Undergraduate Research Conference 2022

Poster Presentation Abstracts

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Mentor: Julie Schneider

Louisiana State University

Effectiveness of Static vs Dynamic Language Assessments

Recent research has advocated for dynamic assessments of language over more traditional, static assessments, as dynamic assessments are more sensitive to linguistic and cultural diversity (Gillam et. al., 2004). This is because static assessments, such as the Peabody Picture Vocabulary Test (PPVT), are designed to probe existing knowledge; whereas, a dynamic test, such as the Quick Interactive Language Screener (QUILS), examines a child's ability to learn a new concept with very little previous exposure (Burton et. al., 2006). However, it remains unclear which type of assessment more accurately captures children's vocabulary knowledge throughout the Deep South. The current study addresses this issue by first identifying whether the PPVT and QUILS measure vocabulary similarly within the same child, and whether one assessment is a more sensitive measure of children's actual language use. To address this question, we had 20 families with children ranging from 3-5 years of age participate in a 15-minute recorded play session.

Children then completed both the PPVT and QUILS language assessments. Using SALT, we transcribed and analyzed these recordings to measure the number of different words (NDW) the child produced. We then compared these results with both their QUILS and PPVT score. Our findings reveal that, while children did overwhelmingly better on the PPVT (M = 107.67) than the QUILS assessment (M = 99.95, $t(17) = 3.71$, $p = 0.002$), vocabulary knowledge was correlated across tasks (R = 0.78, $p < 0.001$). We did also learn that the QUILS assessment was more representative of vocabulary knowledge than the PPVT, since the QUILS assessment was positively associated with the number of words the child spoke during the play session (R = 0.48, $p = 0.045$), where the PPVT was not (R = .31, $p = 0.24$). In conclusion though participants scored better on the PPVT, the QUILS assessment more accurately corresponded to what language and number of different words the child used in conversation on a daily basis.

Monique Blanchard, Diana Taj

Mentor: Dr. Jorge Villa

University of Louisiana at Lafayette

Physiological Changes of Typha domingensis and Panicum hemitomon in Acute Saltwater Intrusion Events

Acute saltwater intrusion events were simulated in four wetlands at the Visser's Experimental Wetland Complex located at ULL's Cade Farm to recreate hurricane storm surges similar to those experienced from hurricanes that occur in Louisiana's natural freshwater wetland environments. This experiment has three treatment wetlands with increases in salinity and inundation periods as well as a reference wetland experiencing the same fluctuation of water levels with fresh water. Using a CI-710 leaf spectrometer, we are able to measure the normalized difference vegetation index (NVDI), photochemical reflectance index (PRI), and plant senescence reflective index (PSRI) of leaves within Typha domingensis (Southern cattail) and Panicum hemitomon (Maidencane) vegetation patches. These plant species are native to Louisiana's freshwater wetlands and are the most dominant species within these four plots. We were able to see physiological changes from the differences in plant indices before and after the saltwater intrusion events due to stressors like increased water levels and salinity stress.

Abigail Brien, Lauren Betzer, & Julie Schneider

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The Relationship between Parental Language Input and Child Word Learning

On average, children from lower socioeconomic status (SES) homes have smaller vocabularies than their higher SES peers (Weisleder et al. 2013). Word learning skills (Shavlik et al., 2020) and the early home language environment (Hirsh-Pasek et al., 2015), measured as quality and quantity of the parent input, are thought to mediate this association. Despite evidence that variability in language input impacts speech processing efficiency (Weisleder et al. 2013), the relationship between parental input and child word learning remains understudied. By understanding how a child's language environment impacts their word learning and subsequent vocabulary knowledge, we can begin to pinpoint how the vocabulary gap between low and high SES children occurs. To address this gap, we examined 20 parent-child dyads as they participated in a 20-minute play session, which was then transcribed using Systematic Analysis of Language Transcripts (SALT). The Quick Interactive Language Screener (QUILS) was administered to measure child word learning. Similar to past reports, both the complexity of parent utterances (MLU; $R = 0.65$, $p = 0.002$) and the diversity of words spoken (NDW; $R = 0.48$, $p = 0.03$) predict children's vocabulary as measured by the QUILS. Maternal education was also positively related to NDW ($R = 0.47$, $p = 0.05$) and the MLU ($R = 0.50$, $p = 0.04$). However, of these variables, only NDW ($R = 0.41$, $p = 0.375$, one-tailed) held a significant relationship with word learning. Word learning and vocabulary were also strongly correlated within this sample ($R = 0.56$, $p = 0.01$). Thus, higher educated mothers tend to provide more diverse words, and this, rather than utterance complexity, promotes word learning, which may impact vocabulary outcome.

Gabrielle Broussard

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Biomaterial Properties of GNS Double Porosity Membranes

At the cross section of nanotechnology and tissue engineering, there lies an incredible amount of potential for advancements in biotechnology applications. The fusion of a biopolymer film, such as a double porous chitosan membrane, and a structurally altered nano molecule, like graphene nanoplatelets, allow for the possibility of unique tissue engineering applications, and this study focused on exactly that. Using double porous membrane films made from a chitosan polymer blend, trials to study the impact of graphene nanoscrolls (GNS) on the integrity of the biomechanical properties of the films were conducted. As chitosan is a biopolymer known for its compatible and biomimetic nature, the use of a chitosan polymer blend as the basis for the study was crucial. The focus of these studies was on the effect GNS has on water absorption and structural integrity, and these properties were evaluated via swelling tests and degradation tests, respectively. Both the swelling and degradation tests were conducted by submerging the double porous films, each containing varying concentrations of GNS, in a lysosome and phosphate buffer saline. The double porous membrane films served as a biomimetic environment, comparable to skin cells, and the addition of GNS may improve the biomaterial properties of the membranes. Pending the results of the effect GNS has, the films may show potential to grow various cell types, from cancer cells for oncological studies to stem cells for regenerative tissue research. The outlook of GNS double porosity membranes points in the direction of successful synthetic environments for various kinds of cell growth and advancements in tissue engineering applications.

Chansey Champagne

Mentor: Dr. Edgard Rivera-Valentín

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Physical and chemical characterization of Micrometeorites found on rooftops in Lafayette, Louisiana

Earth's surface is hit by nearly 5,200 tons of extraterrestrial material in the range of 12 to 700 microns every year (Rojas et al.2021). The bulk of this material reaches Earth as micrometeorites, which are microscopic meteorites (50–200 microns in size).These micrometeorites represent asteroidal and cometary materials. Theoretical studies estimate the micrometeorite flux on Earth's surface to be one 100-micron micrometeorite per square meter per year (Genge et al. 2017).However, until recently, samples were mostly recovered from fairly inaccessible locations, such as polar ice and deep-seasediments, making their studies very difficult. A recent study, however, outlined a method for finding micrometeorites in urban environments (Genge et al. 2017). We have started looking for micrometeorites near rain gutters on flat rooftops and parking towers in Lafayette. Roofs that have not been swept in a year or more are our primary targets, because they allow for the build-up of micrometeorites. Our aim is to build a well-characterized micrometeorite collection that can be further studied by us at UL and also by the wider scientific community, to provide information on under-sampled planetary bodies in our Solar System. Currently, we have candidate micrometeorites that we have chemically analyzed with a scanning electron microscope (SEM) equipped with an energy dispersive x-ray spectrometer. We plan to collect more of these candidates and chemically characterize them using SEM, particle induced x-ray emission, and electron microprobe measurements in order to determine if they are micrometeorites. Rojas, J., Depart J. et al. 2021. The micrometeorite flux at Dome C (Antarctica), monitoring the accretion of extraterrestrial dust on Earth. Earth and Planetary Science Letters. 560 Genge M.J., Larsen J. et al. 2017. An urban collection of modern-day large micrometeorites: Evidence for variations in the extraterrestrial dust flux through the Quaternary. Geology v. 45, p. 119-122

