IU Undergraduate Research Summer 2023 Poster Symposium

IUUR Summer Research Poster Symposium 2023			
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Exploring User Perceptions on the Potential Role of ChatGPT in Healthcare

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This research explores the role of ChatGPT as a virtual healthcare assistant and the many advantages and limitations perceived by users. ChatGPT is a form of artificial intelligence (AI) that has the ability to analyze language and produce human-like responses based on context. Because of its nature, ChatGPT has a potential role in healthcare where it can assist patients with managing their health. However, to accept ChatGPT as a reliable source for patients may be a challenge. There are concerns about how user data will be used and the credibility of medical information that is shared. The main objectives for this research was to explore the perceived benefits and concerns of users when interacting with ChatGPT as a virtual healthcare assistant, how the role of ChatGPT affect patients' decision-making when seeking medical advice, and how patients percieve the credibility and trustworthiness of medical information provided by ChatGPT. The method used was a study where participants roleplayed in scenarios where they would have to interact with ChatGPT to assist with a health concern. Before and after the study, the participants were also given questions to answer to share their experiences, thoughts, and concerns. Based on results, common themes were trust, engagement, and insufficient information. Participants had trouble being open with ChatGPT because they did not want to share personal information. This also led them to be less engaged while interacting with it. Some participants also mentioned how personal connection was important to them and how it affects their comfort in the healthecare setting. Another common theme was that participants wanted more detailed explanation of ChatGPT's responses and how it would help them in the future. In conclusion, users have many perceived benefits and concerns when it comes to integrating ChatGPT as tool in healthcare.

Mentors: Genevieve Mortensen, Department of Informatics, Luddy School of Informatics, Computing and Engineering; Haixu Tang, Department of Informatics, Luddy School of Informatics, Computing and Engineering

Kaliyah Edwards

John McMullen, Biology Department, Indiana University

Bacterial viruses, or phages, can be important drivers of bacterial evolution in plant microbiomes. This effect causes a rise in many questions- one being how these phages impact bacterial function and fitness and what that in turn does to the host plant. This project involves investigating how evolving phage resistance affects rhizobia (nitrogen-fixing bacteria) and their host plant, clovers. We evolved two strains of rhizobia to be resistant to phage infection, and then applied the ancestor and evolved strains to clover plants individually to monitor changes in rhizobia fitness and function. In parallel, we assessed in a greenhouse experiment whether susceptible rhizobia evolved phage resistance to determine a realistic ecological view of the effects on rhizobia function. We found that evolving resistance to phage infections impacted the fitness of some rhizobia by changing their ability to establish in plant roots. Similarly, we found that the evolved strains were less beneficial to plant growth. To determine whether there is a benefit to evolving phage resistance for rhizobia, we tested whether rhizobia developed cross-resistance to other phages, providing enhanced protection against novel parasites. We found that evolved strains were resistant to more phages in our phage panel. Taken together, this work identifies a potential trade-off in phage-infected soils, where there is a cost to develop phage resistance with respect to plant growth promoting potential, but a benefit to rhizobia as they can resist phage infection to novel phages.

Gait Mechanics: Investigating the effect of Consecutive Days of Running on Ankle Joint Angle Kinematics

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Jimmy McDonnell, Kiara M. Chan, Allison H. Gruber, Biomechanics Laboratory, Indiana University, Indiana, USA

In prior investigations concerning Running Related Injuries (RRI), the conventional approach involved comparing injured runners with their uninjured counterparts to identify potential risk factors associated with RRI occurrence. However, this methodology has encountered significant challenges in establishing robust evidence of gait-related risk factors, which are intricately linked to a runner's specific running pattern. These conventional methods have failed to capture the dynamic nature of a true training run, wherein gait characteristics undergo changes as runners progressively experience fatigue. In light of this limitation, the primary objective of this current study is to address this gap by examining how a runner's gait evolves throughout a prolonged run, as well as over multiple consecutive workouts.

Presently, the study has successfully enrolled 12 participants, and initial analysis has been conducted on 2 of them. Encouragingly, it was observed that, on average, these two subjects exhibited a substantial increase of 3.46 degrees in ankle eversion during their third laboratory run, while displaying a contrasting 1.76-degree reduction in ankle eversion during their initial laboratory run

From these preliminary findings, it is worth noting that the muscles crossing the ankle joint appeared to fatigue more rapidly than those crossing the knee joint. Such fatigue in the ankle muscles likely contributed to the observed increments in peak eversion angles during the third laboratory run. However, it is imperative to exercise caution in interpreting these results, as further data processing and comprehensive analysis are still required before drawing firm conclusions from our dataset. As part of our future analyses, we intend to employ Linear Mixed Effects Models to explore the influence of running day and timepoint on peak joint angle measures.

In conclusion, this ongoing study endeavors to shed light on the nuanced dynamics of a runner's gait during extended runs and multiple workout sessions. By capturing these changes in gait patterns, we hope to identify potential risk factors associated with RRI more accurately, ultimately contributing to the advancement of preventive measures and tailored training regimens for runners.

References: [1]Willwacher et al., (2022), *Sports Med*. [2]Ceyssens et al., (2019), *Sports Med.* [3]Willwacher et al., (2019), *Gait & Posture.* [4]Derrick et al., (2002), *Med Sci Sports Exerc*. [5]Sanno et al., (2020), *Med Sci Sports Exerc* [6]Dierks et al., (2010), *J Biomech*. [7]Edwards et al., (2012), *J Biomech*. [8]Hintermann et al., (1998), *Sports Med*. [9]Weir et al., (2020), *Med Sci Sports Exerc*. [10]Mizrahi, J. et al., (2000), *Hum Mov Sci*. [11]Noakes, (2000), *Scand J Med Sci Sports Sports.*

Title:
How obstacle contrast effects ones foot clearance when stepping over a stationary object.
Name: Aaliyah Johnson
Pod members: Arth pate1, Meri Yusef, Diana Tran
Mentor: Kierstyn Napier-Dovorany, optometry
Abstract Body:

Falling is very common among older individuals. About 36 million falls are reported among older individuals per year, which is resulting in more than 32,000 death per year. A major cause of falling, Results from tripping over a stationary object, which ultimately causes injury. However, the brightness ratio between its object and its surrounding, allows the object to be distinguished. The contrast of an obstacle dictates how to properly step over the obstacle. Obstacle contrast may be an important component of obstacle visibility and may thus impact fall risk. Therefore, this study investigated how obstacle contrast affects one's foot clearance when stepping over a stationary object.

Presence of a Coviewer and the Impact on Multilingual Children's Electrodermal Activity

Manpreet Khera
McCall Booth, the Media School, Indiana University Bloomington

With the rise of technology, children are spending more time with media–from television to scrolling through social media. This has provided new opportunities for parents to develop their relationships with children. One particular avenue of interest is co-viewing, where parents and children watch together, and the impact it can have on children's processing of information. Prior research has shown that arousal is related to optimal learning. This study focuses on understanding if there is a discernible difference among multilingual children's physiological response, specifically skin conductance which can be a measure of arousal when viewing alone versus viewing with a parental figure. This is a pilot study sample of n=2 of children aged 7-10 years old who watched short video clips in both English and Spanish with and without their parents. EDA was used to gather psycho-physiological data for skin conductance for both parents and children. Although this is a pilot study, the results indicated that skin conductance for the alone condition, on average, was higher than the co-viewing condition was higher than the co-viewing condition by 3.877154 microsiemens every second, indicating that the arousal was higher when the child was watching alone. This disproves the hypothesis as it was initially thought that co-viewing would indicate higher arousal; thus, the results showed that it may be beneficial for children to watch media alone, as they may process the information better and have a greater educational benefit.

Effects and Preference of Cyanogenesis in Clovers on *Spodoptera exigua*

Proxima Lee
Jen Lau Lab, Biology Department, Indiana University

Genetic diversity can benefit populations by reducing herbivory. Cyanogenesis in clover allows clover to produce cyanide in order to reduce herbivore consumption. Cyanogenesis in clover is adaptive, but the adaptiveness of diversity within this polymorphism has not been measured in a population. This project explores how consuming different genotypes of clover impacts percent of clover consumed and herbivore survival rate. Utilizing *Spodoptera exigua*, food choice tests and consumption patterns were measured. It is possible that the data might reveal a trend toward selection against cyanogenic clover or that the Acli and acLi clover together are more deleterious than acyanogenic clover.

Appetitive and Aversive Motivation through Pacman: Comparing Physiological Data Based on Motivational Tendencies

Lily Leslie

Neil Ni, Media School and School of Psychological and Brain Sciences, Indiana University

Appetitive and aversive motivation have been studied by using measurements such as the Motivation Activation Measure (MAM) and the Mini Motivation Activation Measure (MiniMAM). While the values derived from these measures are valid, there is still a need for a measurement of appetitive and aversive motivation in a non-linear, dynamic context. The goal of this study is to measure appetitive and aversive motivation with a dynamic paradigm and to see if the physiological data collected aligned with known, valid measures. Participants were separated into groups (low/high appetitive motivation and low/high aversive motivation) based on MiniMAM values. All participants then played a modified version of Pacman while physiological data (heart rate, corrugator muscle activity, orbicularis oculi activity, and skin conductance) were collected. The results found that there was not significant difference between the mean physiological values gathered across both groups for the most salient positive and negative stimuli. While there was not a significant difference of physiological values between low and high appetitive motivation and low and high aversive motivation, a dynamic model measuring these values, along with other important variables, should still be pursued.

Visual Experiences of Infants

Mazvita Ndhlovu, Jenny Zual, Alex Cruz, Emy Michalek, & Natalia Dickerson

Ph.D. Linda B. Smith, Hadar Karmazyn Raz, Sara Benham, Department of Psychological and Brain Sciences, Indiana University.

