

31st Annual Student Research Conference at Southeast Missouri State University



April 18 and 19, 2023

31st Annual Student Research Conference

April 18 and 19, 2023

Tuesday, April 18 Schedule Oral Presentation Sessions

	Presenters	Location
9 a.m. - 10 a.m.	Nolan Briegel (U)* Ayibongwe Mathe (U)** Tuyen Nguyen (U)** Moe Toyoda (U)*	University Center Ballroom A
11:30 a.m. - 12:30 p.m.	Yumna Aksoy (G) Steph Conway (U) Derek Honaas (U) William Borgerding (U), Jacob Carson (U), Colton Crouch (U), and Nick Hemberger (U) ****	University Center Ballroom A
3 p.m. - 4 p.m.	Mayowa Adebowale (U)**** Tetiana Dronova (G)*** Hannah Vaughn (U)	University Center Ballroom A

* Denotes competing
undergraduate presenter

** Denotes competing
capstone presenter

*** Denotes competing
graduate presenter

**** Denotes capstone
presentation

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Tuesday, April 18 Schedule Poster Presentation Sessions

	Presenters	Location
8 a.m. - 9 a.m.	Rita Acosta (G) *** Arif Ayon (G) Tayler Gudde (U) * Sanako Hishinuma (U) Danielle Kramer (U) *	University Center Ballroom B
10 a.m. - 11 a.m.	Prasanthi Badri (G) **** Steph Conway (U) Larry DeLay (U) Akriti Kafle (U) Sophia Martin (U) * Thao Pham (U) **** Jesse Yount (U) ** Marissa Peters (U)	University Center Ballroom B
2 p.m. - 3 p.m.	Austin Broughton (U) Bailee Cairel (U) * Josie Fryar (U) Connor Hundl (U) Diana Omayio (G) ****	University Center Ballroom B
4 p.m. - 5 p.m.	Jaina Bemis (U) Tu Nguyen (U) ** Abriana Record (G) ***	University Center Ballroom B

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Wednesday, April 19 Schedule Oral Presentation Sessions

	Presenters	Location
10 a.m. - 11 a.m.	Mitchell Morris (U) Emmanuel Nsiah (G)*** Thao Pham (U) * Ashley Wilthong (U) **	University Center Ballroom A
11 a.m. - 12 p.m.	Nguvan Agaigbe (G)*** Nisa Muhammad (U) * Kate Appleman (G) ***	University Center Ballroom A
2:30 p.m. - 3:30 p.m.	Caleb Hitt (U) Taylor Nelson (U) Destiny Penfield (U) Zoe Rees (U) and Madden Delaney (U) *	University Center Ballroom A

* Denotes competing
undergraduate presenter

** Denotes competing
capstone presenter

*** Denotes competing
graduate presenter

**** Denotes capstone
presentation

31st Annual Student Research Conference

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Wednesday, April 19 Schedule Poster Presentation Sessions

	Presenters	Location
12 p.m. - 1 p.m.	Trinity Calinescu (U) Molly Cook (G) *** Lindsey Dewey (G) *** Lizzy Stock (U) *	University Center Ballroom B
4 p.m. - 5 p.m.	Alyssa Boyd (U) Sneha Ghimire (G) Sho Nakayama (U) ** Lindsey Noel (U) Scott Wasmer (U) Dilasha Pandey (U) ****	University Center Ballroom B

* Denotes competing
undergraduate presenter

** Denotes competing
capstone presenter

*** Denotes competing
graduate presenter

**** Denotes capstone
presentation

Keynote Address



Dr. Pam Parry “The Will To Learn”

Keynote Address

Tuesday, April 18, 2023

1 p.m. – 2 p.m.

Dr. Pam Parry, professor of public relations, has been writing for more than 40 years. An award-winning journalist, she is a national scholar on media history, public relations, diversity, and presidential communications. She is the author of *Eisenhower: The Public Relations President*, and editor of *Journalism History* – the nation’s oldest peer-reviewed journal of mass media history. Dr. Parry has appeared on C-SPAN, NPR and BBC Radio to discuss her research. She has co-edited two books on diversity, and is the lead co-editor of a book series on *Women in American Political History*, which has published six titles with more books on the way. She holds four degrees, and previously was an accredited congressional correspondent, who also covered the White House and the U.S. Supreme Court. Dr. Parry has written for *The Baltimore Sun* and for “The McLaughlin Group” television show as an independent practitioner. In 2016, the Kentucky Communication Association awarded her the Applegate Award for Excellence in Research. She also received the 2020 Best Podcast Guest Award from a media history podcast in which she discussed President Eisenhower. She is writing a second book about Eisenhower, scheduled to be published in 2025. Her favorite time of day is when she is in the classroom where she interacts with each of you.

150 *Years*



150 Years of Photos



150 Years of Smiles



150 Years of SEMO Pride

For 150 years, “Making History” has been an inherent part of what Southeast Missouri State University has contributed to the region. The Copper Dome of Academic Hall rises to welcome students to a tradition of innovative academics, educational excellence, and launching extraordinary careers. As we plan for our next chapter, the Sesquicentennial will celebrate our storied history and our diverse graduates who are now “Making History” in their own communities.



150 Years of Surprises



150 Years of the Will to Do

Full Abstracts

Body Composition Predictors of Lower Extremity Injury in Collegiate Dancers

Rita Acosta (primary author) Kyle Schneider (secondary author), Jeremy Barnes (secondary author), Charlotte Cervantes (secondary author); Faculty Sponsor: Kyle Schneider*

While many studies have evaluated the relationship between body image and body composition, few have explored the relationship between body composition and injuries from dancing. Injuries can affect dancers' career and lead to adverse health and career concerns. Impacts of body composition on performance have been evaluated in athletes, but not in dancers. Purpose: The purpose of this study was to identify factors that are common among injured dancers, and to explore body composition factors that may predict the future presence of injuries. Methods: Twenty-four female collegiate dancers aged 19.79 ± 1.14 years old from SEMO's Conservatory of Theatre & Dance had their body composition evaluated via the InBody 230 Body Composition Analyzer. Of those, eight reported a lower-extremity injury during their collegiate career that required them to seek care from. Injury specifics were collected, including body part injured, type of injury, severity of injury, acute vs chronic injury, and time lost due to injury. Results: The average BMI of participants was $24.43 \pm 3.14 \text{ kg/m}^2$. A positive significant correlation between skeletal muscle mass and total body weight was present ($P=0.01$, $r=0.826$). An insignificant between group non-injured ($M=27.86\%$, $SD=5.6\%$) vs. injured ($M=30.84\%$, $SD=5.6\%$) difference in percent body fat was found at 15.81% ($P=0.704$, $r=0.474$). The mean difference within groups was $15.81 \pm 5.58\%$. An insignificant positive correlation between time missed due to injury ($M=77.25$ day, $SD=925.99$ days) and percent body fat ($M=30.84\%$, $SD=5.6\%$) in the injured group was present ($P=0.698$, $r=0.164$). An insignificant negative correlation was present between time missed due to injury and skeletal muscle mass percent in the injured group ($M=38.13\%$, $SD=2.8\%$) ($P=0.621$, $r=-0.208$). Conclusion: The first conclusion is that injured dancers have a 15.81% higher body fat percentage than uninjured dancers. The second conclusion is an increase in time missed due to injury results in an increase in body fat and decrease in skeletal muscle mass.

Establishing Dance Therapy as a means to minimize the effects in persons with Parkinson's

Mayowa Adebawale and Elvis Maina; Faculty Sponsor: Michelle Contrino*

Dance therapy is a form of movement therapy that uses dance as a way to promote physical, emotional, and social well-being. It has been found to be effective in helping people with various ailments, including Parkinson's disease. Parkinson's disease is a neurodegenerative disorder that affects movement and causes tremors, rigidity, and difficulty with coordination. There is currently no cure for Parkinson's disease, but treatments are available to help manage the symptoms. These can include medications to increase dopamine levels in the brain, as well as physical therapy, occupational therapy, and speech therapy to help improve movement and communication.

This research pivots towards the influence of dance beyond the surface. It's Devine influence in coordination and recovery, based on a group of aged Parkinson's patients studied in the film "Dance and Parkinson."

