychology minor
Project Advisor: Dr. Ashley Ross

Abstract

The purpose of this project was to produce a silicon flow cell capable of diluting for analysis four different molecules, such as the neurotransmitters dopamine, serotonin, and gamma-aminobutyric acid, on the same cell. This was done using the single-molecule flow cell created by the lab group, research and development done through AutoCAD, and analysis of the new flow cell's capabilities using COMSOL. The outcome of this work is a flow cell able to successfully dilute four different molecules on the same cell, which reduces the cost of materials used in making individual cells for each molecule to be analyzed and reduces the overall cost of research into neurotransmitters through diluting their concentrations to analytical amounts on the cell instead of having to buy pre-diluted neurotransmitters for analysis.

A-05: Successful Isolation of a Protein Involved with DNA Repair: A Crucial Step in Understanding its Role in Mitigating Cancer

Atrium

Angela Heintel, Chemistry
Project Advisor: Dr. In-Kwon Kim

Abstract

Cancer research has evolved to successfully isolating and understanding the role of cellular proteins involved with DNA repair. In order to mitigate cancer, specifically breast cancer, it is critical to gain knowledge on the molecules involved with repairing damaged DNA. DNA contains sequences that can later produce proteins, which are essential for organisms to carry out specific functions for survival and reproduction. A protein that is commonly researched is HPF1 (Histone PARylation Factor 1, which is a factor accessory for DNA damage response that can identify the specific region that needs to be repaired. Before completing experiments to understand reactions between HPF1 and other molecules, it is necessary for these proteins to be purified. Protein purification is a series of procedures that aim to isolate, or purify, a desired protein from a complex mixture. Some of the procedures involved in protein purification include bacteria cultivation of the protein of interest and liquid chromatography which separates molecules based on their specific polarities. These techniques are vital in cancer research because they help identify characteristics of specific proteins and their resistance to certain drugs. SDS-PAGE gel electrophoresis was used to confirm successful isolation of HPF1, which is a technique used for separating proteins based on molecular weight and appear as various bands that correlate to the amount of protein within the sample. The value of learning protein purification contributed to personal growth and societal growth, in hopes that this research will cure cancer in the near future.

A-06: Investigating Biochemical Differences between Key Metabolic Enzymes and How They May Contribute to Lymphoma Development and Progression

Atrium

Sam Zumwalde, Biochemistry

Project Advisor: Dr. Tom Cunningham

Abstract

The phosphoribosyl pyrophosphate synthetase enzymes, PRPS1 and PRPS2, regulate the rate-limiting step in nucleotide biosynthesis by catalyzing the conversion of ribose-5-phosphate to phosphoribosyl pyrophosphate (PRPP), a necessary intermediate substrate for the production of all nucleotide species. Preliminary evidence indicates that the loss of PRPS2 leads to decreased viability in MYC-overexpressing lymphoma models, coupled with a decrease in reactive oxygen species (ROS). Conversely, these models lacking PRPS1 have no such viability defects and exhibit slightly elevated levels of ROS. These two enzymes share 95% amino acid homology, but they have variances at critical regions in the enzyme that may be contributing to these phenotypic differences. This project aims to investigate two areas, the first being to create cell lines that knockout the expression of both enzymes simultaneously to show the reliance of these models for at least one being present. We hypothesize that this will lead to a complete loss of viability, highlighting the importance of this enzymatic reaction in lymphoma models. The second area focuses on the differential amino acid sequences around the catalytic site in the enzymes that are believed to be critical to their function. We hypothesize that these differences are contributing to the opposing phenotypes seen in our models. These projects will use a variety of functional assays that provide insight into protein expression, cell viability, and redox homeostasis. Overall, these projects can further the knowledge in how lymphoma cells function and lead to possible targets within them.

A-07: Large-Scale Preparation Of Human DNA Ligase III-beta

Atrium

Josh Salmons, Chemistry

Project Advisor: Dr. In-Kwon Kim

Abstract

DNA ligases are vital for the maintenance of genomic integrity, such as DNA replication, DNA damage responses (DDR), and recombination. Human DNA Ligase III is one of three DNA Ligases, the others being I and IV. Specifically, LigIII is important for DNA repair pathways, single-stranded break repairs, base excision repairs, which are essential to cell survival. LigIII possesses a unique N-terminal zinc finger, which improves the intermolecular ligation efficiency. The joining of two DNA fragments has been found to be the rate-limiting step in DDR. The presence of the zinc finger in LigIII is similar to that in poly(ADP-ribose) polymerase (PARP). PARP1 is one of the main enzymes that catalyzes ADP-ribosylation. ADP-ribosylation is a reversible post-translational modification which controls major cellular processes, such as DNA repair, DNA replication, and gene expression. ADP-ribosylation works by adding one (mono-) or more (poly-) ADP-ribose to the target protein with the help of nicotinamide adenine dinucleotide (NAD+). ADP-ribosylation on PARP1 signals DDR-associated proteins, such as LigIII-XRCC1 complex to be recruited to the site of lesion thereby acting on repairing the damaged DNA. Towards this end, human LigIIIꞵ, which lacks the C-terminal BRCT domain, was purified from E. coli in a milligram quantity.

Purification was done through different chromatography techniques in order to isolate and characterize LigIII◻ with minimal impurities. The purification of LigIII◻ would help us learn about how DNA ligation by LigIII◻ is regulated by ADP-ribosylation.

A-08: Iron Misregulation in Mitochondria: Insights into the Mechanisms of Parkinson's Disease

Atrium
Angelica Pernia, Biochemistry
Project Advisor: Dr. Anthony Grillo

Abstract
Iron accumulation in the brain is a prominent trademark of Parkinson's disease. The mechanisms of iron misregulation are unclear, but a better understanding of iron's metabolism in the cell might help identify new targets to prevent Parkinson's disease. In cellular respiration, electrons obtained from the Krebs Cycle are transferred to the final stage of cellular respiration, which is mediated by a group of complexes in the inner mitochondrial membrane that form part of the electron transport chain that transfers protons across the mitochondria membrane and establish proton gradients providing drive for oxidative phosphorylation that translates into cell energy. One of these electron transfer proteins is Complex I, the first protein in the electron transport chain that acts as the entry point for most electrons to oxidative phosphorylation. A model of mice missing Complex I can be used to understand iron misregulation. Therefore, we studied iron's misregulation in Complex I deficiency models. Specifically, we asked whether a deficiency of Complex I may lead to iron perturbations in the cell and correlate with accelerating brain damage and Parkinson's disease progression. To answer these questions, we propose determining heme and non-heme iron concentrations in mice tissue and liver cell cultures by applying different iron analytical techniques and determining the concentration of heme and non-heme iron in the cell. Understanding the speciation and distribution of iron in the cell and comprehending the role of iron in iron misregulation could improve understanding of the role of iron in brain damage associated with Parkinson's disease.

A-09: Understanding the Biology in a Human Pathogen through Genetic Modification and Manipulation

Atrium
Aqsa Raja, Biological Sciences
Project Advisor: Dr. Miguel Chiurillo

Abstract
Chagas disease affects up to 8 million people, primarily in the Latin Americas. It is caused by Trypanosoma cruzi (T. cruzi), a microscopic parasite that can be transmitted to mammals through an insect, popularly known as "kissing bug". Currently, there is limited treatment available for Chagas disease. Understanding the biology of this parasite may help unveil potential drug targets and minimize the risk of Chagas disease. We studied a specific protein, Flagellar membrane protein 6 (FLAM6), which is predicted to play a significant role in the viability of the parasite. We are interested in knowing where in the cell this protein is localized as well as its importance in the T. cruzi life cycle. To address these

aims, we used an advanced gene editing technique, commonly referred to as CRISPR, to insert and attach a "tag" to the FLAM6 gene. The tagged protein was visualized under a special microscope showing that FLAM6 is specifically localized to the parasite flagellum, which is a structure related with the movement and the infectivity capacity of this organism. Using CRISPR, we tried to eliminate or "knock out" the two copies of the gene that encodes for FLAM6 protein. However, the gene was only partially knocked out. Currently, we are using these partially KO cells to obtain a complete knockout. Once obtained, the KO cells will be used to study whether FLAM6 could be an alternative target for new drugs to treat Chagas disease.

A-10: Effects of Experimental Drugs on Traumatic Optic Neuropathy in Mice
Atrium
Robert Grimaldi, Neuroscience - Neurobiology Concentration
Project Advisor: Dr. Nathan Evanson

Abstract
In the United States, traumatic brain injuries (TBI) are the number one cause of disability and death in both children and young adults, affecting 2.8 million Americans. TBI is an immediate source of visual deficits and impairments via direct or indirect trauma to the eyes, optic nerve, and/or visual processing areas of the brain. Traumatic injury to the optic nerve is called traumatic optic neuropathy (TON), and usually occurs in the setting of TBI. Recent research has suggested that the cellular stress response known as Endoplasmic Reticulum (ER) Stress, with the associated Unfolding Protein Response (UPR) is involved in cell death of retinal ganglion cells as a result of TON. Pharmacological manipulations of an ER Stress pathway (such as with Salubrinal or ISRIB) have displayed promising neuroprotective effects, by acting on a specific protein that determines cell survival or death. Salubrinal is a selective phosphatase inhibitor of this protein. Conversely, ISRIB inhibits its phosphorylation. We hypothesize that treatment with Salubrinal will improve, while ISRIB treatment will decrease neuroprotection, following TBI compared to control. In this study, we used a model of trauma-induced TON in male mice. Retinas were used for Western Blotting to identify proteins with neuroprotective effects. We found neuroprotective effects of Salubrinal and ISRIB that correlate with altered phosphorylation states of this molecule compared to control mice.

A-11: Traditional Psychotria insularum vs. Western Medicine's Ibuprofen: Parallels in Inflammation Reduction via Iron Chelation
Atrium
Sofia Stitz, Biological Sciences and Ballet
Project Advisor: Dr. Eric Tepe

Abstract
Traditional medicinal plants contain an array of compounds which can be used for therapeutic purposes and as precursors for the synthesis of modern pharmaceuticals. Samoan traditional medicine is rather understudied, despite the astonishing effects it has shown amongst indigenous Samoan people. "Matalafi", the leaf homogenate of the coffee relative, Psychotria insularum, is habitually used in

Samoan traditional medicine to treat inflammation. Matalafi has been shown to have powerful effects on the body, comparable to commonly used Ibuprofen. The focus of this study was to highlight both therapeutic and metabolic similarities between the effects of active compounds in P.insularum with modern day Ibuprofen. Through a study published in the Proceedings of the National Academy of Sciences of the United States of America, an iron homeostasis role was identified in P.insularum, using a genomics approach, to better understand its mechanism of action, and usefulness in its traditional use for reducing inflammation. Through fractionalization of the homogenate, the researchers were able to identify two flavanol glycosides, rutin and nicotiflorin, each which binded iron. Relating these findings to mammalian immune cells and their traditional action in the human body, researchers found that the iron-chelator activity of the P.insularum homogenate decreased pro-inflammatory responses in the body and enhanced anti-inflammatory cytokine responses within immune cells. Similarly, Ibuprofen chelates iron in a stable manner, enabling treatment of inflammation due to iron overload. Using metabolomics, a deeper understanding of Samoan traditional medicine and its parallels to western medicine can be used to advance pharmaceuticals as we know today.

A-12: Association Between Melanin, Skin Barrier Function, and Allergic Comorbidities in Atopic Dermatitis

Atrium

Erin Patton, Psychology and Chemistry minor
Project Advisor: Dr. Jocelyn Biagini

Abstract
Atopic dermatitis (AD) is a common chronic, inflammatory skin disorder with a complex etiology and heterogeneous presentation affecting up to 20% of children worldwide1. AD has been highlighted as the first step in the "atopic march", whereby AD typically predates the development of other allergic disorders. It has been estimated that one-third to half of AD patients will develop asthma2, although the mechanisms that promote disease progression remain unclear. o The Mechanisms of Progression of Atopic Dermatitis to Asthma in Children (MPAACH) cohort was designed to better define phenotypic/endotypic subgroups of AD and to predict AD outcomes and development of allergic comorbidities. MPAACH is the first US-based early life cohort of children with AD. The goals of the cohort are to define AD phenotypes and endotypes, dissect the mechanisms that contribute to the progression of AD to other allergic disorders, and to identify novel biomarkers that identify children at high risk for the development of asthma and wheezing phenotypes. To enable mechanistic studies, extensive biospecimens are collected from both lesional and non-lesional skin. At annual exams, blood (immunophenotyping), saliva, stool, skin tapes (skin biome and transcriptomics), contact agar plates (microbial studies) and saliva are collected, objective assessments of skin barrier function (trans-epidermal water loss) are obtained, skin prick testing for food and aeroallergens are performed, and detailed questionnaires for health outcomes and exposures are collected.

Category B: Sensing, Perception and Sensor Technology

B-01: Music and the Mind
Atrium
Grace Elliott, Psychology
Project Advisor: Dr. Monica Mitchell

Abstract
Studies have shown that music programs can have a beneficial impact on the development of children's executive functions, academic skills and academic performance outcomes. Music programs have shown to improve cognitive development, self-regulatory skills and provide intrinsic motivation to learn. This study, "Music and the Mind," evaluated the impact of Peanut Butter & Jam, a 30-week music program, on the executive functioning and development of three and four-year-olds attending six Cincinnati Preschool Promise Preschools. Participants' development was assessed by the Teaching Strategies (TS) GOLD Assessment. Preschool providers were surveyed about participants' observed change in attitude, behavior, and relationship development. Both methods measured the impact of the music program on multiple domains of development. A paired samples t-test was conducted using TS GOLD scores from before and after program participation. Findings from the TS GOLD showed a significant difference in the cognitive and mathematics domains from pre-test to post-test. Provider feedback showed a perceived positive impacts on students' social emotional and cognitive development and an increase in listening skills, socialization, and effectiveness of group learning. Finding from this evaluation suggest that music program participation can have a positive impact on executive functioning skills and development in children. These findings align with previous research that music programs can have a positive impact on children's cognitive and social-emotional development and skills important for future academic performance.