I worked in the cognitive development lab where I focused on the visual experiences of infants through images. Through these visual images, I created a focus on how many images have hands in view based on the age and location of the child. The variables I looked at include the child's age, where they are located either in India or Bloomington, and lastly, the frequency of hands in the images from the child. Articles that contributed to my research included Kennedy Caseys' Sticks, leaves, buckets, and bowls: Distributional patterns of children's at-home object handling in two subsistence societies, Marisa Casillas' Early Language Experience in a Tseltal Mayan Village, and Linda B. Smiths' Real-world visual statistics and infants' first-learned object names. The article Real-world visual statistics and infants' first-learned object names highlights how object handling helps babies with language development, sensorimotor skills, and exploration. The other two articles provide context for how object handling differs from culture to culture but the idea of its importance in cognitive development remains the same. The fact that age also plays a role in this context further enriches the complexity of the findings. This kind of research is valuable in contributing to our understanding of early cognitive development and can have implications for education and child development programs.

Appetitive and Avoidance Motivation measured using a Continuous Appetitive Variable

AnhThu Pham
Neil Ni, The Media School, Indiana University

When playing a video game, participants make decisions and display reactions that stem from biological motivational systems. Specifically, the aversive and appetitive motivational systems are a large contributor to participant behavior. The appetitive system motivates participants to approach things that may aid in their survival and is generally thought to be connected to positive emotions. The aversive system is what motivates participants to avoid things that may be harmful to their survival and is generally thought to be connected to negative emotions.

To simulate aversive and appetite situations, a modified version of the Pac-Man game is used in which the participant must make a decision to avoid or approach various characters in the game. Then using sensors, the physiological data of the participant (heart rate, skin conductance, and facial muscle movement) is collected.

Though results are not yet conclusive, trends in the physiological data demonstrate that positive emotions, less attention, and less arousal are associated with characters that are more rewarding to survival. Whereas negative emotions, more attention, and more arousal are associated with characters that are more harmful to survival. To provide more validity to these results, I believe that more data needs to be collected.

Impacts of microbial community & resource environment on clover nutrient allocation

Kim Reish, John McMullen, Jay Lennon
Indiana University Department of Biology

Rhizobia and clover have a mutualistic relationship where the rhizobia fix atmospheric nitrogen in exchange for photosynthesis products. Theoretically, this mutualism may be subject to external pressures from nitrogen fertilizers and bacteriophages that disrupt the mutualism. Thus, we performed a factorial greenhouse experiment to test how nitrogen addition and bacteriophages impacted rhizobia of varying nutritional benefit to clovers. We determined how rhizobia and nitrogen addition impact plant nutrient allocation. Based on dry matter content, nitrogen and the presence or absence of high or low quality symbionts contributed to significant effects on the host plant. To determine the driver of these differences in nutrient allocation, we specifically measured plant protein content. Initial analysis shows that the increased soil nitrogen content promoted plant protein load and biomass. Rhizobial nutritional quality also had a significant effect on total plant protein, driven by their varied benefits to the plant. Additionally, when high and low quality rhizobia were present, they negatively impacted plant protein likely due to interstrain competition. This opens up new avenues to test the effect of competition in this mutualism, an often under considered but important element in this system.

Pac-Man and Motivation: Response Analysis Using Players' Distance and Health

Sammy Sproles

Yuqian (Neil) Ni, The Media School, Indiana University Bloomington

This study investigates the relationship between biological motivational systems and players' decision-making and emotional experiences in the context of a modified Pac-Man game. The fundamental premise is that human behavior in video games is significantly influenced by appetitive-aversive motivational systems, which drive approach-avoidance behaviors. This research explores how players' internal states of deprivation/satiation (Pac-Man's health) and external stimulation (distance to foods/threats and their strength) dynamically shape their approach-avoidance motivations during gameplay. The research contributes to an understanding of how biological motivations affect human responses, not only in gaming but also in real-world situations. The study revolves around exploring the impact of appetitive-aversive motivational systems on players' decision-making and emotional states in the modified Pac-Man game. By analyzing psychophysiological data (heart rate, skin conductance, and facial muscle activity) collected during gameplay, the study aims to gain insights into the neural mechanisms underlying players' emotions and approach-avoidance motivations. Participants play the game in either appetitive or aversive mode, while their physiological data are collected. The game incorporates various animal types, each affecting Pac-Man's health differently. Approach and avoidance motivation time courses are calculated based on players' internal deprivation/satiation and external stimulation. The research findings uncover the significance of imminence and urgency in players' decision-making and emotional responses during gameplay. Analysis of the collected psychophysiology data reveals that players' approach-avoidance motivations were influenced not only by their internal state of deprivation/satiation and external stimulation but also by the perceived imminence of potential threats and rewards.

Please put your abstract here (note: section 4 is sized in order to fit your abstract into 250 words or less):

Section 1: Abstract Title

Quality of detecting visual field defects utilizing 10-2 versus 24-2 vision tests

Section 2: Author Names

Diana Tran[1]

Section 3: Author Department and School Affiliation

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Section 4: Abstract Body **[note: Your abstract must fit inside this box and be 250 or less]**

Purpose: It is normal for one's vision to slowly worsen as they get older, which can affect their gait. Therefore, understanding what kind of visual field test(s) is the most useful in detecting any defects within one's central field of vision is important as allows one to take action promptly if a serious defect is found, e.g. central scotoma or glaucoma. The purpose of this research was to compare the extent of which the 10-2 and 24-2 visual tests can detect visual field abnormalities that can eventually be further applied to determine the magnitude of impact in one's gait performance.

Methods: The mechanics of the iCare COMPASS, which facilities the 10-2 and 24-2 visual field testing, was focused on to get a clear understanding for how these visual field tests are conducted. Various components from 10-2 and 24-2 test results, such as the mean deviation (MD) and the number of test points accounted for, were considered to effectively compare the efficiency and quality/value of each test. The two visual tests were conducted on a patient with no known serious visual field impairment. These results were then compared to test results of a patient with a known serious visual field impairment.

Results and Conclusion: The 10-2 test turned out to produce better quality results that gave detection of visual field abnormalities as well as insight to the progression of these abnormalities. However, these two tests performed fairly similar to each other, thus the value of each test may be debated depending on the kind of results desired. By gaining a sense of the differentiating factors between these two tests, one can decide to perform one test over the other to obtain results that would give the best insight to how a certain visual field impairment is impacting one's gait performance.

Section 5: Research Project Mentor or Advisor

Mentor: Kierstyn Napier-Dovorany, School of Optometry, Indiana University, Bloomington, IN

Socio-demographic characteristics associated with differences in COVID-19 protective behaviors of the US population.

Ini-Abasi Udoh

Mentor: Dr. Maria Litvinova, Department of Epidemiology and Biostatistics, School of Public Health, Indiana University

The aging US population and the increasing prevalence of diseases that elevate the risk of more severe symptoms of respiratory infections are anticipated to escalate the burden of the seasonal outbreaks and epidemics of respiratory infections. Consequently, it is imperative to address health disparities and safeguard vulnerable individuals to enhance public health and healthcare outcomes. Efficiently protecting these populations necessitates understanding the factors influencing the adoption of recommended protective behaviors, such as vaccination, physical distancing, and masking, while identifying barriers and costs to physical and mental health.

Studies have underscored the costs of physical and social distancing for older adults, including heightened loneliness, social isolation, and potential impacts on mental and cognitive health. Therefore, comprehending the drivers and obstacles that influence population adherence to recommendations is vital to optimize protection against infections and mitigate costs to mental and cognitive health. To achieve this, we conducted a literature review and analyzed data from the Understanding America Study (UAS) on self-reported protective behaviors and individual characteristics.

Our investigation explores the differences in implementing protective behaviors across various characteristics, such as age, gender, income levels, presence of health conditions, attitudes, concerns, and social network size. Additionally, we compare the observed behavioral differences with self-reported COVID-19 history. We demonstrate statistically significant associations between a higher propensity to adopt protective behaviors and specific individual characteristics. This underscores the significance of comprehending socio-demographic drivers of behavior during disease outbreaks, facilitating targeted public health interventions to effectively safeguard vulnerable individuals.

Child Psychophysiological Responses to Bilingual Media

By Manie Vongpraseuth

McCall Booth, The Media School, Indiana University

Bilingualism has numerous benefits, and many studies have examined the psychophysiology of bilingual speakers. In particular, children have both a distinctive benefit in language learning and unique psychophysiological reactions when interacting with a parent. The objective of this pilot study aims to analyze the psychophysiology response of young bilingual children in a media environment that is not in their family's primary language. Children age 7 to 10 years viewed 8 short clips in English and their native language (Spanish).

While viewing the media clips, participants wore ECG electrodes in order to measure heart rate. Results from this pilot indicate that the Spanish clips elicited greater deceleration compared to those in English. Given that greater heart rate deceleration is used as an indicator of greater cognitive resource allocation, we can conclude that the Spanish media garnered greater child attention. This study helps reinforce the importance of bilingualism and media language for child cognitive processing, and parents may seek to utilize media in their heritage language in a bid for boosting their child's attention to media content.

Using Testing Measure to Detect Central Scotomas

Meri Yusef, Diana Tran, Arth Patel, Aaliyah Johnson
Kierstyn Napier-Dovorany, Gait Lab, Indiana University

The research examines the relationship between vision and gait, specifically when stepping over an object. The focus is the changes in eye gaze and gait for people with central visual field impairment. A component of this research was the equipment used for visual field tests. To assess which of the two visual test fields was most effective for detecting central scotomas, it was necessary to evaluate the instruments used to measure central visual field impairment, particularly the 24-2 and 10-2 visual test fields. A comparison of the 24-2 and 10-2 visual test fields reveals similar performance in the peripheral visual fields, as well as similar amounts of loss in the central visual fields. In the 10-2 test, there were additional points that returned a greater number of groups of defects, as well as a greater degree of correlation between structure and function. The 24-2 test is universally used compared to 10-2; although a similar set of criteria is applied to identify the presence of the defect. For this study the 10-2 performed better at giving a more detailed report of the cluster of defects, the extra points created a more characterized identification of the defect and a finer prediction of central vision function.