Movement and fine-scale habitat selection by stone partridges (*ptilopachus petrosus*) in a tropical savannah landscape

*Nguvan Agaibe**, Emmanuel Thompson, Fidel Atuo; Faculty Sponsor: Fidel Atuo

Understanding the relationship between an animal's habitat preference and the structures, on the one hand, and the animal ranging behavior and home range size, on the other, is important in providing wildlife managers with the knowledge that can be useful in predicting areas suitable for their habitat, gauging the quality of the habitat, and further improving their conditions for sustainability. The Stone partridge *Ptilopachus petrosus*, is one of the African native Galliformes, economically important to humans as game birds. The birds are monotypic, with a taxonomic enigma, restricted to arid rocky areas of the northern savanna belt, which includes the Sahel and the Southern border of the Sahara Desert. The bird species are locally declining, as a result of overhunting and habitat destruction; nevertheless, little information is known about their habitat selection, foraging behavior, space use, and interactions. To understand the space use and habitat selection of the bird's species, we captured, radio-tagged, and monitored twenty (20) individual stone partridges and calculated their home range size using minimum convex polygon (MCP) and core areas of utilization using fixed kernel density estimation (KDE). At each bird location, we recorded a suite of vegetation habitat variables at a fine scale and paired each location with a randomly selected point to assess habitat availability. The mean home range size \pm SE of the birds using MCP was 0.73 ± 0.10 ha (25% MCP), 1.82 ± 0.27 ha (50% MCP), 3.85 ± 0.49 ha (75% MCP), and 6.56 ± 0.80 ha (95% MCP); and, 4.63 ± 0.46 ha (50% KDE), using KDE. Birds selected areas with ground cover and litter cover, however, they avoided areas with increased grass height.

Morphological Processes of Social Media Neologism: A Comparison between Instagram and TikTok among the Public Figures

*Yumna Aksoy**; Faculty Sponsor: Sarah Dietrich

This research investigates neologisms created by public figures on two popular social media platforms, Instagram and TikTok, by analyzing the morphological processes used to create neologisms. A total of 50 data points were gathered from 43 public figures on both platforms, which were then categorized according to morphological processes such as blending, compounding, affixation, conversion, and acronymization. Based on the findings of the analyzed samples, the study shows that the most commonly used morphological processes are blending and abbreviations/acronyms, with slight differences between the two platforms. However, it should be noted that the study had a limited sample size and data collection timeframe, so the results should be viewed as an initial exploration rather than a comprehensive analysis. Therefore, no broad conclusions can be drawn at this stage. Nonetheless, the study provides valuable insights into the diversity and creativity of word formation in English, especially in the context of social media platforms such as Instagram and TikTok. Further research with larger sample sizes and broader linguistic contexts is recommended to expand upon these findings. Keywords: morphological processes, neologisms, social media

Measuring the Efficacy of Left Atrial Appendage Tissue to Function as an Aortic Valve

*Kate Appleman** and Katarina Lettner; Faculty Sponsor: Lucas Kirschman

Left ventricular outflow tract obstruction (LVOTO) is a congenital heart defect that impedes blood flow from the left ventricle to the aorta. The aorta is the main artery that delivers blood to the body from the heart. The focus of this study is on the LVOTO, a deformity commonly associated with aortic stenosis (AS). AS occurs when the aortic valve (AV) does not open properly. This condition could lead to aortic insufficiency (AI), a

condition in which the function of the AV is compromised and causes backflow. The AV is typically replaced when the conditions of AS and AI are present.

Current AV replacement procedures use either a mechanical valve or an animal tissue valve. However, this study investigates the use of left atrial appendage (LAA) tissue as a substitute material for the AV replacement. The aim of this study is to further the understanding of the efficacy of the neo-LAA valve to withstand increased pressurization conditions. The current results reinforce the idea that LAA tissue could be a good alternative material for reconstruction of the LVOT. Therefore, the results could potentially lead us to the betterment of surgical procedures used to correct LVOTO.

Intake of Brain Growth Nutrients Differ Among Boys and Girls

Arif H. Ayon, Francis A. Tayie, Amy R. Moore, Lea Anne Lambert; Faculty Sponsor: Francis A. Tayie*

Background. Boys and girls may have different dietary patterns which may affect the intake of brain growth nutrients. Even though dietary intake of brain growth nutrients may differ among children due to variation in dietary habits, research data is lacking.

Objective. Average dietary intake of the following brain growth nutrients: iodine, choline, arachidonic acid (ARA), docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA) were determined to study any associations with sex of children in the USA.

Methods. The dietary and demographic data from 1,768 children, comprising 868 girls and 910 boys, aged 1-5 years, in the National Health and Nutrition Examination Surveys (NHANES) 2017-2020 were included in this study. Descriptive and inferential statistics were used to study associations between brain growth nutrients intake and sex of children.

Results. There were significant associations between the intakes of brain growth nutrients and sex of children. The ARA intake of boys (93.18 ± 3.12) was higher than the intake of girls (82.73 ± 3.35), $P=0.02$. Similarly, boys (19.47 ± 2.82) had higher intake of DHA than girls (15.90 ± 1.61), $P=0.011$. Boys (13.70 ± 1.90) intake of EPA was higher than girls (8.65 ± 0.73) intake, $P=0.010$. Compared to boys (225.15 ± 5.18), girls (207.40 ± 4.58) intake of choline was significantly lower $P=0.011$. Boys (274.40 ± 18.87) and girls (276.10 ± 19.31) had similar intake of iodine.

Conclusion. Boys had higher intake than girls in all the brain growth nutrients except iodine. Nutrition and pediatric professionals should focus on dietary interventions to equalize the intake of brain growth nutrients among boys and girls.

Association between intake of brain growth nutrients and household food security status of children in the US.

Prasanthi Badri, Francis A. Tayie, Amy R. Moore; Faculty Sponsor: Francis A. Tayie*

Background. Food insecurity may associate with decreased consumption of brain growth nutrients, such as Choline, Arachidonic acid (ARA), docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA).

Objective. To determine associations between brain growth nutrients intake and household food security status in children aged 1 year to 6 years in the USA.

Methods. Data from 2,068 children, aged 1-6 years, comprising 1,070 girls and 998 boys in the Prepandemic National Health and Nutrition Examination Surveys (NHANES) 2017-2020 dietary sample were analyzed to study the average intakes of selected brain foods. The relationship between food insecurity and brain foods intakes were examined using inferential statistics.

Results. The ARA intake of food insecure (89.90 ± 4.01) and food secure (86.73 ± 2.18) children appeared similar, $p=0.46$. The EPA intake of food insecure (9.62 ± 1.08) children seemed lower, though insignificantly different, than food secure (12.08 ± 1.14) children, $p=0.21$. The DHA intake of food insecure (14.11 ± 1.62) and food secure (18.49 ± 1.74) children seemed different though insignificantly, $p=0.14$. Choline intake of food insecure ($303.83.95 \pm 35.52$) children though higher, was insignificantly different compared to food secure (268.95 ± 12.31) children, $p=0.24$. Food insecure children were equally likely to be iodine deficient (odds ratio: 1.30, 95%CI: 0.81-2.09) compared to their food secure counterparts.

Conclusion. Food insecurity did not associate with dietary intake of ARA, EPA, DHA, and Choline. There is need to define reference intakes guidelines for brain food to enable clinical-based comparison.

Preliminary Study of the Electrochemical Properties of Some Naphthoquinone Derivatives Possessing Antiparasitic Properties

Jaina Bemis, Mary Wachtel, Josh Birke, Sajjan Silwal, Philip Crawford; Faculty Sponsor: Philip Crawford*

A preliminary electrochemical study of some naphthoquinone derivatives containing an amine group in the 3 position has been carried out. The derivatives tested have varying degrees of reported anti-parasitic activity, and the mechanism is believed to involve inhibition of the electrochemical potential of the Leishmania mitochondrion. To help gain insight into the possible mechanism of action, the redox properties of a number of these derivatives were studied in dimethylsulfoxide (DMSO) using cyclic voltammetry. For each of the compounds studied, electrochemical reduction in DMSO occurred in two successive, reversible (or quasi-reversible), one-electron steps, the first of which involves formation of a radical anion: $Q + e^- \rightarrow Q^{\cdot -}$. The relationship between molecular structure, reduction potential, and biological activity was examined.