B-02: Understanding Expressive Language for Culturally and Linguistically Diverse Preschoolers in a Post Pandemic Setting
Atrium
Gabrielle Matz, Speech Language Hearing Sciences
Project Advisor: Dr. Leslie Kokotek

Abstract
This project aims to describe the potential relationships in expressive language performance in preschool-age children who speak different dialects of English (i.e., Standard American English [SAE] and African American English [AAE]) following over a year of remote learning and social distancing restrictions during the COVID-19 pandemic. We used both standardized and authentic measures of language expression to conduct our analysis. With some of the methods for authentic Language Sample Analyses (LSAs) requiring complex and time-consuming calculations, this project also describes the feasibility and benefits of using automated computerized examinations of LSAs, which provided a more robust set of data for comparison to the traditional expressive language assessment (i.e., the Structured Photographic Expressive Language Test - 3rd edition [SPELT-3]). The automation process for LSAs included both the Systematic Analysis of Language Transcripts (SALT) and Computerized Language

Analysis (CLAN). To capture these results, five preschool-aged children, (n=3, SAE; n=2, AAE) completed the SPELT-3 and completed a 15-minute play-based language sample. LSAs included: Mean Length Utterancew/m, Number of Different Words, Type-Token-Ration, Developmental Sentence Scores, and the Index of Productive Syntax. A spearman analysis was completed to understand how children's LSAs compared to the SPELT-3. Results indicated no statistically significant relationships between LSAs and children's performance on the SPELT-3. This suggests that even the SPELT-3 which allows for the inclusion of dialectically appropriate responses, does not comprehensively detect features of children's grammatical complexity as noted by the lack of relationships between the SPELT-3 and all measures of LSAs.

B-03: Sensory-Skeletal Integration: Exploring the Relationship between Sensory Organs and Facial Bones in the Mexican Tetra

Atrium

Ally Angst, Biological Sciences
Project Advisor: Dr. Josh Gross

Abstract

Despite being studied for hundreds of years, the mechanisms explaining the positioning of facial bones in fish remain unknown. Numerous hypotheses have been proposed, including influence from the sensory system or external factors. By combining literature review and experimentation, I hypothesize that canal neuromasts, sensory organs that detect changes in water, provide key positional information for the placement of suborbital bones, bones that reside under the eye, in fish. In this study, we examined the suborbital bones in Astyanax mexicanus, a freshwater tetra with surface fish, and multiple cavefish populations. Surface fish and three cave populations were cleared and stained to visualize bone position and morphology. Specimens were imaged and scored to see variation in bone positioning. We hypothesized that canal neuromast positions would predict bone positions. Additionally, we chemically removed neuromasts by treating with gentamicin, an antibiotic that kills and destroys hair cells comprising neuromasts. Following treatment, individuals were placed in Calcein, a fluorescent bone label, then DASPEI, a live fluorescent marker of neuromasts. Our results showed that there is substantial variation in suborbital bone position in cave fish, corresponding to variation in canal neuromast positioning. In contrast, surface fish demonstrated little variation in both neuromast and bone position. Additionally, we found that chemical removal of canal neuromasts, still results in bone formation, suggesting another component of neuromasts other than hair cells may be responsible for bone production. This work suggests sensory neuromasts exert partial control over bone growth and positioning of facial bones, an example of sensory-skeletal integration.

B-04: Exposure to UV Containing Light is not Necessary for the Development of Properly Focused Eyes in Sunburst Diving Beetle Larvae

Atrium

Ruby Hyland-Brown, Neuroscience
Project Advisor: Dr. Elke Buschbeck

Abstract

Various invertebrate model organisms are used in biological research to understand visual function and development. Findings from studies using such model organisms may be applied to research involving other species and inspire technical innovations. These organisms are typically reared indoors to create a controlled and accessible environment. However, lack of clarity still exists regarding UV light exposure, which tends to be absent in artificial light environments. We know that visual input, such as light, plays an essential role in the development of properly focused eyes of vertebrates, but it has been suggested that this is not the case in arthropods. Sunburst diving beetles (Thermonectus marmoratus) have image-forming camera eyes in the larval state that need to reestablish focus after their eyes grow dramatically between larval stages. To address this question of the role of UV light, Thermonectus marmoratus larvae were reared in a typical indoor lab environment without UV, a lab environment with added UV illumination, and an outdoor setting with natural sunlight to control for lab specific artifacts. The refractive state of larval eyes from individuals reared in each group was measured live, using a custom-built micro-ophthalmoscope. Here, we show that the presence or absence of UV light in the environment in which T. marmoratus larvae are reared does not significantly influence correct focusing. These findings strengthen previous findings that visual feedback does not influence the development of properly focused eyes in arthropods.

B-05: How Light Aversion Affects Grooming in a Mouse Model of Traumatic Brain Injury

Atrium
Lillian Holloway, Neuroscience
Project Advisor: Dr. Nathan Evanson

Abstract

Every year 2.8 million Americans endure a traumatic brain injury (TBI), with 68% reporting visual dysfunction and 55% reporting photophobia. Photophobia increases stress levels in response to light, but little research has been done to assess TBI-induced photophobia in animal models. In mice, the cephalocaudal progression is an instinctive behavior that is used to reduce stress, which is expected when experiencing discomfort. This progression includes grooming of the paws, head, and body in that order. This can be divided and measured as body versus rostral grooming, where an increase in rostral grooming may be a result of light aversion as the mouse is trying to cover their eyes or relieve discomfort. Following a TBI, we hypothesize that damage to photoreceptor cells increases photophobia, which increases rostral grooming and impairs the cephalocaudal progression. To establish a baseline of visual function and grooming behavior before injury, adult male C57bl/6J mice were assessed in our optokinetic device, which was adapted to produce an aversive visual environment. This aversive environment utilized increasing light intensities (80 lux, 400 lux, 1100 lux, and 3200 lux) and a spinning drum. Mice incurred a closed-head, weight-drop TBI and were tested 2, 7, 21, and 35 days post injury. Grooming patterns were recorded for the cephalocaudal progression and time spent on rostral versus body grooming. By measuring the grooming patterns of mice following TBI, we can determine light aversion and visual deficits caused by impact to the optic chiasm, which may correlate to TBI-induced photophobia in humans.

B-06: Temporal Patterns of Cells after Traumatic Brain Injuries and Chronic Variable Stress

Atrium

Abby Ramsey, Neuroscience - Neurobiology Concentration

Project Advisor: Dr. Nathan Evanson

Abstract

Traumatic brain injuries (TBI) have a plethora of long-term symptoms associated with axonal degeneration that affect daily living. Thus, it is common to experience stress after injury associated with these major life changes. However, the potential relationship between TBI and stress is poorly understood. We found that chronic stress after TBI improved neurodegeneration, but this degeneration still returned. Axonal degeneration after TBI is associated with activation of supporting brain cells called glia, and this activation is associated with their ability to engulf cellular debris (called phagocytosis). Interestingly, microglial, and astrocytic activity also changes in stress models, so we hypothesized that microglia and/or astrocytes would show less phagocytosis as time post-injury increases. Adolescent male C57Bl/6 mice sustained a closed-head weight-drop TBI or sham injury, then were exposed to two weeks of chronic variable stress (CVS) (e.g., wet bedding or cage tilt) or no stress. Immunohistochemistry was performed on brain tissue collected 2 and 28 weeks after injury, to examine phagocytic microglial (IBA1/ CD68) and astroglia activity (GFAP/LAMP2). Two weeks after injury, microglial phagocytosis was significantly higher in the TBI+CVS group compared to CVS or TBI groups alone, but by 28 weeks, this was no longer true. Astrocyte activity shows the opposite temporal pattern; at 2 weeks, there was no significant Lamp2 expression, but the overlap between GFAP and Lamp2 becomes significantly higher at 28 weeks. These findings could indicate a compensatory relationship between astrocytes and microglial cells depending on time after TBI.

B-07: A Novel Approach for Assessing Traumatic Brain Injury Induced Light Aversion in Mice

Atrium

Ayesha Shaik, Neuroscience

Project Advisor: Dr. Nathan Evanson

Abstract

Up to 50% of traumatic brain injury (TBI) patients suffer from photalgia, abnormal light sensitivity, when exposed to bright light. The diffuse forces of a TBI commonly lead to tissue damage to vision-associated regions (e.g., the optic nerves and optic radiations), contributing to vison problems that arise after injury. Photalgia is also associated with cone dystrophy, the loss of retinal cones, and normal visual acuity relies on the proper function of cones at higher intensities of light to relay visual information to retinal ganglion cells (RGCs). It is, therefore, possible that if TBI leads to either photoreceptor or retinal ganglion cell dystrophy, we might be able to assess photalgia by testing visual acuity at varying light levels. We hypothesized that we could test for these cone/RGC-driven light sensitivities in the mouse via the optokinetic response (OKR). For, if this involuntary reaction to moving stimuli declines more severely after injury at higher light intensities, that could indicate photalgia. Male C57BL/6J mice experienced a closed-head, weight-drop TBI. OKR was observed two days before injury, then after injury on days 2, 3, 7, 9, 21, 23, 35, and 37. Mice were assessed under four light intensities: low (80 lux), room (400 lux), medium (1100 lux), and high (3200 lux). We expect that the optokinetic response will be

triggered less when mice are exposed to high light intensities post-injury likely due to loss of cones. This study could be used as a new assay to understand light aversion in mice.

B-08: Optimizing Electrode Surface Interactions for Estradiol in Brain Detection

Atrium
Manisha Fowler, Chemistry
Project Advisor: Dr. Ashley Ross

Abstract
Estradiol is the most prevalent type of estrogen in many biological processes, including as a rapidly released neuromodulator in the striatum and hippocampus. An expansive number of electrochemical sensors have been made for detection of estradiol in wastewater. However, these sensors do not currently extend to detection in a tissue structure due to limited selectivity and sensitivity and substandard spatiotemporal resolution. Fast scan cyclic voltammetry (FSCV) is commonly used to monitor rapidly released neurochemicals; however, estradiol is poorly detected using traditional carbon fibers with FSCV. E2 is a sterol, so interactions at the electrode surface are likely different than those with amine functionalization, like most neurochemicals measured with FSCV. We use a wide range of experiments on three different fibers (TS30, MS40, HS40) to determine surface sensitivity, degree of absorption, and E2 orientation at the electrode surface. We analyze the characteristic behaviors of estradiol at different surfaces and determine each material's electrochemical surface characteristics.. The findings from SEM, Raman mapping, and XPS will be used to obtain characterization at the surface of the electrode. Oxygen modification and nitrogen modification are used to determine E2's ability to absorb at the electrodes surface. The results of these experiments will allow better detection of estradiol with FSCV leading to sensitive and selective monitoring of estradiol signaling in the brain.

B-09: Quantification of Quenching Reactive Oxygen Species by Antioxidant Using 19FNMR (Nuclear Magnetic Resonance)

Atrium
Edwin Rodriguez, Chemistry
Project Advisor: Dr. Peng Zhang

Abstract
Reactive Oxygen Species (ROS) is an unstable molecule that contains oxygen and has high reactivity. ROS includes two different types. Type 1 ROS is generated from electron transfer which includes superoxide radical anion ($O_2 \bullet -$), hydroxyl radical ($OH \bullet$), and hydrogen peroxide (H_2O_2). Type 2 ROS is generated from energy transfer which includes singlet oxygen ($1O_2$). In mitochondria in animals and chloroplast in plants, the generation of excess ROS from stress or external source is the cause of various diseases like asthma, cancer, pulmonary hypertension, and Parkinson's disease.   Antioxidant from food, drug, or synthesized chemical helps to balance the excess ROS, and they prevent the generation of various disease from animal and the disturbance of photosynthesis from plant. Therefore, a study about the quantification of antioxidants to specific ROS will be helpful to measure the efficiency of antioxidants. In

this study, we did quantification of antioxidant of superoxide radical anion by TEMPO (2,2,6,6-Tetramethylpiperidin-1-yl)oxyl which is a quencher of superoxide radical anion using 19FNMR.

B-10: Benchtop Spectroscopy for Water Contaminate Analysis

Atrium
Elaina Truhart, Chemistry and Physics
Project Advisor: Dr. Pietro Strobbia

Abstract
Modern Raman spectroscopy has made huge strides in smaller and more compact units, making the possibility of portable Raman systems a feasible idea. Our goal is to develop a system that can be used in the field for convenient analysis of multiple water samples. In this project, we set up a Raman system capable of collecting signal from a fiber sensor. LabVIEW was used to control a Raman spectrometer, a laser and Thorlabs shutter, creating a simplified user interface capable of monitoring a live spectrum output as well as measuring the optical response of several sensors in succession. This system uses Surface-Enhanced Raman Scattering (SERS). SERS offers many advantages over other optical readouts (e.g., sensitivity and multiplexing capabilities) and can be used for in situ (near or at sample collection site) analysis using aptamer-based fiber optic sensors. We are currently optimizing design elements of aptamer-based sensors on fiber optic substrates. Fiber based sensors show great potential for detection of environmental contaminants because they can be placed directly in a water sample and their optical response measured using a portable Raman spectrometer. This project aims to move aptamer sensors closer to in situ applications, with the goal of developing field-ready sensors capable of detecting environmental contaminants.

B-11: Using Upconversion to Produce Higher Energy Emitted Light

Atrium
David Elliott, Chemistry
Project Advisor: Dr. Peng Zhang

Abstract
The purpose of the research was to discover if chemiluminescence, being the emission of light from a chemical reaction, could be produced using the light excitation of a different color. The hypothesis is that the process of chemiluminescence using luminol, hydrogen peroxide, and sodium hydroxide, which produces blue light, could be altered using methylene blue and red light excitation instead of the hydrogen peroxide and sodium hydroxide to produce blue light. Red light will be used in upconversion luminescence, where low energy photons (red light) are converted to higher ones (blue light). To test the hypothesis, different components, component volumes, and different emission wavelengths were used to attempt to create the emission of blue light using this upconversion process. After multiple experiments using different variables, the hypothesis was determined as inconclusive. The results were unexpected, as it was believed that some components would give a result, regardless of how small, that could be tinkered with to produce more meaningful data after completing future experiments. The

research did, however, yield great experience for an undergraduate with little research knowledge. The failure provided more learning experiences than if the experiment was successful.

B-12: Unique Redox Labels for Baseline Reduction in Electrochemical Aptamer-Based Sensors

Atrium
Paige Wittich, Chemistry
Project Advisor: Dr. Ryan White

Abstract
Many electrochemical aptamer-based (E-AB) sensors have a redox label, typically methylene blue or ferrocene, that will produce a measurable signal both in the presence and absence of target. The difference between the signal is then used to determine relative changes in concentration of target. This model of signaling relies on the initial concentration, or lack thereof, to be known in order to make accurate measurements. However, by changing the redox label to carminic acid, which is electrochemically inactive when in the dimer form, the sensor will not produce a measurable signal if no target is present. This allows for the sensor to immediately determine if target is present and in what concentration, shifting the focus from quantifying relative changes in concentration to absolute quantification. In this work, we use a dual probe E-AB sensor consisting of a dsDNA aptamer, with both strands being labeled with carminic acid at the terminal ends in order to form the carminic acid dimer in the absence of target. Once target is added, the aptamer-target interaction breaks the hybridization, and therefore the dimer, producing a measurable current from the newly monomerized carminic acid labels. Using the dimerized carminic acid-labeled E-AB sensor also forces a shift in how signal is quantified since the traditional approach of percent signal change relies on a non-zero "no target" signal. To overcome this obstacle, the data was normalized by plotting peak current density as a function of target concentration.