Adult vs. Child Object Handling and Touching

Jenny Zual
Sara Benham, PhD, Hadar Karmazyn Raz, PhD, Linda B. Smith, PhD
Department of Psychological & Brain Sciences, Indiana University Bloomington

This research aims to discover the ways in which visual perception in early infancy shapes infants' cognitive development. My research specifically, focuses on how often caregivers and infants hold objects when hands are in view. From this, I will emphasize whose hands are in view, and whether object handling or touching occurs in adults and the child. It is imperative to examine adult and child object handling when checking for whose hands are visible in the child's visual perspective. Infants' object handling depends on the objects that they have access to since certain cultures have different child-rearing practices and home environments (Casey et al., 2022). Additionally, the ways in which infants learn first words associates with a frequency of objects that they see and hear from caregivers (Clerkin et al., 2017). This infers that pervasiveness of words from interactions with parents or caregivers is imperative as it can lead to first words. Furthermore, infants' playtime at home demonstrates duration of object interaction, suggesting that exuberant activity allows infants to learn various routines and the language that goes with them (Herzberg et al., 2022). Visual experience matters with language development as first words learned comes from pervasiveness of words during the interaction between caregivers and infants. Caregiver interaction is crucial since playtime allows for learning of various objects. However, object learning and interactions vary due to culture differences since infants have access to different objects such as toys and household objects. As such, these differences will be observed in the objects held in their hands.

Samuel Coleman

Abstract

Abstract

Plants that grow in soil with higher nitrogen levels tend to grow differently than plants with lower levels of nitrogen. Due to this I conducted an experiment testing how nitrogen levels in the soil affect insect population and diversity around the plants. In this experiment 12 3x3 meter plots with either high or no concentrations of nitrogen additions in the soil were observed. Insect pitfall traps were placed inside of each plot. The number of insects that fell inside of the traps were then categorized by morphospecies and the amount of them were counted. This experiment was done to observe insect abundance and insect diversity additions between these treatments. With the results with this experiment, we will be able to find out if nitrogen rich plants impact insect populations. This can be very important as many fertilizers that we use contain nitrogen.

Methods

Cups filled with soap and water were placed into 12 plots with different levels of nitrogen. After the cups laid in the plots for 2 days each pitfall trap was put into a Ziploc bag labeled with the plot they come from. When the pitfall trap was removed from the Ziploc bag only insects and water would be left in the bag. Each insect was identified and divided their morphospecies, food habits, and species richness per plot.

The Effects of Nodule-Associated Bacteria on Clover Growth

Askar Mazitov

Jennifer Lau, Department of Biology, Indiana University

Legumes form nodules to capture rhizobia and form a mutualism whereby the plant receives nitrogen fixed by the bacteria in exchange for providing nutrients and a safe environment for the rhizobia to grow. Forming nodules is a rhizobia-specific interaction, and legumes only nodulate in the presence of rhizobia. However, bacteria other than nitrogen-fixing rhizobia can be found in these nodules, which have unknown impacts on plant growth and health. Eight bacterial cultures were isolated from clover nodules and grown in liquid culture, including one strain of rhizobia. Clover was planted in sterile soil with three seeds per container and then inoculated with the liquid cultures. Plant containers were given bacteria or control inoculants with and without rhizobia, resulting in 16 different bacterial treatments. The date of germination for each plant was collected. Data including biomass, nodulation, and chlorophyll measurement will also be collected as the plants grow.

Title: "Effects of Obstacle Contrast on Foot Clearance in Individuals Below 60 Years of Age"

Arth Patel

Kierstyn Napier Dovorany School of Optometry Indiana University

Purpose: The study's goal is to research and assess how the contrast of obstacles affects foot clearance during walking in people under the age of 60. The study's goal is to better understand the relationship between obstacles visibility (as indicated by its contrast against the background) and the height at which people elevate their feet to prevent tripping or falling on the obstacle.

Methods: A total of 7 participants, with an average age of 21.86 years, participated in the study. The experiment took place on a black carpeted walkway measuring 6 meters in length. Participants were required to walk along the pathway and negotiate a single obstacle, placed 4 meters from the starting point. The obstacle's height was varied between 1 cm and 19 cm, and its colors were black and white to provide different levels of contrast. Each participant completed 10 trials for each of the four randomized conditions. The lower limb kinematics were captured using a motion capture system containing13 high-precision cameras. To evaluate foot clearance (FC), the vertical distance between the highest point of the obstacle and the distal toe or heel of the participant's shoe was measured, considering whichever contact point was closer to the obstacle's highest point. This calculation allowed for a precise assessment of how participants adjusted their foot clearance while encountering obstacles with varying heights and contrast levels during the walking task.

Photomorphogenic Influences on Rhizobia's Evolutionary Dynamics

Damien Sparks

Jenifer Lau

A change in the amount of light a plant receives has been shown to cause many changes in the plant. It also causes changes within the microbial community of the plant's nodules. It changes the relationship between the rhizobia and the plant because they both behave differently. This brings up the question of if this difference may change the evolutionary traits of the rhizobia. Different strains of rhizobia are grown in these separate light environments and then plated on liquid media. Over time a couple of different traits were measured in order to find what differences these strains could have. The traits measured are growth rate and biofilm production. Some of them may be able to be more adept at fulfilling these traits due to their experience in harsher environments. These traits may be able to show how differently the rhizobia are able to function based on their ability to grow and adapt.

Development of an Advanced Real-Time Autonomic Nervous System Tracker: Normative Data Collection Based on Polyvagal Theory

Sarah Ali,
Kinsey Institute, Luddy School of Informatics Engineering and Computer Science, Indiana University

The Autonomic Nervous System (ANS) plays a crucial role in regulating physiological responses and adapting to stress. This research introduces ANSTracker, a real-time software tool for monitoring the ANS with significant improvements over existing options. The study aims to gather baseline normative data aligned with Dr. Stephen Porges' Polyvagal theory to develop the tool's algorithm. Participants in this controlled study were seated on a chair or recliner, and data collection involved multiple sensors, including ECG, respiration, EDA, PPG, accelerometer, and blood pressure measurements. The research protocol consisted of baseline and main protocol phases, incorporating tasks like deep breathing, grip strength, mindfulness meditation, mental arithmetic, and a cold pressor test. Data collection utilized Acknowledge software with simultaneous timestamp logging through the Simple Event Logger app, ensuring robust data capture. The research outcomes will contribute to an advanced algorithm for real-time tracking and interpreting autonomic responses. ANSTracker's monitoring capabilities hold promise in stress management, biofeedback, and healthcare applications. By providing a comprehensive dataset and sophisticated tracking tool, this research advances health-related technologies, improving physiological monitoring and promoting well-being. The ANSTracker is poised to address critical challenges in physiological tracking, benefiting researchers and healthcare practitioners alike.

Mentor: **Gregory Lewis, Kinsey Institute Traumatic Stress Research Consortium, Indiana University**

Competition Between Rhizobia and Other Bacteria from Nodules

Laniah Beck
Jennifer Lau, Biology department, Indiana University

Many bacteria can help the growth of plants by helping them obtain nutrients needed for survival. Rhizobia, a specific bacterium that lives in the nodules of plants, fix nitrogen into a usable form for the plants. This allows for a mutualistic relationship between the two, with the plants being given the nitrogen it needs to survive, and the bacteria is given a home. Just how plants compete for sunlight, water, and nutrients, bacteria also compete with each other. Inside of the nodules, rhizobia and non-rhizobia bacteria compete with each other for space and resources. The objective of this experiment is to figure out how these bacteria compete with each other and if the rhizobia will outcompete the non-rhizobia bacteria to provide the plants with more resources. To complete this experiment, two strains of bacteria (rhizobia and another type) were plated and grown together in liquid media. It was found on all 10 plates that in comparison to the rhizobia, the non-rhizobia bacteria produced more colonies at a faster rate. In this study, the non-rhizobia bacteria outcompeted the rhizobia on the plates.

Gait mechanics: How does consecutive days of running effect peak knee flexion

Author and collaborators: **Brandon Benbow**, Rezwana F. Habib, Jimmy McDonnell, Kiara M. Chan, Allison H. Gruber
Mentor: Jimmy McDonnell, Kiara M. Chan, Allison H. Gruber, Biomechanics lab, Indiana University Bloomington

In prior research on Running Related injuries (RRI) they would typically compare injured runners to uninjured runners to identify risk factors that may be associated with RRI's. However, this approach has particularly found challenge in providing strong evidence of gait-related (related to runners specific running pattern) risk factors. These traditional methods fail to represent what is more typical of a true training run that is that these gait characteristics change over course of the run as runners continues to become fatigued. The purpose of this study is to account for that and observe how the runners gait changes from the beginning of a long duration run to the end of that same run and, how the gait changes overtime with multiple consecutive workouts. Subjects were to run until exhaustion for 3 consecutive days while fitted with various motion capture devices where their gait could be analyzed throughout the run through software. Of the 12 participants analyzed from the ongoing study two of the subjects experienced an increase in knee flexion of 1.15 degrees during their first run and an increase of 0.52 degrees during their third run. Ankle eversion was also looked at and on average these subjects experienced a 1.76 degree decrease in ankle eversion during their first lab run and a 3.46 degree increase during their third lab run. Knee flexion and ankle eversion were chosen to be examined because of their role in active shock attenuation. From this preliminary it suggest that muscles crossing the ankle joint fatigue faster than muscles crossing the knee, although additional data processing and analysis needs to be completed before drawing conclusions.

