



URCAF 2024

→ Undergraduate Research and
Creative Activity Forum



April 12, 2024



Schedule

8:45 – 9:30am

Student Registration, RS 266 Pikam

Applied Sciences Poster Presentations

Booth Number	Presenter's Name	Presentation Title	Abstract Page
1	Salsabila Attaria, Jacey Arnett	UTILIZING A WEARABLE FETAL HEART RATE MONITOR TO INCREASE OBSTETRICS HEALTHCARE ACCESS: DETERMINING THE DEVICE ACCEPTABILITY	35
2	Justin Burman	DIFFERENCES IN APPLICATION DRIVEN CUED STROOP BETWEEN ADULTS WITH AND WITHOUT PARKINSON'S DISEASE: PILOT STUDY	11
3	Elliot Chambon	DESIGN OF FULLY INTEGRATED LED QUANTUM MAGNETOMETER ARDUINO SHIELD BASED ON NV DIAMOND CENTERS	39
4	Callum Cunningham, Theresa Lee, Justina Smith	TO STEM OR NOT TO STEM: COMPARING CAREER PLANS OF GRADE 6-12 STUDENTS IN DIFFERENT SCHOOL SETTINGS	13
5	Marianna Fronciani Farina, Desmond Cockrell, Savannah Denny	C.O.S.M.O.S. COSMOSHOX ON-SITE MARTIAN OVERLAY SYSTEM	33
6	Lucas Hofer- Holderman	OASIS	26
7	Ciara Keeler	A LIFELONG SMILE	27
8	Jose Miranda	TEST-RETEST RELIABILITY OF A NEUROCOGNITIVE MOBILE APPLICATION IN HEALTHY ADULTS	13
9	Merry Phan	EXPLORING THE ACCEPTABILITY OF A WEARABLE FETAL HEART RATE DEVICE BY RACE AND ETHNICITY	37
10	Andriana Rajagopal, Rahul Madhavan, Elsie Clark, Divya Padamati, and Rajprasad Loganathan	TESTING THE ROLE OF EXERCISE TRAINING IN AGING-RELATED STEM CELL DYSREGULATION	23
11	Chantel Schuster, Jenn Williams, Alyssa Dooms, Lexi Wilson	SAFETY IN SPECIAL SMILES	28
12	Josie Sloan	CO-CONSTRUCTED STORYTELLING FOR A PERSON WITH APHASIA FROM TRAUMATIC BRAIN INJURY	17

13	Ayşe Yildirim, Siva Sai Reddy Gudepu Krissy Alonso, Kylie	RECYCLING ADVANCE ENGINEERING MATERIALS	25
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52

		CONNECTED UNBOUNDED CIRCULAR SLIT DOMAINS	
22	Adelyn Heuer	ANALYSIS OF SEVERE WEATHER IMPACT ON TRAFFIC PATTERNS USING LONG- SHORT-TERM- MEMORY NEURAL NETWORKS	38
23	Aiden Holt	AERODYNAMIC ANALYSIS OF VARYING TAIL ANGLES OF A BARN SWALLOW MODEL	28
24	Tommy Huela	RESTORATION OF LEADPLANT IN FORMERLY TILLED FIELDS: EFFECT OF SEEDING PATTERNS AND SOIL TYPES WHAT'S LINKER HAVE TO DO WITH IT?	31
25	Lauren Hughes	EXAMINING THE STRUCTURE &	

34	Alice Ukoha, Ellie Buresh	ASCY3 AS A PROBE OF PROTEIN CONFORMATION IN THE PROTEIN ANTHRAX LETHAL FACTOR	20
35	Zachary Walker, Marcus Ang, Felipe Lima	3D PRINTED NOVEL WICK STRUCTURES FOR ENHANCED CAPILLARY FLOW	25

Social Sciences & Humanities Poster Presentations

Booth Number	Presenter's Name	Presentation Title	Abstract Page
36	Piper Davis, Natalie Ream	ON THE FRONTLINES: PERCEPTION FROM SAFE STREETS WICHITA STAFF ON T	

guided the exploration of an inkjet system, helping to determine the cavitation force,