B-13: Using Hyperspectral Imaging to Explore Facial Sexual Dimorphism in *Habronattus* Jumping Spiders

Atrium
Samantha Packwood, Biological Sciences
Project Advisor: Dr. Nathan Morehouse

Abstract
Animals may exhibit sexual dimorphism due to differences in reproductive strategies between the sexes or specifically for intersexual communication. Habronattus jumping spiders are highly visually acute, trichromatic animals, with spectral sensitivity peaks ranging from red, green, to UV wavelengths. To human viewers, the faces of these spiders seem to have a high color distinction between the sexes, however humans do not see into the UV wavelengths as these spiders do, and their facial colorations have not been empirically measured. This project aimed to examine sexual dimorphism in the Habronattus jumping spider faces as modeled through their spectral sensitivity peaks. We collected face reflectance data from both male and female spiders of four syntopic species using a hyperspectral imaging approach. Compared to traditional approaches, such as with microspectrophotometry, the

hyperspectral camera allowed us to obtain data from a more biologically relevant scale (i.e., measuring the entirety of the face instead of acquiring data from smaller points). Spectral reflectance and color vision modeling was done on the hyperspectral data using the R package 'pavo'. Our findings revealed some intersexual differences in facial coloration in the different species. This suggests the potential importance of facial color signals in intersexual communication in these spiders. Future studies may further explore how Habronattus spiders actively view these face signals and the role it may play in sexual selection.

B-14: At Face Value: Analyzing Species and Sex Differences in Facial Colorations of Two Co-occurring Species of jumping Spiders Using Microspectrophotometry

Atrium
Jenna Breiner, Biological Sciences and Environmental Studies
Project Advisor: Dr. Nathan Morehouse

Abstract
In nature, visual signals may convey important information such as species identity. Studies have found that organisms from diverse lineages sometimes signal such information through facial color, pattern, and ornamentations. Many of these studies have focused on primates, but little is known about the role of faces in non-primates, especially invertebrates. The Habronattus genus of jumping spiders acts as an ideal model for gaining a better understanding of this concept due to their color vision capability, high visual acuity, and diversity of facial colors exhibited by male spiders. We hypothesized that Habronattus spider faces may communicate species- and sex- specific information. In this study, we analyzed the facial colorations of two co-occurring species of jumping spiders: Habronattus orbus and Habronattus decorus. We used a microspectrophotometer to measure the color reflection at 6 specific focal points on the faces of both male and female individuals from each species. We used the R package 'pavo' to visualize and model this data into how Habronattus might distinguish between these colors. Our results indicated both sex- and species-specific differences in facial coloration. These findings shed light on how an invertebrate system may utilize similar regions important to many primates, likely to select potential mates or for species discrimination. These insights further serve as the building blocks to future research to test potential differences in visual communication across different species in these jumping spiders.

Category C: Community and Cultural Connections

C-01: Edge of Chaos: Effects of the Russo-Ukranian War on the Baltic states

Great Hall
Tanmay Srivastava, Digital Media and History
Hunter Shallcross, Digital Media and Film & Media Studies
Project Advisor: Dr. Michael Gott

Abstract

The Edge of Chaos is a Documentary research Film. The concept of the film combines our two areas of expertise and focus as students; Geopolitics and Filmmaking. The Edge of Chaos as a concept is a road trip documentary that follows us and our crew as we travel along Europe's Eastern Border with Russia. We would travel through countries such Estonia, Latvia, and Lithuania. In these countries, we would explore the lasting impact of the Soviet Union, and the modern- day impact of the Russian Federation. In addition to that, we would like to examine the individual cultures of these countries in an attempt to explain, understand, and contrast them in an effort to combat the stigma that all Eastern European countries are inherently 'Russian.'

C-02: Community Based Programs Impact on Recidivism in Kenton County, Kentucky
Great Hall
Kenzie Troehler, Social Work
Project Advisor: Dr. Gary Dick

Abstract
The purpose of this research is to evaluate the effectiveness of the Life Learning Center program through a descriptive quantitative study. This study will look at the exit-interviews done by ninety-two individuals at the end of the twelve week course. Participants will self report on various areas of their life at the end of the program. These areas in question will look at income, mental and physical health treatment, Substance Use Disorder Recovery, and how effective the program was in their lives. This will be helpful in looking at the impact of community reentry programs and the impact they have on recidivism in Covington, Kentucky, United States of America. Research is lacking in this area for individuals in the United States where these programs are less popular.

C-03: Life Experiences of Adolescent Boys Living in Group Home Care
Great Hall
Reagan Schwartz, Social Work
Project Advisor: Dr. Anjanette Wells

Abstract
This study was conducted to measure the life experiences of teenage boys living in group home care and what the best interventions are to use in this setting. There are differing opinions on whether group homes are a helpful way to house children that cannot be with their families. In this study 8 adolescent boys living in the same group home were surveyed about their experiences in areas such as resiliency, substance abuse, education/school, and delinquency/behavior. The study shows that while not all, most participants found group home care to be helpful to them in some way. Majority of the participants were receptive to incentive style intervention. Group home care may not be the best option for some but others do well in the setting and majority of the time it does not make life experiences worse than before care.

C-04: The Effect of Social Support on Supervision Violations

Great Hall
Elizabeth Burkhardt, Criminal Justice and Psychology
Project Advisor: Dr. Amber Petkus

Abstract
Many studies have analyzed the effect of social support on an individual's ability to succeed and positively adjust to probation and parole. Prior research has shown that individuals with stronger social bonds are more likely to successfully complete probation (Griffin & Hepburn, 2004). Additionally, stronger social support has been associated with higher life satisfaction while on probation, and better connections with treatment providers and probation officers (Haddad et al., 2009). However, little information exists regarding the link between the social support an individual on probation or parole experiences, and supervision violations they receive. The current study seeks to understand how the amount of social support an individual on probation or parole experiences affects the number of violations they receive while on supervision. Qualitative data collected from 98 interviews of individuals on probation and parole in five states is used to answer this question. Data was collected as part of the Arnold Ventures' sponsored Community Corrections Fines and Fees Study (CCFF). Specifically, interview responses to questions from the Multi-Dimensional Support Scale (MDSS) (Winefield et al., 1992) assessing the availability and adequacy of social support are used to measure social support amounts. Participants reported the number of violations they received on supervision. Each participant's age, type and seriousness of crime, prior supervision involvement, and socioeconomic status are also considered. Findings from this study will have important implications for the importance of social support and an individual's ability to successfully complete supervision. Implications for practice will be discussed.

C-05: Resilient Communities: Partnership Development and Experiential Learning

Great Hall
Olivia Sawchuk, Communication
Max Montag, Communication
Project Advisor: Dr. Michael Sharp

Abstract
Resilient Communities wants to develop and sustain partnerships in order to continue community building with a perpetually expanding workforce. Without these existing and future partnerships, they will be unable to accomplish the major changes they set out to create. Through the creation of worthwhile projects, our team plans to provide a new steady form of communication and connection to the University of Cincinnati's offices and resources. This new avenue of communication will enable Resilient Communities to have a greater reach to engage with partners and students looking for work/experience.

C-06: The Oral Health Project

Great Hall
London Brinkman, Communication

Project Advisor: Dr. Michael Sharp

Abstract
Our team was tasked with the challenge of creating market materials and other helpful templates to assist Village Life Outreach Project as they take a trip to Tanzania to execute the Oral Health Project and help the team reach over 1000 villagers and educate them on quality oral health practices with the goal of making sustainable differences in the community.

C-07: Fundraising Strategies for a Cincinnati Non-Governmental Organization: Resilient Communities
Removed 4/19/23

C-08: Building Effective Marketing Materials for Resilient Communities, a Non-Profit Organization
Removed 4/19/23

C-09: I've Got You Covered: Working with Green Umbrella to Educate the Public
Great Hall

Emma Hanners, Environmental Studies
Jack Hoyt, Environmental Studies
Project Advisor: Dr. Teri Jacobs

Abstract
We will be working with the local organization Green Umbrella to educate the Greater Cincinnati area on climate change and the environment. We will be doing this in a few different ways. First, we will help create a newsletter and make content for the newsletter like articles. Going along with that, we will be making infographics as well since research shows they can be effective. Next, we will be creating and planning content for webinars. We will research topics to discuss and then make a plan for Green Umbrella to use when they have the webinar. Lastly, we will be contributing to a climate change action playbook. This will be a tool for local groups, individuals, and businesses to use to become more sustainable, trouble shoot a problem, etc. We hope by creating this content that people in the community will gain more knowledge about what is happening in their environment. Education is a really powerful tool, and we hope to empower the community with knowledge.

C-10: What is the Perception of Current Patients of the Council on Aging on the Coleman Model?
Great Hall

Brittany Hill, Social Work
Project Advisor: Dr. Gary Dick

Abstract
At any age, maintaining good health is essential, but for senior citizens, doing so is especially crucial for living a long, fulfilling, and active life. Throughout my proposal, I will discuss the importance of maintaining good health and the Coleman care transition model utilized in thousands of hospitals

nationwide. This model is designed to reduce the hospital readmission risk among senior citizens. In addition, local hospitals in the city have partnered with agencies such as Council on Aging to come in and assess the clients and enroll them into the FastTrack Home program. This program promotes independence and allows clients to remain in their homes.

Category D: Health and Body

D-01: Using Current and Historical Data to Identify Trends and Relationships for Characterizing Speech in Bilingual Jamaican Children

Great Hall
Megan Miller, Speech Language Hearing Sciences and Spanish
Hailey Spencer, Speech Language Hearing Sciences
Project Advisor: Dr. Leslie Kokotek

Abstract
Purpose: Jamaican children speak Jamaican Creole (JC) and English, with English being the language of classroom instruction. During the COVID-19 pandemic, Jamaican children used less JC due to the requirement of English use during the classroom. This study characterized JC and English-speaking bilingual preschoolers' speech productions before, during, and after COVID-19 for English productions with the goal of identifying possible trends across these time-periods.   Method: Forty-one typically developing JC-English-speaking bilinguals ages 3;6-to-5;3 were recorded producing items from a popular speech test over three repetitions for three different groups: Before COVID-19, n=6; During COVID-19, n=10, and After COVID-19, n=25. Acoustic whole-word durations and percent consonant correct (PCC) were established for each production to examine durational and transcription-based differences. Result: We observed a statistically significant difference in PCC scores (p=.02) between the Before COVID-19 (M=82.4, SD=6.7) and During COVID-19 groups (M=93.9, SD = 7.3), with an 11.5-point difference on average, 95% CI [1.9, 21.2]. A statistically significant difference (p=.004) also existed between the Before COVID-19 (M=82.4, SD=6.7) and After COVID-19 groups, (M=98.4, SD=2.5), with a 16-point difference, 95% CI [7.1, 24.9]. For the durational analyses, a statistically significant difference was observed (p=.024) between the Before COVID-19 (M=.01, SD=.003) and During COVID-19 groups (M=.02, SD=007), with a .01-point difference on average, 95% CI [.001, .02].   Conclusion: Regardless of the approach used, children's productions evidenced differences based on timepoint. More research is needed to better understand the impact of these differences in production intelligibility on Jamaican children's lives.

D-02: Automatic Acoustic Workflow for Speech: Testing Usability in a Research Lab

Great Hall
Paige Pasadyn, Speech Language Hearing Sciences
Grace Miller, Speech Language Hearing Sciences
Project Advisor: Dr. Carrie Rountrey

Abstract

Speech-Language Hearing (SLH) scientists and clinicians are interested in acoustic analysis to reflect physiological states in persons with and without speech disorders. Some acoustic measures correspond with how well people are understood by their conversational partners; this is referred to as intelligibility. Analyzing large sound files representative of intelligibility in connected speech is time-consuming and impractical for clinicians. Opportunities exist to leverage technology to automatically analyze these sound files. The CINCI-lab designed an automatic acoustic workflow (AAW) in collaboration with computer science. This new AAW needs a usability assessment. AAW is a computerized tool that analyzes speech sound files for acoustic measures associated with intelligibility. Usability refers to the ease of use and effectiveness of a specific tool; for this project, AAW. We aim to investigate the usability of AAW, so SLH students can reliably use this tool for sound file analysis. Our framework for establishing usability is as follows:

- Learnability: The level of difficulty to complete the task at hand using the workflow.
- Satisfaction: Measuring the level of future engagement of AAW through self-evaluation.
- Error tolerance: How efficient AAW is in notifying errors and the user's ability to recover the error.
- Teachability/Implementation: Effectiveness with which we can teach AAW to another lab member and reasonably expect implementation in our own lab.

We will present our findings on AAW usability in terms of learnability, satisfaction, error tolerance, and teachability/implementation. We will also deliver recommendations to make AAW more user-friendly as needed for SLH scientists.

D-03: A Review of Four Speech Sound Interventions Used by Clinical Speech Pathologists: Which are Best for Children?

Great Hall
Sydney Weeks , Speech Language Hearing Sciences
Project Advisor: Dr. Amy Hobek

Abstract
The purpose of this presentation is to answer the clinical question "What speech sound interventions are currently recommended in the speech pathology research literature for clinical speech language pathologists to use with children?". Cabbage et al. (2022) explains many speech language pathologists (SLP) report that they predominantly use only three approaches to speech sound intervention in their clinical practice. These approaches include traditional articulation therapy, Hodson's cycles approach, and minimal pairs intervention. There are other approaches, however, that have been more recently reported as being effective interventions in the research literature that SLPs do not report using as frequently in their clinical settings. This presentation will discuss four evidence-based clinical approaches and the research that supports their efficacy: Hodson's cycles, maximal oppositions, multiple oppositions and minimal pairs. This presentation will additionally compare and contrast the approaches and their use with different children and varying diagnoses within speech sound disorders.

D-04: Syllable Repetition in Children with Speech Sound Disorder and Typically Developing Children: Task Performance and Neural Basis

Great Hall
Cormac Maloney, Speech Language Hearing Sciences
Project Advisor: Dr. Jennifer Vannest

Abstract

This portion of a larger study aims to gain insight on neural networks and structures related to speech in children during a syllable repetition task to better understand and treat speech sound disorder (SSD).   5 children (4F) with Speech Sound Disorder; 4:0-5:11 [years:months-years:months]; and 25 typically developing children (16F); ages 4:0-5:11 performed a task of listening to and repeating speech sounds during functional magnetic resonance imaging (fMRI). Sounds that children acquire in early development were used to create syllable sequences such as /maba/ and /nada/. The number of syllables increased over the course of the task. Most children were successfully able to complete the task, and audio recordings of their responses were analyzed for accuracy. Poor task compliance and complications with the MRI-compatible microphone resulted in some participants' data being excluded. In addition, fMRI sensitivity to movement is antithetical to preschoolers' ability to sit still, resulting in some brain scans being unusable due to participant motion, even when the child completed the task accurately. Group analysis of the remaining fMRI scans showed activation of motor and auditory brain regions for repeating relative to listening. The study is ongoing; however the hope is that the data will provide better understanding of how the brain processes speech differently in cases of SSD. This could illuminate causes of the disorder as well as notable deviations in specific neural networks and structures associated with atypical speech development.