My research explores the organizational level of public key infrastructure, specifically focusing on instances where failures arise due to systematic vulnerabilities. These vulnerabilities are not solely rooted in technological shortcomings but often stem from dissonance between business practices. To investigate this issue, I analyzed Bugzilla Reports from numerous companies using qualitative coding as the primary data analysis method. While we are still in the process of collecting and analyzing data, our findings are expected to offer valuable insights and guidance for organizations to strengthen their cybersecurity measures in the future.

Development of a pipeline to understand the role of Kif18B on spindle positioning

Destiny Cooper[1,2], Jordon Winn[1], and Claire E. Walczak[3]
[1]Department of Biology, Indiana University, [2](LSAMP), Indiana University, and [3]Medical Sciences, IU School of Medicine Bloomington

To create viable daughter cells, the cell proceeds through mitosis using a complex machine called the spindle. The spindle is a bipolar football-shaped structure made of microtubules with two spindle poles. Radiating from the spindle poles towards the cell cortex are the astral microtubules. The astral microtubules are the major players in spindle positioning and orientation, which is critical for daughter cell survival in many cell types. This makes understanding the mechanisms behind spindle positioning an important field of study. Centering a spindle requires the cell knowing its geometry, and so the aster microtubules are employed to probe for the cell cortex. This means any changes in the astral microtubule array can influence the ability of the cell to detect cortical changes and subsequently orient the spindle. This is seen when Kif18B, an astral microtubule destabilizer, is knocked down and the spindle is mis-positioned. In cells, Kif18B is localized to the plus ends of astral microtubules through a direct interaction with end-binding protein (EB1) at the plus tips. The spatial regulation of Kif18B at the plus tip is also modulated by the two Ran receptors, importin α/β, through two nuclear localization signal (NLS) sites. Loss of the interactions with the importins causes Kif18B to improperly localize to a smaller subset of EB1 decorated microtubule plus tips and causes the loss of Kif18B dependent bipolar spindle formation. To further explore the role of Kif18B in spindle orientation, mutants were made that separated the function of each NLS site, cells were knocked down of endogenous Kif18B and rescued with either GFP tagged wild type or mutant Kif18B constructs. A pipeline was then created to assess the spindle positioning and length in each condition. We found that spindle positioning were not significantly different between the NLS mutants and wild type Kif18B. We also observed a downward trend between protein expression levels and spindle length in the different mutants, suggesting higher expression results in shorter spindle lengths. To explore where the Kif18B NLS mutants localize, we will next determine the protein expression levels in different areas of the spindle.

Exploring the Impact of Vaping on Bronchial Epithelial Cytokine Expression: Insights from a One-Hour Exposure Study

Jackson S. Crenshaw
Dr. Patricia Silveyra (the Silveyra Lab), Indiana University-Bloomington

In this study, we aimed to investigate the potential impact of vaping on the levels/expression of interleukin-10 (IL10), interleukin-8 (IL8), and interleukin-1B (IL-1B) in the bronchial epithelium. Vaping has emerged as a popular alternative to traditional smoking; however, concerns have arisen regarding its potential effects on respiratory health, particularly related to airway inflammation. Based on our initial hypothesis, we expected an increase in IL10, IL8, and IL-1B levels/expression after one hour of vaping due to heightened inflammation in the bronchial epithelium.

To address this hypothesis, we employed an experimental approach utilizing human cells exposed to vaping for one hour, comparing them with unexposed cells as the control group through real-time PCR to measure gene expression. Subsequent analysis revealed no significant differences in the expression of IL10 after one hour of vaping compared to the unexposed cells. This suggests that IL10 may not be promptly expressed in response to one hour of vaping exposure or that a longer period of exposure might be necessary to observe changes in IL10 expression.

A Cross-Cultural Study of Visual Experiences in Infants from Chennai, India, and Bloomington, Indiana

Alexis Cruz, Sara Benham, PhD, Hadar Karmazyn-Raz, PhD

Linda B. Smith, PhD, Department of Psychological & Brain Sciences Cognitive Development Lab, Indiana University

As newborns enter the world, they embark on an extraordinary journey of exploration and learning, developing essential cognitive skills that form the foundation for future intellectual growth. This poster delves into the key stages of cognitive development, focusing on the location of 2 different cultures, one from a fishing community in Chennai, India and another from Bloomington, Indiana. This will discuss how young babies from different locations diverge in their early visual experiences in their home environment (Casey K., Elliot M., Mickiewicz E., Mandujano A., Shorter k., Duquette M., Bergelson E., Casillas M., Sticks, leaves, buckets, and bowls: Distributional patterns of children's at-homeobject handling in two subsistence societies, 2022). Drawing from current research and established theories such as babies being able to create words from putting objects in their mouths called mouthing (Fagan M. and Iverson J., The Influence of Mouthing on Infant Vocalization, 2007), this will shed light on the remarkable cognitive capabilities of babies and environmental factors in nurturing their cognitive growth. Understanding the intricate process of cognitive development in infants not only enriches our knowledge of human development but also offers valuable insights for parents, educators, and professionals working with young children.

How an intracellular symbiont manipulates its host biology? A yeast tale.

Wendy M. Deras, Sergio López-Madrigal, Irene L.G. Newton

Sergio López-Madrigal, Irene L.G. Newton/ Biology Department, Indiana University Bloomington

The intracellular alphaproteobacterium *Wolbachia pipientis* infects 40-60% of insect species. Maternal transmission and *Wolbachia*-derived host phenotypes (e.g. reproductive manipulation, pathogen blocking) explain its extraordinary prevalence and make *Wolbachia* a suitable biocontrol agent against insect pests, and insect-borne diseases. Yet, little is still known about the bacterial effectors driving the biology of *Wolbachia*/host symbioses. Along these lines, ankyrin repeat proteins (ANKs) are at the spotlight, as (1) they are over-represented in *Wolbachia* compared to closely related bacterial genera, and (2) they are known to mediate protein/protein interactions in other microbe/host consortia. The Newton lab has recently screened for *Wolbachia*/host, ANK-mediated protein/protein interactions in the *wMel*/*Drosophila* symbiotic model through a Yeast Two-Hybrid (Y2H) approach. Preliminary results suggest that some ANKs might target a handful of *Drosophila* proteins. Here we aim at implementing a complementary, Y2H-based screen for ANK-to-ANK interactions. To that goal, 21/26 *wMel*-encoded ANKs have been cloned into the destination vector pDest-AD, while *Saccharomyces cerevisiae* Y8800 have been successfully transformed with 16 of them. The results from our (future) Y2H assays will shed light on the complexity of putative, ANK-mediated mechanisms driving the *Wolbachia*/host molecular crosstalk.

Visual Experiences Across Culture Involving Hands

Infants provide a window into the nature of early visual experiences in early development. However, the extent to which culture impacts cognitive development is still not well understood. In this project, 70,000 infants' visual experiences were recorded for short periods of time and analyzed from a fishing community in Chennai, India and from Bloomington, Indiana. This study aims to discover if babies in vastly different environments share similar visual experiences, as sight is a tool for learning. This subproject looks to find how often hands are a part of the visual experiences of these infants, and to see if the distribution differs in the two different locations.

Western studies have shown that around 12 months, babies tend to look at hands for information(Fausey et al., 2016), but is this finding a cultural or human truth? Cross cultural studies have shown that many aspects of infant development are constant across all cultures (cite the sticks leaves etc paper here). For instance, language, a cognitive function, has developed all across the world in humans, regardless of culture. Despite widely different language input, children globally learn language in similar fashions, and around the same age (cite). Patterns of learning through object handling stay constant through culture as well (cite). The visual experiences that aid in cognitive development of children may or may not be consistent between different cultures, but only the results can tell.

Esther Faniyan

McCall Booth, Media School, Indiana University

A common way parents interact with their kids is by media coviewing, and prior research has explored how parent-child coviewing could positively impact parent-child relationships. However, more research is needed on the mechanisms behind these associations. This study focuses on the use of psychophysiological measures of attention, with an emphasis on one of the most commonly used measures: Electrocardiography (ECG). Heart rate deceleration is used to indicate cognitive resource allocation, and utilizing measures of heart rate, we were able to examine congintive processing for multilingual children coviewing multilingual media with their parents. We recruited children aged 7-10 years, and their parents for the study. The children were presented with 8 clips from various animated movies in both an alone condition, and a coview condition, with some clips in English and some in their heritage language. Results from this study showed that the association between watching media alone and coviewing with their parent was significant. In particular, the findings suggest that viewing media alone produces greater heart rate decelration, indicating that the child pays more attention to what is being shown when they are by themselves. Perhaps the absence of a parent allows the child to further relax and engage with the content, without the need to be monitoring their parent's enjoyment.

Rhizobia is a soil bacteria that fixes the nitrogen levels inside nodules. During the course of my highly engaging research lab, we studied the interactions of each stage that rhizobia goes through to do this task and how it affects new hosts. My role in the research lab was to assemble not just one but two distinct rhizobia strains and then characterized the genomic changes. As part of this work, I also compared two genome assemblers. I used Canu and flye to assemble reads from Nanopore. After the reads were assembled, the computer language Linux was used to code to get ancestral and evolved reads. This involved mapping, using methods like snippy, to get the evolved genomes back to the ancestral genome. Once the mapping process was done, a small amount of Python was used to get the results of how the evolution of phage resistance impacts the rhizobia genome.

Abstract

Bacteria phages are viruses that infect and replicate primarily in bacteria cells. They are common parasites of bacteria that evolve to interact with bacteria and affect the symbiosis between plants and bacteria. To accomplish this experiment, we used a variety of methods to record and measure our data. Such methods included platting, growth assay, and bacteria colony counts. We learned that the two strains we were testing 461 and 262 have differing slopes. This further proved our hypothesis which states that due to the strain's difference in susceptibility, they would therefore have different rates of attachments correct. In conclusion, our research uncovered that the two strains' differing slopes showed that eh abundance of phages in each correlated with their slopes.