Automated Hydroponics System

William Borgerding, Jacob Carson*, Colton Crouch*, Nick Hemberger*; Faculty Sponsors: Brad Deken, M. Rasheduzzaman, Andy Chronister, Hannah Kilburn*

The phenomenon of cultivable land area shrinking has emerged as a major concern due to multiple factors such as urbanization, deforestation, soil degradation, and climate change. These factors have resulted in a decline in soil fertility and reduced its suitability for crop cultivation. In order to address this issue, an automated hydroponic system designed for industrial farm applications has been proposed. The system incorporates advanced technologies such as robots, cameras, and sensors to provide an automated solution that eliminates human errors in system maintenance and plant monitoring. This enables companies to continue crop growth and harvesting even during shutdowns when workers may be unable to attend to the system. The system is powered by Arduino-controlled timers for pumps and lights, and features a frame and hydroponic tubes for an ebb and flow system. Furthermore, Google Teachable Machines have been employed for plant identification. The project aims to enhance hydroponic farming in industrial settings, by optimizing water conditions in the tubes using Total Dissolved Solid and pH sensors and by providing warnings for nutrient replenishment. Additionally, the team is working on developing a robot equipped with a camera for plant monitoring and harvesting, thus further streamlining the automation process. Ultimately, this project

aims to revolutionize hydroponic farming in industrial settings, providing a more efficient and resilient solution for food production in land-constrained areas.

Medical Marijuana and the military

*Alyssa Boyd**; Faculty Sponsor: *Shawn Guiling*

In the news media there is a great deal of controversy regarding the US military and the usage of medical marijuana. Many policies deny the usage of medical marijuana while being on active duty in the military. Benefits of medical marijuana usage include a decrease in depression and anxiety. The present research explores benefits of medical marijuana, including decreasing depression and anxiety, and advocates that such benefits be available to those on active duty in the military. Many service members get out of the military and should not have to if they could use medical marijuana. The policies that prohibit the usage of medical marijuana while being in service should be reevaluated.

Factors that can influence a verdict decision during a police use of force trial

*Austin Broughton**, *Brandi Peoples*; Faculty Sponsor: *Chasity Ratliff*

There are various factors that can influence a verdict decision during a police use of force trial. One major factor is the extent to which the jury member takes the perspective of the defendant in the trial. Several measures can predict the level of perspective an individual may take. The gender of an individual has been found to influence perspective taking. Research conducted by Smith et al. (2016) suggests that women are naturally more empathetic and more likely to see from the perspective of others. Similarly, Flannery and Smith (2016) found that women, on average, had a higher tendency to take the perspective of others. This supports the hypothesis that women would be associated with higher perspective taking. Conversely, age has also been found to impact an individual's ability to take the perspective of others. O'Brien et al. (2012) found through self-report data that older people score higher for empathy and perspective taking than younger people. Furthermore, it was found that middle-aged people scored the highest for empathy and perspective taking among all three age groups. Taking both views into account, it supports the hypothesis that middle-aged females would score the highest in perspective taking and thus be more likely to take the perspective of the defendant in a police use of force trial.

Transformational Leadership

*Nolan Briegel**; Faculty Sponsor: *Erin Fluegge*

Transformational leadership (Bass & Avolio, 1993) is a leadership theory in which leaders create and inspire change in individuals and social systems. While transformational leadership is one of the most effective ways to lead a team (Islam, Furuoka, & Idris, 2021), it also requires the formation of authentic connections with followers. The ability to connect with others on a deeper, more vulnerable level, requires trust from both the leader and the follower, and without that trust, there is no connection (McAuliffe, Bostain, & Witchel, 2019). Addressing such genuine interactions between leaders and followers in *Social Excellence: We Dare You*, Mattson, Williams, and Orendi, (2011) outline what aspects create authentic connection and how trust is earned in different situations based on the level of vulnerability and the eagerness of the leader to engage with their follower. Specifically, a leader must 1) choose to engage, 2) choose to care, and 3) choose to be vulnerable. Using these choices as a lens, this research project reviews transformational leadership and authentic connections as well as their impacts on organizations and people.

Comorbid Autism Spectrum Disorder and Obsessive Compulsive Disorder

*Bailee Cairel**; Faculty Sponsor: *Shawn Guiling*

Obsessive-compulsive disorder (OCD) and autism spectrum disorder (ASD) have a high rate of comorbidity. These two disorders often go under diagnosed and untreated because of the extreme similarity of their symptoms and indicators. Research has shown brain overlap, symptom overlap, and other disorders that may go unnoticed, such as attention-deficit hyperactivity disorder, various eating disorders, and anxiety disorders. With OCD and ASD there is a larger likelihood of an individual being diagnosed with additional disorders, which could very well go underdiagnosed or even unseen. Research has shown viable solutions to ease symptom severity, as well as to lower the chance of disorders going unnoticed. Obsessive-compulsive disorder (OCD) and autism spectrum disorder (ASD) have a high rate of comorbidity. These two disorders often go under diagnosed and untreated because of the extreme similarity of their symptoms and indicators. Research has shown brain overlap, symptom overlap, and other disorders that may go unnoticed, such as attention-deficit hyperactivity disorder, various eating disorders, and anxiety disorders. With OCD and ASD there is a larger likelihood of an individual being diagnosed with additional disorders, which could very well go underdiagnosed or even unseen. Research has shown viable solutions to ease symptom severity, as well as to lower the chance of disorders going unnoticed.

AD/HD clients in psychotherapy

*Trinity Calinescu**; Faculty Sponsor: *Shawn Guiling*

Attention-Deficit/Hyperactivity Disorder (AD/HD) is characterized by hyperactivity, impulsivity, and the inability to focus on a task for a prolonged period. AD/HD can impact young children, teenagers, and adults. Many people diagnosed with AD/HD receive treatment in the form of medications and psychotherapy, or both in the most severe cases. Psychotherapy refers to the individual or collective collaboration that a mental health provider has with their clients. Present research challenges the idea that AD/HD can only be treated with medications. People with AD/HD benefit from working with psychotherapists who have been equipped with knowledge about the disorder. Psychotherapy sessions with clients with AD/HD are more effective when the therapist adopts an ethical perspective towards the client, including using person first language, displaying a non-judgmental attitude, and showing unwavering patience during sessions.

Commonalities in Resilient Families

Steph Conway (primary author), Shawn Gulling (secondary author), Tony Faber (secondary author), Sarah Kuborn (secondary author);* Faculty Sponsor: *Shawn Guiling*

Family resilience is the way a family can respond, adapt, and continue operating in the presence of stress. Studies have examined family resilience across many topics including immigrant experiences, war and service members, healthcare settings, physical and neurological conditions, and most recently COVID-19, but little has been studied about families with an open court case regarding custody of their children. To understand family resilience in this context, semi-structured interviews were performed with three at-risk families that had participated in parenting classes through a community organization in Southeast Missouri that serves families with children 0-3 years of age with an open case in family court, with resources and training. The hypothesis used was that families with multiple characteristics present from the Family Resilience Framework (Walsh, 2021) would be more resilient and better able to manage stress. The results of the data analysis show that the existence of specific attitudes, organizational processes, and communication and problem-solving practices, was a significant indicator of resilience within these families. Conversely, those that lacked these characteristics exhibited dysfunction in their communication style, personal relationships, and home.

Student Alcohol Use

*Steph Conway**; Faculty Sponsor: *Shawn Guiling*

Nearly 50% of full-time college students drank alcohol in the last month (National Survey on Drug Use and Health [NSDUH], 2021). A little over half engaged in binge drinking in that same period (NSDUH, 2021). College students' use of alcohol can begin as an expression of their newfound independence, but at times use escalates as they attempt to cope with the stress in their life. The present research examines the prevalence of student alcohol use, both in Missouri and the United States. Further, the immediate and long-term risks to students will be discussed, as well as the problems students encounter because of their alcohol use. Finally, a review of popular college prevention programs will be examined. Research for this project is ongoing.