Lucy Chen

Mentor: Man Yu Li

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Attitudes towards homosexuality across age groups in China

The purpose of this study is to explore people's attitudes towards homosexuality in China. Traditional Chinese culture stresses the importance of carrying down the family names (Wang et al., 2019); therefore, non-heterosexuality and gender minority are generally being disapproved and excluded from the society (Xie, 2018). Furthermore, the government does not establish any laws or public policy to protect these minority members (Jeffreys, 2018). To understand current attitudes towards homosexuality in China, this research asked: What are the attitudes towards homosexuality among people in China across six age groups? This study used the World Value Survey Wave 7 (2018) China data. The data consist of 3,036 participants. Among the participants, 1,533 (50.5%) were females and 1,503 (49.5%) were males. The participants were divided into six age groups. Attitudes towards homosexuality were operationalized (measured) in two different ways: 1) whether they would accept to have a neighbor who is homosexual, and 2) whether they found homosexuality to be justifiable (rated on a 10-point scale). Descriptive analyses were conducted to see if percentages of homosexual neighbor acceptance within an age group varied across ages and if the average ratings of justifiability varied across age. Results showed that, descriptively, the younger generations demonstrated higher acceptance. However, the 65+ age group appeared to be more accepting of having homosexual neighbors than were the 55-64 age group. Future studies may explore covarying factors (e.g., influences from family attitudes, having friends who are homosexual) and predictors of attitudes towards homosexuality other than age.

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Amani Comeaux and Jung-Im Seo

Mentor: Jung-Im Seo

Southern University and A&M College

The Meanings of Shapes in African-American Quilts

Quilting has a long history and a part of human histories within different quilting styles and colors. Quilt is the great art forms of communication and historical documentation in African Americans' life. Although the main purpose of African American quilts is to keep its families warm during cold nights, the quilt is one of tools to symbolize the African Americans' tribes. Especially, African American quilts include family story, family tree, and religious story with vertical strips, bright colors (red, blue, orange, green, and yellow), large designs, symmetry, asymmetry, improvisations, multiple patterning, and symbolic forms. The religious story in African American quilts is the unique subject matter, which is different from the European or Anglo-American quilts. In African Americans quilts, the 'bow tie' means a higher status, the 'bear paw' shows an animal trail through the mountains to find water and food, and the 'log cabin' represents a seeking shelter, which the people here are safe to speak with. The asymmetry and line structure symbolize rebirth, and acted as a way to ward off evil spirits. Like this, the old African American quilts contain a lot of life stories in their quilts. The African American quilts currently thrive and express love, protest, and artistry abound.

Will Decker

Mentor: Dr. Julie M. Schneider

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Anxiety and Word Learning in College Students

Anxiety is a common feeling many college students experience at different points throughout their academic career. There are two types of anxiety: state anxiety and trait anxiety. State anxiety is a short, temporary, and direct response to adverse experiences. Trait anxiety is one's consistent response to adverse events over time and is rooted in pathology. Despite state and trait anxiety being normal to everyday living, little is known about the relationship between anxiety and cognitive processes like word learning, which is form of semantic memory that one employs when learning new words. Generally, it is known anxiety can impede cognitive functioning, but the precise and exact implications that anxiety can have on certain cognitive processes like word learning is unknown.

We conducted an EEG word learning study and collected measures of state/trait anxiety in an effort to determine the relationship between anxiety and word learning in college aged students. Anxiety was measured with the State-Trait Anxiety Inventory (STAI). Participants completed a word learning task, where they were exposed to sentences presented auditorily that ended in a novel word (NW) while looking at a representational image (RI) of that NW. After hearing each NW in four different sentence contexts during this exposure period, participants completed a post-test to gauge their recall of the NWs. It was hypothesized that state and trait anxiety would negatively impact participants' word learning abilities.

We found that trait ($R = 0.34$, $p = 0.13$), but not state anxiety ($R = 0.25$, $p = 0.27$), was moderately associated with participants' ability to accurately recall NWs during the post-test. Individuals high in both state and trait anxiety were more likely to say they learned the NW during the learning exposure (State: $R = 0.37$, $p = 0.10$; Trait: $R = 0.44$, $p = 0.05$). These findings are counter to our hypothesis and indicate trait anxiety may actually facilitate the learning and retention of novel information. Future directions seek to identify whether other cognitive functions, such as working memory, mediate this relationship.

Ayush Deshpande

Mentor: Dr. Brooke O. Breaux

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Fake News: An Empirical Definition

Objective: The word fake news is defined as news that incorporates or conveys false, fabricated, or deliberately misleading information[1]. However, in recent years, there is little empirical evidence to suggest that this is an accurate description of what people understand by the term. The research attempts to discover a more accurate, empirical definition of what the term "Fake News" means to people.

Method: The project involved analyzing data collecting from 235 UL Lafayette students. The participants were presented with a news story and were asked to rate the degree to which "fake news" could be used to describe it, as well as how the story made them feel, describing what they thought the author's intention was and the story's truthfulness, how much they agreed with the information presented in the story, the extent to which they had seen similar stories, and whether they thought the story would go viral. Information on the participants' affiliation was collected about the participant.

Results: We found that the person's perceived mood, the perceived intention and status of the author, as well as the perceived truthfulness and agreement of the information had a significant effect on what the participant understood as fake news. However, neither the participants' political affiliation nor the type of information presented in the news story had a significant effect on the extent to which participants thought a news story was "fake".

Conclusion: The project found that an empirical definition of fake news would be a news story that (a) makes them feel happy, (b) written by someone whose intention it was to be deceptive, (c) written by a politician or a person on the internet, (d) they think contains mostly false information, and (e) contains content they disagree with. This is similar to previous definitions of fake news, which state that fake news "is made-up news, manipulated to look like credible journalistic reports that are designed to deceive us."[2]

References:

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Cy Dupuis, Anna C Romero, Brielle Y Jones, Dr. Hung-Chu Lin, and Joy M Martin

Mentor: Dr. Hung-Chu Lin

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COVID-19 Experiences, Parenting Stress, Maternal Self-Efficacy, and Social Support as Predictors for Mood Symptoms in Postpartum Women

Background: The COVID-19 pandemic has negatively impacted the well-being in postpartum women (Brooks et al., 2020; Harville et al., 2021), which can compromise the quality of parenting and child outcomes (Bernard et al., 2018; Kingston et al., 2018).

Objective: The study examined the associations of the COVID-19-related experiences, parenting stress, maternal self-efficacy, and social support with postpartum depression and anxiety.

Method: A sample of 310 women (M_{age} = 33.8, $SD\ age$ = 3.56) responded to a survey, including the measure of COVID-19-related experiences (including items assessing worries about the impact of the pandemic on health, contracting COVID-19, accessing resources during the pandemic, and feelings of grief), the Parenting Stress Index (Abidin et al., 1995), the Maternal Self-Efficacy Scale (MSE; Teri and Gelfnad, 1991), the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1998), the Center for Epidemiologic Studies Depression (CES-D; Radloff, 1977), and the Generalized Anxiety Disorder Scale (GAD; Spitzer et al., 2006).

Results: Regression analyses, with demographic variables and pre-pandemic mood symptoms controlled, indicated that the COVID-19-related experiences and PSI showed positive main effects on depression, while MSPSS showed negative effects, $F\ (17, 191) = 9.61, p < 0.001$. For anxiety, only the COVID-19-related experiences showed positive main effect, $F\ (17, 186) = 8.38, p < 0.001$.