Please put your abstract here (note: section 4 is sized in order to fit your abstract into 250 words or less):

Section 1: Abstract Title

Construction of Database to Recreate Project "Persistent Effects of El Niño on global economic growth"

Section 2: Author Names

Christian Matthes, Toan Phan, Lucia Koo, Rafael Ramirez

Section 3: Author Department and School Affiliation

Department of Economics, Indiana University Bloomington School of Liberal Arts

Section 4: Abstract Body **[note: Your abstract must fit inside this box and be 250 or less]**

ENSO cycles are random but predictable cycles in the sea surface temperature of the tropical Pacific Ocean that have significant effects on temperature and precipitation on a global scale. It was proven these changes in temperature and precipitation have a significant impact on economic output of nations. We attempted to recreate this study with a focus more on a global scale and in a more long-term fashion, as to try to measure the effects of climate change. The other research assistant, Lucia, and I were tasked with recompiling the data used in this experiment, to recreate this experiment with our own database. We achieved this tasking by using the programming language Stata18. We created two datasets one with economic data for every country from three different sources ranging from 1820-2021 and another one with weather data ranging from 1901-2021. With this dataset the professors will move on to continue and conclude the recreation of this experiment.

Section 5: Research Project Mentor or Advisor

Christian Matthes, Department of Economics, Indiana University School of Liberal Arts, IU

Pacman and MOtivation Lab

Zachary Walker, Sammy Sprol, Lily Leslie, and Anh Thu Pham

Arts and Sciences, Computer Science, IU School of Liberal Arts

Our group's topic was psychology and media called Pacman and Motivation. To many: Video games are seen as prime examples of modern technology, but the decisions made by a game player, and the emotions that player feels, are largely driven by biological motivational systems, particularly the appetitive-aversive motivational systems, as known as the approach-avoidance motivations. Our goal is to investigate neural mechanisms of approach-avoidance motivation using Pacman to see how people dynamically interact with naturalistic appetitive and aversive situations.

To do this we will record the subjects' psychophysiology data every trial we do instead of resetting every 15 seconds, (including heart rate, skin conductance, and facial muscle activity) and neuroimaging data (fMRI) when subjects play the game. One result we analyzed of the data was that the heart rate is usually lower for the aversive stimuli (threats) when the subjects are more focused and active information processing. Another result we recorded was that the continuous external stimuli on average have a higher corrugator movement due to threats making more arousal. To find the corrugator number of the trials of tigers and snakes is snakes minus the average of the rams and rabbits and that red is bigger than green like we thought.

Related to the corrugator is the skin condunctance and arousal result. We asked originally: What are the neural correlates of the approach and avoidance motivation variables? We found and concluded that the skin condunctance was higher for the aversive stimuli meaning threats are more arousing than the rewards (appetitive stimuli). This will be of use to the field of media studies that want to research what decision making is most influenced by and maybe employers too.

Mentors: Neil Ni
Department of Media and Psychology, IU PhD, IU

Drought Resurrection Study on Evolutionary Changes in Setaria faberii

Delaney Howard

Jordan Ziss

Jen Lau, Lau Lab/Biology Department, Indiana University

Abstract:

In the face of escalating global climate change and its impacts on ecosystems and evolution, understanding the resilience and response of plant species to extreme weather events like droughts becomes crucial. This study investigates the germination rates and height dynamics of *Setaria faberii* seeds that underwent varying drought conditions. The experiment consists of three groups: pre-drought, during drought, and post-drought throughout the timeframe of 2019, 2020, and 2021 with respective conditions. These conditions were plotted from five genotypes per twelve plots and placed under consistent growth environments. Germination rates were closely monitored for each container, allowing the comparison of seed viability and sensitivity to drought-induced stress. Additionally, the height of germinated seedlings was measured to assess their growth and development under different drought conditions and the overall response to water scarcity with adaptive mechanisms for survival of *Setaria faberii.* As a result, the drought history of the plants would affect the germination and growth rates. A subset of plants would potentially represent a population of drought-resistant adaptations or phenotypic plasticity. The post drought phase could potentially offer insight into beneficial evolutionary qualities like faster germination rates and an increase in plant growth. This study could contribute to an increase in knowledge of plant resilience in the face of climate change and may aid in creating strategies for crop drought tolerance and the survival of ecosystems with rapid increases of ecological stressors.

Early Visual Experiences of Edges Across Cultures

Emersyn Michalek, Sara Benham, PhD, Hadar Karmazyn-Raz, PhD

Linda B. Smith, PhD, Department of Psychological & Brain Sciences Cognitive Development Lab, Indiana University

It has been shown in controlled lab experiments that infants tend to be biased toward high-contrast, simple, and visually large patterns in their visual experiences (Jayaraman & Smith, 2020; Anderson et al., 2023). But what makes up these patterns in the child's natural, everyday environment, across cultures has yet to be investigated. The research done in this project looked at whether there was a "big edge" present (i.e., high-contrast with few edges), what made up the big edge, and how these compared between the visual environments of children from Bloomington, Indiana in the US and from a fishing community in Chennai, India. It has been shown in previous studies that the patterns of language development were similar across cultures (Casillas et al., 2020). The current project builds on these earlier studies by focusing on the visual experiences of children, specifically what makes up these experiences and whether they differ across cultures.

Assessing Children’s Recall in Multilingual and CoViewing Settings

Marina Saweeros
McCall Booth, Media School, Indiana University

In our pilot study, we assessed bilingual children ages 7 to 10's recall for various short media clips. This study was conducted to bridge the gap in the literature where language is a factor and how different languages potentially have an effect on children's recall, in CoViewing situations and in alone situations. This study was conducted by having 4 conditions of viewing, viewing media in English and the given participants' Native Language, and the other condition where the child viewed media with their parent and viewed alone. Shortly after viewing, we followed up with a direct recall assessment and an open-response recall questionnaire. The direct recall assessment involved flashes of the clips, and the participant (child) determines whether that picture was a part of the clip that they just watched or not. This study aims to investigate whether having a parental figure present while viewing media enhances a child's recall or not. Reflecting on our results, the effects of parental CoViewing have a trending significance on a child's ability to recall media. This project is crucial in establishing whether having a parental figure affects a child's recall and answering the ultimate question of whether it is important to have a parental figure for a child to retain and recall information.

Functional Expression of Human VKORc1 in Escherichia coli

Dariana Chavez, Cristina Landeta

Cristina Landeta, Biology/Microbiology, Indiana University-Bloomington

Disulfide bonds are formed from covalently bonded sulfhydryl side chains of two cysteine residues and serve to activate and stabilize proteins in prokaryotes and eukaryotes. Most disulfide bond formation pathways in bacteria utilize a DsbAB system where DsbA, a thiol disulfide oxidoreductase (TDOR), oxidizes nascent proteins and is reduced. DsbB, a disulfide bond formation protein, restores DsbA to its oxidized state and regenerates the pathway. Escherichia coli carries a DsbAB system to fold proteins in the periplasm while eukaryotes, actinobacteria, cyanobacteria, and some deltaproteobacteria have disulfide bond formation pathways that use the enzyme, vitamin K epoxide reductase (VKOR) instead of DsbB to oxidize DsbA. VKOR and DsbB are nonhomologous, yet they both perform the similar function of oxidizing DsbA. Rat VKOR (RnVKOR) was successfully cloned in E. coli. Complementation of DsbB by RnVKOR in the disulfide bond formation pathway was achieved through the deletion of amino acid residues, A31AR, and alteration of the genome (2). Mutations of the insertase, YidC and protease, HslV, were shown to enhance the insertion of transmembrane proteins, as well as suppress protease activity. However, these mutations did not result in the complementation of E. coli DsbB with human VKOR (HsVKOR). In this experiment, RnVKOR and HsVKOR alignments and the positive rule were used as basis to mutate residues in HsVKOR. HsVKOR mutants were tested for complementation of E. coli DsbB in the disulfide bond formation pathway.

Determine the morphological changes caused by the lack of disulfide bond formation in Mycobacteria

Rebecca Collins, Adrian Mejia-Santana and Cristina Landeta
Microbiology Department, Indiana University

Disulfide bonds are covalent bonds linking the sulfur atoms of two cysteine residues. Disulfide bonds are vital for the stability of proteins sent to or through the cell envelope, including virulence factors. They form through an oxidative process that is catalyzed by periplasmic proteins DsbA and DsbB in Gram-negative bacteria (Bardwell et al., 1991; Bardwell et al., 1993). This system was discovered in *Escherichia coli*, where DsbA is not essential under aerobic conditions, which is hypothesized to be due to background oxidation. However, under anaerobic conditions DsbAB become essential for the folding of the two essential proteins: LptD and FtsN, which are responsible for outer membrane biogenesis and cell division respectively (Landeta et al., 2018). However, *Mycobacterium tuberculosis (Mtb)* instead of DsbB has a protein named vitamin K epoxide reductase (VKOR) (Dutton et al., 2008). DsbA and VKOR are essential in *Mtb*, and also in its close relative *Mycobacterium smegmatis* (*Ms*). We therefore hypothesize that disulfide bond formation is required for cell division and cell envelope biogenesis in Mycobacteria. We showed that the deletion of *vkor* in *Ms* displays abnormal phenotypes, including cells with membrane perturbations (blebbed). These phenotypes are attributed to membrane protein defects as a result of the *vkor* deletion and the lack of disulfide bond formation. To study the morphological changes that result from a lack of disulfide bond formation, we used fluorescent microscopy to better distinguish cell morphology and analyzed those images using Fiji software. We observed increased cell segmentation, blebbing, and shorter cell length in the *Δvkor* compared to WT strain. This was done alongside growth curves of CRISPRi knockdowns of DsbA and VKOR in *Ms* under different concentrations of inducer. The knockdown strains showed decreased growth with the inducer, which validated the essentiality of those proteins. Altogether, this data suggests that the absence of *dsbA* and *vkor* causes cell division and membrane defects in Mycobacteria and enforces the idea that targeting disulfide bond formation in Mycobacteria is a viable strategy to fight antibiotic resistance.