The Nutritional Intake of Vitamins in Insects

*Molly Cook**, *Timothy Judd*; Faculty Sponsor: *Timothy Judd*

There has been limited information when it comes to understanding the nutritional intake of vitamins in insects. This is especially true for termites where it is unknown how vitamins affect their foraging behavior. Studies on termites typically focus on the intake of macromolecules, an example of such would include the preference of a high cellulose diet rather than a high lignin diet. Vitamins are an essential micronutrient that is needed for metabolic function, development, and other biological functions. The majority of studies on vitamins come from ascorbic acid and the vitamin B-groups. Some studies have supported the claim that ascorbic acid and niacin are essential in the growth as well as the development of insects at the larval stage. This study utilized geometric framework to examine the effects of vitamins C and B3 on food selection. Ten containers, each with 100 termite workers, were given access to two artificial foods with contrasting levels of the two vitamins. The amount of food consumed was tracked over a two-week period. Evidence from this study shows that artificial food with more vitamin C than vitamin B3 was found to be the preferred source in their diet.

Evaluating species composition and abundance in a Sudan Savanna landscape using camera trap technology

*Larry DeLay**, *Nguvan Mercy*, *Fidel Atuo*; Faculty Sponsor: *Fidel Atuo*

The resulting impact of species decline and ecosystem degradation is felt across the globe and approaches to curb their would menace require an understanding of threats to wildlife populations and ecosystems at the same level. Our study evaluated the impact of human-related on the population status and distribution of multiple taxa in a tropical Sudan Savanna landscape that offers ample opportunities for biodiversity conservation and associated economic gains. Between 2021-2022, we collected wildlife counts remotely using a 20-megapixel digital trail camera with in-built large storage capacity, a 0.3-second trigger time, and a 20-m range of IR LED that allows for nocturnal captures. Fourteen cameras were strategically placed at the Yankari Game Reserve – a 2244 km² protected area in Northeast Nigeria managed by the Bauchi State Government primarily for ecotourism and conservation of native species. Camera placement cut across forests, rivers, a saltlick, natural springs, and savannah woodland areas to maximize capture rates and minimize sampling bias. Captured data included species images, date of capture, time, and temperature (Celsius). Collected photos were then sorted into guilds: birds, mammals, primates, and rodents. Our results show that large mammals were the most abundant and most distributed species accounting for 72.25% of captured images, followed by primates (17.41%), birds (7.16%), and rodents (3.17%). All detections for primates and birds were diurnal compared to 40% of large mammals and 22% of rodents. Major threats to species were poaching,

unprescribed fires, and intense/illegal cattle grazing. By identifying local threats to biodiversity in this region, this project contributes to global conservation priorities of identifying high-risk ecosystems for targeted conservation planning.

How Beaver Recolonization Influences Insect Emergence

*Lindsey Dewey**, *Kelley Fritz*; Faculty Sponsor: *Kelley Fritz*

Emerging aquatic insects from a stream are an important aquatic to terrestrial subsidy that can make up a large portion of the diet of riparian predators. The biomass and abundance of aquatic insects can be influenced by several factors including ecosystem engineers. Ecosystem engineers, such as beavers, can increase the amount of pool habitat in a stream by creating dams. Our goal is to evaluate the impacts of natural beaver recolonization on emergent insects using a long-term sample set. Emergent insect samples were collected, and physical characteristics were assessed from 2011 to 2018 at Kimball Creek in Colorado. Insects were then identified down to the family level and measured for biomass estimates. Due to beaver damming activities the percent pool increased at KCR2 (12% to 40%), KCR6 (4% to 76.9%), and KCR8 (19% to 100%). There was very strong evidence that percent pool increased insect emergence biomass m⁻¹ (F1, 25 = 50.0, $p > 0.0001$) and abundance m⁻¹ (F1, 25 = 35.6, $p > 0.0001$). The increase in pool habitat likely led to the increase in insect emergence biomass and abundance. The increased aquatic emergent insect subsidies to the terrestrial environment could lead to an increase in the diversity and abundance in the riparian zone.

English Influence on Retail Advertising in Ukraine

*Tetiana Dronova**; Faculty Sponsor: *Irina Ustinova*

Continual globalization has led to English gaining more and more popularity around the world, and in Ukraine in particular. The English language in Ukraine is often implemented into advertisement. The sphere of retail advertisement has changed drastically over last three decades, and nowadays the main modifications are connected with the English language being used in proper names, mostly in advertisement headings, as well as their subheadings, slogans, and additional information about the establishment. For this study, one hundred fifty samples of Ukrainian retail advertisements were collected and analyzed. English-Ukrainian code-switching and mixing cases were explored, as well as the instances of incorporating Latin and Cyrillic scripts. The most and the least common changes in the Ukrainian language of retail advertisement were traced, with the most common ones being writing Ukrainian words using Latin script, and the least common ones – spelling English words using Cyrillic script. Thus, it is concluded that the English language has a great impact on retail advertising in Ukraine.

Functional Communication Training in behavior management

*Josie Fryar**; Faculty Sponsor: *Shawn Guiling*

Children with autism often experience a variety of problematic behaviors, including aggression, self-injury, and property destruction. These behaviors may lead to more stress on the child's parents, teachers, and caregivers and may become more challenging during the transition to adulthood if not addressed. Research suggests that problematic behaviors serve as a way for the child to communicate a need or desire. Functional communication training is investigated as a means of aiding children with autism to express their needs more appropriately. Functional communication training involves learning to express certain words or touching flashcards to better communicate. The combination of functional communication training along with crisis intervention training, as needed, may provide better ways for parents and teachers to help prevent or manage the child's behaviors.

Iodine Deficiency Among Children and Implications for Growth and Development

Sneha Ghimire, Francis A. Tayie, Amy R. Moore, Bismita Ojha; Faculty Sponsor: Francis A. Tayie*

Background: Iodine is crucial for brain development and physical growth in children. Vulnerable age groups are at higher risk of iodine deficiency, necessitating continuous monitoring.

Objective: To provide national-level estimates of the prevalence of iodine deficiency among children and to report any predisposing dietary factors in this group.

Study Design, Settings, Participants: The dietary and laboratory datasets from 3,402 children, aged 2-10 years, who participated in the US Prepandemic National Health and Nutrition Examination Surveys 2017-2020 was analyzed for this study.

Measurable Outcome/Analysis: Urinary iodine concentration (UIC) was used to assess iodine nutritional status. Descriptive and inferential statistics were used to estimate deficiency prevalence, differences between groups.

Results: The mean UIC was 143.5 µg/L. About 28% of the children were iodine deficient (UIC<100 µg/L), and 9.5% were severely iodine deficient (UIC<50 µg/L). Greater proportion of girls (12.8%) than boys (6.2%) had higher deficiency rate, $p=0.001$. Girls were more likely to be iodine deficient than boys, odds ratio (OR): 1.80, 95% CI: 1.20 - 2.70, $p=0.005$. Iodine nutritional status did not associate with type of cow milk and salt used, income, or race.

Conclusion: Iodine deficiency is prevalent among children, particularly girls. There is a need to develop nutritional interventions to improve children's iodine intake.

Hormone Implants Used For Growth Comparison in Beef Steers

Taylor Gudde, Landon Hahn, Samantha Siemers, C. Schabbing; Faculty Sponsor: Samantha Siemers*

Anabolic steroid hormone implants improve average daily gain and feed efficiency and provide a significant economic return for beef cattle producers. The purpose of this study was to determine the difference in average daily gain for weaned beef steers administered an anabolic steroid implant vs. nonimplanted beef steers. A group of Sim-Angus weaned beef steers ($n = 8$ of 15) received a Synovex-S implant on day 0 of the trial. All steers were moved to an enclosed feeding facility at the David M. Barton Agriculture Research Center where they received a grain ration, ad-lib water, and grass hay. All steers continued to be weighed on a bi-weekly basis after administration of a Synovex-S implant. Average daily gain (ADG) was calculated using pounds gained/days between weigh periods. Comparatively, ADG of the Synovex-S implanted group was 2.03 lbs/day, whereas the non-implanted (control) group was 1.92 lbs/day. Factors to consider in future research includes length of time between weigh-ins, genetic influence, and economic impact for producer.

Do Office Hours Positively Influence Students?

Sanako Hishinuma; Faculty Sponsor: Shawn Guiling*

Office hours are an opportunity for students to interact with instructors, ask them questions about class, and seek extracurricular activities in their interests. Yet, the majority of students do not considerably utilize office hours. There is an ongoing discussion of the influence of office hour usage on academic success. For example,

research findings by Guerrero and Rod (2013) showed a positive correlation between the number of office hour visits and students' course grades, while Gao et al. (2022) found no relationship. Current research explores office hour usage and student performance at higher education institutions, including trends in both face-to-face and online education.