Conclusion: The COVID-19-related experiences revealed the largest effect on both postpartum depression and anxiety. Parenting stress had a main effect on postpartum depression but not anxiety. Above and beyond all other factors, social support appeared to be a buffering factor for postpartum depression but not anxiety. The findings highlight the importance of addressing challenges imposed by the pandemic to mitigate the symptoms of postpartum depression and anxiety. Targeting parenting stress and increasing social support may prove to be necessary for postpartum women experiencing depression during a pandemic crisis.

Michael Foster, Hunter Strickland, Paul Kim, Audrey Kim, Caitlyn Stamps, Nicholas J Kooyers

Mentor: Dr. Jamie Newman

Louisiana Tech University

RNASeq reveals expression of drought-responsive genes in *Trifolium repens*

RNA sequencing allows for the identification of metabolic responses, adaptations, and interpopulation differences within organisms through the direct analysis of all transcribed genes within a sample. It allows a deeper view of the complexities involved in gene expression and regulation. Our research sought to identify differentially expressed genes within Trifolium repens and determine changes in drought response between native and introduced populations. Native European and introduced North American plants were selected from populations in high and low latitudes and were cultivated within identical conditions. Plants in the experimental group were subjected to a dry-down. Plants were harvested, mass and wilt were measured, and RNA was extracted. The resulting extracted RNA was enriched for mRNA and fragmented to produce 150bp fragments which was followed by PCR amplification depending on transcript concentration. The library preparation was performed according to the QuantSeq 3' mRNA-Seq protocol from Lexogen. The prepared library was sequenced by Novogene.

Reads were QC checked, trimmed, and analyzed in a branched method: reference based mapping and de novo transcriptome generation before mapping. Both branches utilized DESeq2 for differential expression analysis. The first branch utilized the existing transcriptome available on GenBank with reads mapped and transcripts counted with Salmon. The second branch utilized a de novo approach where Trinity was used to generate a de novo transcriptome. This was annotated through the use of numerous databases and reads were mapped and quantified with Kallisto.

We found that de novo assembly improved read mapping but identified fewer genes both overall and differentially expressed. Among the differentially expressed genes identified in both methods, we found induction of a known drought response regulator, abscisic acid, and the downstream effector kinase MAPKKK that influence adaptation and drought tolerance. Other upregulated genes involved in disease/ROS resistance, osmotic balance, photorespiration, and metabolism were identified.

Ainsley Graveson, Alyssa Villermin, Jaci Philliber, Cantika Nasution

Mentor: Hung-Chu Lin

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The Associations between Adverse Childhood Experiences and Somatic Symptoms in College Students

Background: Prior research has indicated that adverse childhood experiences (ACEs) are a predictor of somatic symptoms which causes lifetime physical and mental impairments (Kuhar & Zager Kocjan, 2021).

Objective: The study observes the relation between ACEs and somatic symptoms above and beyond sociodemographic factors (age, sex, race/ethnicity) and mood symptoms (depression, anxiety, and stress).

Method: A sample of 483 college students (361 females, $M_{age} = 20.6$, $SD_{age} = 3.9$) was recruited through SONA participant recruitment program of the Psychology Department at UL Lafayette and responded to an online survey. The measures included the Adverse Childhood Experiences Questionnaire (Dube et al., 2003; Felitti et al., 1998), the Cohern-Hoberman Inventory of Physical Symptoms (Cohern & Hoberman, 1983), and the Depression Anxiety Stress Scales-21 (Lovibond & Lovibond, 1995).

Results: Females reported higher scores on the ACEs ($M = 1.91$, $SD = 2.04$) than males ($M = 1.69$, $SD = 1.68$), $t = 2.38$, $p = .02$ and higher scores of somatic symptoms ($M = 49.84$, $SD = 13.3$) than males ($M = 43.08$, $SD = 17.04$), $t = 3.59$, $p < .001$. All variables were mutually correlated (at the level of $p < .001$). Regression analysis indicated that, with sociodemographic variables and mood symptoms controlled, ACEs showed a positive main effect on somatic symptoms, $b = 0.12$, $t = 2.75$, $p = .006$, $F = 23.26$, $p < .001$.

Conclusion: Females appear to be more vulnerable to ACEs and somatic symptoms than males, potentially due to certain biological and social factors. The robust link between ACEs and somatic symptoms above and beyond sociodemographic factors and mood symptoms underscores the importance of addressing early adversity when treating somatic symptoms. The findings provide insights into the prevention and intervention program aimed at mitigating the negative impacts on individuals suffering from somatic symptoms.

Aidan Guidry

Mentor: Dr. Hung-Chu Lin

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Differences in Empathy, Attachment Insecurity, and Perceived Parenting between Inmates and College Students

Background: Previous studies indicate that justice-involved population shows lower levels of empathy (Lin et al., 2017), poorer perceived quality of parental care (Rafail & Haque, 1999), and higher levels of attachment insecurity (Aliloo et al., 2014), when compared to a normal population.

Objective: The purpose of this study was to replicate the findings on the differences in empathic concern, perspective taking, perceived parenting, and attachment insecurity between inmate and college student samples.

Methods: A sample of 102 inmates (M age = 33.4, SD age = 10.5) was collected from the Lafayette Parish Correction Center (LPCC) and 110 college students (86 females, M age = 23.9, SD age = 7.08) from the UL Lafayette SONA program of the Psychology Department. Participants responded to the Interpersonal Reactivity Index (IRI) (Davis, 1983), and the Parental Bonding Instrument (PBI) (Parker, Tupling, & Brown, 1979), and the Experiences in Close Relationships Scale-Short Form (ECR-S) (Wei, Russell, Mallinckrodt, & Vogel, 2007). Results: Separate t-tests showed that, compared to college students, inmates reported lower empathic concern (EC) (t = -2.32, P = .02), perspective taking (PT) (t = -2.78, P < 0.006), and collective empathy (PT+EC) (t = -3.03. P < 0.003). Also, inmates reported poorer perceived parental care (t = -3.86, P < 0.001) and higher levels of attachment anxiety (t = -2.499, P < 0.013).

Conclusion: Lower levels of empathy in inmates suggest their limited ability to relate to others in plight–a potential cause for the propensity to impose harm on others. Lower quality of parental care and higher levels of attachment anxiety in inmates underscore their deprived developmental context and poor representations of the self. The findings provide possible accounts for the development of antisocial behavior and implications for targeting parental care, attachment security, and empathy to attenuate the propensity for antisocial behavior.

Tarryn E. Hill, Roze D. Dornellas, Robert J. Shelton, Michael J. McDermott, Ph.D.

Mentor: Michael J. McDermott, Ph.D.

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Examining the Role of Anxiety Sensitivity and Emotional Dysregulation on Physical Health beyond PTSD

PTSD is associated with physical health conditions such as osteoporosis, diabetes, and migraines (El-Gabalawy et al., 2018). Emotion dysregulation (EdysR) is characterized by a lack of awareness and clarity of emotions and difficulties engaging in goal-directed behaviors when distressed (Gratz, 2004) and has been implicated as a factor in poor physical health (Crowel et al., 2015). Another factor relevant to physical health is anxiety sensitivity (AS; Horenstein et al., 2018), which is defined as the fear of anxiety-related arousal sensations (Taylor, 2003). Despite established effects of PTSD, EdysR, and AS on poor physical health, few studies have investigated the combined effect of these factors on physical health. Therefore, the current study examined the role of EdysR and AS on physical health beyond the effects of PTSD. Undergraduate participants (n = 537; M_{age} = 19.3 years; 71.7% female) completed questionnaires designed to assess AS (*Anxiety Sensitivity Index-3*; Taylor et al, 2007), EdysR (*Difficulties in Emotion Regulation Scale*; Gratz & Roemer, 2004), PTSD symptoms (*PTSD Checklist for the DSM-5*; Roberts and Kitchener, 2021), and physical health (*Cohen-Hoberman Inventory of Physical Symptoms*; Cohen & Hoberman, 1983).