D-05: Ear to Ear: Hamilton County Head Start Hearing Screenings

Great Hall
Taylor McCreary, Communication Sciences and Disorders
Project Advisor: Dr. Katherine Russell

Abstract

Hearing loss in young children can affect many developmental milestones including communication, language, and social skills. Individual states along with national professional organizations have published and recommended hearing screening requirements and criteria for school-aged children. Often these criteria differ depending on who the individual is, what age/grade they are in, how the testing will be completed, when the testing is completed, and how follow up plans will be achieved. In the Fall of 2022, University of Cincinnati Speech and Hearing Clinic Doctor of Audiology (AuD) students and a licensed supervisor screened students in eight Hamilton County Head Start schools. Results were recorded based on the age of the child and the type of screening completed including pure tone behavioral audiometry or Distortion Product Otoacoustic Emissions. Doctor of Audiology students (AuD) screened the hearing of both ears for 236 preschool students across eight Hamilton County Head Start schools. Students screened were between the ages of 36-65 months at the time of testing with a mean age of 49 months. Results from 42 students were not included in the data. After completing hearing screenings from eight Hamilton County Head Start schools, we found that 194 of the 236 students' data

could be divided into students who were screened using behavioral testing and students who were screened using DPOAEs.

D-06: Consequences of Lower Extremity Fatigue on Balance in Young Adults

Great Hall
Anna Lohmeier, Health Science
Elizabeth Origlio, Health Science
Courtney Dodds, Health Sciences
Project Advisor: Dr. Susan Kotowski

Abstract
Muscle fatigue is a common risk factor for falls and slips. Literature has shown that muscle fatigue directly affects movement response, increasing the likelihood of delay. There have also been findings between fatigue and dynamic balance, which displays that muscle fatigue decreases stability in balance. Based on the literature, further investigation into muscular fatigue and static balance is needed. This study's aim was to evaluate balance before and after cycle training, recovery and balance. The methods of the research included quantitative measurements of balance, time, strength and qualitative evaluation of RPE and fatigue. Participants were healthy college students aged 18-25. This study was composed of 10 female and 10 male students. Participants were asked to rate their RPE 1-10 and fatigue 1-6 throughout the study as each student performed balance trials on a force plate, timed up-and-go, and rode a bike with resistance correlated to their weight. Data will be evaluated to compare population differences, balance before and after bike performance, and recovery time performance. The results of this project will help to better understand the relationships between balance, recovery, and fatigue. When these relationships are understood, this study can be applied to larger populations beyond the scope of college students, such as adult populations and the geriatric population. Older populations are at the highest risk for falls and slips, but with comprehension of muscle fatigue, injuries and accidents may be prevented.

D-07: Effects of Abdominal and Back Muscle Fatigue on Balance and Core Stability

Great Hall
Anna Dorhout, Health Science
McKenna Abbey, Health Science
Ross Beverly, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract
From the articles we have studied, core strength has improved from activities that work your lower back. Working the muscles in the lower back showed significant improvement to core stability when the muscles were focused on. Muscle regulation showed very great improvement when working with the lower back and had very great improvements on core stability. The articles found for core stability were about abdominal fatigue or back muscles fatigue, rather than combining the two together. The purpose of this project was to evaluate both abdominal back muscle fatigue, and testing how long it lasts

between trials. The methods of this study included measuring balance as a quantitative factor, and having participants rate their individual RPE, fatigue, stability, and difficulty of the task as the qualitative factors. Participants were healthy college-aged individuals with no health conditions that would prevent them from completing the exercises, no current pain, and no history of balance issues. Participants were asked to perform a timed plank and supported back lifts until fatigue. Then the participants were to do six tests: a functional reach with both dominant and nondominant foot, a toe touch with dominant and nondominant foot, two eyes open force plate balance tests (one with foam), and two eyes closed force plate balance tests (one with foam). The functional reach and toe touch are performed twice, and the others are performed once. Participants then rate the difficulty from 1-10 and their stability 1-10. The results of this project will help better understand back versatility.

D-08: The Effect of Local Application of Cooling Devices on the Core Muscle Activation in Young Adults

Great Hall
Amaya Siddiqi, Health Science
Mary Sonner, Health Science
Ryan Cann, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract
Previously, it has been found that lowering core temperature via external cooling enhances overall exercise performance during aerobic exercise more than anaerobic exercise. Additionally, it has been found that lowering core temperature via external cooling influenced EMG amplitude of wrist muscles while performing isometric exercises. Core muscle activation is another important component of exercise performance, and research on how cooling affects EMG amplitude of this muscle group is lacking. Therefore, the objective of this study was to investigate the relationship between core temperature and core muscle activation. Activity of the bilateral rectus abdominus and erector spinae muscle groups were measured via surface EMG during a treadmill walking task. Three incline positions were tested - flat, 5% grade, and 10% grade. Two different skin temperature conditions were tested - normal and cooled. The cooled skin temperature condition was achieved by placing ice packs on the front and back of the trunk for five minutes prior to the exercise task. Muscle activity was evaluated during the walking task as was a Rating of Perceived Exertion. The order in which the three walking tasks were completed was randomized, while the uncooled condition was always completed first, followed by the cooled condition. Muscle activity was calculated as a %MVC (maximum voluntary contraction) and muscle activity and RPE ratings were compared between conditions to determine if there were differences between groups. The results of this study will contribute to a better understanding of ideal conditions for maximizing core muscle activation in performance and rehabilitation settings.

D-09: What is the Relationship Between Dynamic Balance, Ankle Mobility, Grip Strength and Cognition in Healthy, Older Adults?

Great Hall
Emilie Kreimer, Health Science

Abigail Otten, Health Science
Stephany Ruiz, Health Science
Project Advisor: Dr. Rachel Gleason

Abstract
Introduction: It is well documented the older adults have an increased risk for falls and falls in the older adult can have detrimental impact on function, quality of life and morbidity. Literature has shown a relationship between balance, cognitive function and dual tasks. In particular, the Four-Square Step test has been correlated with the Trail-Making Test in patients with Parkinson's Disease. Understanding the relationship between balance and cognitive function is important for healthcare providers in identifying increased fall risk in older adults.Purpose: This project's purpose was to determine the link between dynamic balance, ankle mobility, grip strength and cognitive ability in heathy community dwelling older adults. Methods: Subjects in this project were healthy, older adults aged 50 and older. Participants completed several outcome measures including the Trail-Making Test (TMT) Parts A & B, the Four-Square Step Test (FSST) with and without a dual cognitive task, and an obstacle course. Additionally, ankle range of motion (ROM) and grip strength were assessed. Discussion: Project limitations include small sample size and age of subjects. Other considerations to be addressed in future studies include assessing subjects for previous injury, determining current medications, and fall history. Further research into this topic can help health care professionals have a better understanding of the relationship between cognitive and physical function to help identify fall risk.

D-10: The Effect of Acute Low-Intensity Exercise on Short-Term Memory

Great Hall
Briana Hickle, Health Sciences
Emily Bientz, Health Sciences
Project Advisor: Dr. Susan Kotowski

Abstract
Research has demonstrated that a positive relationship exists between exercise and memory. Based on previous findings, acute exercise has been shown to improve short-term memory function by up to 48% when exercise was performed for less than 30 minutes. Research has also shown that exercising before memory tests yields higher outcomes compared to exercising after exposure. Although aerobic and anaerobic exercise both exhibit a positive influence on working memory, research exploring the benefits of short bouts of acute exercise on short-term memory is lacking. Therefore, the purpose of this project was to investigate the effects of aerobic versus anaerobic exercise on a free recall memory test. Participants included healthy adults ages 18-25. The participants performed a cardiovascular based task (e.g., stair climbing) or a strength training task (e.g., calf raises) prior to completing a recall test, with the order of the exercise tasks randomized between participants. The memory test consisted of a PowerPoint slide containing a set of 15 words. Subjects studied the slide for two minutes, then completed the five-minute exercise task. Following the five-minute exercise task participants had one minute to recall as many of the words they saw prior to exercising. Data was evaluated to compare the difference in percentage accuracy found between both groups on the memory tests to determine if one type of exercise improved recall better than the other. This results of this project provide some insight on how different types of acute exercise impact working memory and recall duration.

Category E: Educational Interventions

E-01: Increasing Medication Compliance in the Pediatric Population

Great Hall
Katherine Monday, Nursing
Grace Carter, Nursing
Kathryn Kleinhelter, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
Amongst the pediatric population medication refusal can result in treatment delay and potential negative outcomes. Nursing staff education on techniques/strategies to overcome medication refusal is lacking. The purpose of the project is to educate nurses about utilizing creative methods of medication administration and collaborative therapies for the pediatric population in order to decrease medication administration refusal. This project aims to answer the PICOT question, "In pediatric nurses, how does education on using creative and collaborative alternative strategies and therapies for medication administration increase the nurses' level of knowledge and willingness to adopt the change in practice during the teaching session?" Using data from peer-reviewed articles, studies were examined to identify most successful methods of medication administration and determine which methods are more suitable for various pediatric patient age groups. Methods identified as suitable were presented to an audience of pediatric nurses in the form of a PowerPoint presentation, tactile examples, and brochures. Pre-test and post-test surveys were administered to evaluate the effectiveness of the teaching session by examining the change in knowledge level and willingness to adopt the presented medication administration methods. It is expected that the educational session will enable pediatric nurses to gain knowledge and skills to successfully address medication refusal. Results from these interventions are pending.

E-02: Preventing Infant Mortality Through Safe Sleep Education

Great Hall
Caroline Schuh, Nursing
Cat Siebert, Nursing
Gabby Hacker, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
Are infants (<1 year) who have caregivers that have not been exposed to safe sleep education within the hospital, compared to those who have successful teaching from nurses, more likely to suffer from Sudden Infant Death Syndrome (SIDS) during their hospital stay? According to the CDC in 2018, there are about 3,500 sleep-related infant deaths each year in the U.S. The purpose of our project is to provide significant education that will decrease the risk of infant mortality due to unsafe sleep practices that are not being implemented properly during inpatient stays at the hospital. We aim to demonstrate effective

routines and habits, like the ABC's of sleeping, to nurses through creating an education session that will include a poster, showing videos, and a simulation activity (bringing in an actual patient crib with a fake baby) to show proper safe sleep to nurses on A6S at Cincinnati Children's Hospital Medical Center. Safe sleep practices at home will be achieved by educating the nurses to educate the caregivers. The impact of the project will hopefully decrease the gap in knowledge regarding unsafe sleep practices at home, thus decreasing sleep-related infant deaths. The outcome of the project will further show statistically increased knowledge and adherence to safe sleep practices among nurses and caregivers. Further results are pending at this time.

E-03: The Relationship between Reading Skills and Children's Autonomy in the Classroom

Great Hall
Sarah Richter, Psychology
Chloe Woeste, Psychology
Kurtis Keller, Psychology
Project Advisor: Dr. Heidi Kloos

Abstract
Establishing intrinsic motivation for learning at a young age is essential for academic success. Autonomy is an important piece of intrinsic motivation, especially for students. However, the circumstances of when and how to give students choices in the classroom is unclear. There are endless amounts of book options with different contexts and reading levels, so incorporating choice seems simple. Despite this, the typical school context is not conducive to student autonomy; daily schoolwork and activities are rarely under control of the student. Adding choice, autonomy, or agency into classroom reading activities also requires deliberate action on the part of educators. To determine situations where autonomy is beneficial, a systematic review was carried out on research that incorporates student autonomy into reading instruction. We focused specifically on reading instruction and interventions that took place in school, as students spend most of their time reading in the classroom. To what extent does it support the development of reading skills? Results from 41 articles show that autonomy positively affected children's reading skills, but not without exception. To account for this discrepancy in findings, a new framework of autonomy is provided.

E-04: Characterization of an Unknown Product for the Development of an Undergraduate Organic Chemistry Experiment

Great Hall
Drew Ladd, Chemistry
Project Advisor: Dr. Christopher Gulgas

Abstract
The undergraduate organic chemistry laboratory at UC Blue Ash has been using the "E2 experiment" which was adapted from the chemistry literature. This experiment involves reactions of a compound with a base followed by characterization using gas chromatography (GC), which is a common analytical technique in commercial and government labs. The UCBA chemistry department recently acquired a

new GC system and work has been ongoing to characterize all possible reaction products. As part of this work, the synthesis of a potential unknown product was carried out. The product was purified and characterized by multiple methods to provide evidence for this product formation in the undergraduate "E2 experiment". The GC method, synthesis of the unknown compound, and sample results from the E2 experiment will be presented.

E-05: Elective Induction vs. Spontaneous Labor
Great Hall
Allison Klimkowski, Nursing
Alex Rupley , Nursing
Amanda Bunse, Nursing
Project Advisor: Dr. Caroline Morrison

Abstract
The practice of elective induction of labor is becoming more routine among pregnant women, but has some potential harmful implications. The lack of education among labor and delivery nurses inhibits expecting mothers to make informed choices regarding their birth plan because they are not properly educated on the adverse events that may accompany elective induction of labor. The purpose of our education project was to understand the literature on elective induction of labor and educate labor and delivery nurses on the negative implications that may be associated with elective induction of labor in term, uncomplicated pregnancies versus spontaneous labor. The goal of our research is to determine if educating nurses will decrease the maternal decision of choosing elective induction of labor, thus decreasing the complications associated with it. We are presenting an educational PowerPoint emphasizing the complications that are associated with elective inductions in term, uncomplicated pregnancies to a group of labor and delivery nurses at Fort Hamilton Hospital. A pre and post-test will be administered to allow for analysis of the knowledge gained through the presentation. Results are pending, but we anticipate an overall increase in knowledge among the nurses in maternal and fetal complications associated with elective induction of labor. This will allow for better informed maternal decisions, and therefore, decreased maternal and fetal complications.

E-06: Impact of Patient Acuity Related to Nurse Staffing
Great Hall
Theresa Ferdiny, Nursing
Marc Albesa, Nursing
Meccah Betts, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
Research shows a significant correlation between nursing staffing models and patient outcomes including falls, hospital-acquired infections and pressure ulcers. Patient-acuity-based staffing allocates resources and time needed to care for patients based on the severity of their disease process, utilization of acuity-based staffing has been shown to result in fall occurrence to reduce from the benchmark of

2.69 per 1000 patient days to 1.35 and pressure ulcers to reduce from 1.57 per 1000 patient days to 1.27. The purpose of this project is to use evidence to show a medical-surgical unit that acuity-based staffing can decrease the incidence of falls and pressure injuries of patients. A literature review was conducted to gather evidence. An educational intervention was developed from the evidence to educate the nurses on the benefits of an acuity-based staffing model. The education will be provided through a verbal presentation and a brochure they could use for later reference of the topics covered. To determine the effectiveness of the education, a pre and post-test questionnaire will be administered to measure known knowledge and knowledge gained. Presently, the project's results are pending, however, the data is expected to determine if the nurses on an orthopedic medical-surgical unit agree that acuity-based staffing can reduce patient falls and pressure injuries when implemented in nurse assignments. Despite the limited availability of research that supports a comparison between patient-acuity versus other staffing models, this project is expected to support the assumption that patient-acuity-based staffing can reduce the incidence of falls and pressure ulcers.