Ally Horwitz
Farrah Bashey-Visser, Department of Biology, Indiana University

Abstract Body

Bacteria use a vast array of weapons to compete for valuable resources in the environment. *X. bovienii*, a bacterium isolated from nematodes, uses phage-like weapons called tailocins to compete with closely-related bacteria. The genomes of 54 isolated strains of *X. bovienii* were analyzed using genome browsers (e.g. MaGe and Phaster) to find the tailocin region, a cluster of 20+ genes found in all *X. bovienii* strains that encode for the structural parts of a tailocin molecule. While many of the genes in this region are conserved among all strains, the tail fiber gene thought to be responsible for host recognition is highly variable, which contributes to the wide variety of killing profiles within the species. The aim of the present research was to analyze these fiber genes to find a relationship between tail fiber similarity and attacking behavior. Prior work used soft agar assays to quantify this behavior. A linear regression was created using numeric scores from the assays and main tail fiber (H1) similarity scores. The results suggest that isolates with distinct H1 proteins are also more distinct in their killing profiles, but that there is no correlation between H1 similarity and resistance. Further research needs to analyze the contribution of other tail fiber genes in the cluster to competitive behavior.

Characterization of Vibrio Mediated Pathogenesis in the Brine Shrimp Artemia franciscana

Nicky Ivan, Logan Geyman
Julia van Kessel, Department of Biology, Indiana University

The *Vibrio* genus encompasses a wide range of pathogens that affect human health and industry. As the oceans warm, the incidence of *Vibrio* infection is rising. Therefore, understanding the pathogenic strategies of these bacteria is increasingly paramount. The shrimp pathogen *Vibrio campbellii* has contributed to the billions of dollars in *Vibrio* mediated livestock loss experienced over the past decade. It is currently understood that this pathogen regulates both its virulence and pathogenic behaviors through quorum sensing. However, these experiments are mostly confined to in vitro works. Therefore, this study seeks to understand how quorum sensing underpins pathogenicity and virulence in an in vivo context. Here we employ *Artemia franciscana* infection to understand how the quorum sensing regulon contributes to the health outcome of the host.

Traits Underlying Local Adaptation in *Viola pubescens*

Alex Kutza, Caroline Edwards, Leonie Moyle
Moyle Lab, Biology Department, Indiana University

ABSTRACT

Local adaptation—when populations of the same species are specialized to their local environmental conditions—influences many ecological and evolutionary responses. Identifying which specific traits are successful in different environments is critical for predicting resilience to environmental shifts. *Viola pubescens*, a native North American wildflower species, shows substantial variation in fruit color and hairiness, which hasn't been associated with any specific environmental factors or survival outcomes. I investigated patterns of local adaptation and traits that might underlie it in *Viola pubescens* using a field common garden experiment, in which individuals from across the species range are grown together in the same environment. Specifically, I monitored individuals transplanted from the northern, central, and southern regions of the species' range and analyzed differences in fruit traits, predator defense, and seed production. The northern (foreign) populations showed increased success in seed production, as well as a lower proportion of purple fruits, compared to other populations. The central (local) plants produced a higher proportion of hairy fruits than other populations. However, fruit color and hairiness traits were not correlated with improved predator defense or seed production. These findings suggest genetic differences between violets from different regions, and provide clues about the functions of these traits and their influence on metrics of plant fitness.

Bridging the gap: Exploring the roles of ETS-Coactivator interactions in promoting prostate cancer

Kaitlyn Mills, Nicholas Downing, Stephanie Metcalf
Peter Hollenhorst, Medical Sciences Program, Indiana University School of Medicine

The ETS family of transcription factors is comprised of 28 members that all share a common C-terminal DNA-binding domain. ETS play essential roles in developmental processes, such as stem cell maintenance, blood vessel formation, and cellular fate. While absent in the normal prostate, four members of the ETS family become expressed in prostate tumors: ETV1, ETV4, ETV5 and ERG. Our lab has previously classified these proteins as *oncogenic ETS* for their ability to promote cellular migration in normal prostate epithelial RWPE1 cells. Transcription factors may need to interact with additional proteins to serve oncogenic roles. My research explores the interactions between 1) ETV1 and EWS, as well as 2) ERG and p53.

Our lab has established that ETV1, ETV4 and ETV5 form essential interactions with EWS, a transcriptional coactivator that promotes ETS activity. In prostate tumors, chromosomal rearrangements result in the N-terminal truncations of ETV1, ETV4 and ETV5. I hypothesize that the EWS interaction domain is retained and that these truncated ETVs will remain oncogenic. Pulldown assays using purified full-length and truncated ETV1 suggests EWS interacts with both N-terminal and C-terminal portions ETV1. I am attempting to express truncated ETV1, ETV4 and ETV5 in RWPE1 cells. Upon stable expression, I will evaluate their interactions with EWS and their ability to promote migration *in vitro*. To identify putative proteins that bridge EWS to ETV1, immunoprecipitation mass spectrometry will be used.

Mutations in p53, a tumor suppressor protein, promote oncogenesis and occur in nearly half of all cancer cases. We hypothesize that mutant p53 interacts with ETS to promote its recruitment to new genomic sites. Previous studies demonstrate that mutant p53 binds ETS2 at a higher affinity than wildtype p53 and we have expanded this list of interacting ETS to include ERG. We seek to explore whether ERG and mutant p53 cooperate to promote oncogenic phenotypes. I successfully cloned wildtype p53, mutant p53 (R248W) and double-mutant p53 (R248W, T81A) into a retroviral backbone. I then transduced RWPE1-Vector and RWPE1-ERG expressing cells to express these constructs. Although additional replicates are needed, it appears that mutant p53 promotes colony formation in both cell types relative to wildtype p53. I plan to validate these observations and generate an appropriate negative control cell line before extending into a mouse model.

Through the continuation of this work, I will provide critical insight into the molecular mechanisms by which a subset of ETS factors achieve oncogenic function. We address the contributions of DNA-binding specificity and coactivator interactions in promoting the phenotypes associated with prostate cancer.

Identifying Key Differences with Sindbis Virus' Fluorescent Reporters: Venus and Monomeric Cherry

Westrick, Megan
Suchetana Mukhopadhyay, Department of Biology, Indiana University

Fluorescent reporters such as Green Fluorescent Protein (GFP) and mKate, amongst others, are a key part of the virologist's toolbox. These reporter constructs help identify viral spread, the presence of virus, and overall health of both virus and cells. However, it has become unclear if these fluorescent reporters all act equally when it comes to viral infection. Venus (a GFP variant) and Monomeric Cherry (MCH) (RFP variant) were being observed to see how the location of these fluorescent reporters in the genome of the virus affect how the virus infects cells and produces infectious particles. Variants of the TE12 Sindbis virus tagged with either Venus or MCH were used to infect Baby Hamster Kidney (BHK) cells, and a series of experiments were undertaken to compare Venus and MCH. Following infection of these reporter constructs into BHK cells, the plaque size, the amount of infections, the rate of infectious particles, and the components of each construct was measured.

Decoding the Experiences of Neurodiverse College Students

Presenter: Malaya Campbell, Jahlea Douglas, and Gabi Guzman

Principle Investigators: Dr. Jane McLeod and Dr. Andrew Halpern-Manners

Indiana University College of Arts & Sciences

Abstract:

As colleges adjust to increasing rates of enrollment of autistic students, it is critical to understand how the experiences of these students compare to their neurotypical peers. There are various challenges associated with the transition to adulthood, especially when considering the challenges related to entering and successfully completing post-secondary education. Our team examined this comparison using survey data from nearly 1400 college student respondents from 2- and 4- year colleges and universities in Indiana. We focused on five primary open-ended questions, however, for this study we focused on the following question: What was the most challenging thing about college? Our preliminary coding and data analysis indicate that autistic students and neurotypical students alike predominantly struggle in three fundamental areas academic and professional, social changes, and balancing time.

How does a wellness space design support college students' mental health? A post-occupancy evaluation of the Kelley School “Balance Room.”

Team Members:
Camryn Andre, Junior, Interior Design
Molly Cai, Senior, Comprehensive Design
Gabby Couch, Senior, Interior Design
Jennifer Lee, Senior, Interior Design
Clara O’Brien, Senior, Interior Design
Sarah Price, Junior, Interior Design

Faculty Advisor:
Miyoung Hong, Ph.D, Senior Lecturer in Interior Design

Abstract

BACKGROUND:

In the past two decades, there has been a surge in demand for college counseling services, but the capacity to treat these students seeking mental care has not proportionally increased (2021 Annual Report, 2021). To bridge this gap, many schools have turned to developing wellness rooms. Established in Spring 2020, the Balance Room serves as a haven for undergraduate business students to unwind both physically and mentally (Balance Room, n.d.).

RESEARCH QUESTIONS:
The research seeks to address the following questions:

1. How do college students behave in a newly renovated academic institution's wellness space?
2. How does the design impact their behavior, and what practices should designers consider to create resilient spaces that promote wellbeing and community building among all stakeholders?

OBJECTIVES:
The overarching objective of this research is to analyze the Balance Room’s effectiveness in supporting its students’ wellbeing through:

1. Identifying what design elements are successful and/or not successful.
2. Determining areas for improvement in wellness spaces.
3. Understanding how built environments promote students’ wellness and mental health.
4. Provide implications for professional design groups in future projects.

METHODS:
The research methodology for this port-occupancy evaluation will consist of:

1. Site visit: in-person analysis and photo essays to identify points of interest.

2. Literature review: synthesis of research on college student mental health, design features, and their relationship.
3. Group interviews: with four major stakeholders – academic partners, program coordinators, student leaders, and designers.
4. Survey: post-occupancy evaluation of room effectiveness by end users.
5. Individual Interviews: with the undergraduate business students end users.