Hierarchical linear regression demonstrated that PTSD symptoms (ß =.52, $p < .001$) significantly predicted physical health symptoms (R^2 =.27, $F(1,536) = 198.81$, $p < .001$) in the first step of the model. In the second step of the model, EdysR (ß =.11, $p = .011$) and AS (ß =.30, $p < .001$) significantly predicted physical health symptoms beyond PTSD symptoms ($\Delta R^2 = .10$, $\Delta F(2, 534) = 44.62$, $p < .001$). The overall model significantly predicted PTSD symptoms (total $R^2 = .37$, $F(3, 534) = 106.81$, $p < .001$).

Findings demonstrate that EdysR and AS may play a role in poor physical health beyond PTSD. Implications, limitations, and future directions will be discussed.

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Mentor: Dr. Elizabeth Martin

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Investigating Endothelial Cell Response to Pathological Macrophage Secretome in Discrete Subaortic Stenosis

Introduction: Discrete subaortic stenosis (DSS) is a congenital heart disease that involves the growth of a fibrous membrane in the left ventricular outflow tract (LVOT); it is found in 6% of children born with congenital heart defects.This membrane is responsible for the disruption of blood flow and increased pressure gradients that result in increased shear forces on the surface of the tract walls[1]. These wall shear stresses play a major role in the alteration of endothelial cell (EC) phenotype from the vascular and valvular tissues, and loss of tissue homeostasis. **We hypothesize** that the mechanical forces exerted by the disrupted flow may cause pathological macrophage-EC interactions that lead to the development of this fibrous membrane. These experiments seek to investigate these specific interactions and evaluate cell-cell signaling between macrophages and ECs under pathological shear in the context of DSS.

Materials and Methods: Human macrophages were cultured in macrophage media (RPMI 1640 + 10% FBS +1% penicillin/streptomycin) and exposed to varying rates of shear for 24h using a cone-and-plate system (in dynes/cm^2): 35 (pathological), 15 (physiological) and 0 (static control). This conditioned media (CM) was collected and added to ECs at different ratios. ECs were cultured for 24h in 6-well plates with the following concentrations of CM for each media type (35, 15 or 0): 25% CM, 30% CM and 35% CM. Media was aspirated from the wells and cells were lysed for RNA isolation. Gene expression from these cells was evaluated using real-time Quantitative Reverse Transcription Polymerase Chain Reaction (rt-qPCR); specifically, the fibrotic gene marker ACTA-2 and the EC marker PECAM-1. The qPCR data was analyzed using a one-way ANOVA.

Results and Discussion: There was no significant change in ACTA-2 genetic expression. However, an upregulation trend can be seen as the concentration of CM is increased across the samples and as the shear rate increases. On the other hand, the cells cultured in the 35-dynes pathological CM showed a significant downregulation of the endothelial cell gene marker PECAM-1, followed by the 15 dynes-CM and the static (control) when the CM concentration was at 30% and 35%. These results were more evident when cells were cultured in 35% CM as seen in Figure 1.

Conclusions: The significant downregulation of the endothelial cell gene PECAM-1, shows that the ECs are losing their phenotype. Although there is no significant upregulation of ACTA-2, the brightfield images showed a modified morphology of normal endothelial cells into a more elongated cell shape similar to ibroblasts. However, the non-significant upregulation trend of the gene leads us into finding a more suitable fibrotic gene marker such as COL1A1 and PDGF for testing our samples and evaluating if the ECs are becoming more fibrotic.
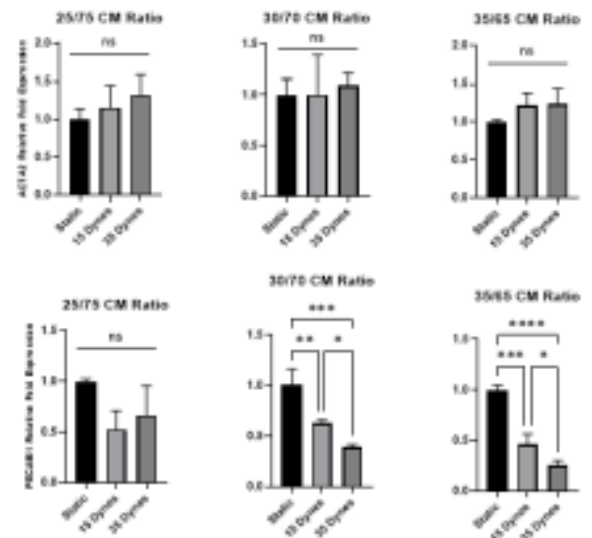

Figure 1. rt-qPCR assessment of gene markers ACTA-2 (fibrotic) and PECAM-1 (endothelial) at different CM concentrations.

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Mynmayh Khamvongsa, Kent Milton

Mentor: Dr. Tanvir Faisal

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Mechanical Characterization of PLA/HA Composite Scaffolds Fabricated with FDM 3D Printer

In recent years, 3D printed bone scaffolds have become increasingly popular for both in vitro and in vivo tissue growth. Hydroxyapatite (HA) is a calcium phosphate ceramic mineral that is widely used in manufacturing bone scaffolds because it is highly osteoconductive, biocompatible, and has a similar chemical structure to carbonate apatite or natural bone. In addition, it provides the environment needed for cells to grow on the scaffold and promote new bone tissue growth. Polylactic acid (PLA) is a synthetic polymer commonly used for being highly biocompatible, biodegradable, and has excellent mechanical properties. It provides the structural support scaffolds need and HA lack on its own.

This study evaluates the mechanical properties of the fabricated PLA/HA composites. Increasing the ratio of HA to PLA resulted in an increase in tensile strength by 4.82% and a decrease in compression strength by 7.25%. There are no notable differences in mechanical properties after 10-15% HA/PLA. Furthermore, scaffold morphology was analyzed through scanning electron microscopy (SEM) images. Fused deposition modeling (FDM) fabricated 3D printed scaffolds have an interconnected and highly porous structure resembling natural bone. Qualitative analysis of the scaffolds was performed, and it was found that all prints on average were scaled up by a factor of .0564 in comparison to the 3D CAD model with no clear trend of the amount of HA affecting the scale factor. The biocompatibility of the printed scaffolds will be further tested for in vitro tissue generation.

Isabel Lanciotti

Mentor: Dr. Hung-Chu Lin

University of Louisiana at Lafayette

The Associations between ACES, Emotional Regulation, and Mood Symptoms

Background: Prior research has indicated that adverse childhood experiences (ACEs) are associated with higher rates of depression (Cambron et al., 2015), anxiety (Gorka et al., 2014), and stress (Karatekin, 2018).

Objectives: This study examines the associations of ACEs with three outcomes, i.e., depression, anxiety, and stress, and whether emotional regulation functioned as a moderator in the associations of ACEs with the three outcomes, respectively.

Method: A sample of 483 college students (361 females, M_{age}= 21.36, SD_{age}= 4.69) (111 males, M_{age}= 20.53, SD_{age} = 4.51) was drawn from the UL Lafayette Psychology Department Subject Pool. Participants responded to three measures: the Adverse Childhood Experience (ACE) Questionnaire (Dube et al., 2003; Felitti et al., 1998), the Depression, Anxiety, and Stress Scale (DASS 21; Lovibond & Lovibond, 1995), the Difficulties in Emotion Regulation Scale (DERS; Gatz & Roemer, 2004).