Parental Divorce and Later Life Romantic Competence

*Caleb Hitt**; Faculty Sponsor: *Shawn Guiling*

Recognizing that children of divorce appear to have varying life outcomes and relationship successes, the current study investigated the relationship between parental divorce and romantic competence. A sample of 106 undergraduate students were surveyed about their romantic competence according to seven domains: relationship locus of control, perspective taking, romantic appeal, intimacy avoidance, emotion regulation, temperament, and conflict regulation skills. Findings revealed that parental divorce is positively correlated with perspective taking scores, suggesting that children of divorce, however, parental marital status was not a predictor of any other domain. It was also found that conflict regulation scores were significantly correlated with scores of each of the other six domains, implying that an individual's conflict regulation skills contribute to the development of each other domain. Results were discussed regarding their indication of parental divorce being a complex event with many coinciding variables. Discussion also supported potential clinical application, as children of divorce may be more emotionally minded than others. Furthermore, teaching conflict regulation skills has potential to improve other areas of romantic competence. Further research should investigate these claims and account for confounding variables.

Filament Extruder Design and Fabrication

*Derek Honaas**; Faculty Sponsors: *Jonathan Kessler, Joseph Murphy*

The primary objective of this project was to design and fabricate a plastic filament extruder to support 3D polymer printing projects run by both students and faculty at Southeast Missouri State University (SEMO). This extruder will be designed to handle polylactic acid (PLA) and polyethylene (PET) plastic. PLA is a standard type of plastic used for polymer 3D printing and PET plastic is commonly used for prepackaged, bottled beverages; both types of plastic are readily available as scrap since operating a 3D polymer printer generates a fair amount of waste plastic and waste plastic beverage bottles are plentiful. These plastics can easily be first broken down via grinding or shredding, the small pieces can be reformed as filament for 3D printing multiple times before significant degradation occurs. An in-house plastic recycling and filament extrusion program would allow for more and larger 3D printing projects, save the department money, drastically reduce PLA waste and be a productive use of PET waste generated/collected at SEMO. So far, I have designed all the metal and 3D printed parts in AutoCAD, including the base plate, upright supports, motor mount, peltier array base, hopper, and the pinion and drive gears. When we have completed this phase of the project the design and implementation of a filament diameter regulation device would improve the quality of the filament and the objects printed with it. Future directions may include an optical diameter measuring system and a control system with feedback loop to adjust the filament diameter regulation device.

Locating and Mapping Places on the National Register of Historic Places Vulnerable to Flood Damage in St. Louis City and County

*Connor Hundl**, *Reilly McDonald*, and *Faith Kinkelaar*; Faculty Sponsor: *Nam Hwang*

The National Register of Historic Places (NRHP) is a nationally recognized compendium of historic locations including buildings, districts, sites, and other resources. One of the most detrimental causes of damage to

these locations, particularly in areas that border the Mississippi River, is annual flooding. This study aimed to assess the potential flood risk posed to NRHP locations within St. Louis City County, Missouri, assigning high, medium, and low risk status to each location. Data provided by the Federal Emergency Management Agency (FEMA), the National Parks Service (NPS), and the National Levee Database was used in the study to map all the NRHP locations within St. Louis City County. The study also used ArcMap 10.8.2 software to build layers and assess data relationships. The results of the study are maps with information on regulatory floodways, protective levee systems, and NRHP locations within St. Louis City County, Missouri. This information could be used by historic preservation professionals to determine priority status for the protection and preservation of these locations based on their risk factor. Overall, the results of the study serve to call attention to potentially severe flood risks of NRHP locations in this area caused by the Mississippi River.

Using a GIS-based approach to investigate the association between asthma and particulate matter pollution in California, USA

*Akriti Kafle**; Faculty Sponsor: *Seong Nam Hwang*

Air pollution is one of the most serious environmental threats to urban populations, negatively affecting individuals of all ages. This study seeks to determine the relationship between asthma and air quality by determining whether elevated amounts of particulate matter (PM_{2.5}) and diesel particulate matter (DPM<10) caused by air pollution lead to an increase in asthma rates. By examining the census tracts and hotspot analysis of PM and DPM in ArcGIS Pro, it ascertains whether areas along the proximity to major highways are directly related to higher rates of Asthma such as Asthma Prevalence, Asthma Emergency Department Visits, and Asthma Hospitalization Rates in the state of California. While public parks and open spaces are anticipated to contribute to PM mitigation, communities that lack access to these facilities may not experience the associated public health benefits. This study used data provided by Census Bureau, California Health and Human Services (CalHHS), California Environment Protection Agency (CalEPA), California Department of Transportation (Caltrans), and National Parks Services (NPS). This research generated maps displaying hotspots for DPM and PM while narrowing analysis to establish their relationship with road proximity and asthma prevalence in the respective demographic areas. The project also suggests the possible areas that are lacking public spaces and. These findings are expected to contribute to environmental health research while helping policymakers and planners address environmental health disparities.

The Peoria International Choir and its Musical Culture

*Danielle Kramer**; Faculty Sponsor: *Jenna Sehmman*

The purpose of this study was to use ethnomusicological research strategies to investigate the Peoria International Choir as a musical culture. The two distinct research goals were to record choir's history and purpose and to observe how the choir lives out its mission in the context of a rehearsal. The primary research methods used were email correspondences with the director and a live field observation. Searches of websites, periodicals, social media, and YouTube also supplemented background research. By using these methods, I discovered that the Peoria International Choir is a unique musical organization that aims to support musicians of all levels and promote music from a variety of cultures. Additionally, I analyzed how the choir fits into the definition of a "community choir" suggested by researchers in the field of choral music, and I recorded a history of the organization. This history includes how the idea was conceived, when and how the choir was founded, and how it is operating today. My conclusion was that the Peoria International Choir is successful in fulfilling its mission, and that other organizations can look to them as a model for an effective way to support people through music.

Autism Spectrum Disorder Difficulties Transitioning into the Workplace

*Sophia Martin**; Faculty Sponsor: *Shawn Guiling*

Young adults with autism spectrum disorder encounter a variety of difficulties, especially barriers when transitioning to the workplace environment. The majority of this population wishes to work and live self-sustaining lives but over half of this statistic is not currently employed (Griffiths et al., 2016). People diagnosed with this disorder often struggle to become employed and retain jobs within the community. Characteristics of autism spectrum disorder that affect this topic may include social anxiety, sensory issues, processing difficulties, and executive dysfunction. Wholistic solutions may include having the business work with individuals utilizing specialists, creating specific frameworks, applying clear communication, and having precise itineraries. Personal adjustments may include providing consistent reminders, feedback, and assistance for support needs.

The Growing Methamphetamine Addiction Problem in Zimbabwe: Advocating for Increased Resources and Support

*Ayibongwe Mathe**, *Sibonginkosi Mathe*; Faculty Sponsor: *Fidel Atuo*

As of March 2023, Zimbabwe faces significant economic challenges, with a 20% unemployment rate and 153% inflation, contributing to a growing problem of methamphetamine addiction, especially among young adults. Methamphetamine use inflicts significant harm on individuals' physical and mental health, tears families apart, and negatively impacts communities through increased crime rates and decreased productivity. Our research project involves a comprehensive review of literature on the experiences of recovering addicts, their families, and healthcare professionals in Zimbabwe. It highlights the critical shortage of rehabilitation centers for those struggling with addiction as a significant issue. Many individuals with addiction lack access to the necessary resources and support, leading to relapse and perpetuating addiction cycles. The shortage of mental health professionals in Zimbabwe is also a challenge, with only 25 psychiatrists serving the entire population. To address the drug problem in Zimbabwe, we propose a multi-pronged approach, which includes increased government investment in affordable rehabilitation centers, community involvement, awareness campaigns, and recruiting and retaining mental health professionals. Our goal is to create a more informed and compassionate society committed to addressing this urgent public health issue.