The results of this work show promise for both the use of the two-cavity method for bulk porous material acoustic testing, and the use of image-processing tools for digital designs and printed materials. In particular, the preliminary outcomes of the later show that the development of an all-digital method to predict the acoustic performance of materials may be possible –

Poster Presentation: Social Sciences and Humanities

Representation Matters: Examining Perspectives of Black Female Physicians with Regards to Black Female Health Disparities

J. Marion Sims is considered the father of Gynecology, despite causing harm and death to countless unprotected Black enslaved female patients used for physical experiments without their consent, permission, or willingness. Though an extreme example of discrimination against Black women in healthcare, this is one of countless disparities (historical and contemporary) of racism as a factor between Black women and their White counterparts. Though less blatant today, we still see racial disparities directly linked to systemic racism. As a result, Black females suffer higher rates of most critical illnesses, including cancer, hypertension, strokes, and diabetes, along with higher infant mortality rates. There is a direct connection between the healthcare disparities and inequalities mentioned above, and the inequities that limit Black female representation as doctors. For this reason, Black female doctors are more critical than ever, as patients are more likely to develop trust and better communication with physicians who share the same gender and ethnicity intersection. This dynamic allows for a better understanding of physical conditions based on living them as opposed to solely learning them scholastically. In my journey as a Black woman pursuing the path made possible by America's first Black female physician, Dr. Rebecca Lee Crumpler in 1864 and several others since, I engaged in the present study to explore through the perspectives of Black female doctors, the challenges that they face in the profession and their perspective on why their representation in the field is critical, necessary, and valuable for ongoing Black female patient health. My hope from this research is to provide a blueprint for my career while broadening the body of research that supports the need for Black female physicians and the need for resources to better enable a growing body of Black females in this space.

Ella Kreger

Faculty Mentor(s): Atri Dutta

College of Engineering

Poster Presentation: Natural Sciences & Engineering

UNDERSTANDING THE EFFECT OF THE NEW DEORBITING REGULATIONS ON CUBESAT OPERATIONS

In 2022, the Federal Communications Commission approved the five-year rule aimed at mitigating orbital debris by limiting the amount of time satellites remain in orbit after the end of their operational lifetimes. The rule has the potential to impact small satellites the greatest owing to a lack of an active deorbiting mechanism in most cases. This study investigates the impact of including deorbiting mechanisms on the spacecraft's operating altitude and mass. Numerical simulations were utilized to quantify the effect for 3U, 6U, and 12U CubeSats, considering onboard drag augmentation and propulsion. The new maximum compliant altitudes of the satellites with the addition of the devices were

by 11% (US Bureau of Labor Statistics, 2023). Given the need for additional STEM professionals, a survey was administered to grade 6-12 students in various school settings to gauge their current career plans.

Students came from multiple school types—high school public, high school public magnet (law, art, science), high school private, and middle school public. The survey instrument ("School-to-Work") was designed for completion by middle/high school students, formatted as interest checklists, and organized into six categories of job interests (Health & Medicine, Agriculture & Sciences, Engineering & Technology—classified as STEM in this study; and Art & Communications; Business & Management; Human & Public Service—classified as Non-STEM in this study).

For the purposes of this study, analysis includes an examination of STEM versus Non-STEM-related career fields. Results will be shared both generally for all participants as well as comparing participants from different school settings. Limitations and implications will be shared, including further research studies and future educational strategies.

Ethan Grohe

Faculty Mentor(s): David MacDonald

College of Fine Arts

Poster Presentation: Social Sciences and Humanities

A Snail's Tale

My piece is written for brass quintet (2 trumpets, french horn, trombone, and bass trombone) and was inspired by the book, *The Sound Of A Wild Snail Eating* by Elisabeth Tova Bailey. It follows the author's experience of being bedridden for a year alongside her pet snail. Half of the book consists of comfy commentary about her experiences with the snail. The other half is highly scientific research about all facets of snail biology and importance.

Introduction Are In Order

The first movement starts with a fanfare, announcing the snail as it marches around, and

After sleeping so long, the snail needs to get back to work! Snails decompose organic material such as dead leaves and shrubbery allowing for our environment to maintain its healthy metabolism. I imagine the snail strutting around and dedicated to its job. This movement is by far the jazziest, with lots of crunchy chords and slick sounds. It ends suddenly as the snail notices something in the distance.