E-07: Preventing Falls Among Post-Surgery Patients

Great Hall
Melonie McDonel, Nursing
Michelle Pham, Nursing
Elaina Von Deylen, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
Approximately 700,000 - one-million hospitalized patients fall each year, resulting in extended hospital stays, increased healthcare costs, and serious injuries including death. The likelihood of patient falls is increased due to medication side effects used to control postoperative pain (i.e. opioids, sedatives). The purpose of this project is to educate approximately six same day surgery nurses on how educating their patients about their risk for falls during the preoperative period can result in increased understanding from patients and reduce their risk of falls after surgery. The PICOT question that guided this project was: will providing patient education during the preoperative period on how opiates can increase a patient's fall risk decrease the number of falls experienced by patients? A literature search was performed, limiting articles published between 2016-2023 and using keywords "fall prevention", "surgical patients", "opioids", and "increased falls". A pamphlet was created that nurses can refer to when educating patients about the risk of fall injuries due to opioid/sedative medications, and preventative measures to decrease risk for falls. The nurses will answer a questionnaire before and after the presentation on knowledge, understanding, and pamphlet effectiveness. Results are pending; however, if proven effective, preoperative education on the side effects of opioids will decrease the occurrence of patient falls. Serious fall-related injuries still exist, prompting hospitals to find new solutions to protect their patients. To ensure patient safety and establish trust in the hospital, addressing the long-standing issue of patient falls is crucial and requires the participation of every healthcare worker.

E-08: Reduction of Work-Related Musculoskeletal Injury Among In-Patient Nurses During Patient Transfer

Great Hall
Kathryn Curry, Nursing
Kyle Lascano, Nursing
Anthony Palermo, Nursing
Project Advisor: Dr. Paul Lewis

Abstract

The physical demands of nursing tasks cause musculoskeletal injury to nursing staff. The U.S. Bureau of Labor Statistics reported that in 2016, musculoskeletal disorders caused 8,730 absences among nurses, leading to poor patient outcomes due to low staffing ratios. The proposed PICOT question is: "Will in-patient nursing staff who receive safe-patient transferring education experience a reduction in the number of workplace injury occurrences, as compared to a group who received no education, within two weeks of training?" The purpose of this project is to educate in-patient hospital nurses on the causes of musculoskeletal injuries and identify techniques that can decrease injury when handling patients, with a focus on using exercises that strengthen muscle groups involved in patient transfer and effective implementation of assistive devices. Following literature searches related to musculoskeletal disorders, occupational injuries, in-patient nursing, and ergonomics, an education session was created including a slideshow presentation and exercise demonstration that will be presented to eight medical-surgical nurses on a cardiac/orthopedic unit. A pretest will be given in person along with two post tests administered at different times: one immediately after the education, and one emailed version to be completed two weeks after, to determine the effectiveness of the taught interventions. It is expected that the audience will demonstrate an equal or greater knowledge of how to prevent injuries when moving patients, a decrease in musculoskeletal injury on the unit, and an increase in the proper use of assistive devices. The results are pending at this time.

E-09: Does Early Mobility Help Prevent 30-Day Rehospitalization More Than Regular Mobility Programs on the ICU Units at Good Samaritan Hospital

Great Hall
Hannah Rodimel, Nursing
Gabriela Santiago, Nursing
Faith Myers, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract

Initiating early mobility programs for patients in the intensive care unit (ICU) has been found to improve patient outcomes which leads to decreased readmission rates and improved quality of life for the patients. Early mobility programs have been used before and there is evidence to show its effectiveness. While researching, many intensive care units lacked proper implementation of early mobilization programs. Referencing quality improvement projects, it is evident that these programs can be put into effect using available resources already existing on the unit. Benefits of early mobility programs include decreased rates of ICU acquired weakness, pneumonia, pressure sores, and deep vein thrombosis. More

research needs to be done regarding the effects of the early mobilization program and the impact on readmission rates. The specific question being asked is: Does early mobility help prevent 30-day rehospitalization more than regular mobility programs on the ICU units at Good Samaritan Hospital. Though some hospitals use an early mobility program, there is a lack of standardization on timelines and types of exercises. A PowerPoint, poster, and videos of patients using the program with specific exercises for care team members to implement will be presented to a Good Samaritan ICU unit based on this evidence. The goal of the education to nurses at Good Samaritan Hospital is to further the implication of this program by addressing concerns and barriers; however, the results are pending. Educating about the program's benefits will further incentivise Good Samaritan to implement the program.

E-10: Effectiveness of Various Performance Drinks During a Timed Running Task

Great Hall

Henry Sopko, Health Science
Kyle Schiell, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract

It is well known that proper hydration is a key component to exercise performance and recovery. With numerous performance drink options available off-the-shelf, many consumers are left to wonder which is best given there is a wide variation in terms of carbohydrates, electrolytes, and other components contained in each. This project aimed to evaluate the effectiveness of different performance drinks on performance during a running task. Participants were 5 females and 5 males age 20-25 who exercised regularly. Participants consumed either water, Powerade orange, or Gatorade Perform 02 series orange prior to each trial. Running trials were performed on an indoor track for consistency. Each test was performed with a minimum 5-day rest before the next trial. Participants began by warming up on an exercise bike for 10 minutes then rested for 30 minutes. The specified beverage was consumed during the first 5 minutes of the rest period. Each subject was also given an RPE questionnaire to assess their exhaustion level after the warm-up bike ride. Each patient then completed a 10-minute run on the indoor track with the goal to complete as many laps as possible within that time frame. All runners started at the same starting point and were instructed to stop once the 10 minutes expired. The number of laps completed was recorded along with a final RPE rating. The outcomes of this project may help provide some insight into the most effective type of hydration during a cardio-based task in a young adult population.

E-11: The Impact of Physical Fitness Level on Heart Rate Recovery

Great Hall

Kristina Richards, Health Science
Peyton Mottice, Health Science
Grace Kellogg, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract

It is well established in the literature that exercise, whether resistance training or cardio focused, is an effective method of improving cardiovascular health. Improved cardiovascular health can lead to increased lifespan and reduced incidences of health issues including high blood pressure, stroke, diabetes, and certain cancers. However, it is unknown what level of physical fitness is required to improve cardiovascular health. One simple measure used to evaluate cardiovascular health is heart rate recovery, or how quickly the heart rate returns to resting state after exercise. So, the purpose of this project was to evaluate how physical fitness level impacts heart rate recovery. Participants were healthy college aged individuals. Resting heart rate was obtained while the participant was seated, and max heart rate was calculated using a gender adjusted equation. Participants began by walking on a treadmill at an initial speed of 3mph at a 2% grade. The speed and grade were increased by 1mph and 1%, respectively, each minute. This continued until the participant reached their max heart rate at which time the subject also gave a Rating of Perceived Exertion (RPE). Immediately after the completion of the trial the subject was seated and heart rate was monitored until it returned to resting level. Data will be evaluated to compare the difference between various physical activity levels on heart rate recovery time. The results of this project will help to better understand how to improve cardiovascular health through exercise training.

E-12: The Impact of Immersion on Postural Sway Using Virtual Reality in College Students

Great Hall

Joseph Stephenson, Health Science
Nick Celestino, Health Science
Azaria Mango, Health Science
Project Advisor: Dr. Mike Riley

Abstract

Virtual reality Immersions (VRI) have the potential to alter postural control systems, which in turn influence a person's ability to keep their balance and recover from imbalance. When comparing post-immersion to pre-immersion results, most young adults have demonstrated increased control over their posture. Although some studies have compared posture control with other cognitive tasks, very few have used VRI with this age group. Therefore, this study aimed to analyze subjects' levels of postural control, as measured on a force plate, prior to and following their participation in a VRI experience. Participants were healthy, college aged individuals who were asked to complete a 10-minute VR immersion task called Adventure Climb VR. Participants wore a VIVE Focus 3 headset throughout the duration of the task. In the Adventure Climb VR task participants participated in virtual climbing, belaying, navigating rock falls and other obstacles, and so forth which mimicked real-life rock climbing. Immediately prior to the VRI the participant was asked to complete a one-minute pre-test postural assessment of shoeless quiet standing. The same postural assessment test was completed immediately after the VRI task. Postural data, in the form of sway deviation in the anterior/postural and lateral directions and total sway, was compared between the pre-and post-immersion tests. The findings of this project will contribute to a greater understanding of how immersion in virtual reality can help improve posture control.

E-13: What's Your Stance on Math? The Effects of Posture on Cognition

Great Hall

Rebecca Yardy, Health Science
Project Advisor: Dr. Mike Riley

Abstract

The ability to perform cognitive tasks is important in daily life. Maintaining an upright position requires the coordination of many body systems dealing with cognition, vision, and balance. In many older adults completing a task while also maintaining an upright posture may be difficult, as cognitive and physical abilities deteriorate with age. Previous research has suggested that cognitive ability differs in upright vs. sitting positions, and that cognition can impact posture, but there has not been as much research on how cognition is affected by standing postures. The purpose of our study was to investigate the impact of standing posture on cognition. The methods of the study involved using a timed arithmetic based cognitive test to quantify cognition under different postural conditions. Participants were asked to complete an oral arithmetic test in four postures (eyes open normal stance, eyes shut normal stance, eyes open tandem Romberg stance, eyes shut tandem Romberg stance). The order of the arithmetic tests and postures were randomized. Data was collected and analyzed to determine average time spent on the task in each posture and average percent of questions answered correctly in each posture. The values were compared across conditions. Our results give insight into how people should be positioned during cognitive work.

E-14: The Effectiveness of Static vs. Dynamic Stretching on Counter Movement Jump Height

Great Hall

Dylan Jiao, Health Science
Nicholas Burch, Health Science
Project Advisor: Dr. Susan Kotowski

Abstract

Previous studies have shown that regardless of age, gender, or training status, pre-exercise static stretching causes acute decreases in some muscular performance parameters such as maximal muscle strength and explosive muscular performance. It has also been found that the negative acute effects seem to diminish with shorter stretch durations. However, the effects of pre-exercise dynamic stretching on muscular performance parameters have mixed results in the literature. Based on previous research, further investigation is needed to compare shorter pre-exercise static stretching durations and pre-exercise dynamic stretching on muscular performance. Therefore, the purpose of this project was to examine the effects of shorter pre-exercise static stretching protocols vs. pre-exercise dynamic static stretching protocols on countermovement jump height (CMJ) in healthy young adults. The methods used included quantitative measurement of CMJ height (inches), and qualitative measurements of fatigue. A baseline jump was recorded for each subject at onset of the study. Participants were asked to go through both a series of static stretching protocols twice, holding each stretch for 15 seconds, and a dynamic stretching series twice for 10 repetitions each on separate days. After each stretching protocol, subjects completed 3 CMJ on a jump mat which calculated height in inches, and height was measured in inches. After the last trial of the entire experiment, qualitative questions were asked. Data was

evaluated to assess the difference between the pre-exercise stretching protocols on vertical jump performance. The results will help better understand how to make more effective jumping workouts.

Category F: Social (In)Justice

F-01: Issues with University of Cincinnati Housing from a Student's Perspective

Great Hall
Ellis Smith, Mechanical Engineering
Laura Fitzpatrick, Biomedical Engineering
Meredith Brinkmann, Computer Engineering
Project Advisor: Dr. Gregory Bucks

Abstract
One of the driving factors of a student's experience on campus is the University housing. The University of Cincinnati has a wide variety of housing options across the campus all of which have varying features. This project aimed to determine UC students' ideal dorm conditions via three surveys. These surveys were designed to collect student input on a variety of housing issues that they have identified.   These surveys were distributed to a sample of on-campus students using online platforms and a network of residential advisors. Respondents were initially asked to simply identify any general issues they had with their housing. Following the initial survey, a new sample of respondents was asked to elaborate on the problems above from the first survey. Lastly, based on the results collected from the first two surveys students were asked to rank proposed solutions on a scale from 1-5, 1 being uninterested and 5 being very interested. A preliminary analysis of the survey data reveals that there are several areas for improvement. Respondents expressed a strong desire for improvements in the following categories: temperature control, functional elevators, cleanliness, and water temperature along with unsatisfactory maintenance of appliances. The results of this project will be used to create suggestions pertaining to future housing renovations. By understanding students' preferences and priorities, The University of Cincinnati can continue to provide a high-quality on-campus living experience that meets the needs of its diverse student population.

F-02: Full Practice Authority for Advanced Practice Registered Nurses

Great Hall
Cole Williams, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
In states like Ohio, which have restricted scope of practice for nurses with advanced degrees, patients bear the negative impacts of a decrease in care providers, the ability of primary care practitioners, and the increased costs that come with a greater number of healthcare workers paid by treatment. This isn't the case everywhere. 23 states and the District of Colombia have expanded their nurse practice acts to "Full Practice Authority", meaning that nurses that are educated, experienced, and board-certified are able to utilize their training and qualifications to care for patients using their skills.   States like Ohio

which restrict the practice of APRNs do so by limiting the specific tasks and abilities of nurses with advanced degrees. They also may require collaborative agreements- a mandate that pays physicians to oversee APRNs, a practice that frequently sees high start-up costs and maintenance fees. Collaborative agreements limit the geography in which APRNs can work and care for patients.   The applications of the findings may help with expanding the scope of practice, which has the potential to decrease the cost of care, expand the availability of care providers, and increase the number of APRN graduates, while fighting the current physician and provider shortages that are rampant across the nation. The nurse practice acts have been expanded in many states to ensure APRNs are rightfully utilized in the care team. Ohio has this same opportunity.

F-03: Characteristics of Children who are Disrupted at Focus on Youth
Great Hall
Megan Gibson, Social Work
Project Advisor: Dr. Anjanette Wells

Abstract
The purpose of this research study was to provide any data about certain characteristics of children that may lead to a higher risk of disruption from a foster home. Disruption occurs when a child is removed from their current foster care home to be placed in the care of a different foster care family. Disruptions can occur for a variety of reasons, but most occur due to the foster parents stating that they cannot or will no longer care for the child. This study was a secondary analysis of previous disruptions that occurred within the Focus on Youth foster care and adoption agency. The disruptions were analyzed to see if children with certain characteristics were disrupted more than others. Specifically, gender and race was tallied to determine if a certain race or a certain gender is at a higher risk for disruption. After completing the research, it was found that caucasian children, male children, and children over the age of five were disrupted the most. This data was consistent with the highest populations of children involved with Focus on Youth, leading to the conclusion that no biases or inequalities are leading to disruptions. More data would need to be pulled from different agencies to determine if this is consistent on a larger scale.