Climate Action Using Emission Trading Systems

*Mitchell Morris**; Faculty Sponsor: *Bambi Robinson*

Severely lowering emissions, especially carbon emissions, has continually been a climate goal in the environmentalist community. Many policies to lower emissions have been proposed and implemented. However, many of the policies have proved to be inadequate and have brought about ethical dilemmas. Through the examination of currently implemented climate policies, one can gain insight into the reality of their effectiveness. Also, by examining expert opinions one can determine what policies should be implemented. A carbon tax, although proposed with good intentions, is the incorrect choice when it comes to lowering emissions. It cannot properly control emitters and can cause moral hazards. Cap-and-trade systems or emission trading systems are a much better tool to use in lowering emissions. Cap-and-trade systems set a hard limit on emissions which makes sure climate goals are met. Furthermore, emitters freely take on the responsibility of pollution while gaining time to adjust to climate goals. Because of this, cap-and-trade systems can be seen as more stable and sustainable. This suggests that the morally correct choice in helping to achieve environmental goals is for the United States to implement a cap-and-trade system nationwide.

Tropes, Trends, and Try it Again: *Contextualizing Black Superheroines in DC and Marvel Comics*

*Nisa Muhammad**; Faculty Sponsor: *Sandra Cox*

This project considers the development of Black women characters in superhero comics. To better understand how Black women in comics are represented, I analyze the aesthetic/narrative tropes present in the characterization of three superheroes: Marvel's Storm, DC's Nubia, and DC's newest hero Naomi. I trace the impact of problematic portrayals and note the importance of positive/authentic representations of Black girlhood in media. Each character was created to be a representation of Blackness in comics. Storm, for example, is a representation of what white creators think Black femininity should be. Early renderings of Nubia would have been just as problematic. The character has been revamped in the past two years by non-white, female, and nonbinary creators, and has become one of the most authentic and nuanced portrayals of Black femininity in comics. Naomi falls in between authentic/problematic. Naomi, created in comics by Brian Bendis, is less resistant to the white supremacist/misogynist tropes than the Naomi portrayed by Kaci Walifall in Ava DuVernay's televisual adaptation of the comic. The adapted Naomi and the revamped Nubia successfully revise some of the problematic tropes found in comics since the 1970s. As I contrast these tropes in the characterization of the characters, I will also examine the characters' respective homelands and communities to show how setting shapes the meanings of Blackness and girlhood.

An Efficient Synthesis of 3-Azide-2-oxopropyl-Dihydrogen Phosphate for Use as an Azide Vibrational Label for Triosephosphate isomerase

*Sho Nakayama**; Faculty Sponsor: *Sajan Silwal*

Dihydroxyacetone phosphate (DHAP) has been known to isomerize, being catalyzed as a substrate by the Triosephosphate isomerase enzyme (TPI). Within TPI, there are active sites where reactions between TPI and DHAP more actively take place. Knowing this fact, we thought we could try to react TPI with substrate analogs that have similar structures and are expected to have similar bioactive properties to DHAP in order to determine potential anticancer activity of such analogs. With this motivation, we had synthesized and characterized the cyano-analog, 3-cyano-2-oxopropyl dihydrogen phosphate to confirm its degree of anticancer activity in combination with TPI and varying concentrations of glycerol. Glycerol functions as a replicate of a cytoplasm environment due to its viscosity. The FT-IR study of the cyano-analog alone only showed an opened-loop spectrum that shows unlikelihood of binding to TPI due to the opened structure. However, the analog in combination with TPI and increased concentrations of glycerol exhibited better area normalized intensities, producing better closed-loops, which shows more likelihood of binding to TPI. More specifically, the study compared 10, 20, and 30 percent of glycerol, respectively. The intensity normalized FT-IR spectrum showed the direct proportionality between the amount of glycerol and intensities. Between 10 and 30 percent of glycerol, there was a huge increase in the intensity. This indicates that as the amount of glycerol increases, the number of closed loops increases, meaning that the analog can have better binding to TPI in the presence of a higher amount of glycerol. In quest of more specific information about the activity of the cyano-analog, 2D-IR spectra were also taken, however, the cyano-analog produced complex signal to noise ratios, which were hard to interpret. This limitation has led to the synthesis of 3-azide-2-oxopropyl dihydrogen phosphate, which functions as an azide-analog, has potential to provide better signal to noise ratios on the 2D-IR spectra.

The synthesis of the azide-analog involves five steps. Tribenzyl phosphite is first synthesized from benzyl alcohol, triethyl amine and PCl_3 in diethyl ether at -30°C under an inert atmosphere using Schlenck's line. An inert atmosphere is required due to the sensitivity of the compound. 1,3-dibromoacetone is then reacted with

NaOMe in MeOH at -15°C to produce (1) 3-bromo-2,2-dimethoxy-1-propanol. Reacting tribenzyl phosphite with iodine in CH₂Cl₂ at -20°C, followed by another reaction with pyridine in CH₂Cl₂ at -30°C, (2) 3-bromo-2,2-dimethoxypropyl dibenzyl phosphate is synthesized. Catalytic hydrogenation using Pd/C in MeOH is then performed to produce (3) 3-bromo-2,2-dimethoxypropyl dihydrogen phosphate. After this, hydrolysis at 65 °C is conducted to synthesize (4) 3-bromo-2-oxopropyl dihydrogen phosphate. In DMSO, 3-bromo-2-oxopropyl dihydrogen phosphate is reacted with NaN₃ to produce (5) 3-azide-2-oxopropyl dihydrogen phosphate.

Major results from the multi-step synthesis above include the isolation of tribenzyl phosphite with 81 % yield. Although, the compound was not very pure producing low resolutions in the NMR spectrum. After purification by column chromatography, the NMR spectrum matched the reference, which shows the presence of tribenzyl phosphite with high purity.

For future work, the synthesis of step (2) to (5) needs to be completed and then the study of the azide-analog using FT-IR and 2D-IR in combination with TPI is to be performed.

“I feel that diversity is being shoved down our throats”: A Qualitative Examination of Students’ Perceptions of Campus Diversity

*Taylor Nelson**; Faculty Sponsor: *Monica Radu*

Racism is largely misunderstood and general misunderstandings about racism tend to align with one of the five fallacies about the character of racism. This research explores if these fallacies may also be applied to university students’ ideas surrounding diversity. Drawing from a 2015 Campus Climate Survey conducted at a research-intensive university, this research examines undergraduate students’ comments (N = 50) about what could be done to improve the diversity climate on campus. Using a qualitative approach and through the process of coding and memoing, preliminary findings suggest that students’ perceptions of diversity align with fixed, individualistic, tokenistic, and ahistorical fallacies. In addition, new themes emerged from the data, including comments surrounding anti-affirmative action, racial colorblindness, and white victimhood. Implications suggest more campus-wide surveys should explore undergraduate and graduate students’ perceptions of campus diversity, including here at Southeast Missouri State University. Future research should further explore students’ misconceptions of reserve racism in higher education and feelings of alienation and exclusion among white students when diversity programs and initiatives become a focus of the university.

Growing crystals from the combination of weak acids and liquid weak bases and determination of the co-crystal structure

*Tu Nguyen**, *Marcus Bond*; Faculty Sponsor: *Marcus Bond*

Crystal structure of liquid compound is hard to obtain using the single crystal X-ray diffractometer. Co-crystallizing liquid substance with a solid substance by dissolving them together in an appropriate solvent helps provides a means to determine the structure of the liquid molecule now as part of a co-crystal. In our project, we will determine the co-crystal structure of a liquid weak base and a weak acid. The chosen liquid bases are lutidines and the chosen weak acids are chlorobenzoic acids or 3-hydroxybenzoic acid. An early result of co-crystallization related to 3,4-lutidine is its co-crystal structure with 3-hydroxybenzoic acid. This provides a surprisingly complicated structure with deprotonation of the acid to form a salt, and a complicated hydrogen bonding network that produces an abnormally large unit cell with one axis about 46 Å in length. For our project, we combined a 1:1 molar ratio of 2,4-lutidine, or 3,4-lutidine, or 3,5-lutidine with 3-chlorobenzoic acid or 4-chlorobenzoic acid. Additional co-crystal structures of liquid lutidines and chlorobenzoic acids, determined by single crystal X-ray diffraction, are reported.