Results: The scores on ACEs, DERS, depression, anxiety, stress were all mutually correlated (all at $p < .001$). Regression analyses indicated that, with age, sex, and race/ethnicity controlled, both ACEs and DERS showed main effects on depression, anxiety, and stress, respectively. Adding the cross-product of ACEs and DERS to each of the previous models indicated a significant interaction effect on each of the three outcomes. Specifically, as the level of emotion regulation increased, the strength of the relation between ACEs and each of the mood symptoms decreased.

Conclusion: ACEs showed a clear link to mood symptoms in adulthood above and beyond a range of sociodemographic variables. The results also underscored the role of emotion regulation as a buffer for the negative impacts of ACEs. These findings carry implications for mitigating depression, anxiety, and stress through fostering emotion regulation skills, particularly for individuals who experienced childhood adversity.

Maegan LeBlanc

Mentor: Jonathan Willis

Nicholls State University

Investigation of the interaction of nutrient loading and flooding depth on the survival and growth of Taxodium distichum and Schoenoplectus californicus, as well as the integrity of associated soils.

The assimilation wetland in Thibodaux, Louisiana, is a part of a much larger degraded swamp. The adjacent wastewater treatment plant releases an average of 11,546 m-3 day-1 m^3/day of highly nutrient-rich water into the 231-ha, or 570.81 acres of cypress swamp. However, the cypress swamp has experienced substantial degradation, significantly reducing individual trees and tree canopy compared to nearby reference sites. This studies research focuses on the potential role of flooding and nutrient concentrations that may be limiting the establishment and expansion of crucial wetland species during restoration efforts through a mesocosm and field study. To accomplish this, the mesocosm study, beginning in the fall of 2021 and continuing through the spring of 2022, a two-species (Taxodium distichum, Schoenoplectus californicus) x 2 flooding depth (5 cm, 40 cm) x 2 nutrient level (ambient, elevated nitrogen) factorial design was implemented. The field study, intimated in early spring 2022, evaluated two species (Taxodium distichum and Schoenoplectus californicus) at current and artificially elevated soil elevations. Overall, flooding depth at the levels tested appears to represent a significant impediment to vegetation re-establishment. Successful re-vegetation at this site will likely necessitate hydrologic modifications to enhance restoration establishment success.

Alisa McCollums, Maya Maynor, Kaylyn Credeur, Michael J. McDermott, Ph.D.

Mentor: Michael J. McDermott, Ph.D.

University of Louisiana at Lafayette

Examining the impact of Covid-19-related cognitive stress on OCD symptoms beyond anxiety sensitivity

Obsessive compulsive disorder (OCD) is experienced by roughly 1-2% of the population and is associated with significant impairment (ADAA, 2021). The COVID-19 was associated with significant increases in psychological distress (Taylor, 2019) and was particularly disruptive among those with OCD, who reported greater COVID-19-related concerns and impairment compared to those without OCD (Wheaton et al., 2021). Although some evidence suggests that university students experienced significant increases in OCD symptoms (Ji et al., 2020), limited research exists examining the effect of the COVID-19 pandemic on OCD symptoms among university students. Further, no studies have examined this relation beyond established underlying factors in OCD such as anxiety sensitivity (AS). AS refers to the tendency to fear bodily sensations associated with anxiety due to concerns of harmful social, physical, or psychological consequences (Taylor, 2003). Therefore, the current study examined the role of COVID-19-related cognitive stress on OCD symptoms beyond AS.

A total of 262 undergraduate participants (M_{age} = 19.15 years; 76.7% female) completed questionnaires designed to assess symptoms of OCD (*Dimensional Obsessive-Compulsive Scale*; Abramowitz et al., 2010), AS (*Anxiety Sensitivity Index–3*; Taylor et al., 2007), and COVID-19-related cognitive stress (*COVID-19 Adult Symptom & Psychological Experience Questionnaire*; Ladouceur, 2020).

Hierarchical linear regression analyses demonstrated that AS (ß =.42, $p < .001$) significantly predicted OCD symptoms (R^2 =.17, F(1,248) = 52.07, $p < .001$) in the first step of the model. In the second step of the model, COVID-19-related cognitive stress (ß =.29, $p < .001$) significantly predicted OCD symptoms beyond AS (ΔR^2 = .07, ΔF(1, 247) = 21.61, $p < .001$). The overall model significantly predicted OCD symptoms (total R^2 = .24, F(2, 247) = 39.00, $p < .001$). Findings suggest that COVID-19-related cognitive stress is associated with OCD symptoms beyond AS. Clinical interpretations, limitations, and future directions will be discussed.

Bailey Meche

Mentor: Dr. Kumer Das & Dr. Bruce Wade
DiseaseNet: A Unified Approach to Disease Detection

We will examine well-known semigroup and Laplace transform techniques from the perspective of an undergraduate student. Our goal is to establish a thorough technique for solving systems of ODE's using only the primitive tools acquired in elementary calculus classes. The implementation and practical applicability of said technique, we believe, may interest researchers. We also provide further research extension ideas.

Kenyetta Nelson-Smith, Brandi Gunn, Ladaisha Burton, and Alexia Herrin

Examining Expected Growth and Development in Three-Year Old's Using the Ages and Stages Questionnaire

Developmental monitoring is considered a vital role of child health practitioners in most Western nations (D'Aprano, Silburn, Johnston, Robinson, Oberklaid, & Squires, 2016). It is an essential step in recognizing children who have challenges or concerns in their formative years before entering school. The Ages and Stages Questionnaire (ASQ) is a parent-completed questionnaire that may be used as a general developmental screening tool (Singh, Yeh, & Blanchard, 2017). ASQ helps parents understand how their child is developing, and assists them in determining their children's strengths, achievements and any areas in which their child might require care. The goal of this project is to examine the developmental growth of three-year-old's enrolled in an early childhood research laboratory.

Danielle Orcutt, Madison Britton, Natalie A. Clay

Mentor: Dr. Lin

Louisiana Tech University

Hot, Sweet, and Salty: Impacts of Urbanization and Temperature on Ant Foraging Across a Salinity Gradient.

Humans are altering physical and nutritional landscapes through activities like building cities and altering waterways, which can impact organismal behavior and ultimately ecosystem function. Sodium is an essential element required for nerve impulse and water balance and sugar is essential for glucose production and energy. Sodium is naturally high along coasts where it is deposited in oceanic salty rain and decreases in concentration further inland. Sugar is relatively rare but found in fruit. Urbanization tends to increase both sodium and sugar. Moreover, urban landscapes tend to be hotter than natural landscapes. We predicted that ants on college campuses would 1) consume more salt as distance from the coast increased, 2) consume sugar at only the highest concentrations, 3) increase recruitment to higher temperature baits with increased latitudes, and 4) disproportionately use the highest salt and sugar concentrations at the hottest baits. At three college campuses from coastal LA to Central AR we set out 12 transects of 185 baits that contained one of three concentrations of sodium (0.1%, 0.5%, and 1.0% NaCl; n=30 ea), sugar (10%, 20%, and 30% sucrose; n=30 ea), or water as a control (n=5). Additionally, a third of each nutrient type received one of three temperature treatments: Black vials (hottest), Amber vials (slightly elevated), or Clear vials (~ambient). Ants disproportionately used the highest concentrations of sugar and few-to-no ants recruited to salt or water controls at all sites. Although there was a trend for ants at the highest latitude to prefer the hottest baits, temperature (vial color) had no effect on ant foraging. These results likely reflect dietary and ecological adaptations of urban ants that experience Na-, temperature-, and sugar-enriched environments. Future studies should compare foraging behavior and critical thermal maximum and minimums between adjacent natural and urban ecosystems.