PRELIMINARY FINDINGS

Preliminary findings from literature reviews and case analyses indicate that student wellbeing is closely tied to academic stress levels and work-life balance (Barbayannis, Bandari, Zheng, Baquerizo, Pecor, & Ming, 2022; Deng, Cherian, Khan, Kumari, Sial, Comite, Gavurova, & Popp, 2022). Therefore, addressing mental health concerns becomes essential at the university level (Sprung, 2020).

The analysis of four precedent wellness centers at universities highlights the significance of designing for student needs, incorporating restorative design elements such as visual and acoustic privacy, appropriate lighting, and biophilic features. In all four case studies the common thread was found to have strong biophilic features, location in clinical health buildings. Differences were room purpose as enclosed or transitional, and in floor material with carpet or hardwood floors.

FUTURE DIRECTION

After preliminary findings, the future direction will be:

a. Developing an online survey with various design features, pilot testing survey, and revising survey based on the feedback.
b. Conducting group interviews with key stakeholders, and individual user interviews with end users, and transcribing the interview results.
c. Analyzing gathered data, drafting the manuscript and presentation proposal, and disseminating findings at the Indiana University Undergraduate Research Conference.

POSSIBLE IMPLICATIONS:

With the significance of mental health on a person's overall well-being, it is evident that wellness rooms are transforming a progressive concept into a standard feature, offering individuals a designated and supportive space for relaxation, stress reduction, and self-care. This research will play a role in the creation, implementation, and utilization of wellness spaces in higher education that are shown to be successful in supporting its users' mental health and wellbeing.

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Title: Exposure to perfluorooctanoic acid induces oxidative stress in a cell model of early and late stage pancreatic cancer

Names: Lilia Brunetti, Isabella McRae, Alondra Mendoza
Mentors: Lisa M. Kamendulis and Barbara A. Hocevar
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Pancreatic cancer is one of the leading causes of cancer deaths in the United States. Human epidemiological and animal models have found that perfluorooctanoic acid (PFOA) exposure is a risk factor for several cancer types, including pancreatic cancer. PFOA is a ubiquitous and stable chemical used in multiple industrial applications, and thus humans are exposed through drinking water, food, and air. One proposed mechanism to the link between PFOA and pancreatic cancer is the induction of oxidative stress, characterized by an increase in reactive oxygen species (ROS) – peroxide and superoxide anions specifically. Though crucial for redox signaling at a low nanomolar concentration, a supraphysiological imbalance of ROS catalyzes inflammation, tumor metastasis, and apoptosis. We used the PANC-1 PTF1A human cell line to model both early and late-stage pancreatic cancer and exposed the cells to varying doses of PFOA in order to measure biomarkers of oxidative stress. Via mass spectrometry, our results demonstrated elevated superoxide concentrations in early-stage pancreatic cancer cells with increased PFOA dosage. Early-stage pancreatic cancer cells also had a dose-dependent increase in mRNA expression for the enzymes catalase (CAT), superoxide dismutase 1 (SOD1), and superoxide dismutase 2 (SOD2), all of which are involved in the catalysis of ROS. Kinetic enzymatic assays indicated higher levels of catalase activity in the late-stage pancreatic cancer cells when exposed to PFOA. These findings suggest that PFOA exposure increases the production of superoxide radicals and hydrogen peroxide which may lead to the progression of pancreatic cancer.

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Title: CRISPR-Cas Mediated Interrogation of the Essential Biofilm Regulator PhoB in the Bacterial Pathogen Agrobacterium tumefaciens

Microorganisms like *Agrobacterium tumefaciens* create biofilms that increase survival for the microorganism. Limited phosphate increases biofilm attachment in *Agrobacterium tumefaciens,* which is known to cause crown gall disease in plants which presents as large tumors on the infected plant. Phosphate regulon PhoB regulates homeostasis of phosphate in microorganisms like *Agrobacterium tumefaciens.* Our work utlilizes CRISPR-dCas9 to target and interfere with the expression of PhoB. We are measuring the amount of growth of the biofilm after the knock down of the essential gene PhoB in low and high phosphate environments.

Abstract:

Cyclodextrins (CDs) are macrocycles with a water-soluble outer layer and an oil-soluble inner layer. When organic molecules are introduced to a CD solution in water, the organic molecules go into the cavity. The resulting mixture of these two molecules is so-called host-guest complexes (host: CD; guest: organic molecule). While these host-guest complexes have been studied by spectroscopy, the structural study by single-crystal X-ray diffraction is rare. In the project, an example of the host-guest complexes is investigated using CD and tetradecane. The first task is to prepare crystals of these complexes which are suitable size for the diffraction experiment. The growth of the crystals is monitored by microscopy. Once diffraction quality of a crystal is found, the X-ray diffraction data is collected. The structural data will be the first to report in the literature.

Sunlight Photolysis of Nitrate in the Presence of Iron-Bound Organic Matter

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Jonathan Raff, Department of Chemistry, Indiana University Bloomington

Abstract

Soil can emit large amounts of nitrous acid (HONO) which is said to be responsible for local HONO daytime budgets. Many researchers agree that this source of HONO is primarily unaccounted for in many observational studies, and is in turn underrepresented in air pollution data. This phenomenon poses a significant concern due to its influence in climate change and the limited knowledge currently available. Nitrate photochemistry is a known source of HONO during the daytime, although matrix effects have yet to be fully investigated. Particularly, we seek to characterize the influence of abundant transition metals, and strong organic ligands thereof, on HONO production rates. Fourier transform infrared spectroscopy (FTIR) was employed to study compositional changes in matrices composed of aluminum oxide samples with various coatings. Iron oxide and the organic ligands catechol and oxalate were introduced to investigate differences in nitrate photolysis rates and subsequent photolysis products. Distinct differences in nitrite (NO_2^-) content were observed between samples. When NO_2^- is protonated in acidic environments, HONO is formed and can emit to the gas phase. Each sample exhibited surface acidification, supported by sulfate-to-bisulfate ($SO_4^{2-} + H^+ \rightarrow HSO_4^-$) conversion. When there was solely nitrate present in our sample, nitrate was photolyzed as nitrite accumulation. Once metals were introduced into the system, less nitrite was observed. The introduction of both metals and organic ligands led to nitrite loss. From these findings, our study suggests that nitrate in the presence of metals and ligands can create reactive environments that lead to the loss of nitrite, either by HONO emission from the acidified surface, or nitrite reduction to other nitrogen oxide species.

Iconic Gesture Use in Aging

Beatrice Burton

Primary Mentor: Katelyn Urena

Faculty Advisor: Brielle C. Stark PhD

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Co-speech manual gestures are common communication tools that aid in cognitive functions such as learning, memory, and language. Although it is known that there are age-related changes in gesture use during healthy aging, there is limited research that investigates spontaneous gesture use in older adults. This study examines spontaneous gesture use in older in ten healthy older adults during procedural narrative tasks. The three tasks were: (1) tell me how to make a sandwich, (2) tell me how you do your laundry, and (3) tell me how you get ready in the morning. This study aims to: 1) investigate the types of representational gestures produced by older adults, (2) examine iconicity usage, and (3) identify sex differences in gesture use. We hypothesized that older adults will mainly utilize iconic gestures that are redundant to speech. Findings of this study reveal how healthy aging impacts gesture, and how older adults naturally gesture during spontaneous speech.

Inner Speech in the Daily Lives of People with Aphasia

Nyah Christman, Julianne M. Alexander, and Brielle C. Stark
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This study focuses on inner speech (little voice in your head) of people with Aphasia. Aphasia is commonly diagnosed after a stroke affecting the left hemisphere of the brain. Our participants consisted of 23 people with post-stroke aphasia completed the study. This poster presents data from 8 participants. The participants with aphasia answered the question "are you having inner speech?" at two points in the day (morning and evening). This was done five days a week for three weeks. They answered the question and then gave more detail about their inner speech. Participants gave descriptions of inner speech through a written packet, a Qualtrics survey, or voice messages, depending on their preferences and abilities. The responses to this were uploaded to NVivo to be coded to find the common themes of their inner speeches. This research is unique because of the use of descriptive experience sampling to have a better understanding of what it's like to live with aphasia. This is important so we can get a better understanding of what it is like to live with aphasia, and we can use it for future work to hopefully improve quality of life. Here we presented preliminary data, but we need to analyze the remaining participants and revise the codes. There could also be more research done to see if the overlapping and unique themes are due to aphasia or because of the age gap. So, more research could be done by collecting data from a control group of people without aphasia with the same ages as our participants with aphasia.

Title of project/poster: **How does the brain keep track of where you have been?**

Nicolas Enciso

Stephen Duncan, Ehren Newman* - Department of Psychological & Brain Sciences, Indiana University-Bloomington

Abstract

Alzheimer's disease is a progressive neurodegenerative disorder primarily affecting older adults, resulting in memory loss and cognitive decline. Understanding the mechanisms and exploring therapeutic interventions for Alzheimer's disease is crucial. Navigation, essential for effective movement, includes path integration that allows individuals to estimate their position and orientation within an environment based on self-motion cues without relying on external landmarks. However, individuals with Alzheimer's disease may experience impairments in path integration due to neural deterioration and cognitive decline. The Triangle Completion Task (TCT) is one paradigm that evaluates individuals' ability, including animal models, to navigate using path integration. Comparing the performance of wild-type rats (control group) and transgenic rats carrying Alzheimer's-related genes is critical in understanding the impact of Alzheimer's pathology on path integration. This research paper examines the effectiveness of an automated TCT scoring method, comparing it with manual scoring to determine accuracy and reliability. Additionally, the study investigates the path integration performance of wild-type and transgenic rats, shedding light on the potential influence of Alzheimer's-related genes on navigational abilities. By understanding the relationship between Alzheimer's disease and path integration, valuable insights into the cognitive impairments associated with this disorder can be gained. This research has the potential to contribute to the development of diagnostic tools and interventions for detecting early set-on Alzheimer's disease.