Utilizing Computer Vision for Waste Management

*Tuyen Nguyen**; Faculty Sponsor: *Robert Lowe*

Young Learners and STEAM in the Southeast Region

*Lindsey Noel**; Faculty Sponsors: *Cassie Borst, Jana Gerard*

Young learners in the Southeast Region need access to high quality STEAM instruction through literacy, play, and exploration. Currently, there is not a systematic way to support Southeast early childhood education students as they introduce and reinforce STEAM education through field and clinical experiences nor is there not a simple and systematic way to encourage STEAM education at the University School for Young Children or among regional P-12 schools and early childhood centers. We created STEM kits for SEMO students and community educators to use to support expiration and play through STEM learning for young learners.

A comparison of variant methods in random forest with multicollinearity data for classification prediction modeling

*Emmanuel Nsiah**; Faculty Sponsor: *Yi-Ching Lee*

Random forest is a popular machine learning model aggregating decision trees to make predictions. Different from standard decision trees, the random forest model uses a random sample of predictors to build a group of decisions. Speiser et al. analyzed 311 classification datasets to compare many variant random forests such as the standard Random Forest (RF), random forest based on a permutation test (Boruta), Regularized Random Forest (RRF), the Random Forests for Survival, Regression, and Classification (RF-SRC), and Variable Importance Testing Approaches (VITA). They concluded that the RRF method had high computation times and low out-of-bag (OOB) error rates. The Boruta method had fairly low out-of-bag (OOB) error rates and computation times. However, all these are tested using datasets with at most 1000 observations. Motivated by Speiser's study, the aim of the research is to examine the classification performance among the above popular variant RF methods using a large dataset with collinear predictors.

Contribution of Sugar to Children's Carbohydrate and Calorie intakes

Diana K. Omayio, Francis A. Tayie, Amy R. Moore; Faculty Sponsors: Francis A. Tayie, Amy R. Moore*

Background: Children have a distinct liking for the sweet taste of sugar and this preference leads them to overconsume sugar-sweetened foods. The Dietary Guidelines for Americans 2020-2025 recommend people two years and older consume less than 10% of their daily calories from added sugar because overconsumption of sugar is associated with metabolic abnormalities and adverse health outcomes. There is lack of data on the contribution of sugar to total carbohydrate and caloric intake in children.

Objectives: To determine the contribution of sugar to total carbohydrate intake and proportion of calories from sugar among children.

Study Design, Settings, and Participants: Dietary sugar intake data from 3,048 children aged 2-9 years who participated in the United States National Health and Nutrition Examination (NHANES) surveys 2017-2020 were examined using both descriptive and inferential statistics.

Results: Mean daily calorie intake was 1,563.2 kcal (range 1257.8-1894.1 kcal) in which 368.0 kcal (range 313.6-431.5 kcal) came from sugar. About half of the children's total carbohydrate intake came from sugar (mean:47.0%; range, 45.8-50.4%). Sugar contributed 24.97% (range 24.17-26.11%) of total calorie intake. Sugar and calories intake did not differ by family income, or race of the children.

Conclusion: Sugar makes up half of the children's carbohydrate intake and contributes about a quarter of their daily calorie intake. The calories gained from sugar exceed the amount recommended by the Dietary Guidelines for Americans 2020-2025.

Treatment Plans for Adolescents with Autism Spectrum Disorder

Dilasha Pandey; Faculty Sponsor: Shawn Guiling*

Each year, adolescents graduate high school with goals to attend college, get jobs, and live independently. Adolescents with autism spectrum disorder (ASD), however, especially those with low cognitive abilities, often experience barriers to these normal functions, including living independently and interacting socially. Adolescents with ASD use camouflaging as a strategy to hide their autistic traits to appear more "typical". The pressure to maintain successful camouflaging is associated with increased anxiety, high-stress levels, low mood, and low self-esteem. Because no cure exists for ASD the goal of treatment plans is to maximize the individual's ability to function by reducing the impact of ASD symptoms, supporting developmental learning, and adapting to effective daily living functioning.

Suicide: Is it Family Violence?

Destiny Penfield; Faculty Sponsor: Kathie Miller*

This is a meta-analysis used to help bring attention to a potentially whole new area of research. Precursors to suicide as well as the long-term effects of suicide overlap with many of the precursors and long-term effects of family violence. While they both affect the interrelationships within a family system, that may not be where the similarities end. Considering the possible points of overlap in the response from the family system to suicidal behavior and family violence, could similar professional responses be considered to assist the family system with recovery? Identifying suicidal behavior as a form of family violence could lead to more effective ways to respond for intervention and advocacy efforts for prevention at the community level.

Gateway to addiction

*Marissa Peters**; Faculty Sponsor: *Shawn Guiling*

It has been thought for years that the gateway to addiction had to be a substance other than what is traditionally abused. Marijuana, caffeine, and nicotine have been to blame for the increased risk for dangerous substance use. However, this is simply not true. In this study, substance use disorders are heavily researched in order to support that trauma is the real gateway. Trauma affects everyone differently, and every individual varies in their reaction to it. Some people have built resilience and can handle life stressors well. However, people with unresolved trauma tend to develop substance use disorders later in life. Biological, psychological, and social factors are investigated, and the relationship of trauma and addiction are analyzed to support this study.

Analytical Predictive Modeling: Impact of Financial and Economic Indicators on JPMorgan Chase Stock

*Thao Pham**; Faculty Sponsor: *Emmanuel Thompson*

Stock price prediction is regarded as a vital task and as accurately predicting stock prices may result in desirable profits for investors. The Financial Sector of the S&P 500 is one of the important business segments in the S&P 500. The sector contains companies involved in finance and investing. In this study, we used JP Morgan Chase (JPM), the biggest player in the Financial Sector Index of the S&P 500 to build a non-linear data-driven analytical model which accurately predicts the Quarterly Closing Price (QCP) of the stock with the predictive performance of 96.55% using six financial, four economic indicators, and their two-way interactions as the attributable entities that drive the stock returns. We order the statistically significant indicators and their interactions based on the percentage of contribution to the QCP of the stock that provides significant information for the beneficiary of the proposed predictive model. We provide a shrinkage approach (L1-regularization) based on statistical learning to perform variable selection in the presence of multicollinearity.

SportsTrace Web Portal

*Thao Pham**, *Tuyen Nguyen*; Faculty Sponsor: *Robert Lowe*

SportsTrace is a Software-as-a-Service technology company that offers a mobile application for athletes and coaches to upload videos and receive detailed body movement analytics. In this capstone project, we will partner with SportsTrace to design and build a Web Portal with the aim of addressing some limitations of mobile device usage expressed by SportsTrace clients, such as small screen size for visualization, and inaccessibility to mobile devices. Specifically, we will be responsible for five main features which are building video select interface, single video analysis view, two videos analysis view, time-based aggregation view, and login authentication.

Augmentative and Alternative Communication (AAC) Education with Nursing Students: Addressing the Knowledge Gap

*Abriana Record**, *Kaylee Anderson*, *Skyler Hornbeak*; Faculty Sponsors: *Misty Tilmon*, *Jayanti Ray*

Knowledge of Augmentative and Alternative Communication (AAC) systems is critical to providing care to patients that use AAC. Nursing students are introduced to many aspects of care for a variety of individual patients throughout their schooling. While Speech Language Pathologists (SLPs) also work with a variety of patients, they also receive training in various communication modalities including AAC and AAC users. Basic

knowledge of AAC systems can affect the outcomes of a patient that communicates using a system. The purpose of this study was to: a) examine knowledge, comfortability, and confidence of nursing students using an AAC system, prior to and following an informational presentation about AAC, b) measure the willingness to collaborate with other healthcare professionals following the above-mentioned presentation, c) identify patients who would benefit from AAC and different types of AAC systems. Pre- and post-focus groups and surveys were utilized to collect information about the knowledge, comfortability, and confidence of nursing students regarding AAC. The survey was administered to 25 Southeast Missouri State University nursing students before and after a video about (AAC) devices presented by graduate SLP students in the Southeast Missouri State University Communication Disorders Department. Results will be presented to determine pre-post educational changes in nursing students' knowledge and perceptions.