Bella L. Patterson, Katrina R. Beo, Emma A. Blanchard, & Michael J. McDermott, Ph.D.

Mentor: Dr. Michael McDermott

University of Louisiana at Lafayette

Borderline Personality Disorder Symptoms Predict Migraine Symptoms beyond Pain-Related Anxiety

Roughly 35% of university students experience migraine (Alharbi et al., 2018), which is associated with significant impairment (Smitherman et al., 2011). Pain-related anxiety is an established underlying factor central to the development and maintenance of pain conditions (Turk & Wilson, 2010). In migraine, pain-related anxiety induces maladaptive avoidance behavior which inhibits habituation to triggers (Ruscheweyh et al., 2019). Although pain-related anxiety is an underlying factor in migraine, disruptive personality traits such as those in borderline personality disorder (BPD; characterized by affective instability, impulsivity, unstable interpersonal relationships, dissociative symptoms, and fear of abandonment; Rothrock et al., 2007) may be particularly relevant in the exacerbation of migraine symptoms (see Davis et al., 2013). However, no studies have examined this relation beyond established underlying factors in pain. To address limitations, the current study examined the effect of BPD symptoms in migraine symptoms beyond pain-related anxiety.

A total of 143 undergraduate participants (M_{age} = 19.62 years; 57.70% female) completed a battery of questionnaires designed to assess symptoms of migraine (*ID Migraine*; Lipton et al., 2003), BPD (*Personality Assessment Inventory-Borderline Scale*; Pilkonis, 2018), and pain-related anxiety (*Pain Anxiety Symptom Scale – 20*; McCracken & Dhingra, 2002). Hierarchical linear regression analyses demonstrated that pain-related anxiety (ß =.32, $p < .001$) significantly predicted migraine symptoms (R^2 =.10, F(1,139) = 15.41, $p < .001$) in the first step of the model. In the second step of the model, BPD symptoms (ß =.18, $p = .047$) significantly predicted migraine symptoms beyond pain-related anxiety ($\Delta R^2 = .03$, $\Delta F(1, 138) = 4.02$, $p < .001$). The overall model significantly predicted migraine symptoms (total $R^2 = .13$, $F(2, 138) = 9.88$, $p < .001$).

Findings demonstrate that BPD symptoms are related to greater migraine symptoms beyond pain-related anxiety. Implications and limitations of current findings and directions for future research will be discussed.

Khang Pham

Mentor: Samuel Owoso and Donghui Zhang

Louisiana State University

Ring-Opening Random Copolymerization of N-(3-tert-butoxy-3-oxopropyl) Glycine Derived N-Carboxyanhydride and N-Butyl Glycine Derived N-Carboxyanhydride.

Polypeptoids are structural mimetics of polypeptides with *N*-substituted polyglycine backbones. In 2017, Guseva and coworkers[1] proposed that the chemistry-to-biology (CTB) transition occurred through foldable polymers carrying random distribution of hydrophobic and polar monomers and exhibiting some catalytic activities. To evaluate this hypothesis, a hydrophobic-polar (HP) polypeptoid random copolymer model was constructed by random copolymerizing two glycine-derived *N*-carboxyanhydride (NCA) monomers, namely, *N*-(3-*tert*-butoxy-3-oxopropyl*)* glycine derived *N*-Carboxyanhydride (^{t}BuO$_2$Pr-NCA) and *N*-Butyl *N*-Carboxyanhydride (Bu-NCA) using benzylamine as initiator. Towards this end, poly(*N*-(3-*tert*-butoxy-3-oxopropyl) glycine)-*random*-poly(*N*-butyl glycine) was synthesized with monomer-to-initiator ratios ($[M^1]_0 : [M^2]_0 : [I]_0 = 50 : 50 : 1$ and $70 : 30 : 1$), molecular weights (M_n) of 6000 Da and 3700 Da and narrow molecular weight distribution (PDI = 1.002 and 1.012), respectively. Investigating the HP random polymer model could help in understanding their folding and association in aqueous solution and autocatalytic behavior that leads to long chains of sequence-defined protein-like molecules.

References:

1. Guseva, E.; Zuckerrmann, R. N.; Dill, K. A. Foldamer Hypothesis for the growth and sequence differentiation of prebiotic polymers. *PNAS*. **114**, 36 (2017).

Camille R. Reaux, Bella Patterson, Erika M. Caramillo

Mentor: Dr. Erika M. Caramillo-Hatch

University of Louisiana at Lafayette

Effects of Aerobic Exercise on Memory Retention in Zebrafish

Zebrafish serve as a model for studying Alzheimer's Disease (AD) due to their homologous brain structures and orthologous genome to humans (Fontana et al., 2018). AD is a neurodegenerative disease that causes dementia and reduced memory retention. Many AD related drugs and non-pharmaceutical therapies are studied in zebrafish (Echevarria et al., 2016). The effects of aerobic exercise, a non-pharmaceutical therapy, on memory and hippocampal volume in rodents and humans show positive effects, but no studies have examined the effects of aerobic exercise on memory using the zebrafish model (Erickson et al., 2011; van Praag et al., 2005). We plan to study the effects of aerobic exercise on memory in zebrafish. The species have been established as an aerobic exercise model but never to determine its effects on memory retention. Zebrafish can be aerobically exercised by having them swim against a current of specific strengths (Palstra et al., 2010). The effects of aerobic exercise on memory retention will be measured using the Object Recognition Task (ORT). Because zebrafish exhibit novel object recognition memory, memory retention can be used for studying the effects of therapies and drugs developed for treating AD (May et al., 2016). ORT measures memory by tracking how long the zebrafish swim around a novel object in comparison to a familiar object. According to May et al. (2016), zebrafish exhibit memory retention if more time is spent exploring the novel object. We aim to observe that aerobic exercise will increase memory retention in zebrafish. Specifically, we hypothesize that fish that are exercised will exhibit increased memory retention in the ORT when compared to fish that have not been exercised.

Jocelyn Rivarde

Mentor: Dr. Gang

University of Louisiana at Lafayette

Role of Nanoparticles and Their Dispersion Techniques to Improve the Service Life of Shape Memory Polymers

The recent development of nanotechnology has gained significant attention in aerospace, automotive, and biomedical engineering. The role of nanoparticles, such as graphene has been investigated to improve the service-life of shape-memory polymers, such as epoxies. In the present work, 2D graphene nanoplatelets (GNPs) were converted to its 1D scrolled architecture known as graphene nanoscrolls (GNS) using a direct conversion technique through lyophilization. Another objective of this work is to assess the role of the dispersion techniques to control the ultraviolet (UV) degradation of epoxies. For this, various nanoparticles such as halloysite nanotubes (HNTs), carbon nanotubes (CNTs), natural clay (MMT), and GNS has been dispersed in epoxy resin using tip and bath sonication. SEM analysis revealed that the nanofilled epoxy samples that underwent tip sonication had a reduction in the number and size of microcracks. The glass transition temperature (T_g) increased with UV exposure, according to DSC analysis. Future research will go beyond these steps, to assess the weathering of these epoxies, and how organic light stabilizers can be injected into the GNS within the epoxies to improve their service life.