Snail Love

While work is good, the snail longs for someone to share their stories with. The first section is sorrowful but turns wistful when the snail encounters another snail! After a brief chat, the snails work together to the sound of a New Orleans style romp with a special focus on the bass trombone. As the snails end their time together, they depart, feeling a bit more connected with the world around them.

Kamran Hafeez
Faculty Mentor(s): Bin Li
College of Engineering
Poster Presentation: Natural Sciences and Engineering

Effects of temperature and thermal history on the conductivity relaxation in compression molded PVDF sheets

Polyvinylidene fluoride (PVDF) is a versatile electroactive polymer with broad applications in electronics, energy, and biological fields. Unique dielectric property is one of the many reasons for its popularity in these applications, and it brings up both opportunities and challenges. This study aimed at a better understanding of conductivity relaxation, one of the major relaxation mechanisms found in PVDF materials at elevated temperatures, indicating a transition of short-range conduction to long range conduction. Conductivity relaxation is critical to both high temperature dielectric properties and transport behaviors of PVDF based functional materials. However, it is insufficiently understood, in comparison to other relaxation processes in PVDF. Our previous study suggested that, unlike other relaxation mechanisms, conductivity relaxation exhibited high sensitivity to processing and testing parameters. As a part of the effort to gain in-depth understanding of conductivity relaxation, this study explored the effects of temperature and thermal history on the conductivity relaxation in the PVDF compression molded at 200°C. The preliminary results revealed the coupling of conductivity relaxation with Maxwell-Wagner-Sillars (MWS) relaxation, as temperature increased to melting temperature of PVDF. Decoupled conductivity relaxation and MWS relaxation were not observed in the PVDF specimens after full annealing treatment. This might suggest that the conductivity relaxation was related to the defects in the underdeveloped crystal structures which were largely eliminated in melting and full annealing processes used in this study. Such findings also showed negligible dependence on the molecular weight of PVDF and thickness of testing

site (14CO3), where WSU has held archaeological field school at in past seasons. Yet we may ask, how exactly do we know that a bison scapula recovered from a site was implemented for use as a hoe tool? To better understand how archaeologists make this identification, and what key characteristics bison scapula hoes display, a bison scapula from a past season of excavation will be carefully cleaned and analyzed for the appropriate markers. The data yielded will be interpreted in the context of what is known about bison scapula hoes in the Kansas archaeological record to determine if the specific sample was used as a hoe tool, detailing how exactly that conclusion was reached.

indicates CMG2 may also have a similar binding quality. To test for collagen binding, CMG2 and a mutant D50A-CMG2 were purified and combined with different forms of collagen in a density gradient sedimentation. Following centrifugation, the gradients were separated into fractions which then underwent SDS-PAGE. CMG2 has demonstrated that it is able to bind to collagen type I, however it may not be dependent upon the MIDAS site for binding as the mutant strain of also demonstrated collagen type I binding. Further experimentation is to be performed to determine CMG2 binding to other types of collagens.

Hope Dimick

Faculty Mentor(s): Smita Srivastava

W. Frank Barton School of Business

Poster Presentation: Social Sciences and Humanities Research Program

Gender, Education and Entrepreneurship

This research paper investigates the influence of entrepreneurial education on gender disparities within the entrepreneurial landscape. Drawing from a synthesis of existing literature and local interviews, the study examines how access to and engagement with entrepreneurial education programs may contribute to or mitigate gender-based discrepancies in entrepreneurial endeavors. By exploring the experiences and perspectives of local entrepreneurs alongside insights from academic sources, this paper aims to shed light on the complex interplay between gender, education, and entrepreneurship. The findings underscore the importance of tailored educational interventions and support mechanisms in fostering gender equity and inclusivity within entrepreneurial ecosystems. This research contributes to a deeper understanding of the role of entrepreneurial education in shaping gender dynamics in entrepreneurship and offers practical implications for policymakers, educators, and practitioners striving to promote diversity and equality in entrepreneurial pursuits.