F-04: Investigating Racial Ideology and Racial Bias within the Cincinnati Waldorf School
Great Hall
Jessica Scheid, Sociology
Project Advisor: Dr. Oneya Okuwobi

Abstract
The Cincinnati Waldorf School is known for its progressive and inclusive approach to education, which focuses on developing a child's intellectual, emotional, and artistic abilities. However, concerns have been raised regarding the school's racial ideology and racial bias within the school. This research proposal investigates racial ideology and racial discrimination within the Cincinnati Waldorf School. Research Questions: What is the racial ideology of the Cincinnati Waldorf School? To what extent do racial biases exist within the Cincinnati Waldorf School? Methodology: This research will utilize a

mixed-methods approach, including both quantitative and qualitative data collection and analysis. First, I will analyze their website, images, handbooks, and policies. Then I will interview an employee of the school, which will allow for a more in-depth exploration of the experiences and perspectives of the school.   Data Analysis: The quantitative data collected from the website, images, and policies will be analyzed to identify patterns and correlations in the data. The qualitative data collected from the interview will be analyzed using content analysis to identify key themes and patterns in the data.   Ethical Considerations: The research will be conducted in compliance with ethical guidelines, and participants will be informed of their rights and the purpose of the study.   The findings of this research will provide a comprehensive understanding of the racial ideology and racial bias within the Cincinnati Waldorf School. The results will help identify areas of improvement for the school and inform policies and practices to promote a more inclusive e and equitable school environment.

F-05: Relationship Tempo for Bi+ Women Partnered with Cismen, Ciswomen, and Gender Minority Individuals
Great Hall
Nia Clark, Psychology
Project Advisor: Dr. Sarah Whitton

Abstract
The well-known "U-Haul" stereotype states that female same-sex couples become serious and move in together very quickly. Some data suggest that lesbian women develop relationships faster than heterosexual women, but this conflates partner gender (same-sex vs different-sex) with sexual identity (lesbian vs. heterosexual). To rigorously test this stereotype, we explored differences in relationship tempo by partner gender in a sample comprised solely of bisexual women. Participants were 180 bi+ women in romantic relationships with a cisman (n=107), ciswoman (n=39), or gender minority partner (n=34). 80 were cohabiting. A 4-item scale assessed tempo of getting serious. A 3-item scale assessed tempo of cohabitation. Participants also reported duration of time together before a) officially getting serious and b) cohabiting. One-way ANCOVAs assessed differences by partner gender in the four measures of relationship tempo, controlling for age and income. Results showed a significant effect of partner gender on tempo and duration to get serious. Those partnered with cismen had a faster tempo of getting serious than those partnered with ciswomen or gender minorities. Those partnered with a gender minority had longer duration before getting serious than those partnered with cismen. There was no effect of partner gender on cohabitation tempo or duration. Findings refute the U-Haul stereotype. Among bi+ women, partner gender has no effect on speed of cohabitation and those with male partners had the fastest tempo to getting serious. This highlights the importance of empirically testing, versus assuming, the validity of stereotypes about sexual minorities.

F-06: Digital Exclusion: Internet Illiteracy Among the Homeless Population and Its Effects on Obtaining Employment in the Digital Age
Great Hall
Verany Iek, Social Work
Project Advisor: Dr. Anjanette Wells

Abstract
Individuals experiencing homelessness lack the proper resources to obtain employment, a higher education, and stability. With today's current expansion within the digital age, the likelihood of resources being kept away from the individuals affected, especially the homeless population, could possibly play a role in their likelihood of self expansion and gaining employment. The following paper is a quantitative descriptive research that will look into the homeless population residing in Shelter House Cincinnati. We will utilize a quantitative survey that will allow the individual to share their experience with obtaining employment alongside their digital literacy capacity, and how the internet has affected their day to day life. We hope to look further into how the digital age has affected the bridge between employers and the individuals who are in search of employment, as well as finding ways in which we can mend the gaps that have been created through digital exclusion.

F-07: How Does a Probation Officer's Relationship/Demeanor With Their Client Affect Their Likelihood to Commit a Technical Violation?

Great Hall

Graicen Siler, Criminal Justice
Project Advisor: Dr. Sarah Manchak

Abstract
Following a prisoner's release, there are many different life-altering decisions a person must make to succeed in life after prison. From housing to job seeking, life after prison can be a significant struggle for all reentering into everyday life. When discussing the reintegration process, one prominent but often overlooked, relationship comes into play. This relationship is the bond formed between the probation officer and the client. To many, the idea of a probation officer is often judged based on past stereotypes that come from this negative view of probation. Probation and Parole are used as stepping stones for those reentering society following their release from prison after being charged and found guilty of a crime. The use of probation is to create this bridge between life in prison and life outside. As a bridge to these two very different worlds, probation officers play a significant role in the transition for these other individuals. Through this study, I have uncovered how the strength of a relationship formed between Probation Officers and their clients differs depending on whether their client has a diagnosed mental illness. I have also found that the demeanor of said Probation Officers greatly affects the likelihood of their clients committing a technical violation of their probation or parole. I have uncovered these connections using a survey presented to up to 300 participants who are on active supervision.

F-08: Examining the Impact of Race and Ethnicity on Fees Assessed to Individuals on Probation

Great Hall

Chiara Contessa, Criminal Justice
Project Advisor: Dr. Amber Petkus

Abstract

Prior research has shown that racial disparities exist in sentencing, in part due to judicial discretion. Monetary sanctions, such as fines and fees, are often assessed at sentencing. Fines are financial penalties the court imposes on a defendant for transgressions, misdemeanors, or felonies. Fees are individual charges accessed to defendants with court dealings, on supervision, to raise revenue. Courts have great discretion over the total monetary sanction assessed. Beckett wrote about a study done in Washington state that found discretion in sentencing has been shown to be influenced by factors such as ethnicity (Harris, Beckett 2011). The study explained that this could lead to racial and ethnic disparities in monetary sanction amounts, similar to disparities found to exist in other sentencing decisions as determined by prior research. Similarly, race and ethnicity have also been shown to impact the total amount of monetary sanctions an individual is assessed (Friedman 239). However, there is a lack of research concerning how race and ethnicity relate to fee amounts assessed in the academic literature. This study considers the impact of race and ethnicity on the total amount of fees assessed to individuals on probation in Texas using administrative court data collected for the Community Corrections Fines and Fees Study. Implications for policy and practice will be discussed throughout this study about the assessment of fees and the relationship with race and ethnicity.

F-09: Social Work Involvement and Recidivism at the Public Defenders Office
Great Hall
Katelyn DeShane, Social Work
Project Advisor: Dr. Anjanette Wells

Abstract
This project focuses on the rate of recidivism at the Hamilton County Public Defenders Office and the impact of social work involvement.

F-10: Women of the January 6th Insurrection: An Analysis of Similarities and Motivations Among Offenders
Great Hall
Stephanie Mendez, Criminal Justice
Project Advisor: Dr. Joseph Nedelec

Abstract
On January 6th, 2021, the United States of America was shocked by the Capitol attack, which took place during the certification of the presidential election. This attack was led by far-right extremists, hate groups, and self-identified Trump supporters (Who Are the Key Figures in the Jan. 6th Inquiry?, 2022). Among the participants were small business owners, prior military members, and families with children. One of the most surprising numbers was the 14% of women who aided the attack ("This is Our House!," 2021). This is because women's participation in far-right extremism is oftentimes downplayed or underrepresented in available data (Samuels and Shajkovci, 2022). Scholars were left with questions about why these women participated and what characteristics they may have in common. Although research on the topic of women in extremist movements is limited, a common trait is their devotion to the nuclear family role (Samuels and Shajkovci, 2022). One theory is that specific characteristics such as

age, racial animosity, adherence to conspiracies, and male influence could lead women to participate in extremist movements such as the aforementioned. This study uses a mixed-methods approach to analyze a database containing 124 women who have been charged for their participation in the January 6th, 2021 Insurrection. The outcome of this work could provide insight on the possible characteristics of the far-right extremist women who participated in the Capitol attack of 2021.

F-11: A Comparison of People Criminally-Sentenced from the January 6th Insurrection and a Black Lives Matter Protest

Great Hall
Mackenzie Cushard, Criminal Justice
Project Advisor: Poppy Theocharidou

Abstract
The January 6th, 2021 Insurrection that happened in response to the results of the 2020 presidential election was an event unlike any other in a democratic nation. Never has a protest gone as far as to infiltrate the nation's capital. The previous year, millions of people across the nation participated in more than 10,00 Black Lives Matter demonstrations, most of which were peaceful, but some turned into riots. The response to both these events by police and lawmakers has been inconsistent with protesters for the Black Lives Matter protests met with rubber bullets and shields, while insurrectionists faced barriers and pepper spray. Additionally, the National Guard was delayed on January 6th. Around 800 arrests of participants of the January 6th insurrection and around 100 arrests of participants of the Black Lives Matter protests in Portland, Oregon. I have compiled a database of these participants and recorded the factors of their case: Age, Sentencing, and Crime to compare judicial reactions. From this database, I have selected 38 participants who were charged with a violent crime such as assault. The assault on the capital was of greater scale due to the importance of our capital and the number of people. Through these findings, I was able to find that those who participated in the insurrection had longer sentences than those found during the BLM demonstration. Whether or not there was bias in the sentencing will need further examination as there is no evidence of bias in favor of the insurrectionists.

Category G: The Natural World

G-01: Long-undetected Skeletal Evolution in the Late Cretaceous Fossil Marine Reptile Mosasaurs (Squamata: Mosasauridae)

Great Hall
William Reisinger, Biological Sciences
Project Advisor: Dr. Takuya Konishi

Abstract
Mosasaurs (Squamata: Mosasauridae) were a group of large to gigantic (~13 m total body length), fully aquatic lizards that evolved and spread across the globe during the Late Cretaceous (ca. 100 to 66 million years ago). In the first 10 million years of their transition from land to sea, mosasaurs evolved two sets of flippers out of clawed limbs, streamlined their body by shortening of the posterior dorsal

ribs, and evolved a downturned tail to support a vertical, forked tailfin. Further evolutionary changes to their skeletal anatomy in the remainder of their evolutionary history however remain poorly understood to date. Herein, we report on hitherto undocumented skeletal modifications that took place in one group of mosasaurs, Plioplatecarpinae, encompassing the next 10 million years of their evolutionary history. The trends that we observe in their skeleton paint a picture of a transition to a progressively stiffer and rounder body, demonstrated by the following suite of characters in Plioplatecarpus houzeaui, a 70-million-year-old plioplatecarpine: an increased neural spine height; vertical elongation of the neural arch; shortening of the vertebrae; and an increasingly flatter articulation surface between vertebrae. Together with the loss of functional zygapophyses, these skeletal modifications are comparable to those that took place in cetaceans (whales) beyond the first 10 million years of their evolutionary history. By analogy, some of the most derived mosasaurs such as Plioplatecarpus studied here may therefore have achieved the level of swimming efficiency akin to modern-day toothed whales, including porpoises and dolphins.

G-02: Plant Remains from an Ancient Mayan City and Their Implications for Land Use
Great Hall
Jessica Brei, Biological Sciences
Project Advisor: Dr. David Lentz

Abstract
Learning from civilizations of the past is very important because it can help us understand history in a greater context and create new innovations based on ideas of the past. The Mayan culture was in existence for thousands of years and evidence of agriculture and other uses of plants has been discovered through archaeobotany. We are using evidence from samples collected in this archaeological site to interpret how the Maya's used their land and how it was managed, which will give us a better understanding of how this community functioned. Botanical samples analyzed in this study came from the Maya site of Aventura in Belize. In this excavation, samples were recovered from commoner and elite households as well as administrative and ritual contexts. This analysis reports findings from one elite household to better understand the access that the occupants at Aventura had to botanical resources. I utilized an array of techniques including flotation and wood charcoal analyses. I sorted the flotation samples by particle size and inspected them for botanical remains. Wood charcoal was collected during the excavation as encountered, and I examined the samples under a microscope. Scanning Electron Microscopy was used to image the charcoal and distinct anatomical characteristics were used to identify the remains to family, genus, and occasionally species. Identifications were compared to plants known locally and records of ethnobotanical uses. The data presented here gives us a better understanding of the environmental landscape at Aventura under Mayan management and the role that the Maya played in the ecosystems surrounding the site.

G-03: Mexican Cavefish Living in Hypoxic Environments Exhibit Changes in Expression of Oxygen-transporters
Great Hall
Lydia Bucher, Biochemistry and German Studies

Project Advisor: Dr. Joshua Gross

Abstract
In order to survive, animals living amidst extreme environmental pressures tend to evolve unusual adaptive features. This principal is well illustrated by differences between the differing morphotypes of Astyanax mexicanus, a freshwater fish species. These fish, from the El Abra region of Mexico, includes surface fish residing in streams and rivers of this region marked by lush vegetation and well-oxygenated water. Cavefish, however, live in underground caves with limited nutrition and detrimentally low-oxygen water. I examined how cave morphs have evolved to survive this extreme environmental pressure. Specifically, I investigated how altered hemoglobin expression in cavefish enable them to thrive despite their low-oxygen environment. This project began with a literature search to identify primary studies measuring gene expression using RNA-sequencing in various Astyanax populations. I examined studies published between 2013 and 2021, alongside one study in preparation for publication. These studies were diverse, including specimens of varying ages (ranging from 24 h post-fertilization through adulthood) and populations (including the Tinaja, Pachón, Chica, and Molino cavefish; and Río Choy surface fish). These studies involved different experimental conditions examining features like sleep loss, dark-rearing, and comparisons between captive and wild-caught fish. My results suggest hemoglobin expression is highly influenced by life history and experimental conditions. The outcome highlights the importance of hemoglobin research in Astyanax mexicanus and informs certain molecular mechanisms of adaptation to extreme environments. This work showcases the nature of cavefish adaptation to low-oxygen environments, and furthers our understanding of how animals assimilate to diverse ecological pressures.

G-04: Environmental DNA Analysis of Fish in the Mill Creek
Great Hall
Evelyn Perry, Biological Sciences
Project Advisor: Dr. Kenneth Petren

Abstract
Taking eDNA from 10 different sites off of the mill creek and ID'ing the fish found in these streams and comparing to MBI from past years of what has been found in these streams using electrofishing. As well as comparing the biodiversity to the drainage size going into the stream.