Mattie Robison, Michael Foster, Laura Lee, Paul Austin, Lescia Valmond, Audrey Kim, Tom Bishop, Paul Kim, Jamie Newman

Mentor: Dr. Jamie Newman

Louisiana Tech University and Grambling

Wastewater Analysis and Genome Sequencing of SARS-CoV-2 Benefit COVID-19 Surveillance

The COVID-19 outbreak was declared a pandemic on March 11, 2020. Since this declaration, there have been over 625 million cases and over 6 million deaths reported worldwide. Quantitative reverse transcriptase PCR (RT-qPCR) and antigen testing have become the predominant surveillance methods for SARS-CoV-2 positivity, the former being more sensitive to viral load and the latter being more efficient. These testing methods are invaluable, but do not provide an accurate assessment of the total caseload in an area. Wastewater-Based Epidemiology (WBE) involves measuring genome copy units in wastewater to allow a quantitative measure of all cases in the area, including asymptomatic carriers and non-tested COVID-19 positive individuals. This method can predict surges in positivity in the area sampled and may benefit healthcare workers by providing more time for preparation of these surges.

During surges, genomic surveillance analyzes positive patient tests to confirm viral presence and identify the variants present in different areas. This approach leads to the ability to monitor novel mutations as they occur in real-time during emerging and active outbreaks. For SARS-CoV-2, there are numerous mutations of concern and the ability to track their prevalence and correlate with epidemiologic data is invaluable. As sequencing has previously been only available to larger institutions, the ability to sequence samples from rural communities provides a more thorough view of the mutational landscape and their distribution across populations. Combined with WBE, these two methods provide new perspectives that can dramatically increase the effectiveness of public health responses to emerging pathogens.

Anna Romero, Kinsey Hatfield, Mia Guidry, and Sydney Guidry

Mentor: Dr. Hung-Chu Lin

University of Louisiana at Lafayette

The Associations between Adverse Childhood Experiences, Emotion Regulation, and Mood Symptoms

Background: Prior research has indicated that adverse childhood experiences (ACEs) are associated with higher rates of depression (Cambron et al., 2015), anxiety (Gorka et al., 2014), and stress (Karatekin, 2018).

Objectives: This study examines the associations of ACEs with three outcomes, i.e., depression, anxiety, and stress, and whether emotional regulation functioned as a moderator in the associations of ACEs with the three outcomes, respectively.

Method: A sample of 483 college students (361 females, Mage= 21.36, SDage= 4.69) (111 males, Mage= 20.53, SDage = 4.51) was drawn from the UL Lafayette Psychology Department Subject Pool. Participants responded to three measures: the Adverse Childhood Experience (ACE) Questionnaire (Dube et al., 2003; Felitti et al., 1998), the Depression, Anxiety, and Stress Scale (DASS 21; Lovibond & Lovibond, 1995), the Difficulties in Emotion Regulation Scale (DERS; Gatz & Roemer, 2004).

Results: The scores on ACEs, DERS, depression, anxiety, stress were all mutually correlated (all at $p < .001$). Regression analyses indicated that, with age, sex, and race/ethnicity controlled, both ACEs and DERS showed main effects on depression, anxiety, and stress, respectively. Adding the cross-product of ACEs and DERS to each of the previous models indicated a significant interaction effect on each of the three outcomes. Specifically, as the level of emotion regulation increased, the strength of the relation between ACEs and each of the mood symptoms decreased.

Conclusion: ACEs showed a clear link to mood symptoms in adulthood above and beyond a range of sociodemographic variables. The results also underscored the role of emotion regulation as a buffer for the negative impacts of ACEs. These findings carry implications for mitigating depression, anxiety, and stress through fostering emotion regulation skills, particularly for individuals who experienced childhood adversity.

Kiswayla Scott, Taygan Kohlman, Natalie A. Clay

Mentor: Natalie A. Clay

Louisiana Tech University

The Effects of Restoration Management on Vegetation Ground Cover in a Shortleaf Pine-Hardwood Forest

Human-caused changes to landscapes impact the biodiversity, ecosystem functions and ecosystem services those habitats provide. Shortleaf Pine-Hardwood forests have nearly disappeared in North America due to land conversion for farming and pine plantations. The relatively dense canopy and nearly monotypic stands of the dominant and often planted Loblolly pine forest significantly differs from the more open canopies and mixed pine-hardwood stands historically in North Louisiana. This is likely to impact ground vegetation cover because sunlight is important for the growth of plants? We tested how different management strategies in a shortleaf pine-hardwood restoration forest impacted ground vegetation cover. Specifically, we measured ground cover at 9 sites differing in restoration management. These sites included: sites that were burned, sites that were burned and received herbicide applications, and control sites that were not undergoing restoration. Vegetation cover was measured by taking four photos of 0.5m x 0.5m plots at each site and averaging the percent green vegetation cover analyzed using ImageJ. Sites undergoing restoration had significantly more green vegetation than control sites, which had little-to-none. Restoration sites had a higher abundance of grasses and herbaceous ground cover and reflects the vegetation structure more characteristic of the native shortleaf pine-hardwood forest. These results demonstrate that habitat management through prescribed burning and herbicide can help restore landscapes.

Nicci Shelby

Mentor: Dr. Tchavdar Marinov

Southern University at New Orleans

Novel approach for identification reproduction number illustrated with COVID-19 epidemics dynamics in Louisiana

We developed a new method for identifying the Effective and Basic reproductive rates Re and Ro for long term epidemics. The proposed method is illustrated with calculations based on real data for COVID- 19 dynamics in state of Louisiana, USA.

Keywords: SIR epidemic model; inverse problem; coefficient identi- fication; time-dependent transmission and removal rates; data mining; COVID-19 analysis and predictions

Drew D Sikat, Eugenia N Dieze, Logan Prichett, Bimi Shrestha, Rafael Hernandez, Dhan Lord B. Fortela, Wayne Sharp, Andrei Chistoserdov, Daniel Gang, Emmanuel Revellame, and Mark E. Zappi

University of Louisiana at Lafayette

Leaching of Tygon tubing into synthetic wastewater inoculated with anaerobic seed and the identification of the compounds in the leachate using GC/MS

E-LFL (Long Flexible Life) food and beverage grade Tygon is widely used in the industry and research laboratory due to its long pumping lifecycle, broad resistance to chemicals, and low gas permeability. Tygon tubing has been used in an attached growth anaerobic digestion system to remove the total organic carbon (TOC) and soluble chemical oxygen demand (sCOD) from an anaerobic digester effluent. Different attached growth media such as bio balls and ceramics were used treating low sCOD level digestate as the influent with continuous flow in the tubes. The increase in total organic carbon and soluble chemical oxygen demand as the digestion continued enquired for an investigation on the possibility of the Tygon tubes leaching into the influent. No increment on the sCOD and TOC values using bio balls in a batch reactor without the use of Tygon tubing eliminated the leaching of the bio balls and the presence of scaling on the tubes on the attached growth reactor system indicated the leaching from the tubing. Tygon tubing was cut into rings and used in DI water, synthetic wastewater, and synthetic wastewater seeded with anaerobic digester sludge from the wastewater treatment plant (50%v/v). The reactor was anaerobically digested in batch mode for 35 days and the pH, sCOD, TOC, total nitrogen, total phosphorus, and total ammonia-nitrogen were analyzed. The influent and effluent were analyzed using GC/MS to identify the removal and emergence of compounds.

Savion Siner

University of Louisiana at Lafayette

Dual Active Bridge Based Battery Chargers for Space Exploration

Rovers play an important role in different exploration missions by different NASA research centers. This project investigates adaptive control schemes to enhance the resilience of the charger unit for battery operated rovers. A buck converter-based charger will be modeled in Matlab/SIMULINK and the performance of the converter's controller will be evaluated under four disturbances. Our tests include constant power load, short circuit at the load side, switching fault, and severe fluctuations in the input voltage of charger. A reinforcement learning based method will be applied to adjust the control parameters in real-time making it adaptive. The performance of the adaptive charger will be evaluated using resilience metrics proposed in different sets of literature.