Arland Wallace, Vanessa Carey, Samantha Hoppe, Christine Nickel

observing and analyzing the profiles of each wall, this project intends to identify areas of anthropogenic activity and stratigraphic variation. Through the analysis of these recovered micro-botanical and material remnants, researchers are better enabled to understand the depositional history of the locale.

Alice Ukoha, Ellie Buresh
Faculty Mentor(s): Jim Bann
College of Health Professions
Poster Presentation: Natural Sciences and Engineering

AsCy3 AS A PROBE OF PROTEIN CONFORMATION IN THE PROTEIN ANTHRAX LETHAL FACTOR

Anthrax toxin is an AB toxin constituted by three distinct proteins: the B component protective antigen (PA), the A component edema factor (EF), and lethal factor (LF). PA forms a membrane-spanning pore that allows either LF or EF to translocate into the cell. The pore includes a narrow iris called the phi-clamp that is only 6 Angstroms wide. Since the pore is very narrow, LF and EF need to completely unfold their protein structure to pass through the pore and enter the cell. Once EF and LF enter the cell, the proteins are able to refold back into their original structure. The process of unfolding, translocation, and refolding in the cell is not understood. To understand these processes, we have mutated residues 53, 54, 60, and 61 to cysteine (LFNC4), which will allow the binding of the fluorescent dye AsCy3. Although these residues are found outside the binding site for PA interaction, it is expected not to have any influence on stability or binding. AsCy3 is known to have a fluorescence emission maximum at 568 nm; however, when AsCy3 binds to 2 cysteine (Cys) pairs across two helical turns of an alpha-helix, the intensity of the fluorescence increases by a factor of six. The emission peak also is red shifted to 576 nm. These characteristics of AsCy3 provide the ability to investigate how LF_n is able to refold in the cell because of the high fluorescence intensity from AsCy3. Our initial experiments show that AsCy3 can bind to LFNC4, which significantly changes the AsCy3 fluorescence. This probe can now be used in unfolding and refolding experiments and, because of its reversibility, in translocation experiments across lipid membranes.

sharing agreements impact state capacity and democratization in post-conflict societies through quantitative analysis. Building upon existing literature in conflict studies, this research analyzes power-sharing agreements through a four-part typology: political, territorial, military, and mixed agreements. There is some consensus within the field that power-sharing agreements help prevent the recurrence of war, but little agreement about what this means for a society. I have attempted to investigate this by measuring the impact of different kinds of power-sharing agreements as independent variables on state capacity and democratization as dependent variables. This process involved constructing a dataset of 79 power-sharing agreements and running eight statistical tests through Ordinary Least Squares (OLS) Regression, with each type of power-sharing agreement tested separately from one another, using the time since each agreement as a control variable. The results of these tests showed military power-sharing agreements and territorial power-sharing practices had a significant impact on both dependent variables. In other words, military agreements, not necessarily the actions of those agreements, are associated with a significant decline in democracy and an increase in state instability, while territorial power-sharing practices are associated with an increase in democracy and a decline in state instability. These findings reinforce previous studies that argue agreements should be considered separately than their implementation (or lack thereof) and that different kinds of power-sharing can have noticeably different results. It also demonstrates there are more factors to the “success” of power-sharing agreements than whether war recurs: it takes more than an absence of war for peace to be meaningful.

Kazune Tazawa, Aiden Holt
Faculty Mentor(s): Suresh Keshavanarayana
College of Engineering
Poster Presentation: Natural Sciences and Engineering

Analysis of Basswood Sheet Specimens Under Varied Grain Direction Angles Using Tsai-Wu Criterion

Wood sheets are fundamental materials in engineering applications, and their mechanical properties are influenced by the grain direction angle. In this study, basswood sheet specimens were tested at grain direction angles of 0°, 10°, 30°, 45°, and 90° to the loading direction.

The Tsai-Wu criterion, a widely adopted method for predicting composite material failure, was employed to analyze the mechanical behavior of the specimens. This criterion incorporates tensile and compressive strengths along different material directions.