Norepinephrine is a chemical that is found within the hippocampus. It is responsible for navigation and the mission of the experiment is to find out whether norepinephrine has a direct correlation to rearing. Rearing is when an animal lifts its upper body off the ground in order to navigate the landscape around it. The experiment uses mice because their brains are structured similar to humans. The purpose of this experiment is to help us better understand how spatial memory works and to delve into the functions of navigation and how memory plays a role in it as well. The experiment has a sample size of 7 mice. Each mouse is given a drive implant into its hippocampus which connects into a fiber optic cable to allow for fluorescence levels to be monitored. Norepinephrine binds to the synapses when it is released and fluoresces when released into the brain. The cable monitors how much the bound synapses fluoresce before, during, and after the mice rears. The results are currently inconclusive, however there are three possible outcomes. The levels of norepinephrine could remain the same (no change in fluorescence) which would mean there is no correlation between norepinephrine and rearing. The levels of norepinephrine could increase right before the mouse rears (fluorescence increases) which would mean that norepinephrine helps in the process to begin rearing. The levels of norepinephrine could increase right after the mouse rears (fluorescence increases) which would mean that norepinephrine helps in the process of storing the information received whilst rearing.

Attributions & Free Will Belief

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Mentor: Dr. Ed Hirt; Elizabeth Ray

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Abstract

Everyone has a relatively high belief in free will. In this paper, the following concepts are explored: Political ideology, free will belief, and attributions. Past studies have identified that there is a correlation between political ideology, free will belief, and attributions. However, research has never used an experimental design to study how they are interrelated with each other. This study manipulated free will belief to explore differences by political ideologies in attributions. This study also looks into how malleable individuals' free will belief is. Participants take a survey that uses psychological methods to manipulate their belief in free will belief using visual (reading), and auditory (listening) manipulations. It has also collected data on whether someone is more prone to attribute blame to others in a flood attribution method. As well as how they are attributed by political ideology. When the experiment is conducted, the results should show that free will belief is malleable and that it can be manipulated. As well as that, free will belief does help explain differences in political ideologies in attributes.

Alzheimer's is a neurocognitive disease that creates problems in people's thinking, behavior, and memory. Alzheimer's is important because it is the seventh leading cause of death in the United States. As people get older they become significantly affected by path integration supported by the hippocampus and entorhinal cortex. It causes severe deterioration with aging. I will investigate whether genes that cause early-onset Alzheimer's cause changes in rodent exploration. Researchers are specifically looking into rats' behavior and seeing whether the genes that they are given will cause a change in their exploratory behavior. Alzheimer's will display in some of the rodents thinking, behavior, and memory during the task they are given which will then be analyzed and compared to different tasks they are doing.

Dopaminergic Modulation of Rearing Behavior

Jillian Matson, Irene Choi

Stephen Duncan, Ehren Newman, Department of Psychological and Brain Sciences

Abstract

Spatial memory is a key component in how we as humans, and mammals survive. But how is it connected to certain behaviors such as rearing, in mice? Rearing is a simple, normal behavior observed in rodents especially that allows them to begin gaining an understanding of where they are and where they've been. This is believed to have a connection to the release of a few different neurotransmitters, one being Dopamine. Our sample size of mice being tracked for Dopamine is five. All the mice in our study have an implant in their brains that allows researchers to study them and watch to see if there are connections between the release of the neurotransmitter and the behavior. Through our experiment we are attempting to prove that connection and explore how and why it works and how Dopamine modulates the rearing behavior. There may be no definitive data for a while that comes from our study, however, an expected result is that we will see a connection between when a mouse rears and the release of Dopamine during that time. This result could come from the moment the mouse begins to lift its head and start looking for landmarks, these memories are then moved and stored in the Hippocampus with other longer-term memories. These memories are stored to be used later, possibly during tests being run, others may never be used again but remain in the long-term memory.

The understanding of the 1-dimensional properties of substances has grown in the past few years. More specifically looking at the quantum state of matter known as a 'superfluid'. To access this state, matter must be condensed to such a small volume that the material no longer interacts with each other or other objects in three dimensions, it acts in only one dimension. A substance that is used most often to grow the understanding of superfluids is the isotope helium-4, due to its inability to become a solid, no matter the temperature or pressure it is under, going from a liquid state of matter to a quantum liquid. To observe these properties and to better understand them a series of computational coding and experimental processes, such as x-ray diffraction and gas isotherm was used on MCM-41 material created in the lab. The structure was found, the pore diameter calculated, and the helium-4 isotope was pumped into the mesoporous material. Then the one-dimensional properties of helium-4 were observed and recorded. The observations found could lead to a host of benefits in the pharmaceutical, medical, biosensor, thermal energy storage, water/gas filtration, imaging fields, and astrophysics world. It could lead to the creation of the *Theory of Everything.*

Alzheimer's is an autoimmune disease where our immune system tries to damage our brains, In result patients start to lose their memories. "African Americans experience a greater risk of Alzheimer's, but are underrepresented in AD research"(Williams, 2010). The reason for these people to be underrepresented is their fear and mistrust of getting discriminated against or abused by the medical staff due to their past histories. Our main goal is to win their trust and motivate them to participate in medical research. We also want to educate them about Alzheimer's as well. Our research is funded by NIH and is a four years long project. We conducted 11 focus groups with African Americans. Most of them were 52 (range 21-86) years old. The research conducted 90 minutes long audio-taped interviews with these people. Each participant received a $25 stipend to spend at the grocery store. The biggest barriers to participation were fear of unknown and adverse effects. But the trust that our team earned from the community and people helped us to create our studies. Currently our team is working to create a platform called CARE. CARE is an app that would help to educate African americans. But the barrier is that the patients are old and don't know how to use this platform. To resolve this issue we are also conducting a voice assistance technology named Lola. Lola will take the comments from the people and will help them with their questions and concerns. After creating CARE and Lola, we conducted research surveys where participants used CARE and Lola and shared their feedback with us. The research team is still working on those feedbacks and changes. The goal is to provide the best tool to the community. As a result people will have an accessible resource where they can find their answers about Alzheimer's and related dementia.

Peer Perceptions of Speech Sound Disorders

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Figuring out our peer perceptions of speech sound disorders is the aim of this research. This is a problem to be cared about because this can affect how children with speech disorders view themselves. They can view themselves negatively and are less likely to make friends with their peers due to being self-conscious of their speech impairments. A gap in this research is to figure out if a person with speech sound disorders will affect friendship selection among children with developing speech and language. To figure this out, tests were done on typical developing children to fill this gap in research. They got their speech, language, and hearing tested before figuring out who they would rather be friends with. With all these tests done, children with speech disorders are more likely to be viewed more negatively by their peers. Something important to note is that children show no remorse whenever they choose a regular speaker over a speaker with disordered speech. Something else is that children get “antsy,” and they have to constantly take a small break to be able to focus and concentrate on the tests so the results can be accurate and honest.

The purpose of my research is to be able to know more about how the brain navigates and if we can understand that it can help us to better evaluate and treat disease where navigation isn't working. The research method I used was the 8 arm radial maze task with Long Evan rats. The goal of the experiment was to test rats' spatial memory in the 8 arm radial maze task. The results showed us that for the training phase over time the rats started rearing less and for the test phase over time the percentage of the correct arm they went down went up. Which shows over time the less rearing done in the training phase helped the rats with going down the correct arms during the actual test itself. This shows that rearing is important and the more rearing is done the better the rats can navigate and remember where they've been.

COLLABORATIVE FOR AGING RESEARCH AND ENGAGEMENT (CARE) PLATFORM

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The CARE platform is a research project that addresses the underrepresentation and mistrust among African-Americans in Alzheimer's Disease and Related Dementias (ADRD) research as well as the low literacy in brain health among the said community. Historically, research has focused on white, male populations, leaving many other communities, such as the African-American community, with limited knowledge and participation opportunities. To bridge this gap, the Collaborative for Aging Research and Engagement (CARE) Platform was developed. In the second year of the four-year project, "Wizard of Oz" sessions were conducted to gather user feedback on the CARE platform prototype. Participants experimented with the voice assistant, chat option, and general application, completing tasks and providing feedback. Transcriptions and participant feedback guided the improvements. The findings emphasize the influence of the previously mentioned historical mistrust on the outcomes. The CARE platform aims to address this by utilizing the human-centered design approach and acknowledging past injustices. The goal is to increase knowledge, engagement, and participation while gaining trust within the African-American community. The successful development of the CARE Platform has implications for closing the gap in health literacy and intention to enroll in ADRD studies among African-Americans. The project strives to create an equitable and inclusive healthcare landscape that meets the needs of diverse populations affected by Alzheimer's Disease and Related Dementias. By refining the CARE platform based on participant feedback, the aim is to create a user-friendly experience and deliver accurate results. The project aligns with the broader objective of addressing underrepresentation and fostering trust within the African-American community.

Many humans alike use Bluetooth devices daily. However, most need to learn that their Bluetooth device can be tracked and their data can be logged. My research dwells on the aspect of giving more security and awareness to the risk that people usually need to learn about. Many scientists in the past have researched this. Some of their research included testing a device that was able to locate Bluetooth signals in a 360 radius in a limited range in a building. Aswell researches the different types of Bluetooth signals and how being able to locate them could be different depending on what Bluetooth signal they have. However, I hadn't seen much of testing a device that would able to track and log information outside and from an extended distance To demonstrate this problem I made a device that could track and log Bluetooth devices from an extended range direction. I made a base out of small wooden planks to hold the antenna and the Raspberry Pi. To power the device I used a battery pack that was on the side of the base. I tested the device in a field near my lab. I located many Bluetooth devices in four directions and was able to identify what was the device and was able to see how far it was from my location. In conclusion, I was able to demonstrate the risks and how easy it is for anybody to able to track Bluetooth signals from afar. As well as log information from the devices.