Brionne Stinger/Jo'Vian Baker, Richard Stepney, John-Clifford Obih, Rachid Belmasour, Mostafa Elaasar, Joseph Olubadewo, Christian Clement

Mentor: Christian Clement

Southern University at New Orleans

Nanoparticle-drug complex simulations-Deep tissue delivery-asymptomatic lung inflammation

In vein-like structures, the particle impedance of liquid akin to the mechanical attributes of blood flow provides characteristic patterns which are not fully determined. Therefore, drug delivery is not generally effective in deep tissues, including the posterior eye, lung, and blood-brain barrier. The purpose of this research is to understand the movement of nanoparticle-drug delivery in deep tissue through gravity and random motion simulations. Nanoparticles are used as vehicle to target disease-infected areas to ensure dosage efficiency and for diagnostic purposes. Determining these particles' movement and patterns can help improve how drugs are administered using nanotechnology. Nano-based drug delivery is a novel process of dispensing drugs using small particles that measure around 1-100 nanometers. The nanoparticles are coated with a particular drug and used as vehicle to target a specific area of the body for drug delivery. In this experiment, fluorescein represented the drug, and bacteria represented RBC, other blood cellular components, natural broth represented the fluid component, and nanoparticles (in this case agarose) as the vehicle or drug carrier. The investigations employed the influence of Gravity and random Brownian simulations of trafficking and accumulations of nanoparticles in blood fluidics. Our initial results show that the higher concentration of bacteria caused the nanoparticles to move slower to the bottom of the test tube. This is ongoing research.

Kyle Taylor

University of Louisiana at Lafayette

Investigation of the Adsorption of Sulfamethoxazole (SMX) onto Ordered Mesoporous Carbon (OMC)

Sulfamethoxazole (SMX) is an emerging contaminant that has been found in water bodies. SMX is used as an antibiotic to treat urinary tract infections, bronchitis, and prostatitis. Due to incomplete metabolism of SMX in humans, SMX is excreted in its pharmaceutically active state. Due to a lack of effective treatment technology for SMX removal, concentrations of SMX have been detected in water bodies worldwide. SMX contamination in water is an issue because it can lead to the growth of antibiotic-resistant bacteria, which can cause disease and is much more difficult to treat. SMX is not toxic to humans, but inevitably is a danger to human health if it were to cause a rise in antibiotic-resistant bacteria. Because of the rising danger of SMX pollution, it is important that advances are made in technology used to remove SMX. In this study, the adsorption capacity of Ordered Mesoporous Carbon (OMC) was tested to determine if OMC is an effective adsorbent for SMX removal. It was determined experimentally that OMC has an adsorption capacity of 334 mg/g for SMX, and it reached adsorption equilibrium in 4 hours. This proves that OMC is a viable adsorbent for treating water contaminated with SMX.

Braden Teer

Mentor: Dr. Brooke Breaux

University of Louisiana at Lafayette

Talking about death and divorce: A pilot study investigating the role of spirituality

Our lab previously explored the words produced by college students when asked to email a friend to explain a serious event. By collecting data in person and simplifying our research design, the current pilot study was designed to address issues we had with Breaux et al.'s (2021) procedures. Would people who are more spiritual be more likely to use figurative language (as compared to literal language) when communicating about serious events and whether similar patterns in language would be found when writing about death as compared to divorce? We recruited 17 college students: They were 19 years old on average, primarily female, and mostly native English speakers. Only half reported being affiliated with a particular religion. We randomly assigned participants to one of four conditions (the death of their friend's mother or father or the infidelity of their friend's mother or father) followed by a randomized sequence of questionnaires to collect information about their spirituality, afterlife beliefs, and religious affiliation. Even with such a small sample size, we found that participants were significantly more likely to use literal language about divorce ($M = 1.86$) as compared to death ($M = 0.90$) and were significantly less likely to use figurative language about divorce ($M = 0.00$) as compared to death ($M = 2.50$). Despite some initial issues involved in collecting data for a subset of our predictor variables, we still found some evidence to suggest people who are more spiritual might be less likely to use literal terms when communicating about serious events ($\beta = -.26$). While conducting this pilot study, we were able to correct some errors in our data collection process. Our current goal is to improve our participant recruitment strategy and collect data from a minimum of 100 college students.

Adrienne Wyble, Will Decker, Eileen Haebig, Julie Schneider

Mentor: Julie Schneider

Louisiana State University

Rhyme and Reason: The Effects of Rhyme on Retrieval from Semantic Memory

Children primarily learn new words through incidental exposure to novel words during real-life communicative interactions (Nagy & Herman, 1987). Highly structured language like meter, rhyme, and repetitive structure is thought to enhance novel word learning. Specifically, rhyme provides a boost to vocabulary learning when novel words are heard at the end of rhyming stanzas (e.g. Read, 2014; Read & Quirke, 2018). Despite rhyme eliciting higher word learning in children, it remains unknown whether rhyme can facilitate word learning and semantic memory in adults. To address this gap, 21 college aged students participated in an EEG study testing their learning and memory for novel words. Participants were randomly assigned to rhyme or no rhyme conditions prior to arrival and engaged in computer tasks to facilitate novel word learning. Using a response pad participants were asked to say if they knew what each made up word meant based on its context in a sentence while simultaneously being presented with an abstract image related to something in the real world. Subsequently, participants were tested on their semantic understanding of the novel words in two ways: 1) participants heard a novel word and selected the image this word represented from four choices and 2) participants heard the novel word embedded in a sentence and selected the image this word represented from four choices. Our results indicate that adults were significantly above chance in their recollection of the novel words at post-test one ($t(20) = 6.67$, $p < 0.001$) and post-test two ($t(20) = 6.11$, $p < 0.001$). Counter to our hypothesis, across both post-tests, adults who learned words in the absence of rhyme demonstrated higher rates of recall than those who learned words with rhyme, although this difference was not significant (post-test 1: $t(7.03) = 0.13$, $p = 0.90$; post-test 2: $t(7.98) = 1.26$, $p = 0.24$). Overall, adults demonstrate high ability for novel word learning regardless of the presence of rhyme in word learning tasks.

Amari Youyoute/Anysia Butler, Christian Clement, Lisa Mims-Devezin

Mentor: Lisa Mims-Devezin

Southern University at New Orleans

Antibiotic Sensitivity of Secondary Bacterial Infections in COVID-19 Patients

In this study, the antibiotic sensitivity of common secondary bacterial infections seen in COVID-19 patients were tested using dis diffusion method. Bacteria are prokaryotic microorganisms that can be either beneficial or harmful to humans. Viruses are acellular organisms that require a host to survive. When a person is infected with a virus like COVID-19, the immune system is compromised, allowing harmful bacteria to enter the body easily. Harmful bacteria cause secondary infections and complications and can be treated by administering antibiotics which are either bactericidal or bacteriostatic to patients affected by COVID-19 disease. To evaluate antibiotic efficacy, common bacterial infections seen in COVID-19 patients were investigated using antibiotic diffusion disks to test the sensitivity of pathogenic bacteria (Enterobacter aerogenes, Pseudomonas aeruginosa, and Bacillus cereus). Methods included the culturing of these microbes in nutrient broth and then streaked onto solid agar media on petri dishes. Standard antibiotics (penicillin, ampicillin, streptomycin, tetracycline, chloramphenicol) were pressed onto the surface of the Agar plates in a modified Kirby Bauer test. Results were recorded as bacteriostatic, bactericidal, or no effect based on the evaluation of the zones of inhibition created by the antibiotics on the cultured solid media of each petri dish. There was antibiotic resistance for some of these bacteria tested. This research is a pilot investigation of actual collection and testing of bacterial infections of COVID-19 disease afflicted patients.