By fitting experimental data to the Tsai-Wu model, the relationship between grain direction angle and mechanical properties was investigated. The aim was to gain insights into how wood sheets respond to varying loading conditions and fiber orientations. During experimental testing, an interesting observation was discovered that off-axis testing at 30° and 45° produces a negative Poisson's ratio.

The study contributes to understanding the mechanics of wood-based materials, offering a basis for optimizing their performance in engineering applications. Future research can build upon these findings to design wood structures resilient to diverse mechanical stresses.

David Hathaway
Faculty

hygiene kits for the students that included floss, toothpaste, and a toothbrush, were all used to provide education. At the presentation's end, students' knowledge was found to have increased based on responses to verbal questions. The independent variable was the oral health education presentation, and the dependent variables were the knowledge levels of high school seniors regarding teeth care, nutrition, and preventive measures. The project conditions involved a one-time educational presentation to the target population.

Results: Pre and post tests were not able to be given due to Institutional Review Board (IRB) restrictions. This age group has a critical need for oral hygiene education. Through verbal responses from the target population, it was affirmed educational intervention is effective in positively influencing the knowledge and awareness of rural high school seniors' oral health.

Implications: An area of concern in young adults that could be further researched is the effects of their daily diets on the oral cavity. The presentation allowed brief time for the topic of making informed dietary and lifestyle choices with only one slide, but this could be expanded to directly relate to this population.

Lauren Hughes
Faculty Mentor(s): Moriah Beck
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Natural Sciences and Engineering

WHAT'S LINKER HAVE TO DO WITH IT? EXAMINING THE STRUCTURE & STABILITY OF PALLADIN'S I_g3-4 LINKER REGION

The protein actin is integral to movement, cell adhesion, and cytoskeleton support within the human body. Actin is the most prominent protein within cells, and it participates in more protein-protein interactions than any other known protein; one such relationship involves palladin. Palladin is comprised of five immunoglobulin-like domains (I_g), each connected via an unstructured linker region. Previous research has proven that the I_g3 domain is the minimal actin-binding domain, meaning it is the only domain required to facilitate binding between palladin and actin; however, binding affinity is significantly increased when the I_g3-4 linker domain is present. To examine the effects of this I_g3-4 linker on overall actin binding, the Beck lab introduced several mutations into the regions. When all the arginines within I_g3-4 were converted to alanine, the binding ability of actin was completely disrupted. Our current research seeks to determine how mutations within the I_g3-4 linker region will affect the overall structure and stability of palladin. Our study was conducted with both wild-type and mutant arginine to alanine linker proteins. These

structure, reconstructed data curves, and suspected wavelength impacts. A preliminary review of this data indicates that the folding of mutated Ig3-4 linker contains more random coils and alpha helix structures while forming significantly fewer beta-sheet folds. Future

inform and address oral health disparities and solutions to embed them into the community.

Methods

This project was conducted to target children with developmental disabilities and their caregivers. A scholarly article search interpreted local census reports from Sedgwick County, Kansas, found data concerning the prevalence of childhood caries and proper oral health in those with developmental disabilities. The method of delivery included a slides presentation delivered in person at Rainbows United in Wichita, Kansas. This presentation was given in s

Participants reported feeling: Respected, Supported and Welcomed by Empower. Participants did have suggestions, but overall were extremely satisfied.

Conclusion and Implications: There was unanimous affirmation from participants regarding the alignment of Empower with participant cultural values. Small business owners felt respected, welcomed, and supported by Empower Evergreen's services. However, other areas of the organization should be evaluated to find similar results. The information from this study suggests that similar organizations could benefit from adopting Empower's approach of employing staff who are Spanish speakers and respect the culture and language of those they serve. Further research should explore specific strategies used by nonprofit services in this sphere.

