

CCAS Research SHOWCASE



2024 ABSTRACT SUBMISSIONS

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

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MESSAGE FROM THE DEAN



This year's Columbian College of Arts & Sciences (CCAS) Research Showcase represents the very best in academic excellence and innovation. With 132 research abstracts submitted from across the college, it's evident that our undergraduate and graduate students are at the forefront of groundbreaking inquiry.

This remarkable body of work—ranging from research on the effect of saltwater intrusion on coastal farms, to the impact of art therapy in treating individuals with dementia—underscores the breadth and depth of research undertaken within our classrooms, laboratories, and creative spaces. At the heart of our mission lies the concept of “the engaged liberal arts,” where students seamlessly integrate knowledge from the sciences, social sciences, arts, and humanities—channeling their insights into experiential learning and critical thinking to forge new avenues of discovery.

These students are poised to join the ranks of the next generation of scientists and scholars, armed with fresh perspectives and innovative ideas to confront the myriad challenges of our time. From climate change and AI technology to data privacy, space exploration, and global health, these are the issues that demand the ingenuity of the best and brightest minds. Our students, fortified by an education grounded in analysis, creativity, and effective communication, are the architects of our future.

Educating this cohort of aspiring leaders, scholars, and scientists is both an honor and a responsibility. We extend our deepest gratitude to the faculty members who have dedicated their time, expertise, and mentorship to empower our students in presenting their diverse and impactful work.

To the 174 presenters and co-presenters in this Research Showcase, we extend our warmest congratulations. Your dedication and ingenuity inspire us all, and we eagerly anticipate your continued contributions in shaping our world in meaningful ways.

Sincerely,

A handwritten signature in black ink that reads "Paul J. Wahlbeck". The signature is written in a cursive, flowing style.

Paul J. Wahlbeck
Dean, Columbian College of Arts & Sciences
The George Washington University

SCHEDULE OF EVENTS

9:30 - 10:00 a.m.

GRADUATE STUDENT POSTER PRESENTER
SET UP

10:00 a.m. - Noon

GRADUATE STUDENT POSTER
PRESENTATIONS

Noon - 12:30 p.m.

GRADUATE STUDENT POSTER REMOVAL
& UNDERGRADUATE STUDENT POSTER
PRESENTER SET UP

12:30 - 2:30 p.m.

UNDERGRADUATE STUDENT POSTER
PRESENTATIONS

2:30 p.m.

UNDERGRADUATE STUDENT POSTER
REMOVAL

CCAS RESEARCH SHOWCASE

ANTHROPOLOGY

The Effect of Habitat on Bovid Forelimbs: A 3D Geometric Morphometric Analysis

Bovids (antelopes and relatives) dominate the African fossil record, and can be used to provide insight about ancient environments. Modern bovids can act as analogues for their fossil relatives by providing information regarding the interaction between morphology and environment. This field of study is known as ecomorphology. Previous work has identified a functional link between hindlimb morphology and environment (Kappelman, 1991; Barr, 2014), yet relatively little work has been done exploring the forelimb morphology of bovids in relation to habitat prediction. We look to determine the effect of habitat type on radioulna (habitually fused radius and ulna bones) shape using 3D geometric morphometrics.

The use of 3D landmarking allows for visualization of complex shapes that are difficult to capture with traditional linear measurements. Our preliminary analysis makes use of 18 3D-scanned bovid radioulnae from the collections of the Smithsonian National Museum of Natural History belonging to several bovid species in different habitats. Habitat preferences of each species and habitat categories: Heavy Cover, Light Cover, and Open follow previous studies focusing on the hindlimb (Plummer et al., 2015; Scott, 2015 Barr, 2014). We used the SlicerMorph package for 3D Slicer to generate and analyze 27 3D landmarks on each specimen. The landmark configurations were then processed using Generalized Procrustes and Principal Component Analyses.

Preliminary results show a correlation between the first principal component and habitat type. We conclude that relationship between morphology of the radioulna and the habitat can give insight to paleoenvironmental reconstructions, particularly those of which bovid long bones are a frequent component.

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CCAS RESEARCH SHOWCASE ANTHROPOLOGY

The Development and Persistence of Adult Female Social Relationships in Wild eastern Chimpanzees (*Pan troglodytes schweinfurthii*).

Research has shown that the distribution of relationships within many animal groups is not random, rather it shows that there is a clear distinction between partner choice based on different association and “friendship” levels (Seyfarth & Cheney, 2012). Maternal bonds and social patterns are seen to play a significant role in determining their offspring's potential social partners; however little is known about how much of an impact this makes in female dispersing species such as chimpanzees (Bray et al., 2021; Maestriperi 2018). The role that early life social experiences play in the development of adult bonds is understudied and remains unclear. A considerable lack of studies has examined whether social bonds developed during juvenility persist into adulthood (Bray et al., 2021). Exploring the role that maternal influence plays on their offspring's social development can help to expand our understanding of social development in non-human primates (Maestriperi 2018). Chimpanzees make a strong model to assess maternal effects due to their prolonged life history stages and prolonged contact with their mother which allows for the investigation of post-natal and post-weaning behavior (Samuni et al. 2020). Maternal effects can be understood in depth when looked at across the long lifespan and juvenile period that chimpanzees have (Markham, et al 2015).

Within this study, I aim to investigate the role that female gregariousness in eastern chimpanzees (*Pan troglodytes schweinfurthii*) plays in the development and persistence of their offspring's social bonds. Based on previous research, I hypothesize that social bonds will be influenced by the social bonds an immature was exposed to through their mother during infancy and juvenility. Compared to bonds between males (Bray et al, 2021), I predict that female relationships will not persist across life history stages because they are characterized by female-biased dispersal and general low gregariousness.

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CCAS RESEARCH SHOWCASE

ANTHROPOLOGY

The Challenges of Mourning: Nursing Homes Betwixt and Between during the COVID-19 Pandemic

Elderly residents in long-term care facilities were one of the populations in the United States hit hardest by the COVID-19 virus. Their deaths highlighted long-standing systemic problems and unmet expectations of the nursing care industry, and the ways social exclusion exacerbated the suffering of residents and their family members. This article, part of a larger collaborative study of COVID death and dying, draws upon ethnographic interviews on COVID death and dying, including an analysis of a podcast series on COVID grief, to suggest that the predominant focus in the anthropology of death—mainly, funeral rites and memorialization—can mask the importance of social practices and institutional constraints prior to death. Discourses on the process of dying of COVID-19 in nursing homes show that loved ones are uncertain about when the process of death begins. We argue that the disjunction between the cultural expectation of survivors to be present with and provide affective care to a dying relative in the nursing home, and the experience of being isolated from them, resulted in a disrupted period of transition from life to death. Finally, we explore how the absence of a ritual process before death – an absence made more legible by the pandemic – complicates grief and mourning.

This material is based upon work supported by the National Science Foundation under Grant No. 2148920.

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CCAS RESEARCH SHOWCASE

ANTHROPOLOGY

Exploring the Effect of Habitat Variation on Extant Bovid Morphology: A 3D Geometric Morphometric Analysis of the Metacarpal

In order to understand hominin evolution it is essential to reconstruct the environments in which early humans lived. Ecomorphological studies aim to link anatomical form with function, and ecomorphological analysis of fossils can aid in reconstruction of paleoenvironments. Due to their abundance in the fossil record and ecological diversity, bovid (antelope, cows, sheep and other relatives) locomotor ecomorphology can be especially informative. This study examines shape variation among extant bovid metacarpals, employing three-dimensional geometric morphometric methods to test how well metacarpal morphology tracks habitat preference in extant bovids. The data set was composed of 22 left sided metacarpals from the Smithsonian National Museum of Natural History. Metacarpals were landmarked and analyzed through the program 3DSlicer Morph. 16 landmarks were placed on the distal and proximal ends of the metacarpal. The current data set contains six Gazella, five Kobus, one Syncerus, six Tragelaphus, two Litocranius, and one Redunca specimens. We classified each species according to its preferred habitat type, and conducted a Generalized Procrustes Analysis, followed by a Principal Components Analysis. The first two principal components account for 93% of morphological variation of the data set. Preliminary results showed a correlation between bovid metacarpal morphology and preferred habitat, supporting past studies that demonstrated the ability of bovid functional anatomy to accurately predict the environment (Barr, 2014; Etienne, 2020; Takeda, 2023).

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CCAS RESEARCH SHOWCASE

ANTHROPOLOGY

Understanding the impact of water fluoride levels and *Salvadora persica* toothbrush tree use on oral health outcomes among Daasanach communities in Northern Kenya

Access to clean water and healthcare is pivotal for oral health, yet Daasanach communities in Kenya's arid north face water challenges and limited healthcare access. Fluoride, beneficial in moderation, can cause dental fluorosis when excessive. Without regulation, fluoride concentrations in water can vary widely, but little research has explored the impact of exposure to diverse Fluoride concentrations. In June-July 2023, data was collected from eight Daasanach communities near Lake Turkana, focusing on water source fluoride levels, self-reported oral health, and fluorosis inspections. Water sources showed varying fluoride levels, with hand-dug wells within WHO guidelines (<0.7 mg/L), while standpipes/Lake Turkana exceeded guidelines, reaching 10 mg/L. Among 147 children and 150 adults, 25% of children displayed mild/moderate fluorosis, while 53% of adults showed mild/moderate, and 21% severe fluorosis. Self-reports revealed that most Daasanach (69%) reported excellent oral health, but 25% of children and 30% of adults reported fair or poor oral health. Logistic regression analyses suggest adults with mild/moderate fluorosis had 1.7 times the odds (95% CI: 0.90-3.22, $p=0.10$) of reporting poor oral health, though not statistically significant. A linear regression model indicates daily use of the *Salvadora persica*, commonly referred to as the "toothbrush tree," was associated with better self-reported oral health ($B=-0.84$; $SE=0.3$; $P=0.006$). These findings underscore the connection between water quality, cultural practices, and oral health, emphasizing the need for culturally-sensitive oral health interventions and cultural contexts to improve overall well-being.

This work was funded by the National Science Foundation (NSF REU #1852406; NSF CNH2-S #1924322).

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CCAS RESEARCH SHOWCASE

ANTHROPOLOGY

“No One Should Feel Like Being Pregnant Is a Death Sentence”: The Importance of Provider-Patient Racial Concordance on Black Birthing Care in Washington,

Situated within the historical context of racial disparities in the city’s healthcare access, this project explores the experiences of Black parents as they navigate birthing care in Washington, DC, as well as perspectives of Black physicians and other healthcare professionals providing this care. The study draws on ethnographic methods of unstructured and semistructured interviews and digital archival research to examine three areas impacting birthing care for Black parents in the nation’s capital: under-resourced facilities; lack of access to diverse medical personnel; and structural impediments to choice and autonomous decision-making around the ideal birthing experience. This presentation will also address modalities of response to those areas, particularly focusing on culturally centered birthing care curated for Black people by Black healthcare providers and patient-provider racial concordance in the DC birthing system. This research acknowledges efforts on the part of Black communities to combat ongoing medical racism and obstetric violence within the United States.

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CCAS RESEARCH SHOWCASE

ANTHROPOLOGY

Attention and Social Learning in 18-30-month-olds

The Social and Executive Learning in Early Childhood Tool (SELECT) evaluates social learning (SL) in the visual (pictorial) and spatial domains. SELECT was used to consider the development of SL in relation to joint attention by the child and experimenter. To evaluate imitation, children (N = 36) were tasked with copying experimenter responses by touching the correct target location (spatial task) or picture identity (pictorial task). Experimenter's judgements of attentiveness were expected to positively correlate with imitation accuracy across conditions. Overall, there was no significant relationship identified between joint attention and imitation in the pictorial ($r(36) = -0.06$, $p = 0.63$) or spatial ($r = 0.04$, $p = 0.42$) domains across participants. However, attention and imitation for the pictorial task were positively correlated for male participants ($r(18) = 0.78$, $p = 0.020$). No significant association was found among male participants for the spatial task ($r(n) = 0.28$, $p = .17$). Limitations include small sample size and subjective rating of attention by experimenters. Future research could address these limitations and consider potential gender impacts on joint attention in SL. Additionally, determining the age range at which sustained attention becomes significant for task completion could inform educational procedures for young children.

This work was supported by a Luther Rice Fellowship.

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CCAS RESEARCH SHOWCASE

ART THERAPY

Art Therapy and Memory Recollection: A Case Study

Dementia is an overarching term for a variety of neurocognitive degenerative disorders that can impact an individual's functioning in a range of areas. One of the main ones impacted is an individual's memory, both in the ways of creating new memories and recalling previously created ones. Art therapy can be beneficial when implemented in older adult populations dealing with dementia for improving quality of life overall. This study focuses on how art therapy, when implemented with individuals who had art making as a prominent part of their past experiences, can help to build up and strengthen the facets of memory.

This study utilized a case study approach to highlight how weekly individual art therapy sessions were able to impact an older adult woman with late stage dementia who frequently created art throughout her lifetime. Each week, over the course of ten months, the woman used colored pencils to create an image of her choosing. The artwork and associated conversations about the artwork, verbal conversations and processing that occurred between the individual and the art therapy intern leading the sessions were considered.

Throughout the progression of the art therapy sessions, the individual began building up short term memory as well as memory recall. Without a directive being implemented, the art created by this woman - according to her husband - exhibited memories of her past. In one example, she represented a set of mountains with a river from the area where she spent her childhood. She consistently created this image, but also occasionally shifted it as sessions progressed. Not only was she able to remember past events in more detail when having conversations with the art therapy intern than in the beginning months, but she was also able to begin incorporating the art therapy intern into her memory.

By looking at the individual's progress on a weekly basis, it seems that art therapy sessions helped to build up short-term memory as well as aid in easier and more accurate memory recall. Encouraging structure in sessions through consistency as opposed to the typical directive method, allowed for the individual to create her own imagery that was meaningful to her, and helped to also improve her quality of life. Using art therapy can be a soothing and advantageous outlet and alternative method of cognitive strengthening for individuals who need it immensely.

Primary Presenter

Bianca Z. Batar

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CCAS RESEARCH SHOWCASE

ART THERAPY

The Effect of Identity-Affirming Art Therapy on Self-Esteem and Emotional Regulation for Neurodiverse Clients

Objective: Neurodiversity encompasses a broad spectrum of cognitive, sensory, and emotional differences. Neurodivergent individuals often face many adversities, including exclusion, ridicule, and denial of fundamental human rights, care, and opportunities. Even well-intentioned therapists can cause harm if they base therapeutic success on how well clients can adapt to unattainable neurotypical standards. Ableism and other life stressors can cause enduring trauma with many consequences, such as heightened nervous system dysregulation and low self-esteem. This study emphasizes the necessity of providing identity-affirming art therapy care to neurodiverse clients and how doing so can improve self-esteem, emotional regulation capabilities, and quality of life.

Methods: In this qualitative comparative case study, the first case was an adolescent Autistic female student in a special education public school, attending group art therapy classes to address emotional challenges amid significant life changes. The second case study was a neurodiverse 8-year-old male receiving individual art therapy services at an art therapy university trauma clinic. He was addressing emotional difficulties and low self-esteem while managing health issues. Data was collected through observation and analyzing client artwork for over four months in the clinic and a year and a half in the school setting. A strengths-based art therapy approach was considered for both clients.

Findings: In this ongoing study, preliminary findings indicate a noticeable improvement in self-esteem, mood, creative self-expression, communication, and emotional regulation in both client cases. The clinic client exhibited increased recognition of positive personal attributes, reported feeling calmer while in art therapy, and independently applied art-based self-regulation techniques. The student benefited from an inclusive, validating art space that provided her the autonomy to explore creative self-expression while forming friendships and learning about mindfulness.

Implications: Although both clients share similar therapeutic goals, a one-size-fits-all art therapy approach does not work. Instead, attuning to and advocating for individual client needs, rights, and interests assists them in embracing their neurodivergent identity while providing an inclusive space for self-exploration through art-making. This research brings attention to the unique aspects and needs of working with neurodivergent clientele.

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CCAS RESEARCH SHOWCASE

ART THERAPY

Art Therapy, Pop-Culture, and Identity Development with Autistic Adolescents of Color: Case Study

Objective: Art therapy is shown to aid identity development, but existing literature often centers on predominantly White male clients. There is a notable research gap in understanding adolescents with Autism who identify as Black, Indigenous, Asian, and Latino. Recognizing the impact of multifaceted identities in treatment is crucial. Research on integrating pop culture into art therapy with clients with Autism demonstrated that when clients can lean into their special interests, it can create an engaging and beneficial therapeutic environment. This study aims to understand the impact of art therapy that adopts an intersectional lens with pop culture metaphors to help adolescents develop positive self-images and emotional and self-regulation skills.

Methods: This study is a retroactive review of case studies of two adolescents. A Korean-American female participated in group art therapy in a community setting. A biracial Black and Latino male had individual therapy at a special education school. The examination specifically identified moments when these adolescents spontaneously incorporated pop culture into their artwork, emphasizing the importance of group settings and peer-to-peer interactions.

Findings: Open studio, client-centered art therapy helped facilitate growth in both tolerance and flexibility within group and individual spaces. Throughout sessions, both students' artwork reflected a greater awareness of self and positive versus negative attributes through depicted characters or portraits. In both cases, reinforcing pop culture interests in group settings with neurotypical or neurodivergent peers helped reinforce their artistic, cultural, and individual identities. Subjects demonstrated improved social interaction with peers and increased ability to self-regulate in times of stress.

Implications: Art therapy provides a unique and powerful resource to BIPOC clients on the autism spectrum. When integrating pop culture references, clients can showcase their intersectional identities. This approach addressed known social challenges associated with Autism by utilizing metaphors for self-expression and common ground for interacting with peers. In group or individual sessions, art therapy offered positive reinforcement of client identity and opportunities for peer and therapist interactions.

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CCAS RESEARCH SHOWCASE

ART THERAPY

Open studio art therapy in penitentiaries for fostering autonomy: Multi-case study

Penitentiary settings are saturated with mental languish due to the disproportionate detainment of those with mental illness, personal trauma histories, and also due to restricted personal liberties, controlled surveillance, and enforced punishment fostering pathology. Within carceral settings, an open studio art therapy approach offers promise for heightening choice-making power by inviting participants to freely select materials, honor their own directive, and participation duration. The aim of this project is to explore how an open studio art therapy approach can facilitate autonomy and artistic liberation for incarcerated clients to improve mental health symptoms and prepare them for post-incarceration.

This study consists of three qualitative case studies from clients residing in acute mental health or substance use disorder units at a correctional facility in a major metropolitan area. Clients participated in open studio art therapy twice a week for 90 minutes. The average group size was eight people - depending on individual length of stay before conviction or enforced separations between clients. The data consisted of observation (artwork and behaviors), documentation of group discussions, and informal interviews.

Facing both systemic injustice and social programming to obey, inmates' willingness to exercise artistic agency was impacted. Trust building and safety in the therapeutic relationship was important to engage in autonomous processes. Open discussion of race, class, and the art therapist's role during sessions provided the opportunity to explore power dynamics, leading to greater participation and deeper processing for clients later in their treatment. Offering a mixture of structured and unstructured directives provided choice to facilitate art making, contain any emotions that arose, and guide those who may benefit from various degrees of instruction due to cognitive ability or level of artistic comfort.

Open studio art therapy had a unique ability to foster connection, resiliency, and decision making power in carceral settings. In the United States, which has one of the highest prison populations in the world today, it is vital to provide competent care to minimize recidivism, improve coping skills, and guide clients in processing the trauma of institutionalization. A broad application of art therapy that fosters autonomy can be a protective factor for those who are institutionalized or gaining skills as returning citizens.

Primary Presenter

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CCAS RESEARCH SHOWCASE

ART THERAPY

Exploring an Extension, The Next Chapter, of the Birds Nest Drawing Assessment: Adult and Adolescent Case Study

Objective: Attachment theory is a fundamental paradigm in human development and psychopathology. Within the field of Art Therapy, the Birds Nest Drawing Assessment (BNDA) is one of the most widely used tools to assess attachment in past and present relationships. Even though BNDA provides valuable information for assessing and treating clients with attachment issues, there is limited research integrating it with an accompanying narrative and different phases of development. This study explores expanding BNDA through "The Next Chapter," an extension of the assessment that allows clients to create more meaningful insights into their attachment patterns and their current mental status.

Methods: This study utilized a qualitative multiple case study design, following weekly individual sessions of two females in different phases of life: adolescence and adulthood. The art therapy sessions were person-centered with an attachment theory approach. The study included data from three sessions. First Session: BNDA; Second Session (a week after the BNDA): The Next Chapter, the client was asked to "Draw the next chapter of the story" (referencing the narrative in the BNDA); and Third Session: revisit the story and assess the client's engagement and progress. Data included client artwork written narratives, and observational notes from the art therapist.

Findings: This study is ongoing. Initial findings in the adult case study suggested they were better able to express and reflect on their current and future situation regarding safety and life transitions. The adolescent expanded her imagination beyond the bird's nest and included more authentic symbols in her storyline. She added a more significant connection to her environment and increased her understanding of her relationships. In both developmental stages, their participation in the extension afforded them the opportunity for autonomy and engagement in the creative process with their art and narratives serving as markers of progress in their therapeutic process.

Implications: The Next Chapter, as an extension of the BNDA, can be a valuable art therapy tool to assist in an increased understanding of client attachment issues and needs in different developmental phases. Further research is recommended to explore cultural factors related to attachment development and the BNDA.

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CCAS RESEARCH SHOWCASE

ART THERAPY

Art Therapy as a Vehicle for Self-Expression and Autonomy for Adults with Intellectual and Developmental Disabilities

As more individuals with intellectual and developmental disabilities (IDD) live well into adulthood, the gap between the need and availability of mental health services increases. IDD can be caused by any condition that impairs the development of the brain before or during birth, or in childhood years (APA, 2021). People with IDD continue to face discrimination and oppression and often do not have access to specialized mental health clinicians or services. This study examined the effectiveness of art therapy on the autonomy and self-expression of adults with intellectual and developmental disabilities in a supported-living residential program.

This study consisted of two qualitative case studies that explored the experience of individuals who attended art therapy as part of their day program services in a community-based organization. Clients participated in 60-minute art therapy sessions once a week for eight months. The groups were 2-5 clients per session, taking a person-centered approach, experimenting with different art materials, and participating in active art-making. The data gathered included weekly artwork and observations during sessions.

Initial findings suggest that the exploration of different media created an opportunity for the clients to develop self-expression. They were able to express their personalities, abilities, and interests through art-making. Therapeutic alliance and safety were important to be able to work together; as the clients grew to know the student art therapist, comfortability around materials and exploration increased. Non-verbal expressions were also part of the development, as clients learned to further communicate with body language as they found autonomy in the art space and their choice of materials.

This research highlights the non-verbal uniqueness of art therapy which allows clients with IDD to find a way of expressing themselves, particularly for adults who did not develop language skills. Art therapy fosters autonomy while engaging in desired art-making and helps build creative skills. Adults with IDD lack services that are tailored to their particular needs, which differ from children or adolescents. It is vital to continue providing mental health services, such as art therapy, where they can process their unique experiences and find autonomy to encourage more participation and acceptance in society.

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CCAS RESEARCH SHOWCASE

ART THERAPY

Traditional and Non-Traditional Administration of the Person Picking an Apple from a Tree Assessment

The Person Picking an Apple from a Tree (PPAT) is an evidence based art assessment utilized in the field of art therapy. It was standardized by Linda Gantt and Carmello Tablone in 1987. The predominant aim of the assessment is to measure problem solving skills. However, there are a variety of results that can be gathered from the assessment. The goal of this research is to administer a traditional and non-traditional version of the PPAT assessment to clients from the Delaware-Maryland-Virginia (DMV) area. The research was completed by two Art Therapy students from George Washington University's Art Therapy Masters program. Each student had separate internships with varying demographics. The research goal was to identify differences in assessment results when administered non-traditionally. When completing the assessment, clinicians direct clients to "Draw a Person Picking an Apple from a Tree." They offer no further elaboration. The traditional assessment asks clients to draw on a 12 x 18 inch piece of white drawing paper with a 12 pack of Mr. Sketch scented markers. One non-traditional version of the assessment changed the material whereas the other non-traditional version had a virtual open studio format as well as a 30 minute time limit.

To measure the PPAT the art therapy students used the Formal Elements Art Therapy Scale (FEATS) which is a rating system designed to measure global variables in a specific drawing. The hypothesis is that the non-traditional administration of the PPAT would yield a higher FEATS score.

The results gathered were inconclusive in regards to the stated hypothesis. The research calls for a wider body of art samples.

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CCAS RESEARCH SHOWCASE

ART THERAPY

The Experience of a Mindfulness-Based Art Therapy Program Among Inpatient Adolescence in China: Case Study

Objective: Much of the research on the use of art therapy in psychiatric hospitals has been conducted in the U.S., U.K., and other European-influenced countries. There is only little research on how clients experience art therapy in mainland China; due largely to the lack of available art therapy services. Due to the unstable nature of the hospital setting, a structured program is reported beneficial to achieve goals. Incorporating mindfulness-based practice is often found helpful for adolescents in emotional regulation, which adolescents always struggle with. This study aims to address this gap by investigating how adolescent patients in a psychiatric hospital experienced mindfulness-based group art therapy.

Methods: This case study documented a structured mindfulness-based art therapy program, comprising nine sessions conducted over a two-week period. Art therapy was offered in a group format for approximately 13 adolescent patients at a psychiatric hospital, where most of the patients were diagnosed with mood disorders. Thematic analysis is based on the art therapy intern's observation notes, follow-up interviews with clients, and photographed artwork.

Findings: The findings demonstrated several facets of art therapy. First, a structured group helped build safety. Second, the mindfulness-based exercise helped patients with emotional regulation and coping skill learning by patients' self-reporting. The use of art mediums encouraged self-expression and promoted relationship-building between patients as well as therapist-patients.

Implications: This case study offers several considerations for expanding art therapy in China. Due to the nature of the hospital setting, art therapists may need to take a considerable amount of time to build safety, such as providing structure. As mindfulness-based practice is not commonly offered to adolescents in Chinese hospitals, providing such approaches may be helpful for teaching self-regulation. In order to expand the field of art therapy for Chinese adolescents, it may be useful to provide guidance that differentiates art therapy from art classes and shifts relationship expectations from teacher-student to therapist-client to prompt therapeutic goals.

Primary Presenter

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

The Role of Autoimmune Antibodies in Chikungunya Arthritis

Objective: Post-chikungunya viral arthritis may persist for months to years after infection and is characterized by relapsing and remitting symptoms, similar to rheumatoid arthritis. Interestingly, chikungunya IgM is known to be elevated for years after the initial infection. The purpose of this study was to investigate the mechanisms of chikungunya arthritis relapses, primarily by determining the correlation between arthritis disease severity, pain, disability, and longer duration of fever with chikungunya infection with the titers of autoimmune antibodies such as chikungunya IgM and IgG in patient samples.

Methods: A Columbian cohort of n = 157 patients with a history of chikungunya infection of varying levels of persistent arthritis had plasma and peripheral blood mononuclear cell samples collected. Disease severity was assessed using the Disease Activity Score-28, and a flare questionnaire originally developed to score rheumatoid arthritis disease severity. Pain was measured by a visual analog scale; disability was measured by the Health Assessment Questionnaire and days with fever were measured continuously. The samples were then examined using semi-quantitative ELISAs to obtain titers of chikungunya IgG and IgM antibodies, as per the manufacturer's instructions (EUROIMMUN, Germany). Means were compared for participants with and without IgM positivity. Correlations were performed with IgG titers.

Results: The percentage of patients who were IgM positive was 0.06% (9 out of 150 patients), and the mean IgG titer was 170RU/mL. IgM-positive cases neither demonstrated higher disease activity by DAS-28 (values compared at 3.3 vs. 3.8, and $p=0.9$), nor significant differences with flare score, increased pain or disability, or longer duration of initial fever. Similarly, there were no correlations between these metrics and IgG titer.

Conclusions: There is no significant correlation between titers of anti-chikungunya IgM and IgG antibodies and arthritis disease severity in patients suffering from chikungunya arthritis, suggesting that these antibodies do not play a role in arthritis disease pathogenesis. Further evaluation of anti-Mayaro, anti-Zika, rheumatoid factor, CEP-1, ANA, anti-CCP, and anti-SA antibodies is pending.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Evaluating Murine Cutaneous Wound Healing in a Myeloid Cell-Specific G Protein-Coupled Receptor Knockout Model

The skin is a complex and multilayered organ that serves as a robust barrier against external harm. However, it is susceptible to various inflammatory conditions such as cancer, fibrosis, and injury. Successful wound healing in the skin involves a carefully orchestrated transition from inflammatory to reparative processes. Medium-chain-free fatty acids derived from dermal adipocytes play a critical role in initiating inflammation and driving subsequent healing processes. Among the receptors involved in fatty acid signaling, G Protein-Coupled Receptor 84 (GPR84) significantly enhances inflammation across tissues. However, its specific implications in skin-related processes remain largely unexplored.

This study investigates GPR84's involvement in skin wound healing through the evaluation of a murine transgenic model of myeloid cell-specific loss of GPR84 (LysM-Cre; Gpr84 flox). Using flow cytometry to observe immune cell numbers during the early stages of wound-induced inflammation and immunostaining to compare parameters of repair during the ensuing phases of wound closure, significant defects were identified in the LysM-Cre; Gpr84 flox wounds.

These findings suggest that effective healing requires GPR84 signaling in myeloid cells, highlighting its potential as a therapeutic target for improving skin repair and addressing related conditions. Unraveling the complex interplay between medium-chain fatty acid signaling and skin physiology may provide insights that could lead to innovative interventions in dermatological health.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

The Role of Hydroxyprostaglandin Dehydrogenase in Contralateral Breast Cancer

Most treatments for breast cancer focus on unilateral tumors, although the incidence and mortality of contralateral breast cancer (CBC), especially in young women, is remarkable. CBC is defined as a second breast tumor in the unaffected breast from the original tumor. While incidence of unilateral breast cancer increases with age, paradoxically, CBC incidence rates among breast cancer patients younger than 35 years are 5 times higher than those for older patients. Major advances in breast cancer detection and treatment have significantly prolonged patient survival rates. However, breast cancer survivors still have a chance of developing CBC. CBC affects young patients disproportionately in terms of both incidence and mortality and is at a higher risk of development with hormone receptor-negative tumors, thus presenting a clinically unmet need. Little is known about what causes CBC development. Although some risk factors like family history and germline mutations have been linked to CBC, the molecular mechanisms for CBC tumorigenesis are not understood. Preliminary transcriptomic analysis has identified a set of lipid metabolic genes that are altered in the second unaffected breast from patients with unilateral breast tumors compared to healthy controls. Additionally, transcriptomic profiling of murine unaffected contralateral mammary fat pad, using preclinical tumor models, identified hydroxyprostaglandin dehydrogenase (Hpgd) as the top overexpressed gene. HPGD has been shown to affect cancer properties in other types of cancers. We hypothesize that the dysregulation of HPGD in the hormone receptor negative primary tumor leads to the promotion of CBC. Our preliminary results indicate that HPGD regulates human and murine triple negative breast cancer (TNBC) cell proliferation and self-renewal. Future studies will focus on screening additional murine cell lines to identify the effect of Hpgd on tumorigenesis. Additionally, Hpgd-overexpressing TNBC cells will be used in creating a syngeneic CBC mouse model. By investigating the underlying causes of this form of early-onset cancer, we will address the unmet clinical need and identify novel biomarkers for early detection and better screening for CBC in young breast cancer patients.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

The effects of HIV Nef protein-containing extracellular vesicles on glial survivability and proinflammatory cytokine production

HIV-Associated Neurocognitive Disorders (HAND) is a complex of nervous disorders that arise from HIV infection and affect up to half of all HIV patients despite utilization of antiretroviral therapy (ART). Although most cases are mild, affected patients experience significant declines in cognition, motor skills, and emotional regulation. Inflammation and cell death are major contributors to HAND pathogenesis. It is currently unknown why these hallmark signs of HAND persist in nervous tissue despite HIV suppression by ART, or how the causative viral molecules evade ART. We hypothesize that Nef, a critical HIV pathogenicity factor released in extracellular vesicles (EVs) from infected cells, puts microglia, the principal nervous immune cells that harbor HIV reservoirs in the brain, in a state of hyperreactivity through epigenetic modifications. This hyperreactive state, which has been previously observed in peripheral myeloid cells, is hypothesized to induce the increased and persistent production of inflammatory signals associated with HAND, causing brain damage.

We hypothesize that this phenomenon may be also observable in other glial cells, such as astrocytes and oligodendrocytes. Through exposure of glial cells to Nef-containing EVs, our preliminary data suggests that production of proinflammatory cytokines increases, and that the application of increased dosages of EVs correlates with a leveled increase in production of cytokines. This pattern is also observed when assessing the impact of Nef EVs on cell death; preliminary data shows that the application of dosages of EVs to glial cells corresponds with a leveled increase in cell death. This data suggests that the effects of EVs are dosage-dependent, and is instrumental for further studies of HIV-associated neuroinflammation.

This work was supported by the Harlan Foundation.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Effects of social buffering on sex differences in stress coping and avoidance behavior

Depression rates in the United States have reached an all-time high, with diagnoses increasing by nearly 10% since 2015 (Witters, 2023). Equally alarming is the persistent gender disparity in depression rates. Current literature highlights that women are twice as likely as men to be diagnosed with depression (Mayo Clinic, 2019). In light of this gender disparity, we examined the effects of social buffering—a form of social support during stress—on sex differences in stress coping and avoidance behavior. We used a six-day subchronic variable stress (SCVS) paradigm to assess stress coping in adult male and female C57Bl/6J mice. After SCVS, we assessed post-stress avoidance behavior with the elevated plus maze (EPM) and three-chamber social interaction test.

Each day of the SCVS paradigm featured an hour-long stressor: foot shock, tail suspension, and restraint. During tail suspension stress, we video-recorded how much time the mice struggled—an active coping strategy. We are currently analyzing the recorded behavior with DBScorer to calculate the time spent struggling (Nandi et al., 2021). 24 hours after the SCVS paradigm, we used Anymaze to video-record and analyze the behavior in the EPM and three-chamber social interaction test. We are currently calculating ratios of time spent in the open over closed arms to assess avoidance behavior, and time spent in the varying interaction zones to examine social interaction.

Most of our understanding of depression originates from studying male subjects. Generalizing data from male-exclusive social buffering experiments is difficult because females may react differently to stress (Hodes et al., 2015; LaPlant et al., 2009; Mudra Rakshasa & Tong, 2020). Analyzing sex differences in stress responses may offer insights into sex-specific stress responses, the role of social support during stress, and corresponding treatments for stress-linked disorders.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

The effect of saltwater intrusion on nutrient composition in salinized coastal farms

Sea-level rise is one of the biggest environmental threats of this century. In the Chesapeake Bay, the rate of sea level rise has increased from 2 mm per year in 1950 to around 5 mm per year today. Outside of issues like coastal erosion, flooding, and marsh migration, sea-level rise also contributes to saltwater intrusion, the process by which freshwater aquifers are contaminated by saline water. Crops decline in productivity when salt is found in water in a ratio greater than 2 parts per thousand. Because 22% of land within 100 meters of the Chesapeake Bay is agricultural, saltwater intrusion poses an increased threat to coastal farms in that region.

The purpose of this study is to investigate the effect of increased salinization stress on soil composition for four agricultural areas in the Delmarva Peninsula. Saltwater reaching agricultural fields by ditch networks creates a gradient by which soil is saltiest near the ditch and less salty further away from the ditch. To characterize the edge effects of saltwater intrusion on nutrient composition, I compared carbon and nitrogen percentages in plant and soil samples from these two sections.

Additionally, I evaluated differences in carbon and nitrogen percentage based on crop treatment. By comparing changes in nutrient composition based on plantings of *Spartina patens*, *Panicum virgatum*, *Panicum dichotomiflorum*, and *Digitaria sanguinalis*, I sought to evaluate the effects of plant treatment on the remediation of soil and plant composition.

This research shows the potential for ecological restoration of agricultural fields altered by saltwater intrusion and highlights the importance of proactive soil remediation in the face of sea-level rise.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Ecological Predictors of Macrofungal and Slime Mold Species Diversity in an Oak-Hickory Forest

Macrofungi (subkingdom Dikarya) and slime molds (infraphylum Mycetozoa) produce reproductive fruiting bodies that can be used for macroscopic species identification. Macrofungi assume diverse ecosystem roles as decomposers, parasites, and ectomycorrhizal endosymbionts with plants. Slime molds feed on microorganisms typically found on decaying matter and form fruiting bodies in response to environmental stress. Macrofungal and slime mold fruiting bodies can be quite ephemeral with some species persisting for mere hours. I sought to investigate macrofungal and slime mold species richness in a second-growth oak-hickory forest and determine how substrate diversity and precipitation influence fruiting body occurrence and community composition.

In 13 roughly biweekly surveys from 6/15/23-2/29/24, I surveyed the same site with a collaborator and logged observations of macrofungi and slime molds with their substrate type. Unknown species were photographed and identified out of the field. After identifying over 100 macrofungi species, I determined that the number of macrofungi species I expect to find at the site has yet to be reached whereas most slime mold species have already been observed. Most macrofungi observations occurred on dead hardwood substrate. There is an emerging positive correlation between precipitation the week prior and macrofungal species richness.

I plan to continue my survey to quantify the seasonal turnover in macrofungal and slime mold communities and to refine the lists of species through online identification groups, field guides, and DNA sequencing.

This work was supported by the Harlan Fellowship and a grant from the Mycological Association of Washington D.C.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Preliminary Lipid Results for a Subset of Participants in the 12-Month Cohort of the NIH Protocol of the Mediterranean-like Unprocessed (CLEAN-MED) Dietary Intervention in Healthy Adults

Objective: The primary aim of the CLEAN-MED study is to measure changes within the gut microbiome in healthy adults who transition from a Western diet to a Mediterranean-like unprocessed food (CLEAN-MED) diet. A secondary objective is to measure lipid biomarkers after diet transition to identify associations of lipid levels with the CLEAN-MED diet.

Methods: A sample size of eight healthy adults in the CLEAN-MED study 12-month cohort are shown. Inclusion criteria necessitated a low baseline Mediterranean diet (MedDiet) score assessed using a survey adapted from the Prevención con Dieta Mediterránea (PREDIMED)-17 and frequent consumption of ultra-processed foods (UPFs) using the NOVA system. Fasting blood samples were collected at baseline and monthly after beginning the intervention. Data shown focus on the baseline (before CLEAN-MED intervention) and month 3 post-intervention timepoints. Values are presented as means \pm standard error of the means.

Results: Study volunteers were recruited from September 2022 to present. Preliminary results from eight volunteers show a trend toward a reduction in total cholesterol after three months of the CLEAN-MED diet compared to baseline (183.9 ± 9.0 mg/dL vs. 200.8 ± 10.8 mg/dL). Average low-density lipoprotein (LDL) cholesterol decreased from 120.9 ± 8.8 mg/dL to 109.6 ± 6.7 mg/dL. The average triglyceride level measured at baseline was 80.4 ± 11.7 mg/dL compared to 73.9 ± 10.9 mg/dL after three months. Variation in individual response is evident with a range for cholesterol deviation from baseline of -47 to $+2$ mg/dL.

Conclusions: At this time, there are many studies exploring the association of the gut microbiome with diet. Few studies are capturing detailed ingredient lists from food logs which is being done in this study. This study will provide a more comprehensive understanding of the impacts of a healthy diet on the gut microbiome and host metabolism. It is important to note that variation in results between volunteers is expected due to multiple factors, including adherence to the Mediterranean criteria for the diet, adherence to the limitation of ultra-processed foods in the diet, and physical activity. Statistical analysis will be performed on the complete dataset from all 50 volunteers, when available. Also, all metadata will be included in the final analysis, but are not yet considered in this preliminary analysis.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Understanding Regional Differences of Genetic Variation in the *Eurytoma gigantea* Wasp

Reproductive isolation, geography, and genetic differentiation play important roles in the process of speciation. The goldenrod gall fly, *E. Solidaginis*, oviposits into the stem of 2 species of goldenrod, *S. gigantea* and *S. altissima*. The flies exhibit strong host preference creating a system of isolated reproduction.

Eurytoma gigantea is a parasitoid wasp of goldenrod gall fly larvae. The wasp oviposits into galls inhabited by goldenrod gall fly larvae. However, the the pattern of genetic variation and genetic differentiation in *Eurytoma gigantea* wasps is relatively unknown, as well as how that correlates to genetic patterns in the goldenrod gall fly and goldenrod itself. This contributes to our overall understanding of ecological interactions in speciation such as host shift and isolated mating. We sampled wasps throughout their range, particularly targeting four regions at the southeast, southwest, northeast, and northwest of their distribution. We extracted DNA from these samples, and then amplified a portion of the mitochondrial COI gene for Sanger sequencing.

This sequence data will be used to/analyzed in these ways to analyze for patterns of genetic variation and differentiation. We expect the find high levels of genetic similarity within each region.

This would support the hypothesis of isolated reproduction correlating with the geographical region and host species similar to that of goldenrod gall flies.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Wolbachia endosymbionts in *Drosophila* regulate the resistance to Zika virus infection in a sex dependent manner

Drosophila melanogaster, commonly known as the fruit fly, has been used thoroughly in scientific research for studying host innate antiviral immunity. This research has led to significant advances in the characterization of the molecular processes leading to the activation of innate immune responses against pathogenic microbes causing disease, including viral pathogens.

Recent studies have shown that the presence of *Wolbachia* endosymbionts in *Drosophila* confer resistance to infection by various RNA viruses and parasitoid wasps. Zika virus is an understudied vector-borne virus that has suddenly expanded its range due to the geographical distribution of the mosquito vector. Zika is a member of the Flaviviridae, a viral family that includes yellow fever and West Nile and is a significant threat to human health. Investigating the effect of Zika virus infection on the innate immune signaling and function of animal models will be informative because it could potentially lead to the identification of anti-Zika virus innate immune mechanisms in humans.

Here, I will describe the effect of *Wolbachia* on the survival ability of *Drosophila* adults following Zika virus infection and the impact on viral load and gene expression in female and male flies carrying and lacking the endosymbionts. An interesting challenge in innate immunity research is to understand the molecular basis and functional role of symbiotic microbes in host anti-pathogen defense.

This research uses an established model host to improve our interpretation of the complex interactions between eukaryotic hosts and symbiotic bacteria in the context of pathogenic infections.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Synthetic multivulva (SynMuv) genes and mes-4 antagonistically regulate the Intracellular Pathogen Response (IPR) in *Caenorhabditis elegans*

How do non-professional immune cells of the nematode *Caenorhabditis elegans* respond to natural intracellular pathogens? To answer this question, we are studying the Intracellular Pathogen Response (IPR) – a transcriptional response in *C. elegans*, that is activated by two molecularly distinct pathogens: Orsay virus and microsporidia *Nematocida parisii*. The IPR consists of 80 highly upregulated genes, including those encoding cullin-RING ubiquitin ligase components. Previous studies have shown that constitutive activation of the IPR protects against intracellular pathogens and improves proteostasis. Induction of the IPR also shares several similarities with the type-I interferon response in mammals. Through two independent forward genetic screens, we identified a member of the synthetic multivulva (SynMuv) family, *lin-15b*, as a negative regulator of the IPR. *lin-15b*, in conjunction with other SynMuv genes, are known regulators of development in *C. elegans*. Here, we found that loss of *lin-15b* causes constitutive expression of the fluorescent IPR reporter, upregulation of IPR genes, and resistance to *N. parisii* infection in the intestine. In a subsequent RNAi screen, we found that many other SynMuv genes, including components of DRM, NuRD, and SUMOylation complexes, control the IPR reporter expression.

Finally, we found that IPR upregulation in *lin-15b* mutants is dependent on histone methyltransferase *MES-4*, which is a critical regulator of chromatin remodeling in embryonic and germline tissues. Previous studies have demonstrated opposing functions of some SynMuv genes and *mes-4* in transcriptional regulation and chromatin remodeling during embryonic development.

Our study suggests that antagonism between SynMuv genes and *mes-4* is not restricted to embryonic development and that it plays an important role in regulating intestinal immune responses in *C. elegans*.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Characterization of HER2 expression and its effect on membrane morphology using genetically engineered mouse models of prostate cancer

Human epidermal growth factor receptor 2 (HER2/ERBB2) has been studied in breast cancer for its role in metastasis and recurrence and has served as a target for clinical and therapeutic treatment. However, HER2 overexpression in prostate cancer (PCa) is understudied. HER2 overexpression is associated with prostate cancer progression and a poorer prognosis, making it a possible target for new therapies. In HER2-positive breast cancer, HER2 overexpression has been associated with membrane deformities. However, it is not known whether similar deformation of the cell membranes occurs in HER2-expressing prostate cancers.

In this study, we characterized HER2 expression using genetically engineered mouse models of prostate cancer and organoid lines generated from these models. Prostate tissues were collected from three genetically engineered mouse models of prostate cancer as well as wild-type controls. Immunohistochemistry (IHC) staining was conducted to evaluate HER2 expression and membrane localization in prostate tissues and organoids. Using scanning electron microscopy (SEM), we then assessed the membrane morphology of cells grown as mouse prostate organoids.

Higher HER2 expression was detected in genetically-engineered mouse models resembling advanced prostate cancers. HER2 expression patterns were similar when cells were cultured as prostate organoids. Our findings suggest that genetically-engineered mouse models for prostate cancer and organoid cultures may be useful for further understanding HER2 function during prostate cancer progression.

This work was supported by NIH R00CA194287 and the PCF and Edward P. Evans Precision Oncology Center of Excellence at the DC VA Medical Center and GW Cancer Center.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Comparative Analysis of Sample Collection Methods for Assessing Annual Net Primary Productivity in Virginia Coast Reserve Tidal Marsh Ecosystems

Salt marsh ecosystems play a crucial role in global carbon sequestration and provide valuable ecological services. However, like for many habitats, climate change introduces stressors that can impact the composition and health of these marsh ecosystems. Variation in elevation, flooding, and salinity creates identifiable zones within salt marshes, and sea-level rise can alter these factors and lead to loss of habitat, landward migration, and overall shifts in vegetation.

Starting in 1999, researchers began collecting end-of-year biomass data from salt marsh 21 sites along the Virginia Coast Reserve to monitor and evaluate how sea-level rise affects marsh evolution and ecosystem state change. In 2021, after 21 years of sampling and collection at these sites, a new method for data collection was developed and employed alongside the old method for collecting biomass samples.

This research compares two datasets of salt marsh annual net primary productivity, from three sites within the Virginia Coast Reserve. The goal of this study is to determine if the new collection method can be integrated moving forward.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Regional heterogeneity in the developmental maturation of thalamic reticular nucleus neurons

The thalamic reticular nucleus (TRN) provides the bulk of the inhibition to thalamocortical relay neurons in thalamus. The TRN plays a critical role in the generation of sleep spindles and other oscillatory brain activity, as well as the regulation of sensory attention and cognition.

Adult TRN neurons all express parvalbumin (PV)—a calcium binding protein that contributes to the bursting properties of TRN cells—and perineuronal nets (PNNs)—an extracellular matrix associated with the opening and closing of critical periods. How this expression is regulated during development and how it relates to function in thalamocortex is poorly understood.

We examined the expression of PV and PNNs in visual and somatosensory TRN, two systems known to differ in the timing of their development. We quantified the number of neurons expressing PV and the normalized intensity of this staining on postnatal day (P)4, 9, and 15 using combined immunohistochemistry for PV and NeuroTrace in both visual (v)TRN and somatosensory (s)TRN. We find that at every age more neurons expressed PV in sTRN than vTRN, that in both regions the proportion of PV expressing neurons increased between P4 and P9 but was stable thereafter (sTRN: $56.9\% \pm 7.6\%$, $n=4$ for P4; $98.8\% \pm 0.4\%$, $n=6$ for P9; $94.4\% \pm 1.2\%$, $n=6$ for P15; vTRN: $12.3\% \pm 4.6\%$, $n=4$ for P4; $85.1\% \pm 8.9\%$, $n=6$ for P9; $87.6\% \pm 1.9\%$, $n=6$ for P15). The mean intensity of PV staining was more dynamic, increasing dramatically between P4 and P9 and again by P15 in vTRN but was relatively stable in sTRN (sTRN: 0.30 ± 0.04 , $n=4$ for P4; 0.43 ± 0.01 , $n=6$ for P9; 0.46 ± 0.02 , $n=6$ for P15; vTRN: 0.10 ± 0.01 , $n=4$ for P4; 0.16 ± 0.01 , $n=6$ for P9; 0.25 ± 0.02 , $n=6$ for P15). Qualitative evaluation of the developmental expression of PNNs suggest they follow PV maturation in both regions, with the sTRN first showing expression at P11 which increased at P14, and the vTRN first showing expression at P14 which increased at P21. Viral mediated tract tracing using conditional expression of EGFP in PV neurons reveals that dense axonal projections of the vTRN to the lateral geniculate nucleus and sTRN to the ventral posteromedial nucleus are robust even before full expression of PV.

In summary we find that while TRN neurons, unlike cortical interneurons, express PV early in development, developmental upregulation of PV and accumulation of PNNs likely reflects and may influence maturation of activity in thalamus and cortex.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Deletion of Negative Elongation Factor B in epithelial stem cells accelerates mouse skin wound healing

Effective wound healing depends on a careful sequence of events where inflammation plays a pivotal role in initiating the process of tissue repair. Inflammation facilitates the activation of keratinocytes, which are the most abundant cell type in the epidermis. Following wounding, keratinocytes promptly coordinate changes in gene expression to progress healing from the inflammation to the proliferation phase by promoting re-epithelialization.

These changes in gene expression are regulated by various factors such as the promoter-proximal pausing of RNA Polymerase II (RNA Pol II) by the Negative Elongator Factor (NELF) complex.

Our study investigates how the NELF complex and RNA Pol II pausing contribute to changes in gene expression in keratinocytes during wound healing. To disrupt the NELF complex in our mouse model, we induce a *Nelfb* conditional knockout in keratinocytes.

Through immunofluorescence, we observed greater rates of re-epithelialization and angiogenesis in the *Nelfb* knockout mice. Additionally, flow cytometry analysis of the myeloid leukocyte populations indicated increased anti-inflammatory macrophage populations at early time points post-wounding in the *Nelfb* knockout mice.

Our findings suggest that the NELF complex is crucial in regulating keratinocyte function during inflammation and promoting skin wound healing.

This work was supported in part by the W.M. Keck Foundation (ECNS91477N). Some images were created in BioRender.com

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Unraveling the effect of geography and host plant on the Genetic Differentiation of an inquiline beetle associated with a Gall-Forming Insect

Exploring the intricate relationships within plant-insect networks is pivotal for understanding evolutionary processes and ecosystem dynamics.

In this research project, I will focus specifically on the relationship across trophic levels, including host plant *Solidago* (goldenrod), gall forming fly *Eursota Solidaginis* and its associated natural enemy parasitoids, including inquiline *Mordellistena convicta* (beetles), two parasitoid wasps *Eurytoma gigantea* and *Eurytoma obtusiventris*.

My research focus on the beetles, where I delved into unraveling the complexities of speciation of beetles within a community of gall-forming insects across different geographic locations. The genetic structure of beetles associated with goldenrod galls is expected to exhibit significant differentiation across geographic locations, reflecting the adaptation to localized host plant variations and ecological conditions.

The process involved DNA extraction from beetles collected across various locations, followed by gel electrophoresis to verify successful DNA extraction. Subsequent PCR amplification targets the COI gene, a crucial mitochondrial gene for cellular respiration, aiming to amplify this specific genetic region. The PCR products will then be sent to a sequencing company for obtaining accurate DNA sequences. This methodical approach aimed not only to map out the genetic landscape of these parasitoids in relation to their host plants but also to provide insights into the evolutionary pressures and mechanisms that drive speciation within this intricate ecological web.

Through this study, I aim to contribute to the broader understanding of how ecological and genetic factors interplay to influence speciation and biodiversity within insect communities that share a common host plant species.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Disentanglement of thermal and mechanical stimuli with an infrared laser in *C. elegans*

Caenorhabditis elegans nematodes have been studied as a model organism for many reasons such as their simple anatomy and nervous system which make them applicable to higher complexity organisms. The present study is concerned with *C. elegans* escape response to noxious thermal stimuli, the pathways of which have been far less studied than other sensory systems and are hard to measure due to difficulty isolating thermal stimuli. Certain mutant strains of *C. elegans* such as *Tax2* and *Tax4* are known to have thermal sensory defects and can be used to identify when only thermal stimuli is being applied or if a confounding stimuli is being applied. A foundational goal of this research is to isolate thermal stimuli from mechanical stimuli when utilizing an infrared laser to measure escape responses in *C. elegans*.

Utilizing these mutant strains, a behavioral assay was created in which *C. elegans* was repeatedly illuminated with an infrared laser for systematically increasing times and intensities. This assay was performed on Day 1 adult (D1) stage wild type and known thermally defective nematodes, such as PR678, measuring the strength of the escape response after each illumination. Our results showed that the intensity and length of illumination was critical to disentangle the mechanical and thermal response in wild-type and PR678 nematodes.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Unveiling the Role of Enteric Glia: Insights into Intestinal Health

Enteric glia are vital components of the enteric nervous system (ENS), maintaining gut homeostasis and regulating physiological processes. Despite residing in the periphery, enteric glia share fundamental characteristics with their counterparts in the central nervous system (CNS), particularly astrocytes expressing glial fibrillary acidic protein (GFAP). Despite their distinct anatomical locations, the functional parallels between GFAP-positive glia in the ENS and astrocytes in the CNS underscore their importance in orchestrating neural function and maintaining tissue homeostasis. Both ENS and CNS glia serve as crucial support cells, providing structural, metabolic, and trophic support to neurons.

In the present study, we investigate the role of the *Arid4b* gene, a component of the SIN3A transcriptional corepressor complex, in regulating GFAP-positive cells in the gut. Using a GFAP-Cre *Arid4b* knockout mouse model, we explore cellular and tissue-level changes caused by *Arid4b* knockout in enteric glia to uncover novel insights into *Arid4b*'s role in GFAP-positive glia within the ENS microenvironment.

Our findings demonstrate a potential variance in the goblet cell population between GFAP-cre *Arid4b* WT and KO gut tissue. Goblet cells form a protective barrier on the intestinal epithelium, and changes in goblet cell density may indicate alterations in mucosal protection and barrier function. Additionally, we have found evidence of a higher density of Iba1-positive cells in GFAP-cre *Arid4b* WT gut compared to KO gut, as well as a possible increase in microglia cell size in the KO tissue, suggesting activated microglia Iba1-positive microglia cells are crucial for gut immune surveillance and response. Lastly, our data also suggests a reduction in overall microvilli width between GFAP-cre *Arid4b* WT and KO gut tissue. Microvilli play a critical role in nutrient absorption and barrier function, and changes in their morphology may indicate disruptions in epithelial integrity and nutrient absorption capacity.

By investigating these endpoints, we will define the intricate relationship between glial function, *Arid4b* gene regulation, and intestinal health. This research will provide valuable insights into potential therapeutic targets for gastrointestinal disorders.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Stenotrophomonas indicatrix promotes innate immune response against intracellular pathogens in *Caenorhabditis elegans*

How do changes in intestinal microbiome affect innate immunity in *Caenorhabditis elegans*? To answer this question, we are studying the Intracellular Pathogen Response (IPR), which is a robust transcriptional response that protects *C. elegans* against obligate intracellular pathogens such as the Orsay virus and fungus *Nematocida parisii*.

The IPR is activated upon infection and involves the upregulation of about 80 genes, some of which encode Cullin-RING ubiquitin ligase components. In this study, we performed a screen using different bacterial species isolated from the natural habitats of *C. elegans* and tested if any of them could induce the IPR in the absence of infection.

We found that *Stenotrophomonas indicatrix* (JUb19) significantly enhanced the expression of the IPR reporter, *pals-5p::GFP*, when compared to the standard bacterial food source *Escherichia coli* (OP50). Our data indicate that the presence of alive JUb19 is necessary for IPR induction, as heat inactivation of bacteria suppressed the phenotype. Following JUb19 treatment, the expression of *pals-5p::GFP* reporter was observed in many tissues including the intestine, epidermis, and neurons, as well as several tissues where it had not been reported before – coelomocytes and somatic gonad.

Our findings suggest that JUb19 treatment leads to a developmental delay which is a phenotype that has been previously associated with constitutive IPR activation. Animals fed with JUb19 also displayed lower infection levels than OP50-fed animals, indicating that JUb19 protects against intracellular pathogens. In summary, our findings establish JUb19 as the first bacterial species that can induce the IPR in *C. elegans*.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

Investigating the Origin of Prostate Macrophages through Genetic Lineage Tracing

The prostate immune microenvironment is highly heterogeneous, containing several distinct populations of cells performing different roles in prostate organogenesis and the promotion or resolution of different prostatic diseases. Published single-cell RNA sequencing data show that macrophages constitute a large portion of immune cells in the prostate. Under disease conditions, different subsets of macrophages can either promote or resolve inflammation, causing tissue damage or aiding in tissue repair.

Previously, it was believed that tissue-resident macrophages were maintained and repopulated by blood-circulating monocytes derived from progenitors in adult bone marrow (BM). More recent studies have revealed that several tissue-resident macrophage populations arise from embryonic precursors in the yolk sac (YS) or fetal liver (FL) prior to birth and continue to maintain themselves throughout adulthood independent from BM-derived precursors.

We hypothesized that distinct populations of macrophages in the mouse prostate arise from embryonic origins and continue to contribute to the heterogeneous cellular landscape throughout prostate development and disease progression. To identify yolk-sac derived macrophages in the mouse prostate, we genetically labeled embryonic macrophages using a yellow fluorescent protein (YFP) reporter in Cx3cr1CreERT2/+; R26REY/+ mice. Prostate tissues containing lineage-labeled cells were then collected during different stages of organ development to assess their presence and localization in the prostate from a prepubescent stage through adulthood.

Through immunohistochemical and immunofluorescence staining for YFP, macrophage marker F4/80 and proliferation marker Ki-67, we show that within the mouse prostate there exist distinct populations of macrophages which originate from embryonic precursors. Further, these cells proliferate locally within the prostate and persist in the tissue after puberty.

This data indicates a tissue-specific role of embryonic macrophages in regulating prostate organogenesis, separate from populations derived from BM. Applying this lineage-tracing method to models of prostatic diseases will further expand on the involvement of embryonically derived macrophages in their pathogenesis.

This research was funded by GW SPARC and the CCAS STEM Summer Internship to PW as well as the following grants: NIH R01DK134311, R00CA194287, S10OD032420.

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CCAS RESEARCH SHOWCASE

BIOLOGICAL SCIENCES

The *Drosophila melanogaster* microbiome is modified by parasitic nematode infection

The gut microbiome is found in the gastrointestinal system and provides its host with health advantages, particularly by controlling immunological homeostasis. The fruit fly *Drosophila melanogaster* is a vital model for studying the microbiome due to the availability of genetic resources and procedures. To understand the importance of microbial composition in shaping immune modulation, it is imperative to investigate the functional role of the microbiota through parasitic infection.

To achieve this, we use entomopathogenic nematodes (EPN) of the genus *Steinernema* which exhibit remarkable ability to swiftly and efficiently infect a diverse array of insect species, facilitated by the mutualistic bacteria found within their gut. *Steinernema carpocapsae* forms an obligate mutualistic association with the Gram-negative bacteria *Xenorhabdus nematophila*, which is an excellent model to study pathogen infection processes and host anti-nematode and antibacterial immune responses. *Steinernema hermaphroditum* harbors the mutualistic bacteria *Xenorhabdus griffiniae* and this nematode produces hermaphrodites in the first generation and males and females in the second generation.

This study aims to examine the microbiome changes in *D. melanogaster* larvae in response to *S. carpocapsae* and *S. hermaphroditum* nematode infection. For this, *D. melanogaster* late second to early third instar Oregon-R larvae were exposed separately to *S. carpocapsae* TT01 and *S. hermaphroditum* CS34 in 96 well plates using our standard EPN infection assay. We have found that *S. carpocapsae* infective juveniles are more pathogenic to *D. melanogaster* larvae compared to the closely related *S. hermaphroditum*. Our preliminary analysis also indicates substantial changes in the size and composition of the *D. melanogaster* larval microbiome during infection with EPN nematodes compared to the uninfected controls.

The obtained results serve as a foundation for succeeding studies to elucidate the EPN-specific effector molecules that alter the *D. melanogaster* microbiome and understand the role of the microbiome in regulating insect anti-nematode immune processes.

This work was supported by a National Science Foundation grant (IOS 2019869) and a GWU Facilitating Fund Award.

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Synthesis of a lanthanide fluoroterephthalate metal organic framework for use in radionuclide detection

Metal organic frameworks (MOFs) are versatile porous materials comprised of a metal bound to one or more organic linkers. MOFs carry out numerous important functions, most notably gas storage, waste removal, and chemical detection. With an interest in nuclear forensics, we sought to synthesize a MOF that could detect the presence of radioisotopes via scintillation.

To maximize the porosity and optical properties of our compounds, lanthanide metal centers were used along with a dual-ligand approach. Presented herein is a series of isostructural MOFs, $[\text{Ln}_2(\text{TFTA})_3(2,2'\text{-bpy})_2(\text{H}_2\text{O})_2]$ ($\text{Ln} = \text{Sm-Er}$), consisting of lanthanide metal cations bound to tetrafluoroterephthalate linkers and 2,2'-bipyridine capping ligands. Both single-crystal and powder X-ray diffraction analyses were used in the initial characterization of these compounds to confirm the structure and purity of our materials.

Future efforts will consist of adsorption isotherm analysis of our compounds to assess porosity, luminescence spectra to assess optical signatures, and thermogravimetric analysis to ascertain thermal data.

This work was supported by funding from the National Nuclear Security Administration.

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Determining Solution-State Conformation of Peptidomimetic Macrocycles for Targeting Protein-Protein Interactions

Protein-protein interactions (PPIs) are therapeutically interesting targets due to their ubiquity in disease and important biological regulatory systems. Many PPIs occur along extensive, broad, solvent-exposed protein surfaces that make targeting with small molecule ligands difficult. Macrocyclic compounds are promising candidates for PPI inhibitors due to their large surface area and precisely displayed functional groups. Ring strain, steric strain, and transannular noncovalent interactions propagate along the macrocyclic backbone such that small alterations in chemical structure can have significant effects on conformation, and thus molecular function.

As a result, we seek to control conformation for the rational design of macrocyclic protein ligands. In this work, we investigate the solution-state conformation of a peptidomimetic macrocycle through a free energy perturbation (FEP) simulation. We synthesized a series of oligomers comprised of alpha amino acids and 2,4-dialkoxy-meta-aminomethylbenzoic acid (MAMBA) using solid-phase peptide synthesis methods. These oligomers were subsequently cyclized to form peptidomimetic macrocycles. Microcrystal electron diffraction (MicroED) was used to assess the solid-state structure. Variable temperature (VT) and two-dimensional nuclear magnetic resonance techniques were then used to determine the strength of intramolecular hydrogen bonds. Structural information obtained from MicroED and VT NMR studies was used as a template to guide FEP calculations.

By perturbing the flexible alpha amino acid backbone of the macrocycle, a variety of possible low-energy solution-state conformers were sampled. Through FEP calculations, we have found a number of low-energy conformers. We are currently determining if they match NMR solution-state data. Future studies on solution-state conformation combined with protein-binding studies will guide the rational design of effective PPI inhibitors.

This work was supported by a Luther Rice Undergraduate Research Fellowship.

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Developing a Gas Chromatography-Mass Spectrometry-Selected Ion Monitoring (GC-MS-SIM) Method to Analyze Adulterated Nitazene Samples

With the continued surge in novel psychoactive substances in casework, drug analysis has become increasingly challenging. Benzimidazole opioids (nitazenes) are one such novel class that has recently appeared in the illicit drug supply. State forensic laboratories will commonly find seized drug samples containing nitazenes at low concentrations due to their high potency. Additionally, these samples are likely to be highly adulterated since these laboratories receive samples further down in the illicit drug pipeline. Current GC-MS scan methods face challenges in correctly detecting nitazenes, as they may not be sensitive enough to fully identify nitazene presence, or which analog it is.

To mitigate this difficulty, we investigated and optimized a targeted selected ion monitoring (SIM) method that is highly adaptable and allows forensic scientists to stay ahead of the changing drug landscape. Our study provides a method and framework for a targeted GC-MS method to separate up to twelve different benzimidazole compounds in anticipated combinations with potentially interfering controlled substances and adulterants.

This method has been tested using highly adulterated mixtures. We determined optimal method parameters for the temperature ramping program and the SIM program. Results include a full separation of all twelve nitazene analogs with baseline resolution, and demonstrable increased sensitivity and shorter analysis time when compared to an untargeted method. The method shows demonstrated selectivity of nitazene analogs when adulterated mixtures are tested, identifying the analog within two standard deviations of the retention time. The targeted gas chromatography-mass spectrometry (GC-MS) method can be implemented in other laboratories and extended to include more nitazene analogs through the proposed general framework in this study. Long-term implementation of this method in other labs would be beneficial as we prepare for a possible surge of adulterated nitazenes in the illicit drug supply, as this class of drugs is a more potent alternative to fentanyl that is cheaper to produce. Rather than being reactive, following the framework to implement this method prior to nitazenes overtaking the bulk of what forensic chemists analyze is imperative to prepare labs for a possible surge in nitazene cases.

The adaptability of this method through the framework of implementation provides a unique way for labs to remain prepared for the emerging drug trends.

This work was supported by the Madeleine Reines Jacobs Fellowship.

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Bifacially Functionalized Arylamide Scaffolds to Mimic Protein Interactions

The majority of proteins in the human body participate in protein-protein interactions (PPIs), which occur over large surface areas of the proteins involved, making PPIs difficult to target with small-molecule drugs.

Foldamers, sequence-specific oligomers that adopt three-dimensional conformations, are one class of molecules used to target PPIs. 2,4-dialkoxy-*meta*-aminomethylbenzoic acid (MAMBA) has been oligomerized to make foldamers that contain a rigid structure due to bifurcated hydrogen bonds between its amide and alkoxy groups while its *sp*₃-hybridized benzylic carbon adds flexibility.

However, the alkoxy groups on MAMBA are present on the same side of the aromatic ring, yielding an oligomer with only one “face” that can be functionalized. Bifacial MAMBA-based monomers, on the other hand, have alkoxy groups on different sides of the MAMBA ring, giving way to a foldamer with two unique faces of functional sites.

We designed 2,6-dialkoxy-*meta*-aminomethylbenzoic acid (2,6-MAMBA) and synthesized it through a series of solution-phase, gram-scale reactions with over 50% yield, followed by nuclear magnetic resonance (NMR) characterization. During the second step of the synthesis, the methoxy group at position 2 in the benzene ring was de-methylated, a serendipitous occurrence that makes asymmetric functionalization possible. The final synthesis step is the protection of the C-terminal with a fluorenylmethyloxycarbonyl-protecting group, allowing for linear oligomers of 2,6-MAMBA to be made using solid-phase peptide synthesis and characterized using NMR.

Through bifacial functionalization, we anticipate that we can design foldamers to mimic a greater range of PPIs.

This work was supported by a Luther Rice Fellowship.

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Conformation Defined Cyclic Oligoamides for Water Solubility

Medicinal chemists have long utilized small molecules to target hydrophobic pockets within disease-associated proteins. While effective, this strategy faces limitations as a majority of the human proteome lacks such pockets, restricting the extent of the “druggable” proteome. Thus, there is a need to design molecules that can interact with broader and flatter protein surfaces.

Here we present cyclic oligoamides that have been designed to be conformationally-restricted and to afford control of the display of functional groups, which are important factors in designing macrocycles to target flat protein surfaces. We introduce a library of macrocyclic compounds with the structure $\text{cyc}(\text{Mmb-Xaa-Xaa-Mmb-Xaa-Xaa})$, where Mmb is a dipeptide mimetic, 2,4-dialkoxy-*meta*-aminomethylbenzoic acid, and Xaa is an α -amino acid. Via Nuclear Magnetic Resonance (NMR) and Circular Dichroism (CD) spectroscopy techniques, we show that stereosequence, the pattern of stereocenters embedded in the backbone of the macrocyclic scaffold, controls the macrocycle conformation in solution.

By comparing macrocycles containing different amino acid side chains, we demonstrate that stereosequence determines conformation more so than side chain identity. As water solubility is a key factor in bioavailability, we investigated the solubility properties of macrocycles with charged side chains. Bearing positively-charged lysine side chains, $\text{cyc}(\text{Mmb-Lys-Ala-Mmb-Lys-Ala})$ was found to have water solubility via NMR and CD. The ability to control water-solubility of the $\text{cyc}(\text{Mmb-Xaa-Xaa-Mmb-Xaa-Xaa})$ scaffold with charged residues is a crucial step towards its bioavailability, functionalization, and its use to target recalcitrant protein surfaces.

This work was supported by a Robert Vincent Fellowship.

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Synthesis and spectroscopic characterization of photoactive lanthanide complexes with 1,10-phenanthroline

We report the synthesis and spectroscopic characterization of thirteen novel lanthanide compounds featuring mono-, di- or tricarboxylate ligands and 1,10-phenanthroline (phen). The coordination polymers Tb(phen)(1,2,3-BTCA) (3, H₃-1,2,3-BTCA = benzene-1,2,3-tricarboxylic acid), Gd(phen)(H-IPA)(IPA) (4), and [Gd₂(phen)(PA)₃] (5, H-PA = phthalic acid) form 1-D chains. Dy(phen)(H-IPA)(IPA) (1, H₂IPA = isophthalic acid) and Pr(phen)(NO₃)(Adipate) (2) form 2-D sheets. Pr₂(phen)(IPA)₃ (6) and the isostructural Ln₂(phen)(C₂O₄)₃ Ln₃₊ = Lu₃₊ (7), Ho₃₊ (8), Er₃₊ (9)) are 3-D coordination polymers. π-π stacking is seen among the aromatic ligands, and hydrogen bonding is seen at protonated carboxylates. [Gd(phen)(BA)₂(NO₃)₂] (10, H-BA = benzoic acid) and [Gd(phen)(p-tol)₃]₂ (11, H-p-tol = *p*-toluic acid) form dimeric units. [Ln(H-Chel)₃] phen xH₂O [Ln₃₊ = Dy₃₊ (12) and Er₃₊ (13), H₃Chel = chelidamic acid] feature the dianionic chelidamate ligand coordinated to a monomeric Ln₃₊ center with a phen in the lattice. π-π stacking is featured between the lattice phen ligands.

We present the solid-state UV-Vis absorption and luminescence of 1-13. We find that emission intensity steadily decreases upon irradiation with UV light, and UV-vis absorption measurements show increasing intensity at wavelengths of emission. This is attributed to photoinduced ligand-to-ligand electron transfer resulting in radical stabilization by the phen. This mechanism has been established as the cause of such properties of metal complexes with similar ligands. This radical-induced photoactivity has also been shown to affect lanthanide magnetism and non-linear optical properties.

This work was supported by a Luther Rice Fellowship.

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Halogen Bonding in Uranyl Halides and Pseudohalides: A Structural and Spectroscopic Study

Understanding interactions between the uranyl cation, $(\text{UO}_2)^{2+}$, and other environmentally relevant species such as halogens is necessary for nuclear waste stewardship. Owing to complex solution-phase speciation, our group studies these interactions in solid-state materials. In this context, the assembly of crystalline uranyl-organic hybrid materials, as directed by various non-covalent interactions (NCIs), is a topic of interest.

In systems with multiple NCIs such as hydrogen bonding (HB), halogen bonding (XB), and halogen-oxo_y interactions (XO_y), hydrogen bonding usually dominates, influencing crystal assembly and bulk properties. For this reason, there is limited research on 'purely' XB and XO interactions, as they play secondary roles in supramolecular assembly.

In this project, we aim to disrupt HB and selectively promote XB and XO_y interactions in a series of uranyl chloride-, bromide-, and isothiocyanate-based hybrid materials by employing 4-halo-N-alkylpyridinium cations, wherein the halogen is varied from the least polarizable fluorine to the most polarizable iodine.

The structures, assembly patterns, and the existence of NCIs in the resulting crystalline materials are determined using X-ray diffraction. Specifically, halogen and pseudohalogen bonding, and XO_y interactions are expected to influence properties such as the U=O bond character, and the electronic structure of the assembly, which will be experimentally explored through a combination of experiment (photoluminescence, Raman, and infrared spectroscopies) and computation (density functional theory). The strength of XB and XO_y interactions, as determined by these methods, will be compared to existing systems where HB is the primary NCI."

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CCAS RESEARCH SHOWCASE

CHEMISTRY

Studying how neuronal proteins turnover using mass spectrometry

Protein turnover describes the dynamic network of pathways that regulate protein synthesis and degradation. Dysfunction in protein turnover can cause an accumulation of protein waste and is implicated in a wide range of diseases.

For neurons, maintaining protein turnover is especially crucial. As post-mitotic cells, neurons cannot undergo cell division and cannot use cell division to dispose of accumulated waste. Induced pluripotent stem cells (iPSC), which are stem cells reprogrammed from skin cells, have allowed neurons to be studied while capturing crucial developmental characteristics.

Using iPSCs, we employed a technique called dynamic Stable Isotope Labeling by Amino-acids in Cell Culture (dSILAC) to study protein turnover. In dSILAC, we introduce “heavy” isotopically labeled amino acids into a “light”, unlabeled cell culture. The amount of “heavy” and “light” amino acids is distinguished using Liquid Chromatography-Mass Spectrometry (LC-MS). Turnover is calculated by monitoring the decay of the light labeled peptides.

BrainPhys™ cell culture media is optimized for simulating neurophysiological conditions, however, a SILAC compatible form is not commercially available.

In this study, we made a homemade, SILAC compatible version of the BrainPhys™ cell culture media and conducted a comparative proteomics study against other traditional cell culture media. Our findings report the improved maturity of complex neuron interactions cultured in BrainPhys™ and validates our platform as a representative model to study protein turnover in neurons.

This work was supported by a Luther Rice Fellowship.

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CCAS RESEARCH SHOWCASE

CORCORAN SCHOOL OF THE ARTS & DESIGN: INTERIOR ARCHITECTURE AND DESIGN

Dim the Lights, Cue the Music: An Analysis of the Lighting and Acoustical Qualities Found in "Lady and the Tramp"

Animated movies must employ lighting and acoustical qualities in a deliberate manner in order to enhance the mood that the director intends. As a result, these movies serve as an excellent basis for an analysis of lighting and acoustic terminology and concepts. This analysis uses the lens of the 1955 Disney production "Lady and the Tramp" because of the vintage age of the film, as well as the breadth of environments found throughout the movie. The following terms serve as the basis of our analysis: Correlated Color Temperature (CCT), Color Rendering Index (CRI), Richard Kelly's elements of light, Coefficient of Absorption (CoA), decibel levels, Sound Transmission Class (STC) and Sound Mapping.

Lighting and acoustic terminology can often be dense and less glamorous to apply, however implementing these concepts to "Lady and the Tramp" offers new focus to a movie that is usually known for its scene of two dogs enjoying a romantic bowl of pasta in a back alley. This led to questioning: Is it the shared pasta that created the romantic ambiance, or was it the single lit candle and indirect lighting that created that mood? This inquiry lies among a host of other questions that guided us through our analysis of the lighting and acoustic qualities found in the movie, and how the director employed these concepts in order to enhance the atmosphere of the scenes.

This analysis provided a foundation for understanding the combined effects of light and sound in selected scenes. More specifically, this research illuminated how we can successfully incorporate these techniques into the design of interior environments in studio class projects and real world applications. Healthy and active interiors no longer consist of lights that are simply turned on or off, nor do they consist of static sound-masking. They are enhanced by changing light levels with color and sound-masking levels that fluctuate with space usage and occupancy. Through this analysis, we confirmed that "an environment makes the sound," as well as powerful lighting findings relating to the creation of dramatic shadows, the use of light temperature, and lastly, how light can be used as a wayfinding technique.

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CCAS RESEARCH SHOWCASE

CORCORAN SCHOOL OF THE ARTS & DESIGN: MUSIC

Born to Run (for President): The Creation of Barack Obama's Presidential Identity Through Bruce Springsteen's Musical Catalog

Music has played a long-standing role in American presidential campaigns since the mid-19th century. Small songbooks (songsters) filled with music set to the tune of already familiar melodies were published for voters to use at campaign rallies or on street corners to attract undecided voters. The tradition of parodying songs for political campaigns continued into the 20th century, allowing candidates to have catchy jingles that left their names echoing in voter's minds.

In the late twentieth and early twenty-first centuries, however, the soundscape of presidential campaigns began to rely more on pre-existing popular music than tailor-made jingles as they did in the past. In her 2016 article "Keepin' it Real (Respectable)...", musicologist Dana Gorzelany-Mostak of Trax on the Trail, a database that tracks the use of music in presidential campaigns, analyzes Obama's engagement with different artists, ranging from Beyonce to Stevie Wonder, to prove his credibility as a candidate with Black voters. This research builds from that by examining Obama's substantial engagement with the genre of rock, through public playlists, campaign music, and direct partnerships with musicians, specifically Bruce Springsteen.

Rock and Springsteen, as I will demonstrate, allowed Obama to simultaneously appeal to a different demographic while forming a sense of presidential identity based on the preconceived notions of who a president was. My project will test this hypothesis by analyzing Obama's engagement with Springsteen beginning with his 2008 campaign and continuing through to the present day as he seeks to secure his historical legacy as the nation's first Black president.

To support this, I analyze the use of Springsteen's music on the campaign trail, Springsteen's personal engagement with the campaign, and consider the electoral gain the Obama campaign had by interacting with Springsteen on the trail.

This paper argues that Barack Obama's relationship with Bruce Springsteen on the campaign trail provided him with proximity to white masculinity, responding to nativist attacks against him and contributing to the formation of his presidential identity.

This work was supported by the Luther Rice Fellowship.

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CCAS RESEARCH SHOWCASE

EAST ASIAN LANGUAGE & LITERATURES

Writing the Revolution: Literature and Communism in Mao's China and the German Democratic Republic

The creation of a “literary society” (Literaturgesellschaft) was one of the foremost cultural policies of both Maoist-era China and the German Democratic Republic (East Germany). Emerging at roughly contemporaneous times in areas that had, until recently, been hostile ground to the Communist ideology, both the Chinese Communist Party (中国共产党: zhōngguó gòngchǎndǎng) and the East German Socialist Unity Party (Sozialistische Einheitspartei Deutschlands) sought to utilize literature as a means of inculcating a new Communist identity among their citizenry, discrediting the regimes they had displaced, providing justification for their radical politico-economic policies, as well as to give form to the new futures they envisioned for their respective states.

As such, an examination of the literary canons of these two states can reveal vital information concerning the formation, solidification, and even collapse of the twentieth-century Communist experiment.

This study employs the form of a literary historiography, tracing key developments in literary policy under both regimes during the period from 1949-1990, while exploring and analyzing the crucial representative works from both countries across these four decades to see how they upheld, reinforced, and occasionally challenged state prescriptions for literature.

Ultimately, this analysis reveals that while, for both regimes, literature served as key means of ideological promulgation, its eventual divergence from the strict confines of regime literary policy, helped bring about the ends of the respective systems—in one case through a shift away from the system's most radical ideological elements (post-Mao China), and in the other through the regime's complete collapse (East Germany).

This study also adds a new dimension to the already substantial body of cross-cultural literary studies for twentieth-century Communist regimes by adopting the novel position of analyzing Chinese and East German literature not in isolation to their respective societies, but against one another, and provides a new angle for understanding the twentieth-century Communist experiment.

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CCAS RESEARCH SHOWCASE

ECONOMICS

The Structure of Social Networks: Characterizing the Relationship between Income Segregation and Cross-Class Social Connectedness across U.S. Cities

This paper explores the relationship between income segregation and cross-class social connectedness within U.S. cities, with valuable insights for upward mobility.

Building on recent research by Harvard Economist Raj Chetty and others, which highlighted the significant impact of social networks on economic outcomes, this study delves into the role of income segregation in shaping the structure of social networks. The central question addressed is whether the geographic proximity of individuals across income levels influences their likelihood of forming friendships.

The theoretical framework considers both "friending bias," preference for friends of the same social class, and the alternative hypothesis that access to individuals from different socioeconomic backgrounds may drive social connections. The hypothesis posits that cities characterized by high income segregation exhibit lower cross-class social connectedness. To test this hypothesis, the study utilizes the Social Connectedness Index dataset from Meta to measure social connectedness between zip codes in each city, as well as data on median household incomes and geographic distance at the zip code level.

The empirical model employs a Network Formation Model, conducting fixed effects logistic regressions on zip-code pairs, to quantify income segregation and cross-class social connectedness. Analyzing data from 190 U.S. cities, the results demonstrate a systematic relationship between increased income segregation and decreased cross-class social connectedness. Access to individuals of different income levels emerges as a key factor, suggesting that cities fostering greater geographic proximity between rich and poor residents facilitate stronger cross-class social connections.

The paper suggests that reducing income segregation through measures such as affordable housing policies and improved public transportation can foster cross-class social connectedness, thereby enhancing prospects for upward mobility. This research contributes valuable insights to the ongoing discourse on social network structures and their implications for economic mobility in U.S. cities.

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CCAS RESEARCH SHOWCASE

ECONOMICS

Math Remediation Course and its Impact on Undergraduate Outcomes - Fuzzy RD approach

Literature on the impact of remedial courses in higher education is mixed, with predictions of development, diversion, and discouragement effects on students (Scott-Clayton and Rodriguez 2015). Many introductory courses, specifically quantitative courses, require a score on a placement exam to register. This lends itself well to studying the impacts of being placed in lower vs. higher level courses on student learning and choices of future courses and majors.

Additionally, students at the same university may come from very different backgrounds with different levels of mathematics preparation. So, to keep a diverse population in the economics and other STEM majors, we want to give all students the opportunity to “catch up” on their math skills and pursue their major of choice.

In this paper, we study the impact of taking a remedial math course prior to Principles of Microeconomics I on students’ performance in their first econ course and long-term undergraduate outcomes. We use a regression discontinuity design around the placement exam score cutoff for entry into the Principles I course to study the causal effect of taking a math for econ course before Principles I vs taking the Principles I course directly.

We use unique institution level data from a US-based university. Preliminary data analysis shows that there is a small but insignificant positive effect of taking the math course on graduating as an econ major and a significant negative effect on time taken to complete undergraduate degree.

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CCAS RESEARCH SHOWCASE

ECONOMICS

Incentivizing Professional Development among Early Childhood Educators: Evidence from a field experiment

Humans have a general tendency to overestimate their capacity (ref: Dunning Krueger effect). However, in low-resource low-skill settings like community education or health in under-developed countries, such overestimating beliefs about one's professional capacity could have a negative impact on policy outcomes. It can be directly detrimental to intended beneficiaries and indirectly it may inhibit the scope of professional improvement among the community workers. Correcting such overestimating perceptions through feedback can potentially induce intrinsic motivation to learn and improve.

I test this prediction by conducting a lab-in-the-field experiment with early childhood care and education providers (ECCE) in India who provide services to children (0-6 years) and new mothers. I find that most ECCE workers overestimate their knowledge level based on a proctored written test they take.

In the experiment, I inform randomly-selected workers about their actual test score and use this randomized information shock to study the effects of closing the knowledge-gap. I find that participants who are informed about their true knowledge level have a relatively higher take-up rate of certain professional development materials offered as compensation.

This paper fills an important gap in the literature in understanding teacher/health worker beliefs or perceptions about themselves and highlights that correcting incorrect biases is important, especially in the case of such high impact under-resourced public service settings. It also supports the idea of feedback-oriented professional training programs in lower and middle-income countries for better policy outcomes.

This work was supported by the Sigur Center for Asian Studies summer field research fellowship, 2023.

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CCAS RESEARCH SHOWCASE

ECONOMICS

Stopping the Spread: The Effect of D.C. COVID Metro Closures on the Spread of Crime

The question of whether the introduction of public transportation systems, such as Metro stops, influences crime rates in their vicinity has long intrigued researchers and policymakers. This paper examines the effect of temporary closures and subsequent reopenings of seven Washington D.C. Metro stations during the COVID-19 pandemic on crime rates. Through a comprehensive analysis combining theoretical models, literature review, and empirical methods, this study sheds light on the complex relationship between public transportation and crime.

Drawing on economic theories of crime, the study explores the impact of mobility facilitated by Metro stops on criminal behavior. Utilizing a difference-in-differences methodology, crime data from D.C. Metropolitan Police Department is analyzed over two distinct periods: before and after the closures. The study also delineates treatment and control groups, comparing crime rates around the closed and open stations.

Contrary to conventional wisdom and some prior studies, the empirical results suggest that the reopening of Metro stops did not significantly affect crime rates in their vicinity. Visual and statistical analyses indicate no discernible increase in crime following the reopening of the stations. These findings challenge the notion that public transportation infrastructure inherently leads to higher crime rates, offering valuable insights for urban planning and crime prevention strategies.

Despite methodological limitations inherent to the study, including data constraints and non-random closures, the research contributes to the ongoing discourse on the relationship between public transit systems and crime. By debunking prevalent assumptions, this study underscores the importance of evidence-based policymaking and highlights avenues for further research in this domain.

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CCAS RESEARCH SHOWCASE

ECONOMICS

Doing More Harm Than Good? Labor Market Consequences to Paid Maternity Leave Extension of India

Can maternity leaves decrease female employment? Amid a recent spark in the global debate, India decided to amend its existing policy on paid maternity leaves and doubled the leaves for mothers. But in this seemingly progressive and generous leave extension, are there unintended harmful consequences on female labor market?

Previous research finds widely contrasting impacts of maternal leave policies on gendered labor outcomes, primarily on account of varying policy structure, underlying labor market dynamics, firm's ability to transfer additional costs of the paid leaves, social norms defining gender roles in a country, etc. In this study, I examine the impact of India's 2017 paid maternity leave extension legislation on gendered labor market outcomes.

The empirical methodology utilizes two-fold analysis to determine the effect of the policy, first by using a firm-level employment data to measure substitution of employment between genders when comparing treated-untreated firms. Then, I use an individual-level panel data to measure the impact to female employment across varying degree of exposure to the policy. I find that the policy leads to substitution of female employees by male counterparts by 1-2 percent points in treated firms, and large declines of female employed in highly exposed industries.

This indicates that the policy worsened labor outcomes for the female gender, and provides evidence of a maternity policy fueling gender differences, when implemented in the absence of an equivalent leave for fathers.

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CCAS RESEARCH SHOWCASE

ECONOMICS

2020's Ripple Effect: COVID-19 and Abortion Rate Changes in the US

This research explores how the first year of the COVID-19 pandemic's unprecedented challenges —ranging from economic downturns, shifts in work environments, and altered family dynamics to policy changes and access issues—influenced the rise in abortion rates in the United States in 2020. Upon conducting a multiple regression analysis, it is evident that the only statistically significant factors associated with the change in abortion were related to confusing policy endeavors and consequential lack of abortion access.

This research overwhelmingly underscores the importance of clear and consistent healthcare policy, especially regarding time sensitive health needs like abortion, even amid pandemics. A further key takeaway regards the fact that economic factors, like pandemic-induced rising poverty and unemployment, did not appear to have a statistically significant association with abortion rates.

A discussion is included about whether these economic factors actually did not have an effect on abortion changes, or if the severity of economic effects on family planning appear to be understated due to the aforementioned lack of access to abortion, leading to a growing number of lower income folks being forced to have children due to policy restrictions amid the early months of the pandemic.

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CCAS RESEARCH SHOWCASE

ECONOMICS

Institutional Strength and Climate Governance: Assessing Administrative Efficiency & Environmental Taxation

Climate change is poised to dramatically reshape the global landscape, underscoring the importance of effective environmental taxes and institutional strength. The efficacy of a government's environmental tax implementation relies on the efficiency of its tax administration. This study examines the influence of tax administration efficiency and institutional integrity on environmental tax revenues, while highlighting the role of corruption and manufacturing industry CO₂ emissions on environmental taxes. It also contributes to the understanding of effective environmental fiscal policies and their implementation, by investigating different institutional designs for global climate cooperation, variations in climate policies through panel data analysis, and non-state drivers for climate action. Previous studies have explained the pivotal role of environmental taxes in addressing climate change, emphasizing the need for strategic design and effective implementation to rectify market failures and drive sustainable practices, as highlighted by the OECD and Williams III (2016). Using the Country-Level Institutional Assessment and Review (CLIAR), World Bank Development Indicators, and other data from the IMF, this study demonstrates the critical role of building strong institutions in achieving effective climate governance and policy outcomes. It examines the differences between the institutions and outcomes in low and middle-income countries.

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CCAS RESEARCH SHOWCASE

ENGLISH

Banning Books: In Defense of Morrison's "The Bluest Eye" and Faulkner's "Light in August"

In this thesis I will give a brief history of book banning and how it has evolved in our contemporary society today, as well as focus on how book banning has become politicalized today. I will primarily focus on two novels that are banned: "The Bluest Eye," by Toni Morrison, and "Light In August," by William Faulkner. Book banning is a type of censorship that is used to manipulate society to create false narratives. If parents feel uncomfortable with material, there should be alternative choices for their children to read within the same contexts but less graphic. What is so dangerous about novels that they must be banned? Do audiences receive pleasure when reading controversial novels? What is being lost and what is being protected when it comes to book banning? Engaging in conversations with children and students about the content of the book and answering any questions will be beneficial. Teachers, parents, and students working together will be beneficial.

Moreover, in many cases, the perception of books as dangerous comes from a desire to maintain control, and that certain ideas could lead to undesirable outcomes. Books also have the power to educate, inspire empathy, promote understanding, and foster positive change in society. Book banning can be an attempt to protect the cultural sensitivities of certain groups. However, when books are banned, there is a trade-off between the perceived protection of certain values or sensibilities and the loss of essential freedoms, knowledge, diversity, critical thinking, and cultural richness.

Additionally, not all readers enjoy controversial novels. What one person finds pleasurable; another might find offensive. Controversy can spark discussion and deeper engagement with the text, which can be rewarding for many readers. Creating a classroom environment where students feel safe to express themselves encourages empathy and understanding of diverse viewpoints; as well, students can consider issues of free speech and censorship. These teachable moments, accessible through the novels of Toni Morrison and William Faulkner, not only deepen understanding of complex issues but also empower people to think critically.

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CCAS RESEARCH SHOWCASE

FORENSIC SCIENCES

Investigation of Extraction Protocols for the Analysis and Quantitation of Cannabinoids in Gummy Matrices using Liquid Chromatography and Photo-diode Array Ultraviolet Detection

The 2018 Farm Bill resulted in a major change to the legal status of cannabis, reclassifying hemp and removing it from the Controlled Substances Act (CSA) [1]. This bill differentiates hemp and marijuana from one another based on the amount of delta-9-tetrahydrocannabinol (Δ 9-THC) present; stating that to be classified as hemp there must be no more than 0.3% Δ 9-THC by dry weight present. Because of this new distinction, labs are now faced with the new issue of having to determine whether a seized sample is marijuana or hemp. Therefore, proper testing and quantitation techniques must be relied upon [2]. This project compared different extraction methods used for the detection of cannabinoids to help overcome this differentiation problem in complex gummy matrices.

In this study, numerous extraction methods were evaluated on various gummy samples to examine cannabinoid recovery. A modified LC-PDA method [2], with extended purge time to reduce the carryover of matrix components, was used to screen samples for 11 different cannabinoids. Extraction methods were then compared across different cannabis-containing gummies to assess recovery, repeatability, and to look for potential interferences. Sample dissociation methods investigated included enzyme digestion (α -amylase) and cryo-grinding.

Three screened extraction methods were then applied to a suite of gummy samples with varying cannabinoid concentrations. Repeatability and detection of key cannabinoids such as cannabidiol (CBD) established these as effective, laboratory-applicable methods that apply to a wide range of gummy samples. It was found that the investigated amylase digestion followed by acetonitrile and QuEChERS performed the best across almost all sample types and cannabinoids analyzed. This extraction method had percent RSDs that typically ranged from 2-10%. In comparison, the other selected extraction methods yielded lower recoveries. Method comparisons and the results of these studies will be presented.

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The work was supported by the National Institute of Justice (NIJ) under Grant No. DJO-NIJ-20-RO-0009 and DJO-NIJ-22-RO-0002.

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CCAS RESEARCH SHOWCASE

GEOGRAPHY

Drivers and Impacts of Climate Change in the Black Sea

Black Sea coastal regions are characterized by extreme diversity of natural and socio-economic conditions. Black Sea coastal areas have experienced a substantial increase in extreme weather events ranging from record-breaking temperatures to torrential rainfall.

This study is to act as one of the first macro studies of climate change in the region looking at its drivers and impacts and forecasting projections for the near future. By mining and analyzing variety of qualitative and quantitative data sources from local news, social media, government publications, local experts, and datasets it was determined that precipitation and surface air temperature are the primary concerns of climate change in the region with its largest impacts being felt in agriculture, tourism, and infrastructure. Using the latest ERA5 climate data an algorithmic model was developed to determine the primary drivers of precipitation and temperature in relation to atmospheric and oceanic circulation and the directionality of climate change trends. GIS techniques were then used to determine areas at risks and to estimate the costs of the climate change impacts on relevant industry and infrastructure, providing a holistic view by linking cause, effect, and impacts. The model will further be trained using relevant datasets to create predictions for the next decade.

The findings of this study can further be used to inform best development and sustainability practices by regional leaders in government and business.

This work was supported by the Belmont Forum.

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CCAS RESEARCH SHOWCASE

GEOGRAPHY

Using Ecological Niche Modeling to Show Changes in Lone Star Tick (*Amblyomma americanum*) Distributions in the United States

Warming temperatures cause species to adjust their ranges, often by shifting them to more northern latitudes. While this often results in negative ecological consequences, it can also have negative public health implications if the species of concern is a vector of human disease.

The lone star tick (*Amblyomma americanum*) is a medically significant tick species currently undergoing range expansion in the United States due to climate change. Ecological niche modeling attempts to predict suitable habitat for a species based on presence-only data and a series of environmental predictor variables. In this study, we use ecological niche modeling to show how the distribution of lone star ticks has changed in the United States from 2010 to 2022. Lone star tick presence data was gathered from online databases and mean temperature and precipitation data from PRISM Climate Group were downloaded for June 2010, 2014, 2019, and 2022. MaxEnt modeling was performed in ArcGIS Pro to predict suitable lone star tick habitats in the United States for each of the four years. Habitat suitability appears to increase throughout the entire United States, mainly in the northeast region of the country.

These findings can inform where future field studies should be targeted to see whether field data aligns with modeling results. Additionally, this information can help determine where tick-focused public health interventions are needed.

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CCAS RESEARCH SHOWCASE

GEOGRAPHY

Public Perception of Vegetation in Washington, DC Stormwater Bioswales

Bioretention cells or bioswales are a type of green infrastructure that cities are adopting globally to mitigate the effects of urban stormwater runoff and the urban heat island effect. These shallow, vegetated channels or depressions are strategically engineered to capture, filter, and slow down the flow of stormwater to reduce the sediment and pollutants affecting the hydrologic cycle.

However, there is conflicting information on appropriate management and public perception of these green spaces constructed along sidewalks in neighborhoods. To address this need, this study investigates quantitative and qualitative vegetation variables and the public perception of 40 bioswales throughout Washington D.C.. Vegetation was assessed by quantitatively assessing vegetative cover and tree characteristics while qualitative assessments included identifying landscaping regimes, plant health, and aesthetic features such as garden tidiness and weeding efforts. Public perceptions of these bioswales were assessed through semi-structured interviews with people passing by each site.

Our findings reveal a positive correlation between favorable public perception and factors such as ground cover, canopy health, and tree count within bioswales. These results suggest the importance of trees and vegetation in shaping the public's appreciation for these features, and provide insights into effective bioswale planning and maintenance.

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CCAS RESEARCH SHOWCASE

GEOGRAPHY

Vegetation and Snow Cover Impacts on Arctic Alaskan Permafrost System

The high northern latitudes are experiencing accelerated climatic warming which has a profound effect on perennially frozen ground also known as permafrost. Warming and thawing of permafrost can promote adverse environmental changes, negatively impact Arctic communities, and further exacerbate warming through the release of greenhouse gasses.

However, the effect of a warming climate on permafrost is not direct. The atmospheric signal is greatly modified within the ground covers (e.g. vegetation and snow) which serve as a thermal insulator to the underlined frozen ground. Moreover, rising air temperatures are contributing to "Arctic greening," the process that describes the increase in vegetation biomass and northward expansion of woody species, creating a set of complex feedbacks between changing climate, vegetation, and permafrost. These feedbacks can be negative if vegetation changes afford permafrost cooling by an increase in summer insulation or positive if vegetation changes promote permafrost warming through greater accumulation of snow in winter.

Here I present an analysis of long-term changes in the insulating properties of vegetation characteristic of tundra landscapes of Arctic Alaska. The analysis is based on 25 years of continuous observations of air temperatures at standard meteorological height (2 m) and under the vegetation cover collected by the Circumpolar Active Layer Monitoring (CALM) program at a series of representative sites. The annual, seasonal, and monthly differences in air and ground temperature were used to assess the insulating properties of various tundra vegetation types.

The results indicate that long-term changes in insulating properties differ drastically for different plant communities. This can partially explain the variability in observed permafrost response for different landscapes under similar atmospheric forcing. This research contributes to the understanding of complex interactions between climate, ecosystem, and permafrost and will allow a more accurate assessment of permafrost stability under ongoing and projected climatic changes. The empirical data and analysis can be used for validating complex climate and ecosystem models operating over the circum-arctic domain.

This work was supported by U.S. National Science Foundation awards OPP-9732051 to the University of Cincinnati, OPP-0352958 to the University of Delaware, ARC-1002119, OPP-1304555, and OPP-1836377 to the George Washington University, and OPP-1836381 to Northern Michigan University.

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CCAS RESEARCH SHOWCASE

GEOGRAPHY

Mangrove Migration and Changing Ecosystem Services Influence Environmental Management

Mangrove forests are rich environments that provide an abundance of ecosystem services to coastal communities around the world. Historically in the Southeast United States, anthropogenic activities such as deforestation, developmental and agricultural contamination, waste management, and tourism have driven the loss of mangrove habitats. However, in recent years, climate change has emerged as a major factor contributing to mangrove distribution. In the southeastern region, a decreased incidence of cold events is promoting the northward migration of mangrove ranges, which is largely attributable to physiological temperature thresholds. Among mangrove species, *Avicennia germinans*, commonly known as the Black Mangrove, is a resilient species projected to migrate more northward than other mangrove species due to its higher freeze tolerance. In certain areas, erosion, increased storminess, sea level rise, and changing ocean currents are driving mangrove losses.

As climate change progresses and materializes into a prominent characteristic affecting the distribution of mangrove habitats, ecosystem services in coastal environments and communities will shift. Provisioning, regulation and maintenance, and cultural ecosystem services will reposition themselves among populations and disrupt established regimes. Dynamic ecosystem services are consequential for environmental managers, who must incorporate microspatial considerations and accurate valuations of ecosystem services through the integration of ecological, socio-cultural, and economic elements.

Effective management must emphasize coordination and communication between scientists, environmental managers, and local stakeholders to deter unintended consequences of well-intentioned environmental management strategies.

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CCAS RESEARCH SHOWCASE

GEOGRAPHY

Forecasting Agro-Productivity: Climate Change Impacts on Agricultural Suitability and Policy in Rio Grande do Sul, Brazil

Changing climatic conditions are significant determinants of future agriculture. As landscapes change, agricultural outputs will be influenced by emerging conditions that boost or limit the land's productivity. This study focuses on agriculture in Rio Grande do Sul, the southernmost state and second-largest agricultural producer by value in Brazil. As the top producer of rice and tobacco in the country, the top exporter of tobacco in the world, and an important soybean and corn state, Rio Grande do Sul can be used as a proxy for agricultural and economic success.

The purpose of this study is to create relative agro-productivity estimates for key landmarks of 2020 (present), 2050 (near-future), and 2100 (far-future). The latest available CMIP6 climate data is used in conjunction with geospatial programming to produce suitability models for rice, tobacco, soybean, and corn growth in Rio Grande do Sul municipalities at these landmark intervals. Through this process, we can identify the suitability of areas for crop production under moderate (SSP245) and extreme (SSP585) projected climate scenarios. Though the state is already a leader in sustainable food systems, government and agribusiness producers will need to continue developing and adapting to oncoming environmental changes to ensure the provision of food, labor, and economic security.

This research concludes with evaluations and recommendations on Brazil and Rio Grande do Sul's current agricultural policies and programs based on these models, functioning as a reference for climate and economy-minded decision-making in agriculture.

This work is a part of the Belmont Forum Coastal Ocean Sustainability in Changing Climate (COAST) Project, supported by the National Science Foundation under Grant Number 2020404.

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CCAS RESEARCH SHOWCASE

GEOGRAPHY

Climate Change Impacts on Energy Infrastructure Along the Red Sea

Saudi Arabia is one of the most at-risk countries to face the impacts of rising temperatures due to climate change. Electricity demand is already high throughout Saudi Arabia's hot summers in order to support air conditioning demand on top of electricity used for business transactions, communication, and infrastructure systems, putting additional pressure on thermal power plants used to produce electricity in Saudi Arabia.

Using the current literature on thermal power plant efficiency and applying it to different scenarios using CESM2 climate models, this paper creates future predictions on the potential impact of rising temperatures on publicly-reported thermal power plants along the Red Sea from the 2020 (present) up until 2100 (far future) under moderate (SSP245) and extreme (SSP585) projected climate scenarios. Our data predicts an increase in future average temperature that will negatively affect the efficiency and maximum outputs of thermal power plants along the Red Sea. These decreases will be especially acute on hot days, when electricity is needed most.

The findings of this research can serve as a directive to policy-makers and energy infrastructure executives to address the modernity of currently operating thermal power plants and the need to strengthen alternative electricity sources in the region.

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CCAS RESEARCH SHOWCASE

GEOLOGY

Influence of Volcanic Setting on the Composition of Silicic Magmas: A Comparative Study of Rhyolite Petrogenesis at Yellowstone and The Cascades

Rhyolite, a kind of igneous rock, is found in volcanic systems known to have violent, explosive style eruptions due to having a 70% or higher content of silica. High silica content causes volatile magmas to be so explosive as to collapse the entire volcanic structure, leaving behind a caldera. Here we investigate and compare the geochemistry of rhyolite magmas at Yellowstone Plateau volcanic field, a setting where rhyolite is expected, and the Cascades magmatic arc, where it is not. Rhyolite magmas at Yellowstone are attributed to hotspot volcanism; rhyolite magmas are much rarer in the Cascades magmatic arc, a subduction zone, but do occur at the South Sister locality. The presence of rhyolite is an important area of study due to the specific dangers it poses to nearby towns.

The hypothesis that there will be a notable difference in geochemical composition between rhyolites at these two sites was tested through analyzing and comparing the chemical constituents of all available samples in both systems. Results show that differences may lie in the two very distinct models of how the magma is produced at the Cascades magmatic arc versus at Yellowstone localities. Further investigation into the unique tectonic environment of the Cascades, as well as our continuing geochemical analysis and plotting of the rhyolites in both volcanic settings, may provide additional distinctions between the magma genesis in these geologic regions

This work was supported by the Mineralogical Society of the District of Columbia Undergraduate Research Award, as well as the GWU Geological Sciences program funding.

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CCAS RESEARCH SHOWCASE

GEOLOGY

Probing Into Seismicity and Slab Depth Across Global Subduction Zones

Subduction zones are locations where two of Earth's tectonic plates, or slabs, collide and one subducts beneath the other. They are home to the most seismically active faults on the planet, and account for some of the largest earthquakes- events that are both damaging and deadly. Despite their impact, our knowledge of subduction zone geometry, which may determine the spatial extent and the size of earthquakes, is not fully known.

By modeling Slab 2 data from the U.S. Geological Survey, correlations and characteristics of subducting slab depth versus seismic activity were examined. The computer programs Terminal and Python were used to interpolate the variables of slab depth versus seismic activity data into models. These were then used to test the hypothesis that seismicity occurs within rocks predicted to contain hydrous phases and not in rocks predicted to be anhydrous.

The results showed both low and high correlation as well as no correlation in some instances. In five locations, there is a correlation between the locations' intermediate-depth earthquakes, the slab depths, and the predicted locations' hydrous minerals, implying dehydration reactions are linked to intermediate-depth seismicity in these locations. Our low to no correlation locations, nine in total, could be explained by a fault being in a "locked" state or that the rocks present at these locations are anhydrous, suggesting that the seismic activity may not be directly related to slab depth in those locations. Modeling this data further may provide insight on the magnitudes and geometry of future earthquakes.

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CCAS RESEARCH SHOWCASE HISTORY

Early GW: A History of the Columbian College from its Founding through the Civil War

In our project, we will be researching the early years of the Columbian College from its founding in 1821 to the end of the Civil War in 1865. The early years of George Washington University are little talked about, and whenever they are, women aren't in the discussion. Even though they did not have set "roles," women were still involved and aided in the university's survival.

From the wives of the presidents, administrative staff, and donors, women have been a secret part of the history of George Washington University. During the Civil War, the single Columbian College building was turned into a barracks, and later a hospital for those injured during the war. There were only ten nurses at the hospital, as that was the amount allowed by the government, and they would often have about 300 patients at a time. The most prominent was Rebecca Pomroy, a nurse at the hospital for the duration of the war.

These important women were largely overlooked due to misogyny at the time. Through research, this injustice can be undone. The final piece of our research is an in-depth investigation of life on the Columbian College campus during the Civil War. From coursework to clubs, the students at early GW navigated a fascinating period in our nation's history, persevering through the hardships and stresses of the great national crisis.

The experience of the student body also gives a fascinating lens to view the experience of life in Civil War era Washington D.C. as the capitol was turned into the largest fortress city in the world. Our project will give a comprehensive timeline of the early university as it grew from a mere idea in the days of the Early Republic to a nationally renowned institution of learning in the Antebellum and Civil War Era.

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CCAS RESEARCH SHOWCASE

HISTORY

Beyond the Bean: Exploring Gender in Seventeenth Century English Coffeehouses

In seventeenth-century England, coffeehouses were crucial social and cultural entrepreneurial institutions. Like any other societal development that challenges the existing system, they were coincidentally incredibly controversial, penned “seminaries of sedition” by one popular critic. Coffeehouses ultimately welcomed every social stratum to discuss state affairs, recent scientific developments, and a variety of philosophical thoughts.

While these institutions did not begin with the intent to alter the state of affairs majorly, they certainly did just that. By the end of the seventeenth century, coffee houses were omnipresent in English social life, failing to discriminate based on gender or class, creating a new type of equalizing institution that heavily influenced English affairs in the years to come. Unlike an alehouse or tavern, coffeehouses were a unique institution that challenged established norms in various ways. The state discourse, sedition, fear of dissemination of false narratives, and public participation in the political sphere that coffeehouses encouraged led Charles II to ban them for their influence on the people temporarily. Due to extreme public outcry, this ban did not last more than eleven days.

Many historians have argued about this ban and other relevant historical details since the onset of the coffeehouse institutional phenomena. In the early eighteenth century, many Englishmen, such as Roger North, abhorred the fact that Charles II was unable to suppress the coffeehouses, “such that ‘now’, he thought, ‘the mischief is arrived to perfection, and not only sedition and treason, but atheism, heresy, and blasphemy are publicly taught in diverse of the celebrated coffee-houses...and it is as unseemingly for a reasonable, conformable person to come there, as for clergyman to frequent a bawdy house.’” Conversations, although sometimes surface level, dissolved socio-economic status, gender roles, occupations, and more in order to truly converse about the political state of affairs.

In particular to gender, these coffeehouses became one of the first spaces for women to converse freely regarding their opinions and ideas, especially on the matter of politics. They relished in the ability to talk freely and independently, making these institutions one of the first and only gender-inclusive spaces. By failing to discriminate based on gender or class, coffeehouses became ubiquitous in social and cultural life.

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CCAS RESEARCH SHOWCASE HISTORY

The Ghost Revival

As a public engagement project for HIST 3301, Catherine Pickett and I are reviving the 1920's student magazine *The Ghost* which ran from 1921 to 1927 and is currently found in the library's physical and digital archives.

During its run it contained a number of problematic jokes including racist cartoons and misogynistic jokes. There is scholarship from fellow GW students about *The Ghost's* problematic elements. "Racist Culture on Campus: 1920-1950" by Stephen Pearce and Jhovana Bohigas discusses racist cartoons found in *The Ghost*. Gwendolyn Cochran wrote "The Ghost: Winifred De Voe and the Feminine Spirit" which chronicles how Winifred DeVoe had to appeal to the misogynistic tone of the period for women's voices to be heard. The last past scholarship we are using is "Opinions Leading to The Ghost's Four-Year Publication Gap" by Megan Flynn which discusses how the perception of *The Ghost's* controversial content led to its publication gap. Despite its flaws, *The Ghost* allowed for GW students, especially female students, to express their sexuality and overall experience as students. Today's GWU could benefit from *The Ghost* because it gives insight on student life in the 1920s in an authentic way. We are resurrecting it as a bi-weekly newsletter, the main audience being current students, focusing on female experiences and bringing some of the controversial elements of the original *Ghost* to light.

We hope to use this project not only to laugh about current happenings at GW but to educate the students about some problematic elements of our past. In our volumes of *The Ghost* we are having three components, the first where we engage with parts of the original publication, potentially including sections like "Quote of the Week", the second where we dissect problematic elements of the magazine and the third being our own original comedy about the school and students. We are engaging with previous papers written about *The Ghost*, old volumes, and other college's humorous publications, like *The Yellow Journal* from the University of Virginia and *The Harvard Lampoon*.

One way to sustain it is by taking contributions from the wider student body through a Google Form to hear about their experiences and collect content for the magazine. Our goal through this project is to make the history of the school, specifically surrounding student life, available to students. Most students aren't able to see the memorabilia room or the archives, so this seeks to send the history to them."

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CCAS RESEARCH SHOWCASE HISTORY

Scalps and the Creation of Race

This work explores the role of the English scalp bounty system in creating an “Indian” racial category for indigenous peoples in colonial New England. Historiography has paid close attention to the role religion played in colonial New England in creating the racial categories that would shape much of American history.

This paper expands on current research by examining how the act of scalping itself shaped English perceptions of race during the era. This research relies on colonial-era newspapers, where scalp bounties and accounts of scalping were frequently published; published collections of colonial correspondence, with particular attention paid to that of colonial officials; and other published materials such as sermons and captivity narratives.

By examining these pieces, it becomes apparent that scalping became an inextricable part of the English’s ideas of indigenous peoples and was an essential part of the English’s racialization of them. This work contributes to a better understanding of the process of racialization that occurred during the colonial period and the violence that is inherent in ideas of race that continue to permeate society today.

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CCAS RESEARCH SHOWCASE

MATHEMATICS

Incompressible surface in double branched cover of links in S^3

For a reduced alternating diagram of a knot with a prime determinant p the Kauffman-Harary conjecture states that every non-trivial Fox p -coloring of the knot assigns different colors to its arcs. In 2022, we prove a generalization of the conjecture stated nineteen years ago by Asaeda, Przytycki, and Sikora: for every pair of distinct arcs in the reduced alternating diagram of a prime link with determinant δ there exists a Fox δ -coloring that distinguishes them.

To explore the geometric approach of GKH, we attempt to extend Mensaco's meridian theorem to double branched cover of alternating prime non-split links by extending the "bubble construction".

In this presentation, we explore the behaviors of lifted loops from link complement in double branched cover along branching set L in S^3 . What is more, we also study properties of incompressible surface, meridionally incompressible surface in such double branched cover and n -cyclic cover of link complement in S^3 .

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CCAS RESEARCH SHOWCASE ORGANIZATIONAL SCIENCES & COMMUNICATION

Unveiling Employee Recovery Experiences: A Meta-Analytic Exploration of Psychological and Physiological Health Outcomes

The act of recovery of employees from job-related stress has been researched and categorized into four distinct categories: (1) psychological safety, (2) relaxation, (3) mastery, and (4) control of leisure time. In this comprehensive meta-analytic review comprising 174 study samples, the goal is to examine psychological and physiological health outcomes of employee recovery experiences, and investigate the differences in how each recovery experience correlates with the various outcomes.

The findings of the meta-analytic path indicates that psychological detachment, characterized by disengagement from work in non-work hours, and relaxation act as a buffer against harmful health outcomes such as emotional exhaustion and negative affect. Mastery, and challenging off-hour activities serve to increase beneficial outcomes such as positive affect and vitality.

Lastly, control over leisure time emerges as a pivotal variable as it both enhances beneficial health outcomes, and buffers against negative health outcomes. This meta-analysis sheds light on the differential impacts each recovery experience has on diverse health outcomes.

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CCAS RESEARCH SHOWCASE
**ORGANIZATIONAL
SCIENCES &
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**TikTok's Impact on How Music is Discovered
and Consumed**

Social media apps such as TikTok have revolutionized the music industry in that it removes costly entry barriers for independent artists; however, it also introduces new challenges for musicians such as defining what values they want to project, keeping up with the latest technological trends, and managing their financial resources.

The purpose of this study is to explore how TikTok users interact with music and musicians online through the lens of uses-and-gratification theory (UGT), all measured via a survey design. Results and implications will be discussed.

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CCAS RESEARCH SHOWCASE ORGANIZATIONAL SCIENCES & COMMUNICATION

Influences on Book-Buying and Subsequent Effects: A Look into the Process

According to the Pew Research Center (<https://www.pewresearch.org>, 2012), 26% of those who had read a book in the prior 12 months did so for the purpose of learning. However, 15% responded that they read to escape their daily lives, and 12% read to relax. In a 2022 survey (<https://www.pewresearch.org>, 2022), 75% of US adults were found to have read a book in the past 12 months, a statistic that has remained consistent since 2011.

Since consumers are reading books, not only to learn but to also improve their mental state, we wondered what decisions might be involved in buying a book that consumers read for pleasure. Through quantitative survey items, this research is designed to explore the mediating impact of the perceived quality of books on the relationship between a set of predictor variables (peer recommendations, online reviews, literary critiques, and celebrity endorsements) and a set of outcome variables (likelihood of purchase, satisfaction with a purchase, and interpretation of a book). 100 participants were surveyed, and the resulting data were analyzed using multiple regression analyses.

All effects and implications of the data will be discussed; future research could explore other possible drivers of book-buying behavior and the unique impact of specific celebrity endorsements on book interpretation. In an increasingly high-tech society, the platforms used to read and discuss books are expanding, and this research may bring us one step closer to identifying how people find that perfect book.

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CCAS RESEARCH SHOWCASE
**ORGANIZATIONAL
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**Popularity and Control: The Influence of Student
Leadership on Organizational Effectiveness**

The presence of student organizations in colleges and universities can be viewed as a framework for success beyond an undergraduate degree. Referencing previous research, the purpose of this study is to explore the relationship between the collective perception of student leaders and their organizational influence alongside the overall effectiveness of their organization inside a collegiate environment.

This study will utilize online surveys as data collection to capture various organization members' perspectives and analyze how the traits of a leader foster or hinder change within the student community. This study's concluding data provides a foundational understanding of how popularity and control impact student leadership and why their influence acts as a key factor for student organizational success.

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CCAS RESEARCH SHOWCASE ORGANIZATIONAL SCIENCES & COMMUNICATION

Employees with Eldercare Responsibilities and Workplace Intervention Strategies

This research navigates the intricate challenges faced by employees concurrently managing full-time jobs and caring for elderly family members. Guided by three pivotal questions —exploring the nature of informal family eldercare activities, discerning distinctions between eldercare and traditional childcare, and identifying strategies for organizational and societal support, the present study analyzed qualitative data from a group of 241 full-time employees with family eldercare responsibilities in the United States.

The objective is to identify and comprehend the stressors accompanying the diverse needs of elderly loved ones; spanning chores, medical assistance, financial support, and emotional well-being. Disparities between elderly care and child care are evident in societal acceptance norms, the contrasting levels of responsibility expected from adults versus children, and variations in efforts towards caregiving. Our findings build upon prior research highlighting the detrimental impact of employees' elderly care responsibilities on work performance revealing prevalent aspects of informal eldercare.

By using first-hand perspectives, this research contributes valuable insights into the experiences and needs of employees with eldercare responsibilities. While childcare enjoys employer and organizational support, eldercare remains an unsupported family responsibility. Organizations tend to offer empathy, flexible schedules, and some paid time off, but fully comprehensive support structures for eldercare are absent. This lays the foundation for discussions on organizational and societal support strategies to alleviate the stress associated with eldercare. This serves as a vital resource for organizations and human resources striving to create a supportive environment for employees managing the complexities of both professional and caregiving roles. More detailed results of the qualitative and quantitative data analyses will be reported in the poster presentation.

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CCAS RESEARCH SHOWCASE ORGANIZATIONAL SCIENCES & COMMUNICATION

Improving Understanding and Acceptance of Sustainable Agriculture

Soil conservation and sustainable agriculture methods are essential for the future of global food production due to the rapid degradation of global topsoil (FAO, 2011; Parr et al., 2020; Tahat et al., 2020). Currently, the messages around regenerative agriculture are understudied, and farmer uptake of regenerative practices is too slow to conserve the appropriate amount of soil, especially in the United States (Parr et al., 2020). It's important to understand what types of messages might persuade people to be supportive of regenerative agriculture practices, including farmers who do the practices, and the lay public who might consume regenerative agriculture products.

Framing can be a powerful persuasive communication tool. Extensive research has been done on the effects of framing in persuasive communication research, especially gain/loss frames: However, research has found mixed results on the relative persuasiveness of gain-vs. loss-framed messages (Nan et al., 2018). Over the past decade both gain/loss frames and topic frames have been used to study climate and environmental communication with both general audiences and farmers (Homar & Cvelbar, 2021; Li & Su, 2018; Ngo et al., 2022). There will likely be different results for farmers and non-farmers due to the general public's perceptions of farming and that farmer's will likely have more stake in messages surrounding their profession and livelihood. Farmers are also more likely to have formed opinions on these topics. We investigate these relationships with the following research questions:

RQ1: Do different message frames (gain vs. loss) and topic frames (environment vs. economy vs. social) lead to different persuasive effects for attitudes and behavioral intentions regarding regenerative agriculture?

RQ2: Do these effects differ for farmers versus lay people?

Using an experimental method (N = 881), we explored the effect of six different message frames on both farmer's and non-farmer's perception of regenerative agriculture methods: these frames include a gain/loss frame and a topic frame, including economic, environmental, and social impacts of regenerative farming. Our relevant outcome measures include motivated resistance to persuasion, self-efficacy, response efficacy, attitudes towards regenerative agriculture, and behavioral intentions.

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CCAS RESEARCH SHOWCASE ORGANIZATIONAL SCIENCES & COMMUNICATION

Menopause in the Workplace

The experience of menopausal employees in the workplace remains an underdeveloped area of research. While data suggests that older, female employees face negative stereotypes at work, the specific impact of menopause on their work outcomes, including their job satisfaction and performance, is not well understood.

This study aims to discover how menopause impacts the participants' experiences as employees, including their performance outcomes and their interpersonal relationships with colleagues and supervisors. Five-hundred participants with ovaries between the ages of 30 and 70 answered quantitative and qualitative questions to provide a full scope of their experiences. Multiple regression analyses were conducted to test demographic (race and age) differences in menopausal experiences and examine the impact of menopause on work outcomes.

Results indicated that there were no significant age and racial differences in menopausal experiences (i.e., symptoms), but menopausal symptoms had significant relationships with work outcomes (i.e., job satisfaction, performance, and turnover). Qualitative thematic analysis will be conducted on the qualitative data to better determine what issues menopausal employees experience and what forms of workplace social support these employees wish to receive from their organizations.

The findings from this study will serve to inform organizations how they can best support their menopausal employees, carrying implications for supervisor training, healthcare benefits, and additional modifications that will improve worker experiences.

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CCAS RESEARCH SHOWCASE
**ORGANIZATIONAL
SCIENCES &
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**Navigating the Division 1 Dream: An In-Depth
Exploration of Coaching Dynamics, Training
Environments, and Mental Health in Female
Student-Athlete Satisfaction during the
Recruitment Process**

This study unveils the delicate journey of student-athletes and what brings them satisfaction via the Division 1 recruitment process. Through a quantitative survey and supplemental interviews, the roles of coaching styles, training environments, mental health, and accessibility to college camps were explored. We're primarily interested in exploring the drivers of satisfaction of female athletes during the recruitment process.

This study also examines the mediation effect of accessibility to college recruitment camps; and contributes to a better understanding of the recruitment process for female Division 1 athletes. These insights can inform institutions, coaches, and the sports community of strategies that can enhance athletes' experiences and overall satisfaction during this critical phase in their athletic careers.

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CCAS RESEARCH SHOWCASE
**ORGANIZATIONAL
SCIENCES &
COMMUNICATION**

Examining the Intersection of Queer and People of Color Identities with Unnatural Hair Colors, Visible Tattoos, and Natural Hairstyles in the Workplace: Implications for Employment Practices, Dress Codes, and Diversity, Equity, and Inclusion Initiatives

The rise in research surrounding diversity, equity, and inclusion within the workplace has intersectionality as an important avenue to explore when considering how minorities experience workplace discrimination. The purpose of this study is to explore how minorities are discriminated against in the workplace, and how unspoken expectations can affect employees.

This study will utilize structured interviews to capture unique perspectives and experiences from stakeholders who have experienced discrimination while holding multiple minority statuses. Through thematic analysis, this study provides a foundational understanding of how voiced and silent norms contribute to organizational discrimination, and how multiple identity factors play into diversity, equity, and inclusion initiatives on an organizational level.

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CCAS RESEARCH SHOWCASE

PHYSICS

Habituation patterns of *C. elegans* to thermal stimuli and imaging analysis advancements

Behavioral research on *Caenorhabditis elegans* nematodes has aided broader neuroscience developments since their introduction as a model organism in the 1960s. Ongoing research in our lab seeks to study the habituation of *C. elegans* to thermal stimuli and the implications on long-term and intergenerational stress responses. To quantify responses to stimuli, behavioral assays are performed in which nematodes are repeatedly illuminated with short pulses from an infrared laser until no further response is observed.

However, there are currently several technical challenges which limit the ability to quantify these results, both in the hardware used to record behavioral assays and in the analytical tools to extract data. Through software analysis of behavioral assay recordings and heat deposition, a linear decrease in response velocity to thermal stimuli over time was found at temperatures known to illicit escape responses. Additional work to update the imaging processes shows significant improvements in the rate and quality of data collection.

To this end, low-peptone imaging plates, real-time tracking of the nematodes, automatic stage movement, and posture-based behavioral analysis are investigated.

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CCAS RESEARCH SHOWCASE

PHYSICS

Chandra X-ray Observations of PSR J1849–0001 and its Pulsar Wind Nebula

Pulsars are some of nature's most energetic particle accelerators. They provide a unique laboratory for studying particle behavior at very high energies. The strong magnetic fields produced by pulsars accelerate the particles around them creating a pulsar wind.

These accelerated particles can emit synchrotron radiation which we observe as a Pulsar Wind Nebula (PWN). This synchrotron radiation is often bright in X-rays, which makes the Chandra X-Ray Observatory (CXO) the optimal telescope for studying these objects. The excellent angular resolution and sensitivity of CXO allow detailed analysis of the dynamics of pulsars and their PWNe. Here we present the results of a new, long observation of pulsar PSR J1849-0001 and its associated PWN.

The images revealed an oddly amorphous PWN morphology, with a hint of a jet extending to the south-west of the pulsar. Additionally, no pulsations have been detected in radio or gamma-rays, which is unusual for such a young and energetic pulsar. The lack of clearly defined PWN features such as a torus hints that the lack of radio and gamma-ray pulsations may be attributed to the high degree of alignment between the pulsar's spin and magnetic dipole axis. The multiwavelength spectrum modeling indicates an unusually low magnetic field for the PWN or, alternatively, potential problems in our interpretation of underlying pulsar wind properties.

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CCAS RESEARCH SHOWCASE

PHYSICS

Extraordinary Polarization and Spin Near Zeros of Vector Waves

A characteristic of vector wave phenomena (e.g., electromagnetic, acoustic, elastic, and water waves) is the necessary formation of time-varying zeros, which appear as continuous threads that can link, knot, or extend for infinite space. Coupled to these zeros, are rich topological and dynamical properties related to the polarization and spin angular momenta density of these fields.

In this work, we discuss the formation of non-divergent polarization structures, polarization singularities, and non-trivial spinning inherent to monochromatic electromagnetic and acoustic waves in the vicinity of their field zeros. To illustrate these general features, we consider fundamental forms of multipole radiation, wave diffraction from various apertures, and vector vortex beams. Our theory offers diffraction-based applications in imaging, remote sensing, and quantum networking.

We wish to acknowledge support from US Army Research Office Award No. W911NF-23-1-0085.

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CCAS RESEARCH SHOWCASE

PHYSICS

Measurement of Compton Scattering Differential Cross Section of ^4He at 85 MeV at HlyS

Over the past decades, nuclear physicists have spent effort studying the proton and neutron, two of the smallest and most fundamental particles in the universe. Given the extraordinarily small size and unstable nature of nucleons, the study using basic instruments presents significant challenges. To address these issues, theorists have developed invaluable theoretical models such as chiral effective field theory (χEFT) to measure and predict the properties of nucleons, especially polarizabilities. These models have been successfully validated by data gathered through experimental efforts, with Compton scattering being one of the most important experiments for testing and validating nucleon structure models. The measurement of differential cross sections is a crucial figure to determine the polarizabilities. Previous research conducted in the energy range from 65 to 115 MeV at facilities like MAX-lab in Lund, Sweden, has contributed substantially to our understanding, but gaps such as high-precision data at 85 MeV remain. This study presents a Compton scattering experiment conducted at the High Intensity Gamma-Ray Source (HlyS) facility at Duke University. In this experiment, circularly polarized gamma rays at 85 MeV impinged on a liquid Helium-4 (^4He) target to reach the result's highest accuracy. Scattered photons were collected by four medium-sized sodium iodide (NaI) detectors. Data from only one detector was successfully analyzed due to issues of several detectors' initial calibration. However, the analysis of the data, after appropriate corrections, yielded the differential cross section with a high precision (small uncertainty) at that one particular angle. Compared with the theoretical predictions and previous work at HlyS, the result proves that this is a valid method to get precise values of the electric and magnetic polarizabilities to test the χEFT theory.

We acknowledge funding support from the U.S. Department of Energy for this work.

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CCAS RESEARCH SHOWCASE

PHYSICS

Using SVM on Fermi-GBM GRBs to Create a Novel Progenitor Classifier

A purpose of studying a particular type of jetted dying stars, called gamma-ray bursts (GRB), is to understand their progenitor systems. The current hypotheses for the causes of these explosions are the collapse of a high-mass star, called a collapsar, or the merging of two dense stellar remnants (neutron stars), called a merger. Collapsars are associated with extremely bright supernovæ, ejecting elements between beryllium and iron.

Meanwhile, mergers are associated with the release of post-iron elements in much dimmer explosions called kilonovæ. GRB observations in the past supported two overlapping prompt gamma-ray emission distributions of these progenitors, where collapsars were long duration and mergers were short.

However, recent discoveries of a supernova signature after a short burst and kilonova signatures after long bursts caused us to look for a new, more complex way of classifying a GRB's possible progenitors. Using machine learning and statistics, we create and test a new classifier, determining that it appears to correctly classify most gamma-ray bursts with some geometry or fluence limits. We also study several stand-in variables to determine if there are promising areas for future observation.

This work made use of data supplied by the UK Swift Science Data Centre at the University of Leicester.

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CCAS RESEARCH SHOWCASE

PHYSICS

Image analysis using machine learning in the field study of primates

Image analysis plays a crucial role in wildlife research for studying the growth and development of animals. We show that machine learning is a powerful tool to optimize this process. In the study of primates, researchers take images of the primates with laser dots projected onto the animals to determine their body sizes. To analyze these images, the laser spots must be chosen by hand on each image, which becomes extremely time consuming when working with hundreds of images. To overcome this problem, a three-step image analysis process is used.

First, a machine learning algorithm specialized for object detection identifies and isolates the primates in the images. Then a computer vision algorithm for color detection identifies objects in the image. In the final step, a second custom machine-learning program, optimized for texture detection, senses whether the green pixels are surrounded by fur. The green key points which pass all three tests are used to compute a pixel-to-centimeter ratio to set the length scale for the overall image. This method is found to be effective in images where there is adequate contrast between the laser spots and the background.

We demonstrate the advantages of this method and its ability to streamline the analysis of hundreds of images. This method has applications not only in biophysics and anthropology, but in ecological and conservation efforts.

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CCAS RESEARCH SHOWCASE

PHYSICS

Photogrammetry in the Field Study of Primates

Wildlife researchers rely on accurate measurement tools to track the growth and development of animals, especially in the context of species conservation. Best practices require non-invasive, remote measurement techniques to limit the spread of disease and protect researchers from harm.

The solution presented here is photogrammetry, a technique that utilizes a laser-based optical instrument and a corresponding software program to set the length scale on photos, enabling researchers to quickly and accurately determine the body sizes of apes in Rwanda. To this end, we developed a software program that allows for high-throughput image processing, and we calibrated the optical instrument to determine its effectiveness at various distances. We found that the optical instrument is effective 10 or more meters from the object of measurement. Moving forward, we recommend the use of our technique in the fields of biophysics and anthropology, specifically in contexts where researchers are motivated to track the development of endangered species.

We show the advantages of this approach, including the capability to enable high throughput processing of large image sets in an affordable, accessible way that prioritizes the safety of both the researcher and the wildlife.

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CCAS RESEARCH SHOWCASE

PHYSICS

Designing and Testing a 3-Stage μ CAT Thruster for CubeSat Applications

Space has been becoming increasingly more commercialized and, as a result, more accessible. Higher demand and technological advancement has driven this expansion and lead to the standardization of low-form-factor satellites, CubeSats. These small systems can provide various services, ranging from GPS and network building to surveillance and intelligence.

Unfortunately, the operational time of these satellites is significantly limited by their ability to perform station-keeping maneuvers for long periods of time. Small electric propulsion systems, with their low complexity and high impulse, are a promising solution to this problem. In this investigation, we characterized the performance of a novel, three-stage pulsed vacuum-arc thruster. Measurements of ion velocity, obtained using ion time-of-flight between two grids, were combined with the total ion current, obtained using a hemispherical collector during firing, to estimate the thrust produced by the system.

This and the power consumed by each of the stages were used to determine the system's thrust-to-power ratio. Though no major thrust improvements over a two-stage design were found, this thruster configuration - pending further analysis - offers possible capabilities in the modification of the cathode arc shape and duration. Such control could be used to extend the lifetime of the thruster and modify its performance for different operating regimes.

This work was supported by the Air Force Office of Scientific Research, FA9550-23-1-0278 (M. Birkan is the program manager).

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CCAS RESEARCH SHOWCASE

PHYSICS

Evaluating Radiative Corrections in Super Rosenbluth Experiments

Electron-proton elastic scattering experiments have mapped out the proton's electromagnetic form factors, i.e., how the proton's electric charge and current are distributed within its volume. Nevertheless, there are some inconsistencies in our determinations of these form factors, especially at high-momentum transfer. In this project, we wanted to determine the impact of radiation emitted by charged particles in collisions, a topic known as "Radiative Corrections," in a class of experiments called Super Rosenbluth experiments. We ran Monte Carlo simulations to conduct a Super Rosenbluth pseudo-experiment using several commonly used radiative corrections approximations in order to evaluate their suitability.

We find that when using the Peaking Approximation, the radiative corrections in Super Rosenbluth experiments are smaller and less kinematics-dependent than in equivalent Rosenbluth experiments.

However, this is not necessarily true when using more sophisticated models, calling into question the assumed advantages of the Super Rosenbluth technique.

This work was supported by a Luther Rice Fellowship and a Walker Fellowship from the GW Physics Department.

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CCAS RESEARCH SHOWCASE

POLITICAL SCIENCE

Religious Freedom or Religious Favor? Exploring Public Attitudes Toward School Vouchers in a Religious School Context

This study investigates the relationship between voters' knowledge of the inclusion of religious private schools within a school voucher program and their attitude toward state-wide school voucher programs. Additionally, this study looks at whether information about the specific religion of the school affects voters' attitudes toward state-wide school voucher programs. Traditionally, using school vouchers at religious private schools was thought to violate church-state separation. However, the Supreme Court ruled in *Carson v. Makin* (2022) that if a state enacts school voucher legislation, it cannot discriminate against parents who want to send their child to a state-accredited religious private school. In light of this, voters are faced with two choices: to support voucher programs with the knowledge that some families will use public funds at religious private schools or to oppose these programs altogether.

This study utilizes a cross-sectional vignette-based survey that presents respondents with one of four newspaper stories of a family hoping to use school vouchers to send their child to a Montessori, Muslim, Jewish, or Protestant school. All four vignettes emphasize that while these schools meet state standards, the students will receive a non-traditional education in life. Each vignette also emphasizes that the parents believe this is the only school able to meet their child's needs. Respondents will then be asked questions about their attitudes toward school vouchers and religiosity. School voucher programs have proved to be a hotly contested issue in American politics at the state and local levels. Advocates often make a liberty-based appeal for funding school voucher programs. They argue that school vouchers allow families to place their children in classrooms that better reflect their family's values.

This study will help determine the effectiveness of liberty-based appeals for school vouchers when applied to state-accredited religious schools.

This work was supported by a Sigelman Undergraduate Research Enhancement (SURE) Award and an Undergraduate Research Grant from the Loeb Institute for Religious Freedom at George Washington University.

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CCAS RESEARCH SHOWCASE

POLITICAL SCIENCE

When Stigmas Become Positive: Analyzing the Connection Between “Third World” Labels and Public Support for Humanitarian Aid

This study explores the preconceptions that people have associated with the term “Third World” and the victimization of the countries that have historically been in that group. Labels are an example of categorical thinking, or a mental shortcut used to group complicated issues into simpler definitions. Over time, the term “Third World” has expanded beyond an economic definition, and is now widely used to describe countries that are less developed technologically and are “behind” the superpowers of the modern world. To combat this stigma, the United Nations has relabeled the historical “Third World” by creating a list of “developing countries” that the organization uses to distribute humanitarian aid effectively.

The vignette-based survey used in this study presents a newspaper article about a country in Western Africa (Guinea-Bissau) currently supported by the UN Peacebuilding Fund. Each treatment describes the country as either: (1) being a part of the “Third World”, (2) being a part of the “Third World” and having a “low GDP”, or (3) not having an extra label beyond the country’s name. The survey then asks respondents how much they supported increasing the amount of aid that the UN sends to Guinea-Bissau and the overall duration that they would continue that support. The survey also aims to prove that there is a negative stigma surrounding the term “Third World”, and that it is inherently linked with the perception of low GDP. To support this point, the survey asks respondents to guess the GDP per capita of the country presented.

However, the study then approaches the stigma of victimization from a positive angle, and explores the ways that these stigmatizing labels may actually benefit humanitarian organizations. While the label is associated with victimization by stronger states in the Global North, it may also enhance support for foreign aid by designating the group as in need of assistance. In the survey results, respondents tend to increase the duration of their support if the country is described as having a “low GDP”. In the future, organizations could rethink the labels they use to describe these countries to garner more donations for their initiatives.

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CCAS RESEARCH SHOWCASE

POLITICAL SCIENCE

Jewish Conformity and Public Opinion in the Israel-Hamas War

Psychology and political science research often emphasizes the role of the group in generating one's beliefs. An individual whose community holds a certain belief is likely to conform to that belief, especially if the belief is central to group identity and membership. I sought to test whether support for the State of Israel is one such belief among Jewish Americans. Using survey data of both Jews and non-Jews, I found that there was indeed a "Jewish Conformity" effect. Jews who were led to believe that most other Jews support Israel were more likely to support Israel themselves, whereas Jews who were led to believe that Jewish opinion is divided were more critical toward Israel.

This has significant implications for how activists and interest groups might go about influencing Jewish public opinion.

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CCAS RESEARCH SHOWCASE

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PSYCHOLOGY

Unveiling the Psyche of Our Lives: The Intersection of Film and Psychology

Culture is at the epicenter of one's lived experience within the world and is an integral aspect in the etiology of the concept of where home lives and how it is understood by an individual. The Psychodynamic Film and Media Set with GW's Professional Psychology Program will share the concept of home and how it is contextualized by discussing an analysis of three diverse short films while challenging the audience to engage in conversation regarding the impact diversity, inclusion and equity has upon finding emotional and physical safe shelter.

The George Washington University Professional Psychology Program hosts the Psychodynamic Film and Media Set in collaboration with the firm PsychMinded Media. Within this research group students engage in viewing indie and motion pictures as well as other media sources to conceptualize the psychological dynamics located within the presented art. Students attend numerous film festivals annually (i.e. The DC International Film Festival, the DC Black Film Festival, Believe Psychology Film Festival in LA) and engage with filmmakers to construct their work. In doing so, the student screen countless cinematic works to determine films that will be selected for discussion with filmmakers on the DC television show, Best Psychology in Film and present at American Psychological Association's Division 39 program Cinematic Imprints.

We have three short films that are representative of the work that we do. The short films display the autobiographical account of a cisgender white male recovering alcoholic artist (Junkin', 2022, Andy Heck ([Director]), a fictional tale of a youngster in Syria while at war (Aysha, 2022, Cengiz Akaygün, [Director]) and an African American couple in search for a location to reside that identifies with their culture (Welcome to AfroTree, 2023, Chase Parker [Director]). These films explore the various aspects of diversity (gender, race, ethnicity) that impact individuals search for both the personal intrapsychic and societal justice.

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND

BRAIN SCIENCES

Evaluation of microinfarcts and white matter hyperintensities on postmortem 3T MRI and their association with Clinical Dementia Rating in dominantly inherited Alzheimer disease

Dominantly inherited Alzheimer's disease (DIAD) is a rare form of Alzheimer's disease (AD) caused by pathogenic mutations in apolipoprotein precursor (APP), presenilin-1 (PSEN1), or presenilin-2 (PSEN2) gene. The symptom onset generally occurs before the age of 60, so studying individuals from families with a known DIAD mutation presents the potential to disentangle disease-related from age-associated confounding factors or comorbidities. In the most common form of AD, called sporadic or late-onset AD, the presence of cerebral microinfarcts and white matter hyperintensities (WMH) on imaging has been strongly associated with dementia, but these findings are also closely related to age. Microinfarcts and WMH are microscopic regions of cellular death and are of ischemic origin, while WMH are of vascular origin. The presence of microinfarct and its association with dementia is not clear in DIAD. This study aims to explore the relationship of microinfarcts and WMH observed postmortem with the clinical score of individuals with a DIAD mutation.

We examined 13 cases from the dominantly inherited Alzheimer disease network (DIAN) observational study with Clinical Dementia Rating® (CDR®) score and ex-vivo T2-FLAIR magnetic resonance imaging (MRI) sequence on 3T scanner. Microinfarct and WMH were assessed on the T2-FLAIR using the Washington University in St. Louis Central Neuroimaging Data Archive image viewing tool. Spearman Correlation Analyses were used to evaluate whether microinfarct or WMH count were associated with age at death and CDR at expiration.

Higher count of microinfarct and higher count of WMH tended to be associated with higher CDR ($\rho=0.40$, $p\text{-value}=0.06$ and $\rho=0.42$, $p\text{-value}=0.05$, respectively). Microinfarct and WMH counts were not significantly associated with age ($\rho=0.27$, $p\text{-value}=0.34$ and $\rho=-0.38$, $p\text{-value}=0.16$, respectively).

These preliminary results indicate that there may be a potential relationship between clinical score and the number of microinfarcts and white matter hyperintensities detected postmortem in individuals with DIAD. Additional cases are currently under review and are needed to confirm these present findings. Further evaluations of the relationship of microinfarcts and white matter hyperintensities with preclinical cognitive measures and AD biomarkers, such as amyloid burden, tauopathy, and neurodegeneration, are of interest.

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CCAS RESEARCH SHOWCASE PSYCHOLOGICAL AND BRAIN SCIENCES

The Effects of Loneliness and Social Media Use on Alcohol and Eating Cognitions

Social media use is prevalent among college students (Rideout & Fox, 2018), and is associated with higher loneliness (Hunt et al., 2018). A Cigna (2020) report found that 79% of young adults reported feeling lonely. While both loneliness and social media use predict alcohol use (Horigian et al., 2021; Ng Fat et al., 2021) and negative eating behaviors (Ganson, 2023; Sidani et al., 2016), research has not compared the effects of loneliness and social media use among college students, which may have a bi-directional relationship, on these health outcomes.

Methods : A secondary data analysis used data from an experimental study (Post & Stock, 2023). A sample of 135 participants (Mage = 19.6; 82% women) answered questions about loneliness levels, social media use and alcohol use frequency, willingness to drink alcohol in social settings, willingness to eat until uncomfortably full, and unhealthy eating intentions.

Results : Multiple linear regressions tested the effects of social media use and loneliness on alcohol willingness and frequency, controlling for age, greek affiliation, and condition. Social media use ($p = .002$) and loneliness ($p = .02$) predicted willingness to drink socially. However, neither loneliness nor social media use predicted drinking frequency ($ps > .05$). Multiple linear regressions tested the effects of social media use and loneliness on eating willingness and intentions, controlling for age and condition. Neither social media use nor loneliness predicted eating intentions ($ps > .05$). While loneliness significantly predicted eating willingness ($p = .03$), social media use did not ($p = .12$).

Discussion : Social media use and loneliness predicted willingness to socially consume alcohol. This may be due to a desire to strengthen social connections when feeling lonely, which may be reinforced when witnessing or experiencing social connections online. Despite past literature showing a link between alcohol use and publishing and viewing social media content, our findings show social media use was unrelated to drinking frequency (Curtis et al., 2018; Hendriks et al., 2018).

Loneliness, but not social media, predicted willingness to engage in unhealthy eating, aligning with research showing a link between loneliness and maladaptive eating (Ganson et al., 2023). However, the finding that social media use was not related to eating cognitions is inconsistent with research showing higher use was associated with unhealthy eating (Sampasa-Kanyinga, 2015).

This work was supported by the GWU Psychology Department Undergraduate Research and Service Grants (URSG).

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND

BRAIN SCIENCES

The Relationship between Gender Discrimination, Loneliness and Perceived Stress on Disordered Eating Behaviors and Alcohol Consumption among College Women

Up to 20% of women report experiencing discrimination in higher education (SteelFisher et al., 2019). Loneliness and stress are other negative experiences college students face (Diehl et al., 2018; Graves et al., 2021), impacting females more than males (Zahedi et al., 2022, Graves et al., 2021). Gender discrimination, loneliness and stress predict disordered eating (Ganson, 2023; Sabik & Tylka, 2006; Beukes, 2010) and alcohol use (Hamilton & DeHart, 2020; Shank, 2022; Han et al. 2003). However, research has yet to compare their differential impact on alcohol use and eating among college women.

Methods: A secondary data analysis was conducted using data from a one wave survey (Post & Stock, 2022). A sample of 344 females ($M_{age}=19.5$, $SD = 1.2$) answered questions about past gender discrimination, disordered and binge eating, perceived stress, and alcohol use and related problems.

Results: Multiple linear regressions tested the effects of gender discrimination, loneliness and stress on disordered and binge eating, controlling for age and BMI. While gender discrimination did not predict disordered eating ($p = .426$), it significantly predicted binge eating ($p = .002$). Loneliness and stress significantly predicted both disordered eating ($p = <.001$, $p =.001$) and binge eating ($p = .016$, $p =.047$).

Multiple linear regressions tested the effects of gender discrimination, loneliness and stress on alcohol use quantity and alcohol-related problems, controlling for Greek affiliation and age. Gender discrimination and stress significantly predicted the average quantity of alcoholic drinks consumed ($p = .041$, $p =.036$) and alcohol-related problems ($p = <.001$, $p = <.001$). Conversely, loneliness was a negative predictor of both alcohol quantity ($p = .036$) and alcohol-related problems ($p = .003$).

Discussion: Gender discrimination predicted both binge eating and alcohol use, whereas loneliness was related to disordered and binge eating, but negatively predicted alcohol use and related problems. Alcohol use may be related to less loneliness in highly social environments (e.g., college; Halim et al., 2012). While results contrast research showing an association between sexist events and disordered eating (Sabik & Tylka, 2006), they align with research showing loneliness relates to maladaptive eating habits (Hanna et al., 2023). Finally, stress predicted both disordered and binge eating, as well as alcohol use and related problems, aligning with prior research (Beukes et al., 2010)

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND

BRAIN SCIENCES

The Buffering Effect of Self-Control on Drinking Identity, Alcohol Use, and Alcohol-Related Consequences

Alcohol use is a prevalent risky behavior among college students with 49% of full-time college students drinking and 28.9% engaging in binge drinking (NIAAA, 2024). Alcohol use can lead to increased risk of health problems and other consequences such as injuries, liver disease, and academic difficulties (CDC, 2024). Among others, two variables are known to impact drinking behaviors and outcomes: drinking identity and self-control.

Drinking identity refers to the extent that an individual views alcohol use as a defining characteristic of their self-identity (Conner et al., 1999). Self-control refers to the ability to focus or monitor one's own behavior and understand consequences (Baumeister & Vohs, 2003). A strong drinking identity can be a precursor to both higher alcohol consumption and more alcohol-related consequences, and higher self-control can buffer the impact of those two relationships among college students (Foster et al., 2014; Lindgren et al., 2014).

At the time, it was unclear how the COVID-19 pandemic would impact alcohol cognitions and behaviors. This study investigated whether these relationships and variables were impacted among college students returning to campus for the first time once in-person learning was again permitted. An online cross-sectional survey was conducted among 637 college students (Mean age = 19.81, 76% female, 53.7% White) in January-February of 2021. Participants were recruited from university psychology subject pools in D.C. and Texas. We examined relationships between self-control, drinking identity, alcohol use, and alcohol-related consequences. Results indicate that a stronger drinking identity predicts more frequent drinking ($p < .001$) and more alcohol-related consequences ($p < .001$).

Additionally, self-control buffered the relationship between drinking identity and alcohol use ($p = .002$), and between drinking identity and alcohol-related consequences ($p = .009$). Consistent with prior research, these findings support targeting self-control and drinking identity as concepts within college student alcohol interventions.

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PSYCHOLOGICAL AND BRAIN SCIENCES

Effects of Offline and Online Racial Discrimination on Internalizing and Externalizing Behaviors for Latinx Adolescents

Racial discrimination is associated with poor health outcomes, such as increased internalizing and externalizing symptoms, in Latinx adolescents. Despite the prevalence of youth engagement in online environments, there is limited research on online racial discrimination in comparison to its offline counterpart. Consequently, little is known about the effects of online discrimination or factors that protect against the effects of racial discrimination in online settings. Ethnic-racial socialization, the attitudes and behaviors that celebrate one's ethnic-racial heritage, is one culturally specific factor that has been shown to protect against the adverse effects of offline racial discrimination on.

However, few have examined whether ethnic-racial socialization similarly protects against the effects of online racial discrimination. To address these gaps, the current cross sectional study examined the relative effects of offline and online racial discrimination for Latinx adolescents' (n = 372; Mage = 17, SD = .90) internalizing and externalizing behaviors and if ethnic-racial socialization is protective. Hierarchical regression analyses were used to examine the unique effects of offline and online racial discrimination on internalizing and externalizing behaviors and the moderating role of ethnic socialization. Offline racial discrimination ($\beta = 4.97, p < .001$) and online racial discrimination ($\beta = 2.80, p < .001$) were significantly positively associated with internalizing behaviors. Likewise, offline ($\beta = 5.39, p < .001$) and online racial discrimination ($\beta = 1.11, p = .015$) were uniquely positively associated with externalizing behaviors. Ethnic-racial socialization did not protect against the effect of either type of discrimination on internalizing behaviors, or the effect of online discrimination on externalizing behaviors.

However, ethnic socialization protected against the effect of offline racial discrimination on externalizing behaviors. The association between offline racial discrimination and externalizing symptoms was attenuated for individuals who reported high ethnic socialization ($t = 4.63, p < .001$) as compared to individuals with low ethnic socialization ($t = 6.48, p < .001$).

Findings suggest that ethnic-racial socialization is a valuable tool for mitigating the effects of offline racial discrimination. However, additional strategies aimed at reducing internalizing and externalizing behaviors in online racial discrimination are needed.

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CCAS RESEARCH SHOWCASE PSYCHOLOGICAL AND BRAIN SCIENCES

Children’s Level of Death Anxiety and Their Experiences with Death: Part 2

In 1988 Dennis E. Schell, Ph.D. completed his dissertation entitled “Predictors of Death Anxiety in Children.” The study included the development of a death anxiety scale for children (DASC), which was the only item in the study that was published. It also included an investigation into what might predict whether children respond anxiously to death and dying. The study involved a complete review and refinement of the collected data using a modern version of SPSS. Part 1 was presented at the CCAS Research Showcase on April 11, 2023 (IRB#NCR234835). The results showed that children who have experienced the death of a pet and/or the death of a human (i.e., family member or neighbor) showed less death anxiety than children who have not.

Based on Part 1, this study (Part 2) hypothesized that children who have visited a funeral home and children who have attended a funeral will show less death anxiety on the DASC than children who have not.

The results of both the t-test analyzing children who have visited a funeral home compared to those who have not and the t-test analyzing children who have attended a funeral compared to those who have not, showed no significant difference in experiencing less death anxiety on the DASC.

The data shows that the most salient experience for children in lowering death anxiety is experiencing the death of a pet or human. Visiting a funeral home or attending a funeral did not lower childrens’ anxiety on the DASC. One explanation for the results reflects Harter’s (1978) effectance motivation, which suggests that when children are successful in mastering a task (e.g., confronting death), they will be less anxious when confronting a similar event in the future. This does not extend to visiting funeral homes or attending a funeral because these involve “active engagement” in the process of bereavement, which is an important step that comes before mastery and may lead to self-efficacy (Worden, 2018).

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND

BRAIN SCIENCES

Rejection and Identity: Exploring the impact and attributional patterns of social rejection by race and sexual orientation

Social rejection is a ubiquitous and painful social experience. Some individuals are more adversely impacted by social rejection than others. In particular, those who hold one or more marginalized identities may experience rejection more frequently on the basis of their identity (i.e., as a form of discrimination), which may impact responses to rejection. Understanding how individuals cognitively respond to rejection, such as how they attribute its cause, may influence the impact of rejection. The present study examines differences in rejection experiences on the basis of race (White vs. racial minority [BIPOC]) and sexual orientation (heterosexual vs. sexual minority [LGB+]). Specifically, we examine (1) the frequency of rejection experiences; (2) the impact of rejection; (3) rejection attributions (i.e., attribute rejection to something to do with self, something to do with the other person [rejecter], to one's sexual orientation, and to one's race).

Participants (N=1549) completed an online survey. They reported their demographic characteristics and responded to an adapted version of the Responses to Rejection measure (Carter-Sowell, 2010). The sample was evenly distributed by race (~50% White, ~50% BIPOC) and sexual orientation (~50% LGB+, ~50% heterosexual).

BIPOC individuals reported fewer rejection experiences than White individuals ($b=-0.16$; $p.05$). LGB+ participants reported that rejection impacted them more than heterosexuals ($b= .29$, $p.05$). LGB+ participants were more likely to attribute rejection to something to do with themselves ($b=.22$; $p<.05$), something to do with the other person ($b=.22$; $p<.05$), their sexual orientation ($b=.28$; $p<.05$), and their race ($b=.05$; $p<.05$) than heterosexuals. BIPOC participants were more likely to attribute rejection to something to do with themselves ($b=.09$; $p<.05$) and their race ($b=.25$; $p<.05$), but less likely to attribute it to something to do with the other person ($b=-.11$; $p<.05$), than White individuals.

Findings are consistent with previous research suggesting that LGB+ and BIPOC individuals may hold negative self-beliefs that impact perceptions of social experiences. Cultural and systemic factors may inform how individuals interpret potential rejection experiences, the impact of those experiences, and associated cognitive processes, which may influence broader psychological functioning and wellbeing.

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CCAS RESEARCH SHOWCASE PSYCHOLOGICAL AND BRAIN SCIENCES

Assessing the Accuracy of Patients' Beliefs about their Handgrip Strength

Sarcopenia is muscle and strength loss due to age. Lifestyle interventions such as diet and exercise can help prevent premature sarcopenia. Research has found that handgrip strength(HGS) is a biomarker for sarcopenia. Given the ease of assessing HGS, it is worth considering whether HGS can be used in clinical settings to educate individuals about their sarcopenia risk.

The effectiveness of such interventions depends on the accuracy of individuals' perceptions of their HGS and sarcopenia risk. Those who overestimate their HGS may not recognize their sarcopenia risk. Currently, there is no information on the accuracy of individuals' perceptions of their HGS, or whether providing HGS feedback improves perceptions.

The objective of the present analyses was to examine the accuracy of individuals' perceptions of their HGS and evaluate whether providing normative feedback improved those perceptions. Patients(N=170) were recruited from the waiting room at a primary care clinic and randomly assigned to the intervention or control condition. The intervention consisted of an educational infographic describing sarcopenia, and information on HGS as an indicator of sarcopenia. Patients then completed an objective assessment of their HGS and received normative feedback on their HGS("Below Average", "Average", "Strong"). Immediately after the intervention patients completed a survey assessing outcomes of interest. Patients in the control condition completed the survey prior to the intervention.

The primary outcome variables included patients' perceptions of their HGS relative to others their sex and age("Below Average", "Average", "Above Average"). Those unable to engage in physical activity or strength training due to a medical condition(N=32) were excluded from analysis resulting in a final sample of N=138(Ncontrol=70, Nintervention=68). The mean age of the sample was 62.77 years(SD=14.03 years), 54.5 % identified as female, 48.9% as White, 35.0% as African American, and 55.1% attained Master's or Advanced Degree. Results show that patients' estimates of their own HGS varied; while 61% of patients estimated their HGS correctly, nearly a quarter (24.8%) overestimated their HGS relative to the objective HGS assessment.

There was a trend for patients in the intervention condition to be slightly more accurate in their estimates. Findings suggest patients who overestimate their HGS may benefit from objective feedback or educational interventions about sarcopenia.

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND BRAIN SCIENCES

Examining Differences in Cognitions Following a Personalized UV-Photo Intervention

Each day, more than 9,500 people are diagnosed with skin cancer in the United States, and two or more people die of skin cancer each hour (The Skin Cancer Foundation, 2023c). The main risk factor for most skin cancers is prolonged exposure to sunlight and UV rays (Bradford, 2009; The Skin Cancer Foundation, 2023a).

Previous studies demonstrated the effectiveness of using UV photographs compared with a standard black-and-white photograph to highlight the skin damage an individual is unaware they have (Gibbons et al., 2005; Heckman et al., 2013; Mahler et al., 2007). The UV photograph shows dark spots or pigmentation on the individual's face where the skin damage has occurred such that the darker the spot, the more damage has occurred (Mahler et al., 2003; Mahler et al., 2013). Comparing these photos as well as giving participants information about skin cancer risks and sun protection behaviors increases one's willingness to engage in sun protection behaviors and reduces the incidence of skin damage (Mahler et al., 2003; Stock et al., 2009; Walsh & Stock, 2012). The present study examined perceived vulnerability to the negative effects of sun exposure, behavioral willingness to engage in sun protection behaviors, and intentions to do skin checks after a UV-photo intervention using a new UV camera system.

Preliminary analyses were conducted on 39 White and Black (84.6% White) college students aged 18-25 years old recruited from the psychology subject pool. Controlling for skin tone differences, initial results indicate those in the UV condition report higher vulnerability to skin damage due to the sun ($p = .021$), as well as lower behavioral willingness to engage in risky sun exposure ($p = .019$) compared to those who did not receive a UV photograph. There was no significant difference between conditions on intentions to do skin checks ($p = .126$).

These preliminary findings indicate that the new UV camera used in this intervention is successful thus far at increasing sun protective cognitions including perceived vulnerability and behavioral willingness. Data collection is ongoing and additional analyses will be analyzed and presented with a goal of testing the effectiveness of the UV intervention among both Black and White young adults. If effective for both populations, racial differences in the effectiveness of the intervention will be tested.

This work was supported by an Undergraduate Summer Research Fellowship (USRF) granted by the Department of Psychological and Brain Sciences.

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND BRAIN SCIENCES

Local Hypervigilance Experiences Among LGBTQ+ People: Geographic Considerations

Stigma towards LGBTQ+ people arises via discriminatory legislative policy (structural level), stigmatizing local norms (community level), and interpersonal experiences of discrimination (individual level; Hatzenbuehler, 2017). Take that anti-LGBTQ+ policies increasingly target local community contexts (Agénor et al., 2022), and LGBTQ+ individuals endorse more family rejection, bullying, and violence than peers (Gamarel et al., 2014). From these and other marginalizing factors, researchers have begun to understand LGBTQ+ hypervigilance—i.e., excessive watchfulness for identity-related threats. While researchers continue to connect structural policy and individual LGBTQ+ experiences, the elicitation of hypervigilance in community contexts remains poorly tapped. The current study employs a novel survey paradigm, conjoint analysis, whereby LGBTQ+ people evaluate iterative forced-choice vignettes for discrimination risk. As such, this study assesses how regional (e.g., Census) breakdowns and demographics intersect to induce community-specific LGBTQ+ hypervigilance.

LGBTQ+ people completed self-report surveys, including a conjoint task that considered hypervigilance biases in location, companion, time, familiarity, and distance from home. For validation, Study 1 (MTurk, n = 455) vignettes included stereotypically neutral (e.g., restaurants) and rejecting (e.g., religious institution) places, whereas Study 2 (Prolific, n = 799) included the former only. In Study 1, versus cisgender men, nonbinary folks in states with 10% more registered democrats valued location 7.6% more. Relative to lesbians, bisexuals valued familiarity 24.5% more in states with a 1% higher females-to-male sex ratio. In Study 2, versus bisexuals, gays valued distance 7.8% less in states with a 1% higher females-to-male sex ratio. Recognizing that many LGBTQ+ people are at-risk of social isolation, these data clarify how ecological contexts—stigmatizing or supportive—are entered, whereby hypervigilance is beholden or recast. Despite this, ecological contexts come in an array, and future research should further consider diverse occasions (e.g., travel) and cultural considerations (e.g., religion), as they influence LGBTQ+ community engagement.

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CCAS RESEARCH SHOWCASE PSYCHOLOGICAL AND BRAIN SCIENCES

Potential implications of statewide anti-equality laws on social anxiety in LGB+ individuals

Anti-LGBTQ+ legislation has increased dramatically in recent years (Peele, 2023), and rights of LGBTQ+ individuals remain at risk (e.g., sports participation for gender diverse people). Discriminatory policies contribute to increased LGBTQ+ rates of mood and anxiety disorders, and loneliness from social anxiety can exacerbate mental health disorders in LGBTQ+ people (Elmer, 2022). This loneliness can further separate LGBTQ+ and heterosexuals' rates of social anxiety, increasing the isolation of LGBTQ+ people. The present study examines if the social anxiety dearth between LGB+ individuals and heterosexual individuals differs based on state anti-equality laws. We hypothesize that LGB+ people will report higher social anxiety symptoms than heterosexual individuals, and that this difference will be greatest when they live in a state with anti-equality laws. Participants (N = 1203; Mage = 35.09 years) completed several online measures, including the Social Interaction Anxiety Scale. LGB+ participants made up 49% and heterosexual participants 51%. We used the Human Rights Campaign's (HRC) state scorecards to determine which states had anti-equality laws. Specifically, we categorized states by whether they have laws restricting the rights of LGBTQ+ youth (e.g., "anti-bullying laws that prohibit enumeration"). The presence of one or more of these laws delineated our state groupings, resulting in 25 states with discriminatory laws and 25 without.

LGB+ individuals showed significantly higher levels of social anxiety than heterosexual individuals ($F(1, 1179) = 59.99, p < .001$). Levels of social anxiety did not significantly differ among those living in states with anti-equality laws versus those living in states without anti-equality laws, regardless of sexual orientation ($F(1, 1179) = 1.11, p = .29$). Finally, we found no significant interaction between sexual orientation and anti-equality laws on social anxiety scores ($F(1, 1179) = 1.761, p = .19$).

Our findings align with research showing that LGB+ people have higher levels of social anxiety than heterosexuals. Living in a state with anti-equality laws as an LGB+ person was not associated with increased anxiety among LGB+ people. State-wide policy warrants more investigation, focusing on awareness of anti-equality laws or adverse mental health outcomes. Community connection is a staple of many LGB+ individuals lives, making social anxiety crucial to LGBTQ+ wellbeing as a barrier to vital support networks.

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CCAS RESEARCH SHOWCASE PSYCHOLOGICAL AND BRAIN SCIENCES

Examining Protective and Risk Factors associated with Alcohol Use, Coping, and Problems among Middle-Aged Black Women

Any amount of alcohol use (AU) will cause harm to ones' health (Lancet, 2023). Over 18 million US Black adults report past year AU (NIAAA, 2024a). AU has negative health effects, including increased disease and cancer risks (NIAAA, 2024b). Women are particularly susceptible to alcohol-related problems; health disparities research emphasizes Black women can be at greater risk due to intersectional minority statuses (Mulia & Bensley, 2020; Ransome et al., 2017). Racial discrimination, loneliness, and stress predict higher AU, coping, and problems (Buckner et al., 2023; Tse & Wong, 2014; Wakabayashi et al., 2022); spiritual and religious coping and social support buffer these effects (Budescu et al., 2011; Lee et al., 2018). However, a gap exists in exploring this with middle-aged Black women (Hatzenbuehler et al., 2011). This study examines whether known protective and risk factors coincide with research for this population.

Secondary data analysis examined 141 middle-aged Black women (M = 48.70 years, SD =6.00) from ResearchMatch. Participants completed a survey online and were given a \$15-20 gift card. We examined relationships between racial discrimination, loneliness, stress, feelings of self-control, social support, sense of belonging with one's racial identity, and spiritual and religious coping with past 6-month AU: frequency and intensity, coping, and problems.

Significant positive correlations were found for AU as coping with racial discrimination ($r=.22$), loneliness ($r=.20$), and stress ($r=.27$); and AU problems with loneliness ($r=.26$) and stress ($r=.23$). Past 6-month AU frequency and intensity, coping, and problems negatively correlated with self-control ($r_s=-.29, -.24, -.34, -.43$, respectively). Social support related to lower past 6-month AU frequency ($r=-.20$), intensity ($r=-.20$), and problems ($r=-.27$). Sense of belonging with one's racial identity was negatively related with AU as coping ($r=-.23$); and spiritual and religious coping related to lower past 6-month AU frequency ($r=-.20$).

Results show significant correlations for alcohol-related variables and known risk and protective factors from younger populations, similar with previous research. This initial analysis gives a baseline for developing more complex predictive models for these relationships with middle-aged Black women – filling a literature gap. Future research should also test these factors with middle-aged Black men.

This research was funded by the Luther Rice Undergraduate Research Fellowship, 2022-2023.

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND

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The Fluidity of Gender Expression: Exploring Heteronormativity in Perception of Gender Expression and Sexual Identity Disclosure in the LGB+ Community

Gender expression encompasses various aspects of appearance, behavior, and interests that represent how an individual understands and presents their gender. Societal stereotypes dictate norms around gender expression, centering femininity in individuals assigned female at birth and masculinity in those assigned male at birth. Gender nonconformity (GNC) is described by a deviation from gender norms, such as a cisgender man with a higher-pitched voice or a cisgender female that wears masculine clothing (Thoma et al., 2021). Heterosexual people tend to project GNC stereotypes onto these individuals by expecting cisgender lesbians to express masculine qualities and cisgender gay men to express feminine qualities (Skidmore et al., 2006). Thus, individuals who present as more GNC may be assumed to be heterosexual, which may be distressing to individuals whose LGB+ status is central to their identity.

To test this hypothesis, the current research study investigates how gender expression is associated with (1) the frequency by which heterosexual peers assume cisgender LGB+ persons are straight; and (2) cisgender LGB+ individuals' desire for others to know that they hold a LGB+ identity. We hypothesize that gender-conforming individuals will be assumed straight more than gender-nonconforming individuals, and will also feel a higher need to self-disclose their sexual orientation compared to gender-nonconforming individuals.

Participants (N = 1,254) were adults that self-identify as cisgender and LGB+. They completed an online survey where they reported demographics, level of importance for people to know they hold a LGB+ identity, the frequency with which others assume they are straight, and a scale of appearance-based gender expression (masculinity vs. femininity). Regression analyses will be run to examine the association between gender conformity and outcomes.

Findings from this study will contribute important knowledge to understandings of the connection—or disconnection—between gender expression and sexual orientation in hopes of decreasing cisnormativity and gender assumption in the LGBTQ+ community. Assumption that gender conforming individuals are heterosexual and gender nonconforming individuals are homosexual leads to the possibility of queer categorization which may be harmful (e.g., for anti-LGBTQ+-based discrimination). As societal attitudes toward GNC improve, normalizing diverse experiences of gender expression and sexual identity is essential.

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND

BRAIN SCIENCES

Assessing the Impact of a Psychoeducational Intervention on Attitudes and Intentions Towards Strength Training Among Primary Care Patients

Sarcopenia, muscle and strength loss due to age, is prevalent among older adults, affecting around 10% of those sixty and older worldwide. Sarcopenia is associated with negative outcomes including cognitive impairment, depression, reduced quality of life, and mortality. Physical activity and strength training can help maintain muscular strength and prevent the onset and development of sarcopenia. Studies have found handgrip strength (HGS) is a biomarker for sarcopenia. However, there is a gap in the literature on how to disseminate information on HGS and sarcopenia to motivate individuals to engage in preventative strength training.

The aim of this study was to evaluate the impact of a psychoeducational intervention on patients' strength training intentions and confidence in their ability to slow sarcopenia. Patients (N=134) were recruited from the waiting room at a primary care clinic, and randomly assigned to the control (N=67) or intervention (N=67) condition. The intervention consisted of an educational infographic describing sarcopenia, its consequences, ways to slow its progression, and information on HGS as an indicator for sarcopenia.

Next, patients completed a HGS task and were provided feedback on their HGS relative to standards for their age and sex. Immediately after receiving the intervention, patients in the intervention condition completed a questionnaire that included the primary outcome variables strength training intentions, and attitudes and beliefs regarding sarcopenia. Patients in the control condition completed the questionnaire prior to the intervention. The mean age of the sample was 63.54 years (SD=13.1), with 55.2% identifying as female, 50.0% as White, 33.6% as African American, and 55.2% holding a Master's or Advanced Degree. Results showed a statistically non-significant trend in the direction of the intervention. Participants in the intervention condition reported greater intentions to increase their strength training in the upcoming 14-days (M=4.24) than those in the control condition (M=4.06; $F=2.06$, $p<.15$, $\eta^2=.02$).

Results also showed a statistically non-significant trend in the direction of the intervention regarding participants' confidence in their ability to slow sarcopenia. Participants in the intervention condition reported greater confidence (M=5.88) relative to participants in the control condition (M=5.56; $F=2.43$, $p<.12$, $\eta^2=.02$). Findings will inform further research aimed at developing interventions to prevent sarcopenia.

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND

BRAIN SCIENCES

Understanding Marijuana Use: Exploring Norms Across Methods of Administration

Literature on recreational marijuana use has identified four methods of administration (MOAs), i.e., blunts, joints, vapes and edibles.

Recreational marijuana use is associated with negative health and academic consequences, making it an important behavior to target in interventions. Two types of social norms, descriptive norms (DN; perceived prevalence of a particular behavior) and injunctive norms (IN; beliefs about others approval of the behavior) are predictors of young adult substance use.

No research has tested whether the norms associated with different MOAs are (dis)similar. The goal of this project was to compare norms associated with various MOAs. College students (N = 159) completed an online survey. Participants self-reported their past marijuana use MOA. DN were assessed as the percentage of friends ranging from 0% to 100% who use each MOA. IN were assessed by the extent to which their friends would approve or disapprove of their using each MOA use ranging from 1 (strongly disapprove) to 5 (strongly approve). The sample had a mean age of 19.21 years (SD = 1.26 years), 50.3% were female, 59.1% identified as White, and 44% of the sample reported past 30-day use of marijuana. Vaping (30.43%) was the most used MOA, followed by joints (21.74%), edibles (21.74%), other MOAs like bongos (19.56%), and blunts (4.35%). A repeated measures analysis of variance (ANOVA) revealed that perceived prevalence of vapes was highest (M = 33.58, SD = 30.28) followed by joints (M = 31.92, SD = 28.4), edibles (M = 32.10, SD = 28.55), and blunts, (M = 21.29, SD = 25.15; $F(3, 435) = 15.18, p < .01$). The greatest perceived approval from friends was for edibles (M = 3.51, SD = 1.24) followed by joints (M = 3.20, SD = 1.35), blunts (M = 3.03, SD = 1.30), and a vaping device (M = 3.02, SD = 1.34; $F(3,471) = 22.95, p < .01$). Because vaping was the most used MOA among our sample, a linear regression analysis was run to explore whether DN and IN uniquely predicted intentions to vape in the next six weeks, over and above past year marijuana use.

Results revealed that DN to vape ($\beta = .298, t = 4.83, p < .01$), and past year use ($\beta = .716, t = 12.01, p < .01$) were significant factors of intentions to vape, but IN were not. The overall model was significant and explained 72.8% of the variance in intentions $F(3, 112) = 100.19, p < .01$. Findings from this study suggest that interventions targeting marijuana use can be tailored to address the social norms associated with MOAs.

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CCAS RESEARCH SHOWCASE

PSYCHOLOGICAL AND BRAIN SCIENCES

Modeling Innate Fear Responses in Mice: A Novel Approach to Studying PTSD Mechanisms

Building on previous research in classical conditioning involving a light footshock paired with a tone to elicit fear responses in mice, this study employs a looming disk assay protocol as an unconditioned stimulus to evoke innate defensive behaviors, simulating an aerial predator threat. This approach is used to examine the consolidation and extinction of learned fear in the context of innate, rather than physical, fear responses.

The experimental design involved two groups of mice: a control group (LD) exposed only to the looming disk stimulus and an experimental group (LDT) subjected to both the looming disk and a high-pitch tone. Over a four-day period, mice were habituated to a testing arena, underwent conditioning, and were then tested for freezing responses to six tones played at random intervals over 24 hours in a home cage setting. The study utilized an open-field arena, a monitor to display the LD, a camera to record the behavior, and a speaker setup.

During the conditioning phase, observations indicated no significant difference in freezing behavior between the LD and LDT groups, aligning with expectations as the tone was not anticipated to affect freezing during the conditioning phase. On the testing day, the LDT group exhibited significantly higher freezing than the LD group during the first three tones, suggesting potential stimulus extinction in the latter tones. Despite these findings, the considerable variability in freezing time, stemming from the limited sample size of seven mice, necessitates further data collection and analysis prior to drawing definitive conclusions.

This study's novel fear conditioning method provides a grounded basis for modeling innate fear responses in mice, contributing to the nuanced understanding of fear conditioning. Further research is needed to map the neural pathways involved in these fear responses to provide deeper insights on PTSD.

This work was supported by the Psychological and Brain Sciences Undergraduate Research and Service Grant.

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CCAS RESEARCH SHOWCASE

ROMANCE, GERMAN & SLAVIC LANGUAGES & LITERATURE

The Born-Einstein Correspondence

The thesis explores the relationship between philosophy, physics, and literature through the lens of the Born-Einstein Letters, examining how this collection of documents illuminates a coexistence between scientific and philosophical inquiry, both of which were influenced heavily by the historical context of the era during which the correspondence took place (1916-1955).

The quantum and relativistic revolutions in science shared a trajectory with the rise of German nationalism and the downfall of Germany. The study will examine German documentary theater of the 1960's as a comparative lens to contextualize the letters and other documents as part of a greater collection.

A close examination of this correspondence reveals how the dialogue between revolutionary thinkers of the 20th century influenced later theatrical portrayals of these scientists in theatrical works. Dürrenmatt's "Die Physiker" and Kipphardt's "In der Sache J. Robert Oppenheimer" emerge as significant examples of this influence.

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CCAS RESEARCH SHOWCASE

SCHOOL OF MEDIA & PUBLIC AFFAIRS

Media Economics & News Access in the Post-Print Era

The leak of the New York Times' 2014 Innovation Report sent shockwaves across the news industry. The report detailed the Times' focus on engaging more readers and keeping up with digital-savvy internet-only outlets like BuzzFeed and Vox. While the Times Report did not directly call for newspapers to begin charging readers for their digital content, its release underscored the relative failure of digital advertising revenue as compared to its print counterpart. In the years that followed, newspapers widely began to adopt the paywall, a type of subscription-based revenue model which prevents readers from accessing articles without paying a fee.

As of 2020, more than 75% of U.S. papers had adopted paywalls. The media's industry-wide pivot away from digital advertising and toward subscription fees marked a major shift in how news organizations generate revenue. While the organizations that adopted paywalls became focused on recruiting subscribers who pay regular fees rather than prioritizing page views which produce advertising revenue, organizations that remained paywall-free continued to pursue the latter as their primary stream of generating revenue. The researcher hypothesized that, as a consequence of their continued reliance on advertising revenue in a digital market that is now dominated by subscription-based competitors, papers that retained their free digital format may be incentivized to change the topics and frames of their stories in order to generate more page views by broadening the size of their audiences.

To test this hypothesis, the researcher seeks to discover the differences between the content of free and paywalled online newspapers. Thus, the aim of this paper is to determine the type of news content that is being consumed in two distinct online media ecosystems by comparing the stories produced by Newsday and The Long Island Press, as well as the stories produced by The Philadelphia Inquirer and Metro Philadelphia.

The researcher hypothesized that free newspapers like The Long Island Press and Metro Philadelphia will produce more locally-based and episodically-themed content than paywalled newspapers like Newsday and The Philadelphia Inquirer do. As a means to test this theory, the researcher conducted a content analysis of Newsday and The Long Island Press' front page stories and coded each story's topic, frame, author, and angle. The researcher repeated this process using stories from The Philadelphia Inquirer and Metro Philadelphia.

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CCAS RESEARCH SHOWCASE

SCHOOL OF MEDIA & PUBLIC AFFAIRS

The Free Britney Body Politic: Unraveling Digital Fandom, Rhetorical Visions, and Political Engagements in the Britney Spears Community

This research explores the intricate dynamics of participatory culture and digital fandom, elucidating their role in shaping and disseminating rhetorical visions online. Through an in-depth examination of the Britney Spears fandom, the study delves into the evolving landscape of political engagement within fan communities, crucial for comprehending the formation of alternative realities. Examining this phenomena is critical for understanding modern politics: Fox News host Jesse Waters and Republican primary candidate Vivek Ramaswamy have propagated conspiracy theories suggesting Taylor Swift is part of a Pentagon psy-op aimed at garnering support for Joe Biden.

In light of political actors mobilizing fan bases, a comparative case study methodology is employed to scrutinize the convergence of these digital spaces, focusing on the #FreeBritney and Banon subcommunities. The key distinction lies in their beliefs regarding Britney Spears' conservatorship status, with #FreeBritney asserting her release in 2021 and Banon maintaining she remains under control. The release of Britney Spears' memoir, "The Woman In Me," serves as a central point of analysis, unraveling how these communities construct rhetorical visions and reshape the discourse surrounding the conservatorship.

The research uses press coverage, legal battles, and the memoir's content, to contextualize a comprehensive understanding of divergent interpretations within #FreeBritney and Banon. A cluster sampling approach across TikTok, X, and Instagram ensures a thorough exploration of fan visions, examining material posted in the two weeks before and after the memoir's release. The analysis, conducted separately for each platform, dissects text posts, images, and videos, aiming to reveal platform-specific patterns in the formation of rhetorical visions.

Acknowledging potential limitations, including selection bias and the dynamic nature of social media conversations, the study also recognizes constraints such as language preferences and evolving social media policies. Ultimately, this research offers valuable insights into the impact of media, fan communities, and podcasts on shaping rhetorical visions within the Britney Spears fandom. In a broader context, it sheds light on how fan culture influences the nature of reality in the digital age.

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CCAS RESEARCH SHOWCASE

SCHOOL OF MEDIA & PUBLIC AFFAIRS

APIs and Academic Attacks: A Comparative Analysis of Social Media Research and Recent Restrictions

In recent years, social media researchers have faced unprecedented challenges, particularly regarding the monetization and restrictions placed on application programming interfaces (APIs) of major platforms such as Twitter and Reddit. This study delves into the ramifications of these restrictions on scholarly works, focusing mainly on the roadblocks they pose to understanding social media's impact on society, politics, and information dissemination.

Due to the recent API and historical documentation access restrictions placed upon technology scholars, it is theorized that future research into social media and its effects will be unable to be conducted. This research study attempts to see if any research - specifically previous scholarly research surrounding social media, misinformation, and polarization - can be conducted today with these new restrictions.

The purpose of this study is to dissect how scholarship surrounding social media is affected today while comparing it to oral retellings of lived experiences from academic researchers in the field. Due to costly API access restrictions on websites such as Reddit and Twitter, independent researchers are currently unable to access the same amount of data and information. This research attempts to show the negative effects of these recent restrictions on independent scholarly research surrounding technology and social media.

The study explores the chilling effects of legal attacks on researchers, particularly those studying misinformation and polarization. This research assesses the feasibility of conducting social media studies in the current climate. The findings shed light on the extent to which social media research has been affected by these developments and highlight the obstacles faced by scholars in advancing our understanding of digital culture and its implications.

This project's findings highlight threats that affect not only the field of independent technology research, but also the collective knowledge of social media, technology and their influence on society. Without proper research surrounding social media, such as misinformation, fake news, polarization, and hate speech, countless individuals will continue to be detrimentally impacted by these adverse effects - further endangering their data, information, and selves.

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CCAS RESEARCH SHOWCASE

SCHOOL OF MEDIA & PUBLIC AFFAIRS

Colors' Impact on Physical Action within Visually – Delivered Public Service Messaging

This study looks at how the use of different colors affects the likelihood of the target populations taking physical action after they viewed visually – delivered public service messages. More specifically this study looks at five different color pallets and their relative abilities to trigger target group engagement at a level beyond simple viewing. I am seeking to examine if the five different sections of the color wheel drive different levels of engagement and why they encourage that engagement.

This study used an ethnographic rapid assessment technique research methodology and a website enriched field experimentation to track viewer engagement within five different post cards. The respondents of the website field experimentation answered a series of questions on a Likert scale. This generated data showing how the information cards helped facilitate their engagement and which color was the most successful at grabbing their attention. The ethnographic rapid assessment technique section of the research used a guided discussion approach to help understand these choices on a more nuance level.

The motivation behind this research is to identify potential knowledge gaps between basic graphic design, specifically color theory, and its application to strategic communication messaging.

This work was supported by the Manheim-Sterling Undergraduate Research Prize.

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CCAS RESEARCH SHOWCASE

SOCIOLOGY

The Symbiosis of World War II Collective Memory and Japanese Pop Culture in Contemporary China Through a Generational Perspective

In contemporary China, there has been a noticeable emergence of a culturally pluralistic attitude towards foreign cultures, largely influenced by the rise of Neo-liberalist ideology. This shift has led to the widespread adoption of Japanese pop culture, particularly among the younger generations born in the 1990s and 2000s. However, this cultural openness exists alongside enduring trauma from World War II (WWII), specifically the collective memory of Japanese invasion, which has engendered deep-seated animosity within Chinese society.

Despite this historical resentment, there is a symbiosis forming between these contradictory emotions, where hatred from traumatic memory coexists with a fondness for Japanese pop culture. This project aims to dissect the complex formation of this symbiotic relationship between historical trauma and cultural affinity. It explores how interactions between historical memory and post-memory, as well as exposure to contemporary Japanese culture through China's culture industry and family contribute to this phenomenon among the second generation of Chinese, born in the 1950s and 1960s.

It raises the question: how the Chinese second generation navigate their conflicting emotions towards the collective memory of the Second Sino-Japanese War and Japanese pop culture in contemporary China? By delving into the early experiences of people in this age group, examining the influences of family dynamics and the education system in perpetuating anti-Japanese sentiments, this study seeks to understand the evolution and perpetuation of these emotions.

Concurrently, it investigates the impact of exposure to contemporary Japanese pop culture through social media and family interactions on their affinities towards the pop culture. Through content analysis and semi-structured interviews with 20 participants, this research anticipates observing significant shifts in experiences from the post-war period to the present, as well as changes in mental states over the decades, contextualized within the backdrop of prevailing Neo-liberalism in China.

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CCAS RESEARCH SHOWCASE

SOCIOLOGY

The COVID-19 Pandemic and Impacts on K-12 Enrollment in the DC Metropolitan Area: A New Juvenile Delinquency Risk Factor

Beginning in March 2020 and without an agreed-upon conclusion, the COVID-19 pandemic has been named a generationally defining event. Within the DC Metropolitan area, public and private K-12 schools were forced into remote learning in Spring 2020, with some not returning to full in-person operations until Fall 2022. I argue that children aged K-12 who were removed from an in-person learning environment during this time period may have experienced a breakdown in the development of their social-emotional competence, which is defined as a person's ability to display empathy for others and make responsible decisions. Social-emotional competence is an important factor in a child's resilience to one or more risk factors for juvenile justice system involvement. I employ the school-prison nexus theory, which argues that the school and prison systems act in tandem to inform the other about which children merit retribution.

This paper examines the impact of already-established risk factors on enrollment numbers in the DC metropolitan area in the months following school closures. Using the Household Pulse Survey conducted by the Census Bureau, I selected survey responses from the DC Metropolitan area that indicated at least one child aged 5-17 living in the household. The percentage of non-enrolled students remained fairly constant throughout the surveyed time period before risk factors were applied. Preliminary results suggest a relationship between risk factors for juvenile delinquency and higher percentages of non enrollment. These results suggest the need for further investigation into the precise impacts of COVID-19-related school closures on the likelihood of juvenile justice system involvement, and the potential identification of those school closures as a new risk factor in and of itself. Further investigation is also needed into the impacts of forced school closures on the social emotional competence of K-12 students.

Existing research on truancy and unexcused absences as potential indicators of future juvenile delinquency does not explore the impacts of lengthy required absences from in-person learning environments. In order to develop effective educational and juvenile justice best practices, it is crucial to have a full understanding of the totality of events which impact K-12 children in the DC Metropolitan area.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

A Pupillometric Study of Error-Based Learning in Language

How do people learn sentence structures? Two prominent theories are: 1) Frequency-based statistical learning - the idea that our brains track how often certain sentence structures are used; and 2) Error-based learning - the idea that our brains have certain expectations for sentence structures, and when these expectations are broken our brains learn especially from those mistakes.

This study uses verb bias and sentence structure manipulation to test the effectiveness of error-based learning in language. Seventy-nine participants watched videos of puppet animals and heard novel sentences, with the structure of Verb-Agent-Patient (VAP) or Verb-Patient-Agent (VPA), describing the puppets' actions. The agent and patient names were in English, but the verbs were 8 different pseudowords such as "flern", "parn", and "stoom." Exposure and testing were split into two blocks.

In Block 1, participants heard 96 sentences with the 8 verbs. Some verbs appeared exclusively in VAP and others exclusively in VPA. Some appeared more frequently than others (18 vs 6 times). After this exposure, they were tested by watching new videos and describing them using this new language. In Block 2, participants were exposed to 48 sentences using the same verbs as before but with the verb-structure associations switched from Block 1. As before, they were tested using new videos after this exposure. The switch of verb-structure associations between the two blocks allowed us to test whether participants generated expectations based on Block 1 and learned from violations of those expectations in Block 2 (i.e., whether there was error-based learning). Pupillometry, which tracks pupil dilation in response to stimuli, was used to measure the participants' surprise at these reversed associations and determine how well they adapted to the change. R-Studio was used to analyze the study's data.

The analyses thus far show that participants successfully learned the verb biases in each block and switched the structure preferences. However, there was no significant effect of frequency and its interactions with the other variables. Analyses of the pupillometry data will provide more fine-grained information about when and how much surprise participants experienced in Block 2. This in turn will allow us to determine whether participants employed error-based learning to learn the verb-structure associations.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

Integrating and Generating Knowledge in the Visual and Verbal Domains

Humans are constantly exposed to new and disparate information from multiple sources. Verbal (linguistic) and non-verbal (spatial) skills are essential to the accumulation of knowledge. Integration is crucial for attributing learned knowledge to new experiences, and is what enables humans to evolve culturally. The importance of integration is emphasized in the human brain's ability to integrate incoming linguistic and spatial information rapidly, often without conscious awareness.

However, the processes used in integration remain unclear. Previous research has shown similar group ability to integrate both linguistic and spatial information, but individual differences indicated domain specific processes in integration. Differences in individuals may also vary based on previous domain knowledge, such as linguistic vocabulary or spatial skills. In this study, the differences in domain integration performance will be explored using a within-subject design exposing participants to tasks where integration is possible (because two integrable events are learned) or impossible (because only one of two integrable events are learned). Participants's previous knowledge in language and spatial domains will be measured using the Woodcock-Johnson III tests.

We hypothesize that there will be a significant relationship between language and spatial performance when integration is possible. If integration is domain-specific, there will be a negative relationship, and vice-versa for domain-general processes. Results will give better insight into our ability to not only learn but expand our knowledge generatively, making cultural evolution possible.

This work was supported by a University Facilitating Fund (UFF).

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

A Pilot Study on Inner Speech in Bilingual Aphasia

Do you experience an ‘inner voice’? How does the concept of an ‘inner voice’ differ for those who speak multiple languages? Similarly, how does it present for individuals with an acquired language disorder?

Aphasia is an acquired language disorder caused by a stroke or other brain injury that manifests as difficulties with speaking, listening, reading, and writing. A hallmark symptom of aphasia is anomia, or naming difficulty (ASHA, n.d.). Yet, 75% of people with aphasia report being able to say words in their mind even if they can not successfully say them aloud (Fama et al., 2017). This ability to silently generate language is known as inner speech (Fama & Turkeltaub, 2020). Inner speech offers a unique insight into the language abilities of individuals with aphasia.

Inner speech has also been extensively studied in individuals who are bilingual (i.e., who speak two languages fluently). In a survey conducted by Grosjean (2010), 70% of bilingual participants reported thinking in both their first (L1) and second language (L2). Language use of L1 versus L2 for inner speech is modulated by various factors including proficiency level, language exposure, and frequency of use (Resnik, 2018). However, no prior studies have examined language use for inner speech in bilingual individuals who have aphasia.

The present study aims to understand the role of inner speech in bilingual people with aphasia through a pilot study with a Spanish-English bilingual person with aphasia. To achieve this, we will adapt an existing measure of inner speech that was previously used with monolingual English people with aphasia to create a Spanish version. To adapt the test, this study will validate the naming of 255 items in Spanish through a picture naming task with 30 bilingual, neurologically intact adults. Subsequently, an L1 Spanish speaker will check the accuracy of participant responses. The 30 items with the highest naming agreement among participants will be used for the Spanish inner speech tasks. These inner speech tasks involve identifying the first letter and number of syllables for each word in a set of pictures that participants will name inside their heads. We have enlisted a bilingual person with aphasia to participate in English and Spanish versions of these tasks later this spring. This study will provide novel insights on the nature of inner speech with bilingual people with aphasia to inform current and future aphasia treatment practices.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

Can PBCAT Training Improve Accurate Detection of Social Lies?

Traumatic brain injury survivors often struggle to comprehend and engage in irony and sarcasm due to pragmatic or social language deficits. These social-cognitive deficits can manifest in difficulty making and maintaining relationships which leads to social isolation and reduced quality of life. The social use of language requires the ability to distinguish between truthful and deceitful speech using a number of cues embedded in verbal and non-verbal behavior. This study investigates the generalizability of an existing lie detection tool in a new context.

The Psychologically Based Credibility Assessment Tool (PBCAT) was originally designed for interrogation purposes and focuses on active deception detection. This training details a series of deception and truth indicators. If The PBCAT can be applied outside of the interrogation room, it holds the potential to inform the creation of a therapeutic tool for traumatic brain injury survivors facing pragmatic deficits. Our study attempts to apply The PBCAT to the context of social lies. Trained participants used The PBCAT's truth and deception indicators to inform their decisions as to whether an individual was telling a true or false account about their activities on a particular evening.

Our preliminary results show that The PBCAT was unable to improve detection of social lies in neurotypical adult males. These findings demonstrate the need for a deeper understanding of the pragmatic subtleties in low-stakes social situations. Further analysis of the effectiveness of each cue is underway and will guide the future trajectory of our research.

This work was supported by a Luther Rice Fellowship.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

Characterizing the Development of Social Learning in Early Childhood

Social learning (SL), the ability to acquire novel behaviors through observation, is crucial to mastering later academic skills such as reading and math. Previous research (Subiaul, 2023) has demonstrated significant variation across domains of SL abilities of children aged 3 to 6 years. It is an open question whether younger children exhibit similar SL skills. It is hypothesized that as children age, their SL abilities will improve across domains.

Here, we explored the SL skills ($n = 95$) of children between 24 to 36 months old. Using a tablet-based task, children were randomly assigned and tested for accuracy on 10 trials (out of a possible 18: 2 tasks X 3 conditions X 3 trials). The tablet task tested childrens' SL abilities in the pictorial (touching the correct picture content, ignoring its location) and spatial (touching the correct location, ignoring the content in the picture) domains. In each pictorial or spatial task, imitation - touching the same picture as the experimenter, emulation - avoiding touching the same picture as the experimenter, and recall - an asocial child-only trial-and-error condition, are all tested.

Through this study, we aim to identify the age that children exhibit above average (50%) social (imitation and emulation) and asocial (recall) learning in the pictorial and spatial domains. Identifying the age range at which children begin to reliably perform above chance on SL tasks is information that can be used to later predict when or why children might encounter difficulty with SL. This can equip educators with ways to better develop children's SL abilities - abilities that are necessary to developing later, more advanced learning skills.

This project has been funded by UFF - University Facilitating Fund.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

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What Are The Neural Correlates of Inner Speech?

Background: This study focuses on inner speech (IS) in people with aphasia. IS is known as the voice in one's head. IS can be measured in multiple ways, capturing at least two definitions: silent retrieval of words (retrieval-based IS [RBIS], e.g., self-report on silent picture naming) and silent retrieval plus manipulation of sounds (manipulation-based IS [MBIS], e.g., silent rhyme judgment of two words).

Questions: What are the neural correlates of IS? Do they differ for RBIS and MBIS measures?

Methods: Data came from a pre-existing dataset including 6 IS measures capturing both definitions. Participants (n=67) were stroke survivors in the chronic phase of recovery. All had MRI scans to identify the precise location of lesions. Brain-behavior relationships were analyzed using lesion-symptom mapping with support vector regression (SVR-LSM).

Hypotheses: Impaired performance on RBIS will reflect damage to the ventral stream (e.g., temporal lobe). Impaired performance on MBIS will reflect damage to the dorsal stream (e.g., frontal/parietal lobes).

Findings: 0 clusters pass the clusterwise threshold of statistical significance ($p < 0.05$). Instead, the unthresholded voxelwise b-maps ($p < 0.01$) are analyzed to reveal trends in brain-behavior relationships.

RBIS: Impairments on the subjective measure of IS were associated with damage to the superior temporal and frontal regions (ventral/dorsal). Impairments on objective measures were associated with damage to the inferior temporal lobe (ventral).

MBIS: Impairments on rhyme judgment tasks were associated with damage to the superior temporal/inferior parietal areas (ventral/dorsal).

Conclusions: We found partial support for our hypothesis. SVR-LSM analyses revealed that the subjective RBIS relies on structures supporting phonological storage (superior temporal lobe) and self-monitoring (frontal lobe). Results differ for the subjective and objective measures of RBIS. Objective RBIS measures were associated with damage to structures supporting lexical-semantic retrieval (inferior temporal lobe). For MBIS, impairments were associated with damage to structures supporting phonological storage and retrieval (superior temporal lobe) and sensorimotor regions (parietal lobe). Contrary to our hypothesis, the neural correlates for the subjective measure of IS reflect the neural correlates supporting manipulation-based measures of IS.

This research was supported by the National Institutes of Health under awards K12 HD093427 (Fama) & R00 DC018828 (DeMarco).

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SPEECH, LANGUAGE & HEARING SCIENCES

Who Did That? How Source Monitoring Impacts Imitation Fidelity.

Remembering and differentiating information and its sources are an integral part of our lives, whether we are conscious of it or not. Previous studies show that people consistently confuse sources of information (i.e. source monitoring) and incorrectly estimate their prior knowledge (i.e. hindsight bias). Social-imitation-learning confounds sources (self v. other), distorting memory (source monitoring). To understand source-monitoring confusion in imitation tasks, we studied the effects of biased encoding and interrupted recall through task-based surveys and videos. Preliminary results showed that encoding and retrieval disruptions harmed imitation abilities.

However, these manipulations did not affect the task or source memory. Generally, we found more accurate source monitoring coincided with poorer imitation (consistent with a memory-performance trade-off). All processes have costs and benefits; the benefits of exceptional imitation may come at the cost of inadvertent plagiarism (i.e. cryptomnesia). The relationship between source monitoring and imitation can provide insights into cryptomnesia and its moral consequences.

This research was funded by a University Facilitating Fund (UFF) award.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

Examining the Role of Executive Functioning in Children's Mastery of Passive Sentences: A Developmental Perspective

Executive functioning, encompassing various cognitive processes such as inhibition, working memory, and cognitive flexibility, allows the brain to make choices and overcome impulses. When processing sentences, our brains are tasked with making choices between sentence structures and overcoming initial interpretations.

For example, English sentences are more often in the active voice, leading listeners to initially interpret passive sentences (e.g., "The boy was kicked by the horse") as active. Mastery of passive sentences is known to be a prolonged process for children. This study investigates the role of developing executive functions in 4-and-5-year-old children's mastery of passive sentences. Utilizing three well-known tasks: Flanker, GoNoGo, and Day/Night tests, we computed an aggregate executive function score for each child as well as an improvement in passive comprehension score after exposure to passives. Our analyses focused on three questions: (1) Are individual differences in executive functioning stable and can they be measured reliably? We will compute test-retest reliability for each of the three tasks. (2) Is executive functioning in children a single unified process or differentiated between multiple sub-functions? We will compute pairwise correlations between tasks. (3) Do individual differences in executive functioning predict children's learning of passives?

We will assess the correlation between the aggregate executive function measure and the improvement in passives comprehension before and after exposure to those structures. These findings will contribute to our understanding of the cognitive mechanisms underlying children's comprehension of passive structures and the developmental trajectory of syntactic acquisition and executive functioning. We predict that executive functioning in young children is characterized not by a single unified process, but rather by a combination of interconnected and independent processes.

We also predict that children with more developed executive functioning will be able to move away from misinterpretation of passives as actives and thereby learn passive sentence structures better.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

Executive Function Measures

Executive function is a cognitive skill that enables us to control our behaviors and mental processes, such as working memory, inhibition, planning, and problem-solving. In this study, we aimed to explore the relationship between various methods to measure executive function, including lab-based tasks and ecologically valid self-report surveys. One hypothesis is that lab-based measures would be reliable, with different tasks correlating with one another.

Additionally, lab-based and ecologically valid executive function measures index the same function and would, therefore, correlate with one another. Alternatively, it is possible that various lab-based tasks measure different functions and that lab-based measures do not sufficiently capture aspects of executive function in real life that are captured by ecologically valid surveys. Presented is a three-part study where each participant performed five tasks: Stroop, Go-no-go, Flanker, Affective Go-no-go, and auditory Stroop. Throughout each part of the study, all performance tests and self-report surveys listed above were administered consistently, with a 24-hour interval between each administration.

A sample of 20 college-aged students(18-22) completed the counterbalanced series of these executive function tests. R scripts will be used to conduct the following analyses: (a) test-retest reliability, whether different administrations of the same task correlate with one another; (b) across-task correlations, whether the different lab-based measures correlate with one another, and whether the lab-based tasks correlate with the ecologically valid measure.

Together, these analyses will answer questions about how stable individual differences in executive function are and whether some tasks are better suited to measuring such differences.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

Access to community resources among local stroke survivors with aphasia

Stroke survivors with aphasia report a lower quality of life and higher levels of psychological distress compared to stroke survivors without aphasia (Hilari, 2011). Community resources are often limited or not provided in an aphasia-friendly format (Briffa et al., 2022). This could negatively impact access to materials and programs that support recovery and improve quality of life. Additionally, as healthcare costs and therapy caps impact stroke survivors' access to rehabilitation services (Centers for Medicare & Medicaid Services, 2019), the availability of online and local resources is needed to support recovery (American Stroke Association, 2023). Based on anecdotal evidence, we predict that there are many resources that stroke survivors are not receiving from their healthcare providers. Here, we aimed to identify those resources and their preferred formatting to increase accessibility and usability. This information will be utilized to create a local aphasia-friendly resource guide.

We developed a 31-item questionnaire about access to community resources and preferred formatting. The questions were asked in yes/no, multiple choice, and open-ended formats. Simple pictures were utilized to support comprehension. The questionnaire was administered in an interview style with rephrasing and repetitions provided as needed. The participants included 13 chronic left-hemisphere stroke survivors with aphasia.

While our results indicate that stroke survivors with aphasia in the DMV area receive information about a variety of resources, there are still gaps in the information provided. Affordable outpatient services, stroke prevention and living a healthy lifestyle, home exercise programs, aphasia and speech disorders, and support groups were the most desired resources that were not consistently received. Our findings suggest that people with aphasia want resources to be provided verbally using simple language and supplemented with icons and pictures. We believe that consistently providing resources in an aphasia-friendly format could increase access to and satisfaction with community resources. Consequently, we suggest that speech-language pathologists partner with local healthcare providers to ensure that the information provided to people with aphasia is aphasia-friendly to maximize comprehension.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

The pathophysiology of dysphagia post-lung transplant: A systematic review

Purpose: One major consequence of lung transplantation is the development of oropharyngeal dysphagia. This systematic review aims to appraise and synthesize the available evidence using instrumental assessments to outline the characteristics of post-lung transplant dysphagia. Specifically, we explored the pathophysiological parameters that are reported and may characterize the swallow of this patient population and the outcome measures used.

Methods: Following the identification of appropriate search terms for the question, a literature search was conducted in PubMed, Scopus, and the Health and Medical Collection of Proquest Research Library) and included records between inception and September 14, 2023. Search strategies included the use of text words and subject headings (e.g. MeSH and Index terms) related to (1) dysphagia or swallowing (swallow*, deglutition disorder*) (2) lung transplant (lung transplant*, post-operative, post-lung), and (3) complications (adverse effects, *complications, treatment outcome).

Results: The literature search strategy yielded a total of 883 studies from the electronic database search, with no additional records identified through other sources. After the removal of duplicates (n =96), a total of 787 studies were screened through title and abstracts which eliminated 775 studies. Seven studies were ultimately included in the systematic review. The selected articles included patients who underwent either single or bilateral lung transplantation and all but one study utilized a retrospective design. A lack of transparency regarding instrumental evaluation protocols including the number and bolus types used during the instrumental evaluations appeared as a theme in the studies included, and both VFSS and FEES were used to assess oropharyngeal dysphagia. The PAS was systematically utilized to measure dysphagia safety outcomes; however, handling of the PAS scale was not consistent across studies, as penetration or aspiration ranged from 52.4% up to 83.5%. Additionally, silent aspiration rates ranged from 14.2% to 61.9%.

Conclusions: This review sought to describe the post-operative swallowing function and its physiological parameters following lung transplantation. We examined the results reported and the methods utilized in obtaining these results in the existing literature. Limited reporting practices for physiological parameters were found, however the PAS was reported in all studies with variation in degrees of swallow.

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CCAS RESEARCH SHOWCASE

SPEECH, LANGUAGE & HEARING SCIENCES

The Number of SLP Therapeutic Recommendations for Patients with Dysphagia from Oropharyngeal Cancer

Patients who undergo treatment for human papillomavirus–related oropharyngeal squamous cell carcinoma (HPV+ OPSCC) present with dysphagia as a common post-treatment outcome affecting their ability to eat or drink and ultimately their quality of life. Treatment modalities for HPV+OPSCC include radiation therapy (RT) alone, concurrent chemoradiotherapy (CCRT), TransOral Robotic Surgery (TORS), and a novel de-escalated treatment modality of neoadjuvant chemotherapy followed by transoral robotic surgery (NAC+TORS). Regardless of treatment modality, patients presenting with dysphagia are referred to speech-language pathologists (SLPs) who recommend dysphagia treatment and management programs, including compensatory maneuvers, strategies, and rehabilitative exercises to target physiologic deficits and improve swallowing function.

The aim of this cross-sectional study is to analyze the relationship between the number of SLP therapeutic recommendations at different treatment conditions/timepoints in patients with human papillomavirus–related oropharyngeal squamous cell carcinoma (HPV+ OPSCC). A total of 91 patients evaluated by SLP for dysphagia symptoms post-treatment were retrospectively reviewed and the number of strategies recommended at each timepoint was extracted. An ordinal logistic regression model examined the effect of degree of diet texture (as captured by the validated IDDSI-FDS scale), and type of cancer treatment received (NAC+TORS, CCRT, TORS, RT, etc) on the number of therapeutic SLP recommendations.

Analyses revealed that, holding all other predictor variables constant, a significant 10.74-fold increase in odds of a higher number of SLP therapeutic recommendations at different treatment timepoints for higher degrees of diet texture modification (IDDSI-FDS < 7) [95% CI, 3.53 to 32.65]. These findings suggest that the number speech-language pathology therapeutic recommendations for patients with HPV-OPSCC and dysphagia increases with the degree of diet texture modification regardless of type of cancer treatment received indicating a higher burden of care for patients who experience dysphagia.

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CCAS RESEARCH SHOWCASE UNIVERSITY WRITING PROGRAM

Perplexing Yet Obsolete: The Boy Scouts of America Commemorative Tribute, its Purpose, Implications, and Future.

Centered on the Boy Scouts of America's Commemorative Tribute in D.C., this essay focuses on the organizational history of the BSA, manifestations of religious iconography in monument design, and elements of human geography's concepts of space and place within the context of memorialization. I aim to evaluate any potential conversations that occur between Tribute's obscure artistic nature and the BSA's extremely troubled history of child sexual abuse and how those conversations may impact audiences (especially victims of sexual abuse) and their abilities to process public history. Given the BSA's organizational history with sexual violence and additional struggles to resolve racism, sexism, homophobia, and classism, the Tribute should be reevaluated and deemed defunct because of the impact its poor design and odd purpose have on the population(s) it was built to represent.

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CCAS RESEARCH SHOWCASE UNIVERSITY WRITING PROGRAM

Free Markets and Climate Change: A Correlational Study of Economic Freedom and Relative Change in CO2 Emissions within the Framework of the Environmental Kuznets Curve

Throughout the past several decades, the rising of Earth's average temperature has raised concerns about its impact on human life. In response to this problem, governments have primarily relied on regulatory means to lower the emission of greenhouse gases and prevent other environmental harms. Their assumption is that the regulation of economic activity is necessary for a better environment, or that free economic activity and sustainability are always incompatible. However, the Environmental Kuznets Curve (EKC) hypothesizes that economic development and a cleaner environment can not only coexist, but that there is an inverted U-shaped relationship between economic growth and environmental degradation. Building upon the theory, this study challenges the view that economic freedom and climate sustainability are incompatible by examining the relationship between the economic freedom scores of 140 countries and the relative change in their individual CO2 emissions per capita between years 1999 and 2019. The results of this study indicate a moderate negative correlation between the two variables, which undermines the argument that economic freedom and sustainability are mutually exclusive.

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CCAS RESEARCH SHOWCASE

WOMEN'S, GENDER, AND SEXUALITY STUDIES

The Marginalization of Unpaid Care Work: A case study on reproductive labor among Latina immigrant mothers

Unpaid care work is a field that has been dominated by women for most of recorded history. Care work can include taking care of children, the elderly, the sick, and the disabled, as well as domestic work and reproductive labor. The unequal distribution of these responsibilities limits women's career choices, stunts their financial autonomy, and can negatively impact their health. In the United States, women spend 37% more time on unpaid household and care work than men, but the worth of their labor goes unaccounted for. Unpaid care work is largely excluded from GDP calculations despite contributing trillions of dollars in goods and services to the global economy each year. Instead, mothers and unpaid domestic workers are globally labeled as "non-producers"—in other words, the value of their labor and their experiences is erased.

Nowhere is this marginalization more overt than among Latina mothers who immigrate to the United States. Immigrant mothers engage in unpaid care work under uniquely arduous circumstances—they take on the tasks of birthing and raising children, fostering belonging and identity, defending themselves from gender-based violence, and financially supporting their families. Latin American women migrants too frequently find themselves fleeing economic and social violence to attempt to find haven in a state that will enact political violence unto them—one that considers their existence inconvenient at best, and criminal at worst. The continued denial of the worth of their labor is a yawning injustice for a growing segment of the U.S. population.

By investigating the experiences of immigrant mothers through secondary source interviews, feminist analyses, and demographic reports, this project aims to shed light on the negotiations of power between the state and heteropatriarchal social forces. To understand these dynamics, this project constructs a theoretical framework which integrates postcolonial theory and queer theory into a cohesive discussion. This structurally intersectional and anti-colonial approach can allow theorists to explore the multiple layers of violence and oppression that immigrant mothers face as they engage in unpaid care work.

This discussion contributes to studies of motherhood, migration, and transnational feminism as it underscores the diverse and complex journeys of immigrant mothers, in the hopes of contributing to a society that values unpaid care work as invaluable and beautiful.

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CCAS RESEARCH SHOWCASE

WOMEN'S, GENDER, AND SEXUALITY STUDIES

Decolonizing Genderqueer History: Exploring Non-Binary Gender Identities in Pre-Modern South Asia

This project provides a glimpse into the rich histories of individuals and communities that embraced life beyond binary gender systems. In order to counteract the dominance of Euro-American accounts of genderqueer history, it centers attention on genderqueer communities in pre-modern South Asia. This project features South Asian contexts that embraced and created space for third gender identities. It chronicles uniquely fascinating examples such as the Vedic *napumsaka*, eunuchs in various court structures, the *hijra*, and *devadasis*. The recognition of genderqueer identities in Euro-American society and media is newfound compared to the acceptance of genderqueer identities over a thousand years ago in South Asia. The popular narrative that the origins of progressive gender archetypes are found in Europe (or the colonized Americas) is a result of Eurocentrism in academia. Through crediting the various Asian gender identities that came before many Euro-American ones, and left stronger communal legacies than them, I seek to challenge so-called objective Eurocentric accounts of gender fluidity. The breadth of gender has been historically misunderstood within Euro-American scholarship, which falsely portrays itself as absolute truth. My research aims to not only add a new perspective to Euro-American narratives, but to decolonize the rhetoric and build the story of third gender identities using South Asia as a focal point.

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CCAS RESEARCH SHOWCASE

WOMEN'S, GENDER, AND SEXUALITY STUDIES

Social Structures Fail Queer Youth: The Overrepresentation of Queer Youth in Sex Trafficking

In America, the marginalization of queer identities and individuals leads to the creation of multitudes of risk factors that lead queer youth into homelessness, drastically increasing their risk of becoming a victim of sex trafficking. Queer youth represent about 5-10% of the United States youth population. However, they represent nearly half of the youth falling victim to homelessness (Morton, Dworsky, & Samuels, 2017). When examining the sex trafficking of adolescent victims, homelessness is one of the most significant risk factors that lead to being victimized (Hogan & Roe-Sepowitz, 2020; Williamson & Flood, 2021).

This study aims to understand the relationship between homelessness and an extended vulnerability to sex trafficking. This paper will examine how power structures in the United States fail to address the issue of queer youth homelessness, thus failing to address the overrepresentation of queer youth in the population of American youths who fall victim to sex trafficking. By understanding how American structuralism and the systemic prejudice within such structures impact the lives of queer youths, we can devise strategies for which said structures could be improved. To understand what strategies would effectively decrease the vulnerability of queer youth to sex trafficking, we have to understand the relationship between how queer youth disproportionately face homelessness and how this increases their risk for sex trafficking.

Therefore, this paper aims to examine social structures and power relationships concerning the sex trafficking of queer youth, focusing on the risk factors of homelessness and family rejection by using feminist theoretical frameworks.

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