

University of the Incarnate Word

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### "Challenging the Known." 16th Annual Research Week: Event Proceedings

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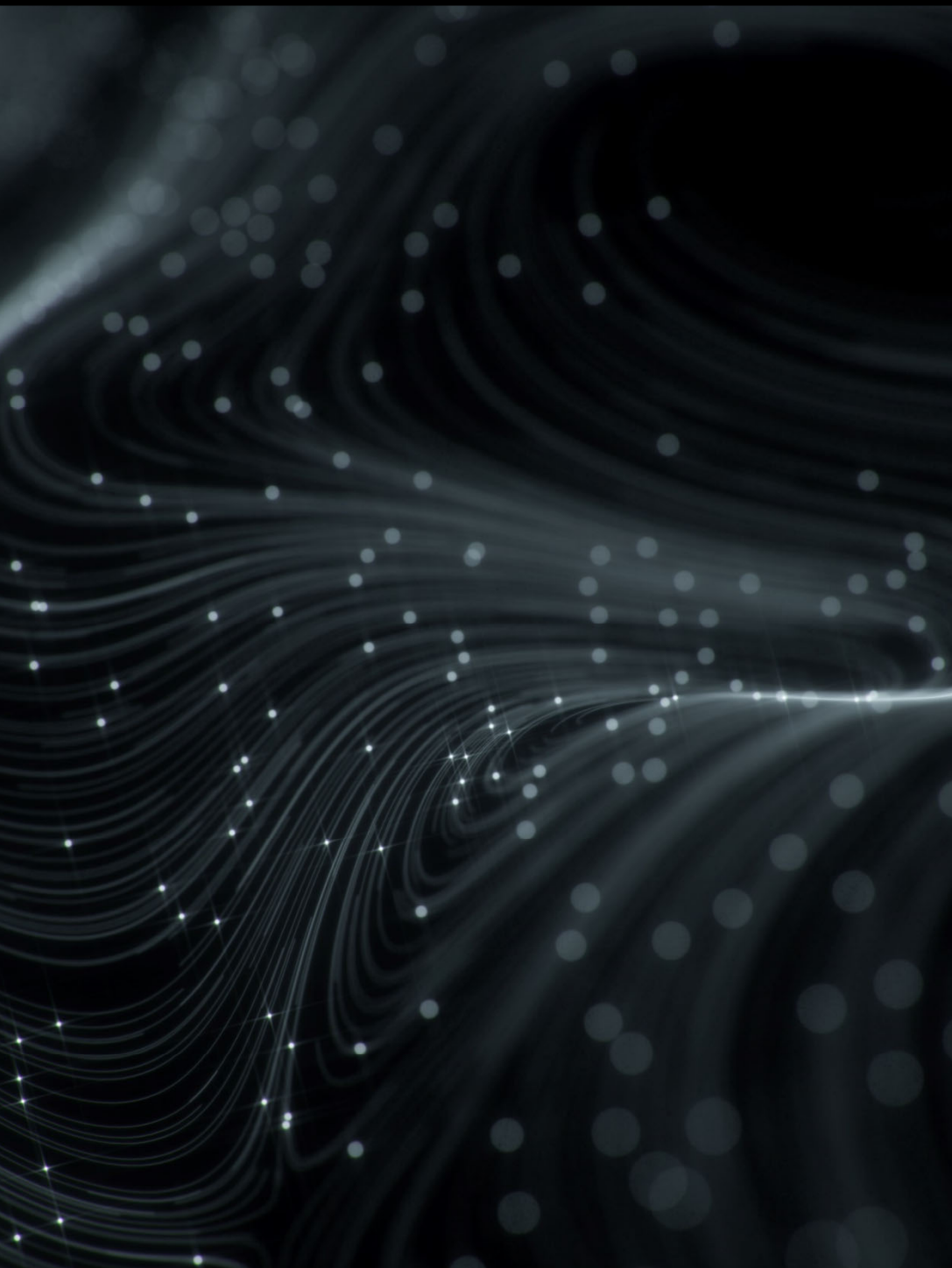
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# RESEARCH WEEK

**2023**  
PROCEEDINGS

## CHALLENGING THE KNOWN



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## Live Events Schedule and Recap

**Tuesday, April 11**

### Research Week Poster Presentations

Noon- 4:30 p.m. | Research Week Poster Presentations, SEC Ballroom



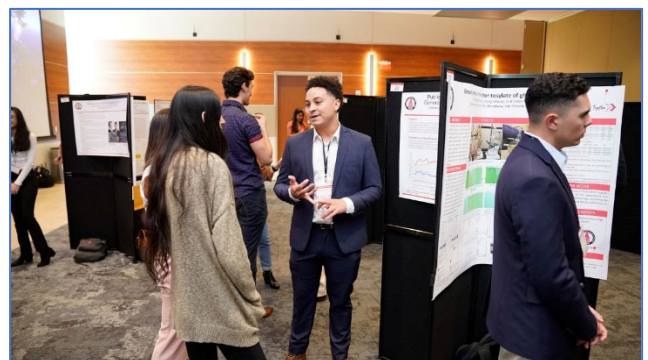
Students and faculty from across UIW participated in the University's annual Research Week, held by the Office of Research and Graduate Studies (ORGS), and the Service Learning and Engaged Scholarship Showcase from April 11-14. This year's theme was "Challenging the Known." The goal of this theme was to show that by challenging what is known, the unknown can be embraced without fear of making mistakes.

The week began with the Service Learning and Engaged Scholarship Showcase. Service is one of UIW's core values, and faculty members are encouraged to utilize [service learning](#), which includes assigning service as part of a course curriculum, to help guide students through reflection to deeper levels of critical analysis, social justice and integration/spirituality.

Research Week then kicked off Tuesday afternoon with poster presentations. Students and faculty from areas such as the School of Osteopathic Medicine (UIWSOM), the School of Mathematics, Science and Engineering (SMSE), the College of Humanities, Arts and Social Sciences (CHASS), and more shared their research.

"I believe that as healthcare providers, or future healthcare providers, we need to have that responsibility with our patients to challenge what we know, make things better, and help them improve their outcomes, especially in rural areas and in medically underserved areas where we lack resources," said Denise Nemeth, a second-year learner at UIWSOM. "By participating here, I'm getting the opportunity to bring awareness to certain issues. Hopefully, it will help a lot of people."

"Research Week is a great way to let others know about the work that students are doing here at UIW, and that we're doing in the engineering school" added Aidan Quinn, a senior Mechanical Engineering student.



## *ORGS Fulbright Student Poster Award Winners*

4:30- 5:30 p.m. | ORGS Fulbright Student Poster Awards, SEC Ballroom

Tuesday wrapped up with prayer led by Fr. Hector Kalaluka and the announcement of the ORGS Fulbright Student Poster Awards presented by Fulbright San Antonio Chapter President, [Dr. Trey Guinn](#) (L), and UIW Vice Provost, Dr. Glenn James (R).

Erica L. Poole, a second-year Vision Science student in the Rosenberg School of Optometry, won first place. Senior Ian Manseau of CHASS's Fine Arts department, and senior Austin Wayne, a biology student from SMSE, were both runners-up.



**Dr. Erica L. Poole, 1<sup>st</sup> Place Winner**

Rosenberg School of Optometry – Vision Science

*[“A New Test of Para-Foveal Sensitivity with Application to Plaqueenil Toxicity”](#)*



**Mr. Ian Manseau, Runner Up**

College of Humanities, Arts, and Social Sciences – Fine Arts

*[Sculptural Exhibit “Human/Nature”](#)*



**Mr. Austin Wayne, Runner Up**

School of Math, Science and Engineering – Biology

*[“Palladium\(II\) complexes of Terpyridine and 4-Chloroterpyridine: Synthesis, Characterization, and Cytotoxicity studies”](#)*