Yousaf Khan

RESTORATION OF LEADPLANT IN FORMERLY TILLED FIELDS: EFFECT OF SEEDING PATTERNS AND SOIL TYPES

Understanding the factors that influence plant establishment and growth is crucial in ecology and conservation biology particularly for species that are difficult to reestablish. One such species is *Amorpha canescens* (leadplant) that is considered of high conservation value, but often absent from prairie restoration projects. To address this problem, we tested how different soil types (homogeneous vs. heterogeneous), seed sowing treatments (spatially aggregated vs. uniform), and patch size (large vs. small) influenced the abundance of *A. canescens* in plant restoration experiments that began in 2017. In the summer of 2023, we quantified the aerial cover of *A. canescens* in plots representing different treatment combinations. We found that the *A. canescens* cover was highest when seeds were sown in an aggregated spatial arrangement for plots composed of heterogeneous soils. This effect was stronger in plots comprised of small rather than large sized patches. In plots with homogeneous soils, *A. canescens* cover also appeared higher under aggregated compared to uniform seed sowing, though this difference was not significant. Amongst individual patches of large scale and heterogeneous soils, *A. canescens* produced more cover in certain soil types than others. There were no differences in the cover among soil types in small scale patches. These results suggest that *A. canescens* cover is highest when isolated from other plant species particularly in heterogeneous rather than homogenized soils. Furthermore, restoration of *A. canescens* in former tilled fields may benefit from sowing or planting seeds in aggregated rather than uniform spatial patterns.

Rory Mata, Ryan Steinert

Faculty Mentor(s): Doug English, Katie Mitchell-Koch

Fairmount College of Liberal Arts and Sciences

Poster Presentation: Natural Sciences and Engineering

CHARACTERIZATION OF NEUTRAL SULFUR REACTIONS AT LOW TEMPERATURES: AN INVESTIGATION OF EUROPA'S SUBSURFACE ICE COMPOSITION

Europa, one of the four Galilean moons of Jupiter, has been under increasing scrutiny in recent years due to the possibility of the existence of life in its subsurface ocean and the detection of key elements on its surface, including sulfur. Sulfur has been detected in various compounds on Europa through the Galileo mission, but the question of its origin remains unsolved. Currently it is unknown if the sulfur is indigenous to Europa or if its source is the nearby moon Io, where there is known to be a large amount of sulfur in many forms. The aim of this investigation is to model a plausible characterization of neutral sulfur reactions in conditions relevant to the subsurface ice of Europa through the use of density functional theory calculations to determine activation energy barriers of critical reactions in the sulfur cycle. Thus far, optimizations of structures and transition state structures have been performed for a reaction similar to those of interest in terms of charge, size, and elemental composition in order to confirm our methodology against a previously calculated standard. Next steps include additional optimizations and intrinsic

reaction coordinate calculations, as well as a transition into the solid phase. Looking further forward, computational chemistry research regarding the sulfur chemistry of the Jovian system could be valuable in the discussion of possible life on Europa and the interpretation of upcoming missions to the Galilean moons, as well as contribute to the validity of density functional theory methods in the context of astrochemical sulfur reactions.

Marianna Fronciani Farina, Desmond Cockrell, Savannah Denny
Faculty

PHOTOPLETHYSMOGRAPHY DEVICES FOR USE IN SPACEFLIGHT

It is important to continuously monitor astronauts' cardiovascular health since the human body is evolved to function optimally in the presence of Earth's gravity.

Photoplethysmography devices use light and an optical sensor to measure blood flow which can determine heart rate (HR), HR variability (HRV), oxygen levels, arterial stiffness, and cardiovascular abnormalities in a patient. We tested multiple designs of the PPG and concluded green light, flexible casing, and adjustable strap provides optimal signal that is inexpensive, lightweight, and noninvasive. Creating a low-pressure environment that replicates microgravity allows manipulation of blood flow compared to normal gravitational environments. Multiple conformal photoplethysmography devices are placed on the forehead, ankle, and wrist to first identify precise locations where signal-to-noise ratio (SNR) is superior. Using multiple devices gives a variety of data since one device is not sufficient. Simultaneous synchronized data collection is performed at all three locations in a low body negative pressure chamber (LBNP). MATLAB software is used to pinpoint each systolic peak in a wave sample and calculations from this analysis can be applied to clinical parameters and measurements, such as HR, HRV, and other cardiovascular health markers. Results can show arterial irregularities, such as palpitations. Our results infer precise locations with low SNR are established, LBNP does alter PPG wave results, and motion artifact creates low SNR. Future testing includes tackling ambulatory motion artifact, creating an algorithm to automatically process data, larger sample sizing, and microgravity testing onboard reduced gravity aircraft.