Evaluating Forensic Anthropology Methods: A Case Study

Zoe Rees, Madden Delaney*; Faculty Sponsor: Jennifer Bengtson*

On August 17th, 2020, a set of human remains was entrusted to SEMO's Anthropology Department's Cold Case Team. The individual was identified through forensic techniques in 2022 as Everette Guy Travis, who was murdered in 1977. Travis's identification provides the opportunity to evaluate the forensic methodologies applied and determine which tests were accurate and which were not, and determine why the inaccuracies may have occurred. Once the reasons for the inaccuracies have been identified, suggestions for improvements to these methods will be given. It is evident there were discrepancies between the biological estimations made during the initial identification process and Travis's physical characteristics. These discrepancies could be based on the individual biological variations of Travis's skeletal remains. Our goals are to determine if individual biological variation is responsible for the discrepancies, or if new methods need to be applied in estimations of biological sex, age, stature, and ancestry. Based on this research, individual biological variation and anthropological methodology are responsible for the discrepancies between Travis' life and his skeletal remains. It is our assumption that while anthropologists' methodology can and should be improved, a certain margin of error will occur in estimations.

Signal detection theory and perceptual load signal detection

Lizzy Stock; Faculty Sponsor: Jeremy Heider*

The Interaction of Signal Detection and Perceptual Load Signal detection (the efficacy of the brain at detecting weak signals from stimuli) and load theory (the way the brain allocates limited resources to processing stimuli) describe different stages of the process of sensory perception and interpretation. According to signal detection theory and noise theory, the more effective signal detection is in one sensory area (sight, taste, smell, etc.), the less energy is available to dedicate to signal detection in other sensory areas. According to load theory, the human brain can only process a limited amount of available stimuli at any given time, and processing speed is affected by the amount the brain is either processing or perceiving at the time. The researcher poses the question of how flexible signal detection actually is, and if it varies in a similar way as load theory would predict.

Gender-Related Effects of Juror Instruction Type on Perspective-Takings

Moe Toyoda; Faculty Sponsor: Chasity Ratliff*

Jury instructions have been shown to have a significant impact on juror decision-making, particularly in fatal police use of force cases. However, there is inconsistency in the language used across different instructions, which could affect how jurors process evidence and reach verdicts. Additionally, jurors' cognitive processes,

such as perspective-taking behavior, can also shape their decision-making. Women tend to exhibit higher levels of perspective-taking behavior than men, which could amplify the effects of instructions directing jurors to view events from a particular perspective, such as that of the police officer. To test these hypotheses, an experimental mock-jury study was conducted through an online survey where the content of the jury instructions was manipulated to be consistent with either an objective or subjective standard of reasonableness, along with a control condition. Jurors Were given either of the instruction types and answered survey questions. However, a factorial ANOVA analysis found that gender did not have a significant effect on perspective-taking behavior depending on the types of jury instructions given (totally, superseding, or control) nor gender differences (Men or Women). Further analysis and discussion for the result will be discussed.

The effect of living environment and political orientation on memory for case facts in fatal police use of force trials

*Hannah Vaughn**, Sydney Provo (secondary author); Faculty Sponsor: Chasity Ratliff

Living environment might predict jurors' memory for case facts. Sanchez-Rodriguez et. al., (2006) found that individuals living in urban (versus rural) areas were at a greater risk for cognitive impairments. Thus, individuals who live in urban (versus rural or suburban) areas would be expected to remember fewer case facts. Living environment also predicts political orientation, with more democrats in urban areas and republicans in rural regions (Jokela, 2021). Furthermore, political orientation might influence memory. Frenda et. al., (2013) found that individuals were more likely to develop false memories about the opposite political party. In fatal police use-of-force trials, political orientation might influence memory for case facts such that individuals who are conservative (versus liberal) would be expected to remember fewer case facts. To investigate whether political orientation mediated the effect of living environment on memory for case facts, an online sample of individual mock-jurors read a trial scenario of a police officer charged with first-degree murder for illegal use-of-force, reported their political orientation, and completed a questionnaire assessing their memory for case facts. Living environment successfully predicted political orientation ($p=.00$) but did not predict memory for case facts ($p>.05$). Political orientation did not predict memory for case facts ($p>.05$).

Agroecological Analysis of Mid-South Agribusinesses

*Jesse Yount**; Faculty Sponsor: Indi Braden

The dynamic aspect of agriculture has led many producers into larger, more specialized farms with more dependence on technology. This has only increased with global markets, international trade, and more corporate-minded business models. While competition pushes for more, society seeks answers for feeding the world, conserving natural resources, more biodiversity, and a better quality of human life. Agroecology provides a way to evaluate a holistic view of complex agricultural systems. Multiple models were considered for evaluating agribusinesses; factors were included based on literature. After visiting several farms in the Mid-South region, information collected through observation or interviews was applied for the farms or businesses to a model for analysis. This allows a comparison of many different and complex systems and at various scales. By analyzing "sustainability" of agroecosystems, consumers and producers can make more ethical decisions to help longevity and resiliency of agriculture in the United States.

Development and Construction of Force Acquisition System for Thor Labs Optical Tweezers

Scott Wasmer (primary author), Taylor Peck (primary author), Nur E Afra Anika (secondary author), Jacob Williams (secondary author); Faculty Sponsors: Jonathan Kessler, Joe Murphy*

An Optical Tweezer is an instrument that utilizes a highly focused laser beam to trap a bead. Through calibration, the displacement of the bead relative to the laser can be used to measure forces on the pico- and nano- scales.

A force-detection module is essential for data collection with high fidelity; however, such modules are expensive. We constructed a cheaper alternative for force detection for a THOR Labs Optical Tweezer device.

A custom cage to hold the photodiode as well as allow for three directional movement was designed in Autodesk Inventor Professional and printed via a FDM 3D printer. The active voltage measurements were collected and visualized via a software frontend created in LabView. The system was then calibrated using stochastic data analysis methods.

Using 3D printed materials, a quadrant photodiode, and a NI data acquisition board, we were able to construct a force acquisition system at a cheaper price. Once calibrated, the system can be tested against known forces on cells to evaluate performance quality.

Logistical assistance in crisis moving from transitional to permanent housing

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This study was conducted to explore the need for logistical assistance in the architectural programming and conceptual design, as well as the selection, procurement, and placement of domestic products for people in crisis moving from transitional to permanent housing. If indicated, future plans include establishing a nonprofit initiative to solicit donations of domestic products, store those products, and then provide them to persons moving into permanent housing from transitional housing. Recipients of selected populations may include victims of domestic violence, those recovering from drug and alcohol addiction, refugees who have sought shelter in the area, and/or veterans in need of housing assistance.

The objective of the study was to conduct an exploration to determine the feasibility of a student lead initiative to help in creating healthy, safe, attractive home environments to persons moving from transitional to permanent housing. The goal of the study was to determine if the need for such assistance, identify particular concerns of the population, and establish how interior design students from a midsize midwestern university might be able to provide support to this vulnerable population.

Grounded Theory methodology was used to explore the preliminary research questions. Grounded Theory, research that focuses on what matters to research participants (Brown, 2012) , was used in hopes of developing or uncovering a theory from the interviews with persons involved in the placement of persons in crisis moving from transitional to permanent housing.

The primary investigator and two undergraduate research assistants conducted in depth interviews after receiving IRB approval from their institution. Persons selected for the interviews were identified as professionals currently providing housing support for persons in crisis.

Preliminary findings indicate that interior design professionals and interior design students have the skill set to support persons in crisis as they move from transitional to permanent housing. Members of the populations

studied are found to have a desire to set up a home that they can be proud of and where they can feel safe and supported.

Concluding data indicates a need for support, both in planning and in securing products such as furniture, bedding, housewares, dishes, artwork, and accessories. Preliminary outreach indicates there is the possibility of securing donations to help persons in crisis to set up permanent housing for themselves and their families.

Implications of this exploratory study are believed to be widespread. Each population studied needs support in setting up permanent housing. Based on preliminary investigations,

community support, through donations of usable household goods as well as monetary contributions, is anticipated.

Acknowledgments

The Student Research Conference would like to take a moment and thank everybody who helped to put the conference together and bring it back as an in person conference:

To all at Southeast Missouri State University, including, but not limited to:

- ◆ SEMO Dining/Chartwells
- ◆ Student Government Association for helping fund our conference shirts
- ◆ The Jane Stephens Honors Program
- ◆ The Office of the Provost
- ◆ Margaret Martinez for our fantastic logo
- ◆ SEMO Marketing
- ◆ The 150 Anniversary Planning Committee
- ◆ The Writing Center
- ◆ Tonya Wells
- ◆ Bruce Skinner
- ◆ Katie Krodinger
- ◆ Ann Hayes

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