G-05: Preliminary Analysis for Potential Wetland Restoration in Hamilton, Ohio
Great Hall
Sarah Shamray, Biological Sciences
Project Advisor: Dr. Ken Petren

Abstract
Before European expansion, 1/5th of Ohio was wetlands. 90% of these wetlands have been destroyed or dried out to make way for human industry like agriculture, housing, and commercial use. Today, those three species and many more wetland inhabitants are threatened in the state. In Ohio, ¼ of all plant

species, ½ of fish species, ⅔ of bird species, and ¾ of amphibian species listed as threatened or endangered are associated with wetlands. Wetlands play a critical role in water control and quality; the increase of impermeable surfaces from urbanization can cause more frequent and more powerful flooding events, which can be avoided by wetland and riparian zones acting as water storage. These areas also offer ecosystem services such as carbon and nutrient storage and sequestration. In Hamilton County, farmland now owned by Hamilton County Parks shows potential for wetlands restoration. Wetlands are delineated by the presence of a high-water table, hydric soil, and aquatic vegetation. To test for these qualities, we will run soil percolation tests, analyze nutrient characteristics of the soil, and conduct vegetation sampling in a known wetland area and compare that data to that taken at the potential site. A successful wetland restoration in Hamilton County would bolster biodiversity in the area, protect some of our valuable waterways, and reduce net carbon emissions.

G-06: How Do Different Methods of Honeysuckle Removal Affect Understory Diversity in Cincinnati Parks?

Great Hall

Megan Heeke, Biological Sciences
Project Advisor: Dr. Kenneth Petren

Abstract

The goal of this work was to find how various forms of removal of the invasive species honeysuckle affected the woody-stem biodiversity within the understory of Cincinnati Parks. The research consisted of completing tree identification in transects through a control group area of no honeysuckle removal and three areas of differing removal methods. These methods of removal included forestry mulching, brush cutting, and volunteer hand removal. The outcome of this research project will further help Cincinnati Park personnel plan and advise others on how to remove an invasive species without further damaging other important, non-invasive species.

G-07: Measuring Microhabitat Preference in Small Mammals using Photocapture

Great Hall

Iris Pratt, Environmental Studies
Project Advisor: Dr. Steve Matter

Abstract

Presence of a variety of small mammal species is crucial for the vitality of an ecosystem. Monitoring for small mammals via the traditional method of capture and release can be challenging, as data collection is limited by the number of traps and available researchers. The use of trail cams offers a less time consuming method for monitoring small mammals, and allows for continuous data collection. Using trail camera photocapture, we are able to monitor use of microhabitats by small mammals and determine preference. The ecological impact of small mammals is often underestimated, though in actuality small mammals habitat usage leads to snowballing impacts on the entire ecosystem. Because of their ecological significance, examining population dynamics and preferences of small mammals can provide great "bioindicators" of general ecological health.

G-08: Tree of Heaven Allelopathic Herbicide

Great Hall

A'Daja Norman, Biological Sciences
Adam Jeffers, Biological Sciences
Project Advisor: Dr. Kenneth Petren

Abstract

The allelopathy of Tree of Heaven, Ailanthus altissima, can inhibit growth and prevent the germination of plants in their surroundings. According to a study by Rod M. Heisy, an Ailanthus post-emergence herbicide was effective on redroot pigweed, garden cress, velvet leaf, foxtail, barnyard grass, and corn in a lab setting. We are curious to know how this treatment would behave in an outdoor field setting. This has led us to Amur Honeysuckle. How could Ailanthus altissima compare to commercial products in efficacy? Could an invasive species help to manage other invasive species? The use of Ailanthus altissima could prove to be a more sustainable and cost-effective method for local parks as they attempt to reduce honey suckle populations.

G-09: Caffeine Modulates Activity and Sleep in Mosquitoes but Does not Impact Blood Feeding at a Low Concentration

Great Hall

Pranav Jayakumar Jayakumar, Biochemistry
Project Advisor: Dr. Joshua Benoit

Abstract

Malaria, Dengue fever, Zika fever and yellow fever are all well-known mosquito-borne diseases. Many species of mosquitoes draw blood from humans for reproductive purposes which allows them to serve as vectors for various disease-causing pathogens. Recent studies have shown that altering the sleep cycle of mosquitoes can lower the frequency of host landing and blood feeding and decrease their ability to serve as disease vectors. There are multiple factors that can impact the sleep cycle of mosquitos such as predation, light pollution, and environmental pollution. Caffeine is a common environmental pollutant and may potentially impact the activity of mosquitoes by altering their sleep. In this study, we exposed female mosquitoes to varying concentrations of caffeine and measured their levels of activity and sleep. Two common species of mosquitoes, Aedes aegypti (day-active) and Culex pipiens (crepuscular) were examined. Our results indicated that sleep amount and activity bouts were altered in mosquitoes exposed to caffeine, relative to control mosquitoes which had no caffeine exposure. Blood feeding assays following exposure to a single caffeine concentration (0.01M) showed no clear difference in blood feeding compared to their control, indicating a higher dose of caffeine may be necessary to see a significant difference. These results suggest that caffeine has a clear impact on mosquito sleep and further research is needed to fully understand if caffeine exposure can impact other aspects of mosquito biology.

G-10: Characterizing the Physical Differences between Urban and Non-urban Common Sulphur butterflies (Colias philodice)

Great Hall

Matthew Toplikar, Biological Sciences - Animal Biology Concentration

Project Advisor: Dr. Patrick Guerra

Abstract

We compared female common sulphur butterflies (Colias phildice) captured from urban and rural areas in the Greater Cincinnati Area to test the hypothesis that butterflies would differ between the two habitat types. We predicted that female urban butterflies would potentially be smaller than female rural butterflies due to potential resource limitation during development in urban areas as compared with rural habitats. Such resource limitation might be due to the effects of urbanization. Using head width, a commonly used metric that assesses butterfly body size, we found that female common sulphurs were significantly smaller when caught in urban habitats (e.g., Burnet Woods, Cincinnati, OH) relative to conspecific females caught in rural habitats (e.g., University of Cincinnati Center for Field Studies, Harrison, OH). Although we do not have records of where butterflies from both groups developed, our data do suggest differences between conspecifics when examined from different habitat-types. Future work will compare common sulphur males and developmental profiles for C. phildice when reared in either urban or rural conditions.

G-11: The Effects of Courtship Behavior and Body Condition on Mating Success in the Wolf Spider Schizocosa saltatrix

Great Hall

Jacob Tucker, Biological Sciences

Project Advisor: Dr. George Uetz

Abstract

Wolf spiders in the genus Schizocosa exhibit both vibratory and visual signals in courting a potential mate. One species, Schizocosa saltatrix, has been shown to have a previously undescribed visual display in addition to its vibratory signal, suggesting the use of multimodal cues. In this display, the male repeatedly raises and lowers his front legs to catch the attention of the female, although more needs to be known about its role in mating. This study investigates the extent to which leg raising contributes to male mating success. Spiders were collected from the Cincinnati Nature Center, housed in a laboratory at UC under controlled conditions, and fed crickets 2x/week. Trials consisted of a male and female paired at random, in large, clear plastic arenas with white filter paper. Females were placed in the arena first to lay down silk, and males were introduced ~10 minutes later. Trials lasted one hour and were video recorded. Upon completion trials were scored and the following events were quantified: male courtship bouts (# of leg raises), female receptivity events, mating/not, latency to mate and cannibalism. Data analysis confirms that male courtship rate and female receptivity are strong predictors of mating. Further testing also shows that latency to court plays an important role in subsequent mating, as males slower to start courting are less likely to successfully mate. However, male courtship rate is not correlated with body condition, and is not a condition-indicating trait, supporting the hypothesis that it serves solely to attract female attention.

G-12: Impact of a Heavy Metal Soil Contaminant on the Behavior of Ground-dwelling Wolf Spiders

Great Hall

Jacob Danner, Biological Sciences - Animal Biology Concentration
Project Advisor: Dr. George Uetz

Abstract

Lead (Pb) is a common and important environmental toxin, and previous studies have found that wolf spiders (Araneae: Lycosidae) were affected by this toxic metal. The objective of our studies was to determine if exposure to Pb-contaminated soil affects prey capture behavior in forest floor wolf spiders. Because of their constant contact with terrestrial litter and soil, two common local wolf spider species [Schizocosa ocreata and S. saltatrix] were selected for this research, and behaviors were quantified as indicators of health. Because the environmental stressor lead (Pb) affects the nervous system, our goal was to quantify the effects on wolf spiders by analyzing the prey capture behavior of female spiders. Juvenile Schizocosa ocreata and S. saltatrix spiders were collected from the Cincinnati Nature Center in the Fall of 2022 and raised to maturity under controlled conditions in the UC lab with soil provided by the EPA. Two sets of trials were run to examine capture of prey crickets (Acheta domesticus): spiders raised on Pb-contaminated soil and unexposed (control soil) spiders. Each encounter was recorded, the videos analyzed, and results calculated. Preliminary analysis suggests that chronic exposure to lead spiked soil affects spider prey capture success, with greater success and shorter latency of prey capture in control spiders. Results suggest that wolf spider behavior may be a good bioindicator of the neurological impacts of lead exposure.

G-13: Pre-mating Exposure and Mating in the Wolf Spider Schizocosa saltatrix

Great Hall

Olenka Tymosch, Biological Sciences
Project Advisor: Dr. George Uetz

Abstract

Previous studies have shown that female Schizocosa wolf spiders vary mating preferences for males after experience. The goal of this research project is to understand the possible effects of pre-mating familiarity among neighboring spiders on mating success of a lesser-known species, Schizocosa saltatrix. We collected juvenile spiders from the Cincinnati Nature Center and raised them to maturity under controlled conditions in the lab. The spiders were assigned to one of three treatment groups: control (no exposure), one week or ~ two weeks familiarity/exposure before mating trials. Each male/female pair in the exposure treatments were placed in side-by-side containers for one or two weeks, while those in the control group were raised in separate containers (no familiarity before mating trials). In the exposure treatments, all sides of the containers except those facing the other spiders were covered to allow familiarity between the individuals. Results show that within the control group, there was a higher frequency of copulation, while in the other groups, there was a decrease in copulation frequency with

increased familiarity exposure. Control spiders also had a shorter latency to mate than the other treatments, suggesting a possible hesitancy to mate. Differences may have also been due to an unexplained difference in weight among female spiders, as control spiders weighed less than the other treatments. We conclude that pre-mating familiarity among neighboring potential mates decreases their tendency to mate with each other, which might serve as a mechanism to reduce mating among kin.

G-14: Effects of Lead-contaminated Soil on Ground-dwelling Wolf Spider Morphology and Behavior
Great Hall
Sunny Tran, Biological Sciences
Project Advisor: Dr. George Uetz

Abstract
The main objective of this study was to gain a better understanding of how toxic Lead (Pb) exposure can affect body condition and mating of two ground-dwelling wolf spiders: the brush-legged wolf spider Schizocosa ocreata and its congener S. saltatrix. Mating strategies and courtship behavior of S. ocreata have been studied extensively due to their complex, multimodal, and energetically costly courtship behaviors, while S. saltatrix is lesser known. Juvenile male and female S. ocreata and S. saltatrix were collected at the Cincinnati Nature Center and raised under controlled lab conditions, then exposed to Pb-contaminated soil after their penultimate (sub-adult) molt. Once matured, male and female spiders were photographed and measured, then paired randomly in an experimental design with species, treatment and sex as factors. Live mating trials were done, and mating behaviors were recorded using a Sony Handycam® camcorder apparatus. We also measured morphological traits and calculated a body condition index (BCI). Mating success was not independent of treatment; fewer spiders in the Pb-contaminated soil treatment mated, regardless of species. Spider body condition index (BCI) varied significantly with species, sex and treatment. Female BCI is greater than male BCI and was different between treatments for both species. In the brush-legged wolf spider Schizocosa ocreata, fluctuating asymmetry (FA) of leg tufts (an indicator trait) was negatively impacted by the lead treatment. These findings suggest that in addition to being good models in behavior studies, wolf spiders may also be useful as biomarkers of ecosystem contamination.

G-15: Efficient electrochemical conversion of biomass-derived materials under mild conditions
Great Hall
Leah Kistner, Chemistry
Project Advisor: Dr. Yujie Sun

Abstract
An area of research that has received considerable attention in recent years is the use of biomass-derived chemicals as replacements for products that are formed using oil and natural gas. Reactions with compounds containing a furan ring have shown potential as intermediates for these alternative products, specifically the use of 5-hydroxymethylfurfural (HMF) and 2,5-diformylfuran (DFF). While current chemical syntheses of these materials and conversion to other similar compounds have

achieved high yields, the processes can be lengthy and involve the use of expensive catalysts. However, current research to improve upon these methods through the use of electrochemistry has shown promising results. Preliminary reactions involving the subsequent oxidation and reduction of HMF and DFF compounds show that they can be carried out electrochemically and still achieve decent yields. In addition, these reactions can be carried out in mild conditions using inexpensive and abundant materials, such as copper or graphite as electrodes. Though current research is still underway, there is promising potential to establish these environmentally friendly protocols for the conversion of biomass-derived furan compounds.

G-16: Evaluating iNaturalist as a Tool for Monitoring Invasive Species in Cincinnati Parks
Great Hall
Dwijen Shah, Biological Sciences and Business Analytics
Martin Werner, Biological Sciences and Environmental Studies
Project Advisor: Dr. Ken Petren

Abstract
The goal of this research is to develop a better understanding of iNaturalist, a citizen science tool, as a data source for monitoring invasive plant species in Cincinnati Parks. Invasive species are costly to monitor, and citizen science tools like iNaturalist have proved cost-effective alternatives to scientific monitoring in certain cases. 50-meter belt transects were used to collect data on percent coverage of ten different invasive species. This data was compared with percent coverage in the same areas as determined from iNaturalist for differences or noticeable patterns. Data collection and analyses are still in progress, but the outcomes will further understandings of relationships between iNaturalist data and measured invasive plant cover. This will allow Cincinnati Parks to make better and more cost-effective decisions and guide their volunteers to use iNaturalist in more helpful ways.

Category H: Mental Health and Human Behavior

H-01: Does Parental Praise of Positive Behavior Decrease Negative Behavior in Prematurely-born Children with Behavior Problems?
Great Hall
Leo Lam, Psychology
Project Advisor: Dr. Shari Wade

Abstract
Objective: Children born very preterm (VPT; <32 weeks gestation) have increased risk of developing behavioral problems. Parent-child interventions can effectively reduce behavioral issues while improving the parent/child relationship. We recently developed Building Better Brains and Behavior (B4) program to provide parents of VPT children with strategies to maintain a positive parent-child relationship, including labeled praise of desirable behaviors. We hypothesized behavioral problems would decrease, and labeled praise increase and changes in labeled praise and total behavioral problems pre- to post-intervention would be negatively correlated.

Methods: VPT children ages 3-8 with documented behavioral issues were recruited for a pilot trial. Parents completed seven online learning modules and weekly therapy sessions involving live coaching of parent-child playtime. Parents rated their child's behavior using the Child Behavior Checklist (CBCL) pre- and post-intervention. Trained coders counted total labeled praises in each playtime recording using the Dyadic Parent-Child Interactions Coding System (DPICS).

Results: Eleven children and their parents completed the study. Paired-samples t-tests showed significant labeled praise increase pre- (M=0.27, SD=0.47) to post-intervention (M=4.55, SD=4.01; t(10)=-3.42, p=0.007) but no significant behavior problems reduction pre- (M=59.55, SD=17.82) to post-intervention (M=55.00, SD=12.17; t(10)=1.13, p=0.286) . There was no significant correlation between changes in labeled praise and behavior problems pre- to post-intervention (p=0.901).

Conclusions: Parents used significantly more labeled praise post-intervention, but this was not associated with reduced child behavioral problems. A closer look is needed at specific behavioral problems impacted by the intervention (e.g., inattention, anxiety). Replication is warranted with a larger sample for more conclusive results.

H-02: Importance of Early Drug Screening on Maternal and Fetal Health

Great Hall
Kaitlyn Richardson, Nursing
Tenley Stickel, Nursing
Cynthia Melton, Nursing
Project Advisor: Dr. Caroline Morrison

Abstract
According to the Substance Abuse and Mental Health Services Administration, 7.7% of pregnant women are reported to use illicit drugs and 7.2% are reported to use marijuana during pregnancy in 2021. The purpose of this project is to understand the literature on screening programs for pregnant women who use illicit substances. We would then present this information in an education session to healthcare professionals at TriHealth. Our project hopes to answer the question, does educating healthcare professionals that work at TriHealth improve knowledge on universal screening programs? There is currently no standard of screening for pregnant mothers, instead screening is currently based on bias and risk factors, which is shown to miss many pregnant women who use drugs. We will be using a pre and posttest given to the healthcare providers at TriHealth to analyze their knowledge before and after our teaching to collect data. The results of our education session are pending, but we expect that we will see an increase in the knowledge base of the healthcare providers we are presenting to. Universal screening may eliminate bias in the healthcare field regarding race, ethnicity, social class and economic class, as well as decreasing maternal and fetal health risks associated with drug use.

H-03: Reducing Opioid Risk

Great Hall
Bridgette Turton, Nursing
Taylor Hendershot, Nursing
Olivia Hart, Nursing

Project Advisor: Dr. Paul Lewis

Abstract
The purpose of this study is to understand the literature provided in order to educate nurses and healthcare providers with a practice change as the goal. The specific question asks how this education for nurses on meditation for pain relief will improve nurses' knowledge base. The object of this study is to increase the implementation of meditation in pain relief techniques in order to inversely decrease the rates of opioid prescription. A literature review was completed with research done on how to educate pediatric nurses on the overprescription of opioids, associated risks, and how meditation can be used as an adjunct therapy to help relieve pain and therefore create a lesser need for opioids. Based on the education provided to the staff at Cincinnati Children's Hospital, the data showed a positive increase in nurse's perceptions of meditation as a pain management technique. Before the presentation, a question was asked to the audience to rate mediation 1-5 from not at all helpful (1) to very helpful (5). The original mean rating was 3.25, but by the end of the presentation the mean rating rose to 4.2 (a 19% increase). When asked about the uses of mediation, only 40% of the audience chose all of the correct responses, but by the end 70% chose the correct responses and all of the audience selected more of the correct answers than before. In addition, the data showed a 20% rise in the number of participants who considered opioid usage to be too much. With *[sic]*

H-04: Anxiety in Middle School Students
Great Hall
Alyssa Bunker, Social Work
Project Advisor: Dr. Gary Dick

Abstract
Anxiety can develop due to adverse life events and anxiety can cause problems in an individual's home, personal, and school life. This is a very prominent and normalized problem in adolescents. While it may be common and even normalized today, it's important to understand the rates, causes, and effects of anxiety. The purpose of this research is to gain a better understanding of the causes and consequences of anxiety in middle school students. I will analyze the data on rates of anxiety in prepubescent (5-9) and early adolescents (10-15). This data will be compared to qualitative findings of adverse life events etc. that may have contributed to the rates of anxiety.

H-05: The Increase in Cases of Elder Abuse During the Covid-19 Pandemic
Great Hall
Kate Perry, Social Work
Project Advisor: Dr. Gary Dick

Abstract
This research project looks at the rate of elder abuse reports in the five regions in Ohio. It focuses on Gross Neglect, Physical Abuse, and Financial Exploitation. This study uses the ODIS database to document the number of made cases regarding these types of abuse during and after the pandemic and

then evaluates the data to understand how the pandemic made have had an impact on elder abuse and report rates to the ombudsman office.

H-06: 'Problem Kids': Evaluating the Use of Trauma Informed Care Among Youth with Behavioral Challenges
Great Hall
Sophia Gugino, Social Work
Project Advisor: Dr. Anjanette Wells

Abstract
The purpose of this research is to provide a descriptive study of youth with complex trauma and evaluate how the use of trauma informed interventions affects their resilience. The study draws from a pool of n=10 youth who have experienced complex trauma and evaluates factors such as: socioemotional skills, externalized aggressions and self-regulation capabilities. The study was conducted through the use of a pre and post test using the Strengths and Difficulties Questionnaire (SDQ) as the analytical tool. The youth were observed in a group setting over the course of approximately six months to allow significant observation time. The results indicate significant value in utilizing trauma-informed care as opposed to other interventions in addressing external behaviors.

H-07: Treatment Outcome Effectiveness with Schizophrenic Patients
Great Hall
Elizabeth Sparks, Social Work
Project Advisor: Dr. Anjanette Wells

Abstract
Schizophrenia is a debilitating mental illness that affects thousands of people every year, schizophrenia is chronic in the sense there is no permanent treatment. The main question I wanted to answer through my research was, what is the most effective way to treat those with schizophrenia? Through research, first-hand observation, and patient exit surveys I witnessed multiple different treatment modes and styles for helping to ease the symptoms of schizophrenia. Common forms of treatment include Cognitive Behavioral Therapy, Dialectical Behavior Therapy, and Trauma-Centered treatment, many having the same end goal but one is most effective specifically for those diagnosed with schizophrenia. The outcome of the research suggests that Trauma-Centered Treatment is the most effective working with patients or clients who are diagnosed schizophrenic and are displaying positive symptoms, such as visual or auditory hallucinations, thought distortion, etc. The value of the outcome due to this research furthers social workers education specifically working in the concentration of patients or clients diagnosed with Schizophrenia.

H-08: Impact of Mindfulness on Stress in Emergency Department Nurses
Great Hall
Cady Tageson, Nursing

Sophia Sharpe, Nursing
Kaeli Koop, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
Stress has major impacts on nursing practice especially in the emergency department as its effects on nurses include difficulty maintaining self care and compassion burnout. This negatively affects their ability to care for patients, decreasing both successful patient outcomes and their own satisfaction. During the literature review for this study, mindfulness has shown to be an effective strategy in stress reduction for emergency department nurses. Our question for this study was does practicing mindfulness everyday over not practicing decrease the stress levels of emergency department nurses? This project teaches emergency department nurses the technique of mindfulness and its impact on stress. Our project entailed extensive literary research on the different types of mindfulness and how it can affect the stress levels among emergency department nurses or nurses in high intensity areas. Our education plan included addressing the knowledge deficits regarding self-care, relaxation and stress reduction techniques by a PowerPoint presentation and brochure. The effectiveness of the teaching will be determined by comparing the pre-test and post-test scores from surveys that measure the level of knowledge and willingness to adopt the learned mindfulness techniques. Currently results are pending.

H-09: Educating Inpatient Nursing Staff on De-escalation Techniques to Reduce Seclusion and Restraints

Great Hall
Garrett Clifford, Nursing and Business Administration
Paige Loveless , Nursing
Haellee Keener, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
The use of seclusion and restraint in psychiatric inpatient facilities is a highly controversial topic, and there is an urgent need to educate healthcare professionals on effective strategies to reduce their use and promote safe and therapeutic environments for patients. The aim of this project is to educate inpatient staff on alternative measures and implementation of training programs to decrease coercive measures and improve patient outcomes. This aids in determining whether the use of de-escalation techniques and educational interventions is beneficial in reducing the number of patients put into seclusion or restraints on each unit. We looked at this by utilizing systematic reviews and scholarly articles related to research from the past five years and turning our findings into an educational opportunity for current inpatient staff at the University of Cincinnati Medical Center, Ridgeway Psychiatric unit. The outcome of the educational session will allow inpatient staff to gain knowledge of different de-escalation techniques and how to implement them to improve patient outcomes. A pre and post-test will be administered to analyze the audience's learning after viewing an educational lecture. The outcome of the education will help reduce inpatient seclusion and restraints and improve staff education. As a result, the implementation of de-escalation tactics/techniques and educational programs will lead to reduced coercion and better patient outcomes.

H-10: Prevention of Burnout Using Stress Management Techniques in ICU Nurses

Great Hall

Zoë Hardaway, Nursing
Kursten Jones, Nursing
Rey Riggins, Nursing
Project Advisor: Dr. Paul Lewis

Abstract

Stress and burnout are two subjects that are interelated pertaining to the field of healthcare. Research has shown that 7.4% of nurses remain absent from the work due to burnout or symptoms from stress which is 80% greater than other working groups. Although these are concerns that have long been recognized by health care workers, recent events such as the COVID-19 pandemic have pushed their impact to the forefront. The purpose of this project is to potentially decrease the rate of burnout among ICU nurses by educating them on stress management techniques. This will be accomplished through identification of common work stressors and instruction on healthy coping mechanisms. A selected group of ICU nurses at The Jewish Hospital in Cincinnati, Ohio were presented with a brief educational powerpoint presentation and were also given a handout with information referencing the importance of stress management in reducing symptoms of burnout. An electronic pre-survey and a post-survey were distributed to the selected nurses before and after the presentation to examine the quality of learning related to the topic. The outcome of this educational project will allow for further examiniation of the existing and gained knowledge of ICU nurses in relation to the matters of stress management and burnout (results pending).

H-11: Night Shift Nurses Often Feel Uneducated on Approaching Night Shift Sleep Routines and Habits and the Effects on their Alertness and Sleep Health

Great Hall

Olivia Greathouse, Nursing
Jamie Rhyan, Nursing
Emily Moeglin, Nursing
Project Advisor: Dr. Caroline Morrison

Abstract

Around fifty eight percent of night shift workers report being somewhat or totally dissatisfied with their sleep quality. Nurses in this role shared that a gap in training about shift work impacted their level of preparedness. The purpose of this project is to understand interventions based on literature that give information on how to improve healthy sleep habits. The literature indicates that including exercise, improving nutrition, and positive coping skills will enhance sleep health and alertness when working night shift. This information was presented to a group of University of Cincinnati Medical Center residency program nurses using a Powerpoint presentation. A pre and post-test was administered to determine the effectiveness of the presentation. Findings pending, however we expect to see an

improvement in knowledge following the educational session. Educating shift workers on healthy behaviors and sleep hygiene may improve sleep quality and alertness during their shift.

H-12: Health Promotion Education to Decrease Stress and Burnout in Emergency Room Nurses

Great Hall
Olivia Taskey, Nursing
Olivia Porpora, Nursing
Madison Young, Nursing
Project Advisor: Dr. Mohammad Othman

Abstract
According to the National Institute of Health, 42% of nurses experienced burnout in 2022. Burnout can result in poor patient outcomes, high turnover rates, and compassion fatigue. There are many factors that contribute to burn out in nursing. One factor of particular relevance to emergency nurses is high stress level. The purpose of this project was to provide emergency nurses in a level-III trauma center with educational and training on mindfulness strategies that they can utilize to help decrease their stress level. The ultimate goal is for those nurses to be able to manage their job-related stress in anticipation of decreasing the incidence and prevalence of burnout among ER nurses. This project was driven by the following PICOT question: "In an emergency department registered nurses, how does a mindfulness-strategies educational session influence job-related stress level when compared to the current practice of not providing one?" A PowerPoint presentation was delivered to a group of ER nurses at Cincinnati Children's Hospital to educate them on some mindfulness strategies that they can utilize to help manage their job-related stress. The presentation was preceded with a pre-test and followed by a post-test survey to gauge the effectiveness of the teaching intervention. Currently, the results are pending. It is expected to see an improvement of the participants' scores on the post-test, suggesting that those nurses will be more capable of managing their job-related stress and less prone to burnout.

H-13: Isolation and Mental Health of the Elderly Population

Great Hall
Zoe Cap, Social Work
Project Advisor: Dr. Anjanette Wells

Abstract
Isolation within the elderly population is a prevalent and increasing problem. A elderly person can feel isolated as a result of several factors including lack of loved ones, physical inability, or location. It is important to understand what leads to elderly isolation, how isolation affects them, and how this can be addressed. The goal of my research was to observe and interview residents of Brookwood Retirement Community regarding their isolation and mental health. The residents I interviewed and observed were Long-Term Care residents meaning they receive 24-hour nursing care and reside in the facility full time. I focused on asking them interview questions regarding their overall mood, what they enjoyed and pursued prior to living in our facility, what they enjoy within the facility, and what they feel would

improve their overall mood and socialization. The outcome of my research shows that resident's overall mood would increase with more activities, one-on-one interactions, and stimulation. If residents are having more interactions and activities their isolation reduces and they are overall happier. The outcome of the research will allow the facility to address the residents needs and give them ideas to work towards improving the resident's quality of life. The outcomes are able to provide feedback of how to reduces isolation and therefore lower anxiety and depression in the elderly population.

H-14: Combating Intensive Care Unit Delirium: Empowering Nurses with Non-Pharmacological Interventions in Acute Care Settings

Great Hall
Jenny Kozek, Nursing
Cassia Oney, Nursing
Regan Abahazie, Nursing
Project Advisor: Dr. Paul Lewis

Abstract
Delirium is a notable decline in cognitive ability that is linked to higher mortality and morbidity rates as well as prolonged hospital admissions related to deterioration in motor, cognitive, and functional abilities. The incidence of delirium is notable in Intensive Care Units (ICU) where it ranges from 45-87%, indicating characteristics of ICU environments are a significant contributing factor to the development of delirium. Current practice does not promote non-pharmacological nursing interventions to reduce the rate or severity of delirium, it instead relies on pharmacological interventions. The purpose of this project is to introduce non-pharmacological nursing interventions to ICU nurses, which have been shown to decrease the incidence of hospital delirium. Nursing interventions such as periodic reorientation, reducing excess noise, and early mobility were introduced in an educational session for nurses working at the University of Cincinnati Medical Center Neuroscience ICU. Using a PowerPoint presentation, participants received education on the signs of delirium, evidence-based non-pharmacological interventions to prevent delirium, and the efficacy of combining interventions into a "bundle" protocol for ease of implementation. A handout was provided to demonstrate an example of bundled non-pharmacological interventions and the advantages of implementing the change in practices. Pre- and post-tests were given to gauge their learning and the effectiveness of the teachings by measuring nurse's knowledge of recognizing, preventing, and reducing the severity of ICU-acquired delirium. Findings are currently pending.