Jayden Island

Faculty Mentor(s): Mark Schneegurt

Fairmount College of Liberal Arts and Sciences

Poster Presentation: Natural Sciences and Engineering

MICROBIAL TOLERANCE TO HIGH CONCENTRATIONS OF MN RELEVANT TO EARLY MARS

Heavy and transition metals are known to interfere with processes in the human body and can have deleterious effects on plants and microbes in the environment. The current study

the presence of bacterial growth. Conclusively, an observance or lack thereof in microbial tolerance to high concentrations of Mn(II) and other transition metals provides substantial information about the capacity for life on early Mars. The dynamic conditions of the region's water supply makes our research critical in determining whether life can not only be formed, but also sustained on the planet.

thin across Wichita, 2) the program only provided intramuscular (needle administration) versus nasal naloxone, which was preferred, 3) requests to provide more links to care and resources with the supplies, 4) general underfunding of the program. The goal of this project is to provide a researched intervention to be implemented in other communities across Kansas.

Merry Phan

Faculty Mentor(s): Nikki Keene Woods

College of Health Professions

Poster Presentation: Applied Sciences

EXPLORING THE ACCEPTABILITY OF A WEARABLE FETAL HEART RATE DEVICE BY RACE AND ETHNICITY

The creation of wearable fetal heart rate devices offers a novel opportunity for urban mothers, providing them with a tool to actively monitor and engage with their pregnancy which was previously unattainable outside of clinical settings. The devices allow continuous and convenient fetal monitoring, potentially reducing maternal anxiety. Additionally, the ability to track fetal heart rate trends over time could aid in the early detection and intervention of potential issues.

These devices have various benefits enhancing prenatal care, but their acceptability across race and ethnicities is uncertain. This study considers the relationship between the race and ethnicity of women and the acceptability of the wearable fetal heart rate among urban women.

An online quantitative survey

Abigail Rees, Madi DeFrain
Faculty Mentor(s): Rhonda Lewis
Fairmount College of Liberal Arts and Sciences
Poster Presentation: Social Sciences and Humanities

The Interplay Between Neurodivergence, Substance Use, and Loneliness Among Wichita State Students

The current study aimed to assess the strength of the relationship between neurodivergence (i.e., Autism, ADHD, learning disorders, or speech disorders) and substance use (i.e., marijuana and alcohol use) and the influence of these two variables on loneliness. This study also explored whether substance use moderates the relationship between neurodivergence and loneliness.

Data for this study were derived from the 2022 National College Health Assessment (NCHA). Analyses included a chi-square test for independence to examine the association between neurodivergence and substance use, as well as a two-way between-groups analysis of variance to explore the combined effects of neurodivergence and substance use on loneliness.

Results revealed a significant association between neurodivergence and substance use. Compared to neurotypicals, neurodivergent participants more often reported using alcohol or marijuana at least once in the 30 days prior to survey completion. Substance use was not shown to moderate the relationship between neurodivergence and loneliness. However, both neurodivergence and substance use were found to influence loneliness independently. Being neurodivergent was associated with higher levels of loneliness, as was having used a substance.

Conclusions drawn from this study are important for the university to consider as the sample was comprised of WSU students. The results suggest that neurodivergent students are at heightened risk of substance use and potential misuse or abuse. Findings also revealed that both neurodivergence and substance use influence students' levels of loneliness. This may be explained as neurodivergent and substance-using students similarly perceiving themselves as different from their campus community peers, which may result in social withdrawal and subsequent loneliness. It is the authors' hope that this research will be used to incentivize the creation of targeted intervention efforts that will support neurodivergent students in accessing resources like support groups and substance abuse prevention programs.

Adelyn Heuer
Faculty Mentor(s): Ehsan Salari
College of Engineering
Poster Presentation: Natural Sciences and Engineering

noise levels.

Krissy Alonso, Kylie Crump, Quynh Dang, Halle Budke
College of Health Professions
Poster Presentation: Applied Sciences

Oral Health for Older Adults