## ORGS Fulbright Student Poster Award Honorable Mentions

Primary Presenter	Poster Presentation	School Of
Tara Alexander	<a href="#"><u>Critically Appraised Topic: Are ankle sprains preventable in youth sports?</u></a>	Physical Therapy
Ana Cristina Alvarez	<a href="#"><u>Combating drug-resistant fungal biofilms using a heat shock protein 90 inhibitor</u></a>	Math, Science, and Engineering
Brazil Andrews	<a href="#"><u>Comparison of Monocular to Binocular Sensitivity of the Human Intrinsically Photosensitive Ganglion Cell Pathway</u></a>	Optometry
Patricia Augustine	<a href="#"><u>Natural Compounds as a Promising Therapeutic Agent for SPOP Downregulated Breast Cancer</u></a>	Math, Science, and Engineering
Malya Breen	<a href="#"><u>Synthesis, Crystal Structure, Hirshfeld Analysis, and DFT Calculations of a Novel Mixed Ligand Copper(II) Complex of 5-Chloro-1,10-Phenanthroline</u></a>	Math, Science, and Engineering
Brianna Brooks Medina	<a href="#"><u>Synthesis, Characterization, and SAR Study of Callyspongamide A and Si-phonellamide A &amp; B</u></a>	Pharmacy
Jazmin Chavarria	<a href="#"><u>SPOP Mutations Lead to GLI3 Stabilization and Enhanced SHH Signaling in Breast Cancer</u></a>	Math, Science, and Engineering
Eve Clarkson	<a href="#"><u>Food Sensitivities in Athletes: Why More Common Than You May Expect?</u></a>	Nursing and Health Professions
Natalie De La Cerda	<a href="#"><u>Regulation of Locomotor Behavior by a Novel Gene, Impaired Mobility</u></a>	Math, Science, and Engineering
Liam Faubert	<a href="#"><u>Palladium(II) complexes of ethylenediamine containing phenanthroline-based ligands: Synthesis, characterization and cytotoxicity studies.</u></a>	Math, Science, and Engineering
Benjamin C. Garza	<a href="#"><u>Preliminary Findings: Relationship Between IgG-Based Food Elimination and Whole-Body Inflammation</u></a>	Nursing and Health Professions
Amore Gonzalez	<a href="#"><u>Zinc(II) complexes of 2,2':6',2''-Terpyridine: Synthesis and Characterization</u></a>	Math, Science, and Engineering
Marcela Gutierrez	<a href="#"><u>Synthesis, Characterization, and Antitumor Activity of Dinuclear Copper(II) Complexes with 2,2'-bipyrimidine as Bridging Ligand</u></a>	Math, Science, and Engineering
Kiana Hall	<a href="#"><u>The Impact of Eye Dominance and Preference on Human Visual Performance</u></a>	Optometry
Nadia Higgins	<a href="#"><u>Interactions between glucose and metformin on alpha-crystallin glycation</u></a>	Pharmacy
James Mack	<a href="#"><u>Mammalian Target of Rapamycin Mediates Expression and Activity of ADAM 17 in Diabetic Kidney Disease</u></a>	Math, Science, and Engineering
Jilliann Mena	<a href="#"><u>3D Game Environment: Witch's Date Diorama</u></a>	Media and Design
William Price	<a href="#"><u>The Cockpit Color Identification Test: A Real-World Metric of Color Discrimination</u></a>	Optometry
Venessa Sailors-Machac	<a href="#"><u>Large &amp; Small Letter Cone Contrast Sensitivity: A New Metric of Color Vision</u></a>	Optometry
Aleeha Shah	<a href="#"><u>Observer perception of parent-shaming on social media: A pilot study</u></a>	Humanities, Arts and Social Science
Rathanart Somphruek	<a href="#"><u>Cone Specific Visual Acuity: A New Metric of Color Vision</u></a>	Optometry
Leah Sterling	<a href="#"><u>Targeting the molecular chaperone, Hsp90, to inhibit Candida albicans biofilm formation</u></a>	Math, Science, and Engineering
Alan Truong	<a href="#"><u>Combating Health Inequity Among Marginalized Populations with Chronic Pain through The Utilization of The Four Tenets of Osteopathic Medicine</u></a>	Osteopathic Medicine
Brittney Vargas	<a href="#"><u>Mixed-ligand palladium(II) complexes of 1,2-bis(diphenylphosphino)ethane: Synthesis, characterization, and cytotoxicity</u></a>	Math, Science, and Engineering
Kaitlyn Velasquez	<a href="#"><u>Calcium-Dependent Dual Oxidase 2 is a Novel Source of Reactive Oxygen Species Implicated in Glomerular Mesangial Cell Fibrotic Response to Angiotensin II</u></a>	Math, Science, and Engineering
Matthew White	<a href="#"><u>Method Optimization and Validation of the Simultaneous Determination of Minor and Trace Metals in Water by ICP-OES</u></a>	Math, Science, and Engineering

## *Service-Learning Showcase, Day 1*

**9 a.m. - Noon** | Service-Learning Showcase, Student Engagement Center (SEC) 2040  
*Service-Learning Showcase Posters on Display all day - SEC Ballroom, Mezzanine*

### **UIW RESEARCH WEEK INVITES US TO “CHALLENGE THE KNOWN.”**

We know that globally the human family has been traumatized by the COVID pandemic. We know that more and more are suffering from Climate Change. We challenge ourselves and those around us to become better rather than bitter though this suffering.

Soon the UIW logo will appear on [Compassionate USA](#) web page indicating that we have been leaders. We wish to continue acting compassionately and we are willing to share and teach others. Express-News columnist Elaine Ayala described our city’s growing leadership in January 2023: “Mayor Ron Nirenberg, who serves as chair of the US Conference for Mayor’s Center for Compassion and Equitable Cities, introduced the Compassionate USA campaign in a talk that landed between speeches by U.S. Surgeon General Vivek H. Murthy and Secretary of State Anthony Blinken. ‘Whether our daily decisions are about isolation and critical mental health services, or pandemic impact recovery and mass shootings, or policies and equitable budgets and issues of state,’ Nirenberg said, ‘fundamental to the necessary shift in all our work is the moral imperative and the skill development of compassion.’

Research tells us that compassion is in our DNA, Nirenberg added. [‘It is the antidote to hate, to extremism, to our violence,’ . . . Like any skill, the Golden Rule, or treating others as we’d like to be treated, needs to be practiced.”](#) has been growing ever since the Charter for Compassion was released globally in 2009 and we had a gathering for that at UIW. We watched the two-minute film of the [Charter](#) The movement grew. In 2017 the City Council voted on a City Resolution declaring that we commit ourselves to work on being a City of Compassion. Whether in education, government, business, health care, in all sectors, we wish to treat others as we want to be treated, we want to create equity.

During this year Service Learning and engaged scholarship have been expanding with a LibGuide and we are grateful to Erin Cassity and the UIW Liaison Librarians and Lorena Cestou, MS, for the ongoing development of that. More teachers are benefiting through the efforts of Dr. Sandy Guzman-Foster’s in the Center for Teaching and Learning and Dr. Erlinda Lopez-Rodriguez’s work with [GivePulse](#), a platform helping educators throughout the US.

We, the University of the Incarnate Word community, continue in the seven-year action plan laid out by [Pope Francis in Laudato Si, Our Common Home](#). We “will integrally and boldly advance” focusing on each of the goals: Support Local Communities, Respond to the Cry of the Poor, Adopt a Sustainable Lifestyle, Respond to the Cry of the Earth, Foster Ecological Economics, Offer Ecological Education, Develop Ecological Spirituality.

We are grateful to each person mentioned because their engaged scholarship and service-learning help to further compassion and justice in the spirit of our founders. –

Sr. Martha Ann Kirk, CCVI

9- 11:55 a.m. | Presentations- SEC 2040 and Virtual

9 a.m. | Welcome by Dr. Kevin B. Vichcales, Assoc. Provost for Undergraduate & Graduate Education Keynote

9:10 a.m. | Social Justice and Earth Justice in Incarnate Word Sisters History and Today

Dr. Laura Cannon, associate professor of History and chair of the Social Justice and Peace Concentration, led student researchers Jude Drouillard, Oliver Soliz and Andrew Perkins in research at the **Incarnate Word Sisters Archives**.

This was a grant program in Humanities Research for the Public Good, a part of the Council of Independent Colleges. The program is **“Connecting Independent Colleges with their Communities through Undergraduate Research.”** Archivist Donna Guerra, Dr. Arturo Chavez and Sr. Martha Ann Kirk were also part of the grant team. [See the booklet here.](#)

Sr. Mary Lou Rodriguez, CCVI, spoke of Sisters’ activities in the area of Earth Justice. Dr. Benjamin C. Miele, Sustainability Concentration Chair, and Sr. Mary Lou Rodriguez, CCVI, will invite conversations on Earth Justice. Engineering students Jorge Arreola, Julian Garcia, Desiray Rodriguez, and their faculty mentors Daniel Potter and Dr. Okan Caglayan will share their capstone **“Project Helios: Development of an Off-Grid Solar Powered Outdoor Workspace,”** soon to be shared with students to use.



Sister Mona Smiley, who was devoted to AIDS education in the 1980's.

10 a.m. | Food Deserts and Grocery Accessibility: Time for Community Empowerment through Urban Farming

Dr. Leslie Martinez, Psychology, and UIW Students

#### **Purpose and Aims**

The purpose of this service-learning project is for the students to grow a better understanding of the role of food insecurity and access to fresh groceries in neighborhoods around San Antonio. The project aims to focus on explaining facts and spreading awareness of the existence of food deserts through photo essays that depict imagery of these realities—from people to maps to grocery experiences. The students intend to also explain how Gardopia also plays a role in filling this gap, while also building community empowerment through gardening.

#### **Rationale and Significance**

The service-learning project is divided into two parts: 1) the facts and daily experiences and 2) the urban farming as an example of one solution. It was important to the class that we not only focus on what is “wrong” in neighborhoods that struggle with accessing fresh foods. They wanted to make it a point to show that communities can grow stronger through educational experiences, like Gardopia, and the community can also see the possibility of beginning to address longstanding concerns surrounding food insecurity. In just the first few weeks of learning content in our course, students realized the importance of understanding how the education of minority populations in these topics has consistently played an important role in fights for civil rights, even for rights as seemingly basic as accessing and eating healthy, fresh foods in one’s own neighborhood.

#### **Methodology**

The students in this service-learning project are currently enrolled in a course called “Latinx Perspectives in Psychology.” This project stemmed from deep class discussions about the history of Hispanic Psychology and the Mexican American historical context in the borderlands, especially focusing on Texas and San Antonio. They will be divided into three main groups who will produce the photo essay for their piece—Facts about grocery stores and attaining food, explaining inequalities, and showcasing a solution.

#### **Findings**

Students focused on three content areas for their group research: facts, sources of inequity, and solutions. There are patterns in grocery store access throughout the city that are related to fewer fresh and healthy food options. Although a strength of San Antonio is that there is an abundance of grocery store options, including ethnic-based.

## 10:15 a.m. | Symposium: Prospects for Rights in the COVID-19 Times

Christopher Melley, Philosophy (Speaking from Japan)

Session 2 Moderator: Dr. Emma Santa Maria, Service-Learning Committee Co-Chair

### Overview

Along with the emphasis on matters of health relating to the COVID-19 pandemic, matters of rights, sometimes called human rights, are worth considering since we often appeal to or invoke one or another right in the ever-growing assembly of rights vying for our attention. Just what is a right and what is the basis or foundation for a right are the topics taken up in the article written in dialogue form, using Socrates as the main character. Socrates is able, through some literary invention, to speak directly with luminaries of the past, such as Eleanor Roosevelt, Marquis de Lafayette, and Jeremy Bentham, also literary characters such as Hamlet, Humpty Dumpty, and Alice, as well as contemporary philosophers such as John McIntyre and Peter Singer. Each character expresses thoughts on rights and can converse and learn from each other thanks to the literary invention.

Consistent with the platonic form of dialogue, the reader receives no final oracle of truth, no Aesop-like moral of the story. Instead, the dialogue fizzles out, and the reader is left to reflect on the thoughts expressed. I chose the dialogue form because it avoids the typical structures of academic writing and allows the reader a more informal and direct contact with the ideas expressed, hopefully in a more accessible form for everyone to enjoy. Since there are no findings to report from having read the dialogue, I can only appeal to the number of reads the dialogue has received in an online journal in two months: nearly 800, which is okay for philosophy.



The dialogue invites the reader to reflect on human rights. Non-human rights are also mentioned. In the era of COVID-19, we may see more restrictions on one or another right. Returning to such a foundational topic as rights, consider our genuine social relationships that today often go far beyond geographic borders and parochial definitions of individual groups. As we go about our day, we may be more mindful of how fragile rights are.

## 10:30 a.m. | The Power of Unity: Building Bridges through a Community Service-Learning Project” on the LGBTQ Health Fair. Christina L. Deltoro, Jared Morgan, Alan Valenzuela - Rehabilitative Sciences, and Dr. Lucero Martinez Delgado- Healthcare Sciences

### Purpose and Aim

Our community outreach project aimed to offer health education and screenings to the LGBTQ+ community in San Antonio while educating undergraduate students in a vulnerable population. The project aimed to create a safe space for the LGBTQ+ community to come and feel welcomed. The second aim was to allow undergraduate students to gain exposure to this minority group. Our purpose directly corresponds to the mission of UIW, which emphasizes the belief that respectful interaction advances the discovery of truth, mutual understanding, self-realization, and the common good. “At its core, the mission is about transforming us from VIEWERS of a disconnected and conflicted international reality to PARTICIPANTS in creating a more interconnected and responsive global community.” –Sr. Dorothy Ettlting.

### Rationale and Significance

A report by the UCLA School of Law Williams Institute (January 2019) estimates that 4.1% of the population in Texas identifies as LGBTQ+. Already a marginalized community, the disparity is only amplified when this population sector is divided into socioeconomic subgroups. 26% of LGBTQ+ Texans are uninsured, and 27% reported food insecurity. These factors emphasize the need for healthcare accessibility, as such significant statistics endanger the well-being of the San Antonio community members. Understanding healthcare needs is vital to learning how to provide compassionate and adequate care best. The generous funding provided by several sponsors allowed the opportunity for accessible, holistic healthcare, education, and collaboration, all of which reduce the disparities that may afflict members of the LGBTQ+ community in San Antonio.



## Methodology

Community service outreach, student engagement, and executing a plan are all necessary to gain knowledge of healthcare needs within the LGBTQ+ community of San Antonio. Before the event occurred, the faculty of the University of the Incarnate Word delivered sensitivity training to participating students to obtain knowledge of how to address the population of the LGBTQ+ community adequately. During the event, UIW's undergraduate students and UT's health professionals engaged with the community by providing health screenings and patient education at tables we set up outside. Health screenings offered at the event included blood pressure readings, glucose readings, mammograms, visual acuity tests, and patient education on nutrition, sexual health, and mental health. Undergraduate students performed blood pressure screenings on patients, and if a student found an abnormal reading, the patient was referred to the UIW Nursing Cardinal Clinic.

## Findings

After receiving verbal feedback from the community, we found that many individuals were surprised that The University of the Incarnate Word was involved if cared about their health. These findings show that we are making a difference by tearing down social bias and building a bridge for the LGBTQ+ community to have social justice in the healthcare system.

## 10:45 a.m. | Communicating with Love and Compassion: Benefits of Integrating Service-Learning

Dr. Darlene Carbajal, Communication Arts

### Purpose and Aims

In a Communication Arts course, students engaged in academic and professional experiences that fostered an understanding of the UIW mission. The purpose of implementing service-learning with the Communication Arts curriculum was to provide students with an educational experience to gain self-awareness and awareness of others through service. Further to help students make connections to the Communication Arts discipline and the opportunity they must create professional work that is innovative, assists our global community, and communicates stories through different media. Students incorporated communication strategies to create multimedia projects and disseminated media to specific audiences based on client needs. Projects were assessed by clients from the Ettlting Center for Civic Leadership and Sustainability, Mission and Ministry, and UIW Young Women's Global Leadership Program, who assisted students in their professional growth and holistic development. The theme of the semester was Communicating with Love and Compassion.

### Methodology

Using the theme of the semester as a central topic, students reflected on love and compassion as it relates to the Mission of the University, Catholic Social Teaching, and initiatives of Compassionate San Antonio. Teachings included presentations by Sr. Martha Ann Kirk who shared the history of the Sisters, Bishop Trevor Alexander who engaged students in interfaith dialogue, and Dr. Ricardo Gonzalez who educated students about the Cardinals' Cupboard Food Pantry and the Community Gardens. Students met with clients to discuss project objectives and worked collaboratively to create communication plans and strategies. They created multimedia content for clients, comprising of audio, video, text, images, and graphics; the projects were assessed by clients and revised for implementation. At the end of the semester, students engaged in the evaluation phase to reflect on the service-learning experience.

### Findings

Students increased their communication skills and made connections to UIW mission and values. In a reflection paper, one student wrote, "I also felt grateful to be able to offer what skills I have to such an important effort. It is easy to be consumed by the social bubble of the United States and forget that there are global issues happening every day, and there are always people affected by those issues. To be able to help YWGLP tell those stories has been an incredibly humbling experience." Another student wrote, "I learned many things about myself. The most important thing would be to love. I have never felt so loved and so welcomed. I felt like we were all learning together under God's roof. And when we are done our purpose is to go out and continue and excel at what we have learned about our career and God." Additionally, a student shared, "You can't get too attached to the work you do because it could change due to criticism, and you must be willing to accept that at times. (...) I was glad to contribute in the efforts to educate those who want to make Peru a better place for the families facing adversities." In summary, students benefited from service-learning. They learned about the Mission of the University and made connections to how their personal and professional interests can be used to create a more compassionate world. Service-learning is effective in increasing self-awareness and inspiring students to create content that gives others a voice.

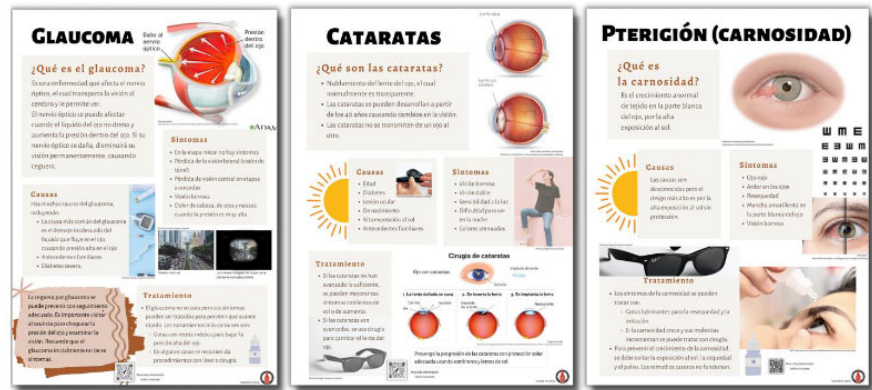


# 11 a.m. | Effectiveness of Educational Posters for Ocular Disorders in Patient Awareness in a Spanish-Speaking Population

Dr. Samantha Lin, Dr. Lourdes Alarcón Fortepiani, and Dr. Jeannette Wong-Powell, Rosenberg School of Optometry

## Purpose and Aims

This study aims to analyze the impact of educational resources on awareness of ocular disorders in Spanish-speaking patients during RSO-associated Mission trips. The goals are as follows: 1- To determine current knowledge of common ocular disorders in Spanish-speaking communities. 2- To determine if educational posters and audiovisual materials are an effective and viable option for patient education in Spanish- the speaking population.



## Rationale and Significance

The World Health Organization released its World Report on Vision in 2019, addressing the most common causes of vision impairment worldwide and the challenges associated with prevention and treatment. Patient engagement and self-management in prevention and compliance are among the most efficient approaches to patient care. Unfortunately, due to time constraints, surgical and medical interventions are often prioritized over individualized patient education and community awareness. The availability of audiovisual resources during the medical visit could provide additional tools for patient understanding and maximize the impact of the overall benefits of mission work.



## Methodology

This study was conducted during a medical mission in the Yucatan peninsula. Informational posters for cataracts, glaucoma, and pterygium were placed around the clinic for easy access during the waiting period between examinations. They contained a video accessible through a QR code for an audiovisual form of the poster. A two-part questionnaire was designed and administered before and after an education session to test the subject's knowledge through open-ended questions. Brochures reviewing the educational material were available for the patient to take home.

## Findings

The results are being analyzed to determine the effectiveness of educational materials presented in this format. There were a few barriers to data collection, which will be discussed further. Although the hope for this project was to encourage healthcare sustainability and education within this population, this opportunity to serve the people through this mission trip was an impactful experience. Leadership, flexibility, and creating meaningful relationships are a few important characteristics of mission work that can also be applied to other aspects of daily living.



## 11:30 a.m. | Refugee Resettlement in San Antonio: Experiences of Students Working with Refugees

Ryan Blevins, Oliver Soliz, Matthew Garza, History majors.

Advisor: Dr. Lopita Nath

### Purpose and Aims

The undergraduate student panel will draw on their experiences mentoring refugee families resettled in San Antonio. The students were part of the Global Refugee Course that offered a service-learning component, whereby students volunteered with Catholic Charities, St. Stephen's Care Humanitarian Crisis and helped refugee families adapt to life in the United States. The students in the panel will present their work with refugees from Afghanistan, Bhutan, Syria, etc. The purpose and aim of their work were to immerse students into the real lives of refugees while coming out with an understanding of the multi-layered issues that a refugee deals with. At the same time provide services that they need to help better establish themselves in American society. The significance of their work is vital to the refugee's transition process and is a crucial step toward how they will go forward into their new lives. This service-learning experience was also crucial for the students to integrate their learning with real-life experience.



### Rationale and Significance

With a political climate that misunderstands and misrepresents refugees, the students had to face serious challenges, first within themselves, with their families, and while working with the refugee families, due to differences in language, culture, and many other factors. This presentation will highlight how the students overcame challenges and difficult odds to have a positive experience. The significance of this work demonstrates how real-life experience shows the complexities of being a refugee.

### Methodology

This research was based on a mixed methodology. It combined literature sources, resources from UNHCR websites, personal anecdotes, and field experiences. Drawing from a variety of multidisciplinary sources, as well as from the oral interviews with the refugees, working with catholic charities in the humanitarian crisis sector, ESL online training with refugees and at-home visits, meetings with refugee foundations, and working in a community garden to help cultivate food resources for refugees, assisted students in becoming acquainted with these dire situations the refugees face coming to our nation.

### Findings

The student researched their family's journey from their home country to the United States, focusing on the reasons for leaving, the conflict and life in the refugee camps, and finally, resettlement and life in America. Although most refugees are uncertain about their life in America, they consider this the lesser of the two evils and are ready to make it a success. This presentation will bring to light the benefits of service-learning and exposure to a diverse community for the student's undergraduate experience. The research concludes that the need for help both in quantity and quality, keeping in mind the cultural differences and other baggage that refugees come with, far outweighs the help provided. Once the refugees get the help, they begin becoming active members of American society, but long-term help and assistance are needed.

Wednesday, April 12

Research Week Podium Presentations

8:30 a.m.- 5 p.m. | Research Week Podium Presentations, Mabee Library Auditorium

9 a.m.- Noon | Service-Learning Showcase, SEC 2040



Moody Professorship Lectures

5- 8 p.m. | Moody Professorship Lecture, Mabee Library Auditorium

*A Provost-sponsored celebration hosted by Dr. Kevin B. Vichcales and Vice-Provost Dr. Glenn James with opening prayer led by Fr. Hector Kalaluka.*

Wednesday featured podium presentations, highlighted by the 2022-2023 Moody Professors, **UIW's Dr. Lee Ann Waltz** and **Our Lady of the Lake's Dr. Wallis Sanborn**. Waltz serves as an assistant professor in the Ila Faye Miller School of Nursing and Health Professions. Sanborn is an assistant professor in OLLU's English, Drama and Mass Communications department.

5:30 p.m. | OLLU: **Dr. Wallis Sanborn**, *The Paradox of Greatness: Language, The Natural World, Genocide, and the Limited Role of Women in the Fiction of Cormac McCarthy*

6:30 p.m. | UIW: **Dr. Lee Ann Waltz**, *Understanding Millennials and Generation Z: What do They Need and Want?*



L-R: Dr. Kevin B. Vichcales (UIW), Dr. Jerrie Jackson (OLLU), Dr. Valerie Martinez (OLLU), **Dr. Lee Ann Waltz (UIW)**, **Dr. Wallis Sanborn (OLLU)**, Dr. Candace Zepeda (OLLU), Dr. George Williams (OLLU Provost), Dr. Octavio Quintanilla (OLLU)

## Service-Learning Showcase, Day 2

9 a.m. - Noon | [Service-Learning Showcase](#) Presentations, Student Engagement Center (SEC) 2040  
*Service-Learning Showcase Posters on Display all day - SEC Ballroom, Mezzanine*

9 a.m. | Service Learning as a component of Active Learning: Building Understanding and Compassion with Refugees in San Antonio. History Majors Lia E. Butanda, Journie Gaeta and Alexis Macias, moderated by Dr. Lopita Nath. Moderator: Dr. Scott Roberts, HEB School of Business

### Purpose and Aims

This presentation will focus on Service Learning as an Active Learning tool for students to build cross-cultural understanding, build compassion and make them enlightened citizens. Service Learning is an essential tool for teachers and students alike to apply their academic learning to the needs of society and the community. Learning here occurs through “action and reflection,” as the learning objectives are combined with community service with a deeper understanding of their role as citizens of a democratic nation.

The presentation will focus on two aspects of such learning taught at UIW’s History Department for many years. 1. Local and Global learning to help students understand the multicultural world beyond their own lived experience. 2. How working with underserved community members for refugees brings compassion and helps to create enlightened citizens. The presentation will show examples of how our students work with the refugees in San Antonio and how that service leads to a greater understanding of the global world.

### Rationale and Significance

San Antonio’s large, resettled refugee community needs help transitioning to American life. Many of these refugees will eventually become American citizens, so helping them integrate, will go a long way in building US society. The Refugees bring much baggage that needs unpacking: health issues, lack of English, Children, Women’s issues, their own culture, customs, etc. Students gain an understanding of this tremendous global problem while, at the same time, developing compassion and being able to respond to the ongoing debates about immigration and refugees and America’s role in this global crisis.

### Methodology

The methodology included examination of scholarly literature and films and fieldwork in San Antonio, working with Catholic Charities and Refugees. Examining the Universal Declaration of Human Rights and refugee-related literature and analysis of UNHCR resources provided students with basic knowledge about the global crisis. After students gained substantial refugee knowledge, they went out into their communities to work directly with refugees. Students taught the English language to refugees using flashcards and conversation. A student’s participation in refugee childcare services taught them the importance of fostering a child’s foundational educational skills at a young age to ensure academic success in the American educational system. Finally, students assisted organizations with refugee office work and learned that no two refugees have similar stories.

### Findings

Through this research, students identified, confirmed, and built upon common challenges and themes facing refugees explored in texts and documents read before volunteer work. Students’ worldly view was expanded, and students were educated on the ongoing crisis in Afghanistan. Both students and refugees were exposed to a new culture and language and could partake in and appreciate each other’s culture through food, language, music, pop culture, etc. Students were able to build friendships with refugees that are continuously nurtured even after the service-learning period, creating a welcoming community.



9:15 a.m. | Inspired Leadership at CommuniCare. Regan Pape, MHA Graduate Student.

Faculty Advisor: Dr. Alan A. Jones

### Purpose and Aims

The project aims to share my 6-month experience of goal-inspired business leadership at CommuniCare as outlined in the UIW McGuire Scholarship for Mission-Inspired Leadership. I was awarded the 2022-23 UIW McGuire Scholarship for Mission-Inspired Leadership. The scholarship required that I complete a 6-month volunteer internship with a local business and reflect on my experiences using Pope Francis', "Laudato Si' Encyclical letter on Care for Our Common Home" and "Vocation of the Business Leader: A Reflection" as a guide.

### Rationale and Significance

The experience has allowed me better to understand the importance of "mission-inspired business leaders." A businessperson is a practitioner who turns dreams into reality. A "mission-inspired business leader" is one inspired by the Incarnate Word's Spirit of service to dream good dreams and make them real for others.

### Methodology

I volunteered 40 hours a month with the CommuniCare Health Centers-East Clinic from June 2022 to November 2022. My preceptor was the organization's Vice President and Chief Clinical Officer, Carlos Moreno, MD. My internship was divided into two phases: (1) Rotations; and a (2) Clinical Study. Reflection served as the foundation for both phases. In phase 1, I rotated among the sections of the clinic. In phase 2, I assisted with a Clinical Study examining CommuniCare's High-Risk Pregnancy Initiative.

### Findings

The results of my project support that CommuniCare possesses "mission-inspired business leaders" as defined by Pope Francis', "Laudato Si' Encyclical letter on Care for Our Common Home" and "Vocation of the Business Leader: A Reflection." The clinic was able to meet the needs of the patients while maintaining the organizations' core values in a very dynamic and stressful business environment.



9:30 a.m. | Health Fair in Spanish and English for housekeepers working at UIW. Dr. Amalia Mondriguez, Modern Languages/Spanish and FSOP (Spanish for Pharmacy 5225)

### Overview

Housekeepers working at UIW are employed by some private companies. Most of them work for Aramark and serve the main campus on Broadway. Housekeepers have low salaries, and many of them do not have a health plan. Their choice to have a health plan is optional, and many of them think they can't afford it. Also, many housekeepers prefer to communicate in Spanish better than in English, because they don't speak English, or they feel they don't speak well enough. Mr. George García, Aramark's housekeeper supervisor at UIW, uses an interpreter to communicate with the housekeepers who speak Spanish only.

UIW's Feik School of Pharmacy (FSOP) understands the need to prepare pharmacists that can do medicine counseling in Spanish. That is why FSOP requires all its students to take 2 courses in Spanish for Pharmacists (Phar 5220 and Phar 5225). The importance of a good diet and exercise are also studied to empower the patients to be healthy. Taken from the FSOP website: Two 2-credit hour courses of Spanish for pharmacists are incorporated into the Doctor of Pharmacy curriculum to increase fluency with basic patient counseling in Spanish that increases practice-readiness among our students and provides the training necessary to provide effective patient care to diverse patient populations in South Texas.



Goals of the health fair include providing written and oral information in Spanish on: Prevention: Nutrition for people with diabetes, high blood pressure, high cholesterol, among others. The importance of exercising. Individual medicine counseling Provide printed information on generic/inexpensive medicines and where to get them Basic labs on site Information about affordable health plans, such as Obama Care Interviews/questionnaires to find out: their access to health care, medicines, health issues, how not knowing English may affect their health, and how can they be helped beyond this health fair.

9:45 a.m. | Equalizing Community Voice in International Service-Learning Projects: Research in Peru. Monica D. Hernandez, Ph.D. Candidate.

### Purpose and Aims

Traditionally, service programs are created and led by host groups, which frequently overlook the international communities' learning process and perspectives and the long-term impact of service missions on the community. The research aim has been to investigate the empowerment and efficacy of an international service project to strengthen relationships between engaged scholars and international communities to improve future service-learning trips.

### Methodology

I investigated a 2021-2022 International Service Learning-Based Photovoice Project using Ettling's Process of Empowerment model as the conceptual foundation for the study. Photovoice is an action research method that allows participants to express their concerns about important community issues. According to Buck et al., (2019), Ettling's model has been used to create capacity in disadvantaged communities globally and at UIW, to align professors' and students' talents and abilities with the challenges of those vulnerable communities. A qualitative narrative inquiry design was chosen to explore the participants' perceptions, with experiential learning serving as the study's theoretical framework.



Six members of the Peruvian social entrepreneurial group Pushaq Warmi led workshops in three surrounding communities of Chimbote, Peru, to include rural areas, providing knowledge on mental health issues, including coping and management techniques brought on by or exacerbated by the Covid pandemic, and demonstrated ways to motivate and inspire their female workshop participants. Pushaq Warmi used the Photovoice method to document their workshop experiences and, with a public exhibition of their work in Nuevo Chimbote, raised awareness of leading mental health concerns women face in Peru.

### Findings

The study revealed that Ettling's Process of Empowerment could be integrated effectively into community led ISL projects. Pushaq Warmi, underwent a transformative change during their participation in the project. At the core of this empowerment are the five central themes revealed in the study: 1.) work aligning with their own professional goals/motives, 2.) ability to motivate, inspire, and share knowledge/skills with others, 3.) expand their own learning and cultural awareness, 4.) capacity to work as a team, and 5.) impact on the people/community. My work with the study participants in an ISL project where they had ownership and control allowed the community voice to be heard. Additionally, the project's focus on women's capacity development demonstrated its sustainability potential. The knowledge and skills that the study participants learned on Photovoice will continue to be drawn from and used to educate and train different communities by the women of Pushaq Warmi.

10:30 a.m. | A Mexican American Woman Activist in South Texas Calling for Change a Century Ago- Giving Us Insight and Courage for Social Justice, Solidarity and Service Today.

Dr. Cynthia Orozco presents on Agent of Change: Adela Sloss-Vento, Mexican American Civil Rights Activist and Texas Feminist. Dr. Orozco just received the Lifetime Achievement Award from the National Association for Chicana and Chicano Studies, 2023. She is an award-winning, best-selling author who received the Liz Carpenter Award from the Texas State Historical Society for the book on Adela Sloss-Vento.

A Round Table discussion considering how this inspiring woman calls us to courage for social justice, solidarity, and service today. Participants include Bianca Arguellez-Garcia, Emily Xochitl Campos, Dr. Laura Cannon, Dr. Darlene Carbajal, Dr. Arturo Chavez, Prof. Miguel Cortinas, Nichole Hernandez, Sr. Martha Ann Kirk, Dr. Lisa Lockhart, Dr. Laura Lopez, Dr. Leslie Martinez, Sr. Christi Sanchez, Dr. Beth Senne-Duff, and Dr. Erlinda Lopez-Rodriguez, Service-Learning Committee Co-Chair.



Presentation and Round Table Discussion through the generous funding of the THECB Somos Unidos Grant, Director: Dr. Monica Jimenez.

**Thursday, April 13**

*Action Research for Community Health and Wellbeing (DSE & NHP Showcase)*

*Dr. Alfredo Ortiz, DSE and Dr. Shandra Esparza, NHP Present:*

**10 a.m.- Noon** | Sembrano Amor: Centering Community Knowledge, SEC 2030

Opening prayer led by Sr. Walter Maher, CCVI

- Tour the Photovoice and Zine gallery exhibit of Community Expert knowledge on breastfeeding/chestfeeding.
- Learn how community experts and institutional partners can work together and leverage resources to support community-centered processes.
- Engage with Community Experts on Breastfeeding/chestfeeding. Program Staff from the City of San Antonio's Office of Health Equity and Healthy Neighborhoods Program, Lactation Service Providers, and UIW Faculty, Staff, and Students from the Dreeben School of Education and the Ila Faye School of Nursing and Health Professions

**1:30- 4 p.m.** | Community-Engaged Participatory Action Research, SEC 2030

- Explore the art gallery, inspired by the experiences of parents of children with autism & LGBTQ+ community members.
- Discuss healthcare challenges that arise from devaluing community knowledge.
- Learn how a "Rewriting the Script" process can help future Health Professionals become Health Equity Allies.
- Join the conversation with community experts, representatives of the nonprofit Any Baby Can, and UIW Faculty, Staff, and Students from the Dreeben School of Education and the Ila Faye School of Nursing and Health Professions in generating actionable ideas to promote health equity.



Thursday, presenters from the Dreeben School of Education and the Ila Faye Miller School of Nursing and Health Professions shared their research called, *Sembrano Amor: Centering Community Knowledge and Community Engaged Participatory Action Research*.

To learn more about [ACTION RESEARCH FOR COMMUNITY HEALTH AND WELLBEING](https://ar4chw.com/), visit: <https://ar4chw.com/>

**Friday, April 14**

## *Mission Integration Panels Retreat (CHASS Showcase)*

**9 a.m.- 3 p.m.** | Mission Integration Panels Retreat, Mabee Library Special Collections

The week closed with the Mission Integration Panels Retreat. Friday included a student panel and a faculty panel, both of which discussed various topics regarding the University Mission's place in the UIW educational experience, such as "Imagining the Ideal University Experience" (student panel) and "Integrating UIW Mission in Pastoral Ministry Courses" (faculty panel). Additional sessions included "Reflecting on Mission Integration with Students" and "Course or Assignment Work Time: Integrating Mission in This Moment." The day ended with a reflection, allowing attendees time to think about the wealth of knowledge that was shared throughout the day.

Overall, the participants enjoyed Research Week and the opportunity to share their knowledge with the community. "I've loved the opportunity to translate what I've learned in the classroom and in the lab and get to apply that knowledge to something practical as well," shared Leah Sterling, a senior who is majoring in Biology with a minor in Public Health. "It's helped enhance my analytical skills and has made me much more confident leaving undergrad and going to graduate school."

"We participated in Research Week to share our product with different people and to practice putting it into terms where it's interesting for people to understand," said Lucas Bryan, senior in Mechanical Engineering. "We want people to know what kind of research we're doing here at UIW and to show that there is still innovation out there for people to make."

**9:10 a.m. - 9:20 a.m.** | Welcome (LuElla D'Amico and Darlene Carbajal)

**9:20 a.m. - 9:50 a.m.** | Sr. Walter Opening: Reflecting on UIW's Mission & Integrating into the Whole Academic Self

**9:50 a.m. - 11:10 a.m.** | Student Panel Featuring:

- Isaiah Schmidt: "Zooming Out: A Stoic Approach to the Good Life"
- Andrea Zulaica: "Imagining the Ideal University Experience"
- David Hefner: "What It Means to Be Human: The Quest for Knowledge through Theological and Literary Lenses"
- Patricia Augustine: "Work-Life Balance in the Good Life"
- Francisco (Frank) Flores and Hessel (Beni) Resendiz: "Cultivating the Development of the Whole Person and Life-Long Learning in Communication Arts Courses"

**11:10 - 11:25 a.m.** | Walking Break (With Guided Reflection)

**11:25 - 11:40 a.m.** | Reflecting on Mission Integration with Students

**11:40 a.m. - Noon** | Lunch

**Noon - 12:50 p.m.** | Faculty Panels Featuring:

- Chris Edelman: "Berry, Socrates, and the UIW Mission: Solving for Pattern"
- Darlene Carbajal: "Integrating Mission into Communication Arts Courses"
- John Kainer: "Social Science and the Purpose of Life: Be Little with Me"
- Joseph Grabau: "Integrating UIW Mission in Pastoral Ministry Courses"

**12:50 - 1 p.m.** | Open Break

**1 - 1:50 p.m.** | Course or Assignment Work Time: Integrating Mission in This Moment

**1:50 - 2:50 p.m.** | Faculty Panels Featuring:

- Mourad Takawi: "Mapping Student Perceptions & Engagement with the University Mission: Insights from 'The Word in the World'"
- Horacio Vela: "Integrating Mission in Religious Studies"
- Tara Hembrough: "Integration Care for Creation and the Composition Classroom"
- LuElla D'Amico: "Reflecting on the Good Life: Mission in the First-Year Experience and Composition Classroom"

**2:50 - 3:30 p.m.** | Whole Day Reflections | Closing: Your UIW Mission Gift

# RESEARCH WEEK POSTER AND PODIUM PRESENTATIONS

## Visual and Creative Arts Presentations

### COLLEGE OF HUMANITIES, ARTS, AND SOCIAL SCIENCES

#### *HUMAN/NATURE*

#### Ian Manseau

**Artist Statement:** My abstract sculptures explore the intricate relationships between humanity, nature, and interpersonal relationships. Reclaiming salvaged trees, my work is a testament to the enduring spirit of the natural world and a reminder of the remnants left behind. My creative process evolves and takes direction in response to the raw details of the medium, such as grain, inclusions, and scars of growth revealed during the sculpting process. These details become an integral part of the final aesthetic and serve as a tribute to the resilience and beauty of the natural world.

The biomorphic form of my sculptures evoke a dynamic sense of movement and energy, mirroring the ebbs and flows of life. They are a visual representation of the interconnectedness of all things and an invitation to consider how we can better understand and appreciate our world and each other. Within my creative process, I sway between expression and reaction in order to create a harmonizing connection, which is often lost in today's digital world.

By creating both reminiscent and thought-provoking art, I hope to foster a greater appreciation and respect for the world around us. My sculptures explore the nature of fragile and ephemeral interdependencies, and I hope they spark conversations about our connectedness. By drawing viewers in and causing them to slow down, reflect, and appreciate the beauty within our world, thus creating a deeper understanding and appreciation.

**Methodology:** I carefully source and select fallen or sick trees to salvage to create my work. My process starts with shaping the initial form using a chainsaw and refining the sculpture with an angle grinder and sander while remaining attentive to the natural details to craft organic, biomorphic forms. Throughout the sculpting process, I stay adaptive, allowing the wood's unique features to guide my artistic vision. The journey from salvaged wood to sculpture takes several months of sculpting, drying, and perfecting to achieve the result. Each piece is finished by diligently sanding and applying a custom-made finish that enhances the inherent beauty and ensures the artwork's lasting appeal.

**Names:** The selection of names in this series is deeply rooted in exploring humanity and its intricate relationship. Each piece in this series is named after a verb representing a facet of human experience, reflecting our complex emotions, actions, and connections with one another and the world around us. The names evoke a range of emotions and experiences that invite the viewer to ponder the depths of human nature. These titles complement the organic and dynamic forms of the sculptures and evoke introspection and conversation.

To see Ian Manseau's art, visit: [www.manseau.art](http://www.manseau.art)



### *3D GAME ENVIRONMENT: WITCH'S DATE DIORAMA*

Jilliann Mena

**Artist Statement:** My Witch's Date Diorama is meant to challenge not only what I know, but what the world knows. It is a cultivation of my skills as an artist and an homage to the individuals persecuted throughout time simply for being "different." The witch motif and romantic theme pool together into a beautiful display of tenderness, born only out of the technical parameters I have mastered. While the fantasy subject at hand is historically old, current technology has brought it back to life and highlights the surprisingly loving side of it.

In creating the theme for this project, I wanted to encompass an air of romance and fantasy, specifically homosexuality and witchcraft. I myself am part of the LGBTQA+ community, and so I strived to commemorate my identity and interests within this piece. The witch's aspect came into play as it served beneficial in fitting both the need for a whimsical setting and affirming the identities of the couples involved. Witches are, historically, women, and so they became the perfect subject for this piece. I then took some time to gather resources to accompany the creative process of the project. researched specific witch's runes that symbolized love and passion and imprinted them onto the surfaces of my models. For the setting, I found that Rowan trees are associated with witches, so I made one to frame the tent. I also modeled the rowan berries and placed them within the tent on top of a grimoire and put a pair of overlapping broomsticks behind the tree. I wanted to parallel the idea of touch and show it in a way without characters. When it came to composing the shot, I utilized the tonal qualities of love by introducing the color pink as a motif. The lighting contrast between the blues and purples also enhances my focal point as the tent, effectively highlighting the cozy and tender atmosphere. To further this, I surrounded the area with rose bushes to ensure my audience would be drawn towards the middle. Finally, mystifyingly floating candles

and effervescent particles add the final touch to the moonlit date of a pair of witches.

Dioramas are an important steppingstone in a 3D artist's life. They are truly an embodiment and cultivation of learned techniques and practices and serve as a challenge to one's artistic eye. Within my discipline, this is a way to elevate yourself above the rest and showcase your ability to take simple props and compose them in such a way that tells a silent narrative. To do this means not only to have a mastery of environmental storytelling, but to have an enlightened understanding of the technical methodology needed to make such a story come to life. Overall, it signifies a marriage between the artistic and engineering parts of an artist.

**Narrative:** Two witches, deeply in love, set out one night for a romantic sleep over in the forest. They pitched up a tent, picked berries from the Rowan tree hovering just above, and lit floating candles. Resting their broomsticks against the tree, the witches' physical presence is unseen, but the remnants of their time together remain encapsulated in this technological, 3D environment.

**Methodology:** Compiled research using PureRef. Created mood study sketches for lighting, colors, and compositional needs with Clip Studio Paint. Established a Graybox version using Unreal Engine with lighting. Used modeling software Maya and Zbrush to create assets (low poly to high poly pipeline). Used Substance Painter software to texture assets (unique and tiling textures). Set up, optimized, and composed assets. Rendered in Unreal Engine 4.

**Acknowledgement:** I would like to thank my environment professor, Troy Mishler, for providing feedback throughout this project. Also, thank you to my supervisor Orion and the Autonomous Vehicle Systems (AVS) Lab for encouraging me to participate in this year's Research Week.

## Poster Presentations

### COLLEGE OF HUMANITIES, ARTS, AND SOCIAL SCIENCES

#### *ACADEMIC ENTITLEMENT'S RELATIONSHIPS WITH POLICY EXCEPTION INTENTIONS, EXPECTATIONS, AND INTENT TO REWARD PROFESSORS*

**Stefanie Boswell, Ph.D.**

**Purpose:** Academic entitlement (AE) is the attitude that one deserves easy academic success (Chowning & Campbell, 2009).

AE includes:

- entitled expectations (EE; "I deserve an A") and
- externalized responsibility (ER; "Professors are responsible for my grades")

This poster reports EE's and ER's correlations with students' intentions and expectations toward professors regarding exceptions from course policies.

**Rationale:** Because they believe they deserve special treatment, students high in AE may intend to ask for and expect to receive policy exceptions and intend to reward professors who provide them with higher teaching evaluations.

**Methodology:** Undergraduates (n=198, 79.8% woman, 66.2% first-year student) completed Chowning and Campbell's (2009) 15-item measure of AE (EE and ER subscales).

They viewed a fictitious professor's teaching philosophy and rated:

1. intention to request three attendance, two assignment, and two exam policy exceptions
2. expectation they would receive these exceptions
3. intention to improve the evaluation of the professor who granted the exception request.

Ratings of intention to ask, expectation to receive, and intention to improve evaluations were aggregated for each type of policy request; this resulted in an 1) ask, 2) receive, and 3) evaluate score for the three policy types, 1) attendance, 2) assignment, and 3) exam). They also completed a demographic questionnaire.

**Findings:** EE was significantly positively related to:

- intention to request attendance, assignment, and exam policy exceptions ( $r=.21, .34, .28$  respectively)
- expectation to receive an assignment policy exception ( $r=.15$ )
- intention to improve the evaluation of professors who granted attendance, assignment, and exam policy exceptions ( $r=.18, .31, .27$ )

ER was significantly positively related to:

- intention to request attendance and assignment policy exceptions ( $r=.28, .20$ , respectively)
- expectation to receive these exceptions ( $r=.18, .17$ , respectively)
- intention to improve the evaluation of professors who granted an attendance policy exception ( $r=.21$ )

Given that individuals high in AE believe they deserve special academic treatment, it makes sense they would intend to ask for and expect to receive policy exceptions.

Students high in AE believe they are university customers; thus, they may behave similarly to consumers who believe they received preferential treatment from consumer-service providers. Receiving special treatment engenders a sense that the consumer has a special relationship with the provider; this contributes to the spread of positive word-of-mouth to others (Che-Hiu et al., 2018).

*A QUALITATIVE STUDY OF STUDENT REACTIONS TO THE USE OF TECHNOLOGY IN FOREIGN/SECOND LANGUAGE CLASSES*

Michael Tallon, Ph.D.

**Purpose:** The purpose of this exploratory qualitative study was to examine emerging themes from several language classes that incorporated the use of technology in specific language tasks. Foreign/second language (FL/SL) teachers are always searching for new and better ways to help their students learn the new language. One area that has provided much excitement over the past several years is the use of computers and technology. The guiding research question for this study was: How do college-level students react to tasks that use technology in foreign/second language classes?

**Rationale:** The Review of the Literature section will discuss a number of benefits for students related to the general use of technology in language classes (e.g., Brownlee-Conyers 1996; Dwyer 1996; McGrath 1998; Weiss 1994; Wang 1993; Beauvois 1995; Beauvois & Eledge 1996; Huang 1999), and specifically the use of computer-mediated communication (CMC) (Kern 1995; Warschauer 1996; Sullivan & Pratt 1996; Beauvois 1995; González-Bueno & Pérez 2001; Arnold 2002). It is interesting to note that most of these studies were conducted using a quantitative framework. Very few studies have been conducted on the use of technology in FL/SL classes using a qualitative framework. This study seeks to help fill that void. The theoretical framework for this study is socio-constructivism and the disciplinary orientation is foreign/second language education and technology. This is a qualitative study in which the data will help to conceptualize emerging themes.

**Methodology:** Four researchers participated in this study, with each one gathering data from one participant involved in a college-level language course that involved the use of technology in language tasks. Three of the researchers studied one of their own students and the fourth researcher, who was not teaching at the time, studied a student at the same university she was attending. The language tasks used in the different classes were not necessarily the same.

However, the focus of this study was not on the specific tasks, but instead on how students react to these language tasks.

Three sources of data collection were used in this study: interviews, observations, and documents. Each researcher conducted one 45-minute interview with his/her participant. An interview guide was used, but other questions were also asked as other topics arose. All interviews were recorded and later transcribed. Each researcher also performed one observation of his/her participant, taking field notes focusing on the interactions that took place between students, use of the target language, level of participation, and tensions. Documents (e.g., transcripts of chats, bulletin board posts) were also collected by each researcher. The procedure of "content analysis" was followed to analyze the data (Berg 2004).

**Findings:** Based on the data, the researchers found that students had both positive and negative reactions to language tasks that use technology in a FL/SL class. Positive reactions included problem-solving strategies (i.e., using the technology to solve specific problems), instrumental strategies (i.e., using the technology as a tool in the learning process, as a way to get extra help in learning the language), self-efficacy/autonomy (i.e., the ability to work independently and be in charge of their own learning), and lower stress/anxiety (i.e., many students felt that working with technology was less stressful than working in a traditional language classroom). Negative reactions included the feeling that the technology was just "extra work," the feeling that using technology was not the same as "regular" class work (i.e., the students perceived the language tasks that used technology as being different from the type of activities they typically would do in a traditional language class), and frustrations with the technology. The study concludes with implications for teaching and areas for future research.

*BATALLÓN DE SAN PATRICIO: A TURNING POINT IN IRISH WHITENESS*

**Michael McLaughlin**

**Purpose:** The Batallón de San Patricio, or the St. Patrick's Battalion, represents a unique and obscure aspect of The Mexican American War. They were immigrants who defected from the United States Army and fought on the side of Mexico. As a relative footnote to history, the understanding and misunderstanding of the Batallón de San Patricio has changed little with the passage of time. This is significant because the persistent belief that all of the members were Irish Catholic appears to be a significant factor in Winfield Scott's presidential campaign.

**Rationale:** Around two-fifths of the defectors were Irish Catholic. The main unifying factor between all its members is that they were overwhelmingly immigrants. Although few journals or diaries exist that explain why specific soldiers switched sides the fact that many of the

battalion's members were all immigrants suggest that America's Anti-Immigrant, especially Anti-Catholic, prejudice during the 1800s fueled a sense of indignation in these soldiers who were not naturalized citizens.

**Methodology:** Examination and analysis of available primary sources and a brief historiography of The Batallón de San Patricio.

**Findings:** This paper argues the Winfield Scott lost his presidential run against Franklin Pierce, in part, because of his treatment of The Batallón de San Patricio. The author believes this implies a significant change in the political attitudes towards European immigrants, especially the Irish.

*CAMPUS FACTORS IN RETENTION AND MENTORING: BALANCING JOBS, FAMILY, AND PROGRESS*

**Kassandra Gomez; Leslie Martinez, PhD, Psychology**

**Purpose:** College environments can be a shock to a freshman student's system. Coming from structure and familiarity of their home life to independent living as an adult can be a jarring experience. The college experience becomes more stressful when multiple personal factors, such as ethnicity, sexual orientation, mental health, and socioeconomic status, collide in academic spaces (O'keeffe, 2013). As institutions of higher education work to retain students, researchers explore students' sense of belonging and what role it plays in persistence. Morison et al. (2013) found students' ability to feel included, actively engaged, and part of a caring environment are crucial to whether they stay enrolled or not, especially low socioeconomic background students. Humphrey et al. (2010) emphasized the importance of students finding community and connectedness with peers and faculty, as well as feeling institutional support.

**Rationale:** The current study examines relationships between external and internal influences on academic progress. When earning a degree, effort involved in balancing academic and personal obligations presents multiple challenges to students, especially for those from traditionally underserved communities.

**Methodology:** Sample data were collected online through Qualtrics from undergraduates at two universities distinguished as Hispanic-serving institutions (HSIs) within South Texas. Refer to Table 1 for a summary of demographic descriptions.

- Sample 1 data (n = 51) were collected at a private, Catholic institution.
- Sample 2 data (n = 342) were collected from a public, state university.

*Campus Factors* (i.e., interactions with peers/faculty)

*Off-Campus Factors* (i.e., family obligations, job status, mental health)

**Findings:** Item- and questionnaire-level analyses represent student successes and barriers. Analyses explain the relationship between academic progress, jobs, and family. For example, sample 1 reported that external responsibilities "occasionally" (48%) or "often" (42%) affect their success in school. Nearly all students (80%) agreed interactions with professors and instructors have influenced sense of belonging on campus. Although 77% of students agreed interactions with faculty play a significant role in the continuation of their educational pursuit, 20% never met with faculty outside of class time. Almost 20% of seniors never met with faculty about career plans. When analyzing faculty interactions and accounting for job status, students were more likely to have never worked with faculty outside of class when they had an off campus (50%) or on campus (60%) job compared to students without a job (38%).

Findings echo importance of sense of belonging and the need for awareness of student experiences. Institutions can encourage personal growth and community, while promoting educational excellence. Discipline-specific mentoring programs create inclusive opportunities for contact with faculty outside of the classroom setting, whether it is about career, post-undergraduate programs, or activities. Peer, faculty, or professional staff mentors are known to aid student retention (Moschetti et al., 2018).

*CHRONICLES OF INTERNET ADDICTION: PROMOTING DIGITAL WELL-BEING IN COLLEGE STUDENTS IN A WORLD OF PROBLEMATIC INTERFERENCE*

**Nathan Hernandez**

**Purpose:** To examine various issues associated with problematic smartphone usage in college students and society. My goal is to provide students with tips and tricks on how to improve their digital well-being with practical interventions and to provide meaningful discussion and conversation about problematic smartphone usage in the UIW community.

RQ: How do smartphones impact college students and society today? What strategies and interventions can college students use to improve their digital well-being?

**Rationale:**

- The rapid integration of smartphones and social media usage in colleges and society has caused quite a concern for researchers, educators, and parents alike.
- Despite being introduced 26 years ago, phones with internet access have become so ubiquitous in our culture that most of the world can access one in their pockets.
- As society changes, new issues brought upon by smartphones are constantly being discovered, meaning that previous studies on the effects of smartphones could quickly become outdated.
- This may make it difficult to fully understand the long-term effects of SU & SM on individuals.
- It is crucial that researchers keep updated with this ever-changing sphere of psychology and sociology.

**Methodology:** To conduct this literature review, I searched multiple databases, including:

- APA Psych Articles, APA Psych Info, ProQuest, Google Scholar, UIW Library Search, Academic Search Complete (EBSCO), JSTOR, Science Direct, InterLoan Library, the DSM-5-TR, books, theses/dissertations, news articles, and YouTube videos published primarily in the last 20 years.
- The review consists of 16 scholarly articles: 3 Descriptive, 1 Systematic Review, 3 Correlational, 2 RCTs, 2 Experimental, 2 Cross-Sectional, 1 Quasi-Experimental, 1 Thesis, and 1 Daily Diary study.
- Keywords included: PSU, university students or young adults, sleep and circadian rhythm, academic performance/achievement, nomophobia prevalence, phubbing, always-on society/culture, etc.

**Findings:** PSUs may be exacerbating a national sleep crisis in college students. The relationship between SU's and academics is a complex double edge sword. Multi-tasking can increase study time and lower grades. Laptop permittance in classrooms may result in diverted attention and hurt class averages on exams. SU's are impacting how we prioritize psychological needs like hunger and pain. SU's are interfering with how we communicate and connect with others. SU's are changing the ways we define and interact in public spaces. Interventions like taking a one-week break from social media or changing phone color to grayscale may be a simple way to promote digital well-being and curb PSU.

*THE CURRENT RESEARCH ON 'CANCEL CULTURE'*

**Mariana Gonzalez; Dr. Teresa Taylor-Partridge, PhD, Faculty, Psychology**

**Purpose:** Cancel culture is a new trend, mostly within the Internet, that involves shunning one or more persons due to some form of misconduct from them. This behavior, as we've witnessed, can range from harsh criticism towards particular individuals due to their unfavorable actions or opinions to extreme life-threatening cases like death threats and physical attacks. For this systematic literature review, we asked one question: is there significant research that addresses the relational and societal effects of cancel culture within the Internet and the real world? Because cancel culture is a new phenomenon, we hypothesize that there will be a lack of in-depth research that identifies cancel culture and its influence.

**Rationale:** A Google search of the term "cancel culture" results in millions of hits suggesting that it is a common reference in social and news media. Cancel culture can be viewed based on the person(s) or groups who are involved in it. In some ways, it has encouraged victims of violence to speak against their perpetrators, thus 'cancelling' them (Maryn & Dover, 2022). This has occurred prominently against political or authoritative figures in the past decades. In other ways, it may discourage some users from voicing their opinions during intellectual conversations online and in real life with fears of being criticized or neglected (Miles & Shinew, 2022). With that in mind, it is essential to systematically study how cancel culture influences relationships, group interactions, and social biases and to what extent.

**Methodology:** For this topic, we did an advanced search on PsycArticles and specifically typed "cancel culture" with quotation marks at the beginning and end to avoid

articles that digressed from this topic. The 'peer-reviewed' button was checked in order to collect the desired type of research. The database showed a total of 5 articles. These articles were recently published from January to October 2022 and were all in English. There was no modification to the search since the results only revealed five articles. This review will discuss four articles out of the five.

**Findings:** The articles were not specifically about cancel culture. They each examined real-world issues in which cancel culture is involved, but cancel culture itself was not the focal point of their research. For example, Knafo (2022) discussed Carlo Strenger's "existential psychoanalysis" about today's society, which mentioned how the Internet has become a source of identity development for many users, yet they possess the fear of 'getting cancelled', so they tend to conceal whatever it is about themselves that is socially unacceptable. Taylor and Bailey's (2022) article highlighted the use of cancel culture to expose previous sexual assault charges against males after years of the charges being put aside. Miles and Shinew (2022) studied the structure of intergroup dialogue and how the mere existence of cancel culture may force individuals to withdraw from meaningful conversations with one another. Maryn and Dover's (2022) gender-based violence study mildly included the severity of cancel culture. This systematic literature review showed less than a handful of scholarly articles that speak very briefly about cancel culture. These articles provided important points on this topic. With this, further research specifically about cancel culture may help to understand the repercussions of cancel culture.

*EXPLORING PLATFORM DIFFERENCES OF EMOJI SELECTION FOR FACIAL EXPRESSIONS OF EMOTIONS*

Rachel Walker, PhD; Sara Brady, PhD, Faculty, Concordia University, Psychology

**Purpose:** Technology has continued to change how people express their emotional facial expressions. For example, the first usage of an emoticon appeared on a 1982 online bulletin board about humor. It suggested the use of a colon, a hyphen, and a round bracket to indicate whether or not a statement was a joke (Fahlman, 2002). As computers became increasingly accessible to the average household, the rise of computer mediated communication (CMC) coincided with the need to communicate facial expressions in text-based communication (Seargeant, 2019). As with any form of communication, there is often variation in the form of CMC to express similar facial expressions, as well as ambiguity in how such CMC is interpreted. Despite the valence of the CMC influencing the intensity of the message, other research has found that using either emoticons or emojis have a similar impact on the interpretation of the message (Ganster et al., 2012; Vareberg & Westerman, 2020). No study has explicitly explored the extent to which people select a variety of emojis to portray specific facial expressions. The current exploratory study seeks to determine the extent to which there are platform differences in the emoji selections used to represent various facial expressions.

**Rationale:** Previous research has explored how people use emojis in CMC and has examined how emojis are used, as well as interpreted across a variety of contexts. Although previous research has

used highly rigorous methods to experimentally test for differences in emoji interpretation across platforms, no study has allowed participants to generate their own emojis based upon the devices that they regularly use. Regardless of the reason for communicating the emoji of a laughing face, for example, do individuals inherently select the same emojis each time? Or do individuals send different emojis to communicate the same facial expression depending upon their preferred platform? Given that emojis are interpreted differently across platforms (Franco & Fugate, 2020; Miller et al., 2016), it may be that different platform users select different emojis when engaging in CMC. No study has explicitly explored the extent to which people select a variety of

emojis to portray specific facial expressions. The current exploratory study seeks to determine the extent to which there are platform differences in the emoji selections used to represent various facial expressions.

**Methodology:** Participants were recruited via email, university posting, and social media. If interested, participants clicked on the link, and were directed to a Qualtrics survey that began with the informed consent. To obtain a more diverse sample of participants snowball sampling were used. In addition to posting the survey link on university forums, adult participants from the community were also recruited on social media platforms (i.e., Facebook). There was no direct compensation from the researchers for participation. Participants were asked to enter the top three face emojis that they mostly use for the following 10 facial expressions: happy face, sad face, surprised face, angry face, disgusted face, neutral face, contempt face, fearful face, laughing face, and silly face.

**Findings:** On average, participants reported using emojis frequently ( $M = 6.02$  out of 10,  $SD = 2.27$ ). A vast majority of participants reported using a smartphone as their primary device when using emojis (94.0%) with most of those participants reporting using an Apple smartphone (79.1%). Of the platforms selected, the most frequently selected platforms were Apple (77.3%), Instagram (63.8%), Snapchat (62.3%), Messenger (51.9%), and Facebook (49.4%). A notable proportion of participants also reported using emojis on TikTok (38.9%), Twitter (32.9%), Discord (15.0%), WhatsApp (14.2%), YouTube (12.2%), and Google (10.7%). Across the entire sample of 401, participants entered 9,953 total emojis and 122 distinct emojis into the survey. On average, participants entered a total number of 24.82 emojis ( $SD = 5.72$ ) into the survey and 22.39 distinct emojis ( $SD = 5.46$ ). The most frequently entered emoji across the entire survey was Laughing with Tears of Joy: u+1f602 (4.49% of all emojis entered). Across all emojis entered for each facial expression, the top three selected emojis captured the majority of emojis for laughing (73.5%), neutral (64.5%), disgust (63.3%), anger (58.0%), and silly (55.7%) facial expressions. To visually analyze the emojis selected for each facial expression, word clouds were created for each facial expression.



*OBSERVER PERCEPTION OF PARENT-SHAMING ON SOCIAL MEDIA: A PILOT STUDY*

Aleeha Shah, BA; Teresa Taylor-Partridge, Ph.D., Faculty, Psychology

**Purpose:** The study aims to explore individual attitudes toward and experiences with the online shaming of mother versus fathers with regard to controversial parenting topics. Specifically, the research investigates if mothers are judged differently than fathers based on their online posts about their parenting choices. Additionally, the study seeks to determine if individuals' parenting experiences, gender, and stance on the handling of disputable parenting situations influence their ratings on agreement with the parent's post and their endorsement of replies, either constructive or destructive. Participant replies to the faux social media posts were also recorded for future research. The current study serves as a pilot to develop methodology.

**Rationale:** According to a report conducted by Edison Research, 93% of mothers report having a presence on social media (DeCesare, 2021). While social media sites promote unity for mothers, they also provide an outlet for combative mothering, creating debates involving certain parenting topics (Abetz & Moore, 2018). The term "mom-shaming" is used to describe the experience of criticizing mothers for their choices. A 2017 poll conducted by Mott Children's Hospital founds that 61% mothers reported being shamed (Clark, Kauffman, Singer, Schultz, Gebremariam, & Freed, 2017). Fathers are also implicated in the wave of "parent-shaming." A 2019 Mott Poll Report found that 52% of fathers in the study indicated that they were the target of negative criticism, (Clark, Singer, Schultz, Gebremariam, & Freed, 2019). Criticism of parents can take place online, in fact 19% of mothers and 12% of fathers report receiving criticism in public domains or online (Clark et al., 2017; Clark et al., 2019). Given the prevalence of parents using social media and the presence of online criticism, we sought to explore how parenting posts, and constructive/destructive replies to those posts, are perceived.

**Methodology:** Participants were recruited through Introduction to Psychology classes. They completed a survey through Qualtrics. This study utilized a vignette-

based method. Participants were presented two fake Facebook posts (OP) about public temper tantrums and child harnesses/leashes made by mothers or fathers (IV1; implied by name). They then rated their own agreement with how the parent handled the dilemma. They were also asked how they would reply to the post if they saw it online. Afterwards, participants then read fake replies (either constructive or combative) to the OP. They were asked to rate this reply for harsh, helpful, and appropriate (DVs). Participants were also asked about their own experiences with online shaming. For analysis, we ran a multiple regression with each dependent variable. Each dependent variable was measured on a Likert scale of 1 (strongly disapprove) to 7 (strongly approve). The two scores from both scenarios were added together.

**Findings:** Multiple regression analysis was conducted based on the participants' ratings of agreement with how the parent handled the situation, as well as their ratings of harshness, helpfulness, and appropriateness of the replies. The best model included type of reply, agreement with OP, and the interaction term to predict the three dependent variables. The model predicted ratings of the replies' harshness,  $F(3,86)=123.759$ ,  $p<.001$ ; appropriateness,  $F(3,86)=79.79$ ,  $p<.001$ ; and helpfulness,  $F(3,86)=75.24$ ,  $p<.001$ . This study supports the hypothesis that participants will rate constructive and combative replies different depending on observers' agreement with how the parent managed controversial parenting situations. Participants that saw the combative reply and evaluated the parent's handling of the situation high, rated those replies higher on harshness and lower on appropriateness and helpfulness; while participants that saw the constructive reply showed the opposite pattern. Parent-shaming is a topic commonly discussed on news and social media but is rarely studied empirically. Systematic study is necessary to operationally define the concept of parent shaming and discover the extent and potential reasons it occurs online, as well as outcomes.

*PROLONGED GRIEF & MEDIA EXPOSURE: A SYSTEMATIC LITERATURE REVIEW*

**Christa Vento-Jones; Teresa Taylor-Partridge, Ph.D**

**Purpose:** Our society has entered a new era where increased amounts of media exposure have influenced the way individuals appraise events. Among these events include devastating tragedies such as school shootings that leave victims with trauma, guilt, and overwhelming grief. While prolonged grief can occur after any type of loss, we wanted to explore research on media and the grieving process in those directly affected by school shootings.

The purpose of this systematic literature review was to analyze and quantify the amount of research that has been conducted on prolonged grief and its correlation to media exposure. Given that this topic is quite specific, we hypothesized that there would be a small amount of research articles that cover each of these concepts.

**Rationale:**

“Prolonged grief” is a condition characterized by symptoms such as debilitating separation distress from the deceased that lasts for more than 6 months (Prigerson et al., 2009; Shear et al., 2011).

A recent study showed that PGD affects one out of ten adults after a non-violent loss of a loved one (Lundorff et al., 2017). There was limited research on the prevalence of PGD after violent loss.

- According to the Sandy Hook Promise foundation, gun violence kills 12 children each day and injures 32 (Sandy Hook Promise Foundation, 2022)
- Since the 1999 Columbine shooting in the U.S, 338,000 students have been exposed to gun violence (Sandy Hook Promise Foundation, 2022).
- In 2022 alone, there were 46 reported school shootings in the U.S with 34 deaths and 43,000 children having an encounter with gun violence (Sandy Hook Promise Foundation, 2022).

**Methodology:** We utilized psychology Database and PsycINFO to find peer-reviewed research articles on prolonged grief and media exposure.

- The key terms were "prolonged grief," "media exposure," and "school shootings" with "anywhere" in the article as the criterion.
- Other criterion in the search included "peer-reviewed," "English," and in between the years 2016-2022.

**Findings:**

- The first search included “media exposure” and “school shootings.” This yielded 20 results in PsycINFO and 679 results in Psychology Database.
- The second search included “prolonged grief” and “media exposure.” This generated 6 results in PsycINFO and 359 results in Psychology Database.
- There were no results when all key terms ("media exposure," "school shootings," and "prolonged grief") were searched.
- We narrowed these searches down to four articles by choosing the research that was more closely related to our topic and had most of the keywords we searched.

Overall, there is still more research that needs to be done on the specific topic of the correlation between prolonged grief among those impacted by school shootings and the media coverage that follows. Change on a broader scale can occur once research is understood, and it is through this understanding that progress can be made. By acknowledging what research has already been done, new research can be conducted with the purpose of being beneficial to those who are suffering.

*REPRESENTING RELIGION DURING COVID: SUPERSPREADERS, ANTI-VAXERS AND RELIGIOUS FREEDOM*

Julie Miller, Th.D.

**Purpose:** The purpose of this project is to examine how the media portrayed religious organizations' and individuals' reactions to the challenges brought on by Covid-19. The media focused on two issues, the decision of some churches to close their doors during the pandemic and the refusal of many Americans to receive the Covid-19 vaccine. Thus, I examined not only the theological and religious reasoning used in these decisions but also the tone in which the media reported their findings.

**Rationale:** Very early on in the pandemic, news reports began to talk of "superspreader" events occurring at churches. These were incidents in which religious leaders chose to allow church members to meet as usual, not only for services but for communal gatherings and activities such as choir practice. Reading about these events, I became curious as to the reasons a church or parish would make such a decision to remain open, especially in the face of strong governmental and social recommendations not to. Later, in early 2021, when a vaccine was finally ready, many people decided to forego it and seek a "religious exemption." These two situations provided a unique opportunity to examine how theological, religious, and spiritual elements became entwined with specific political and cultural stances; they were also a good opportunity to see how various media portrayed religion and religious people.

**Methodology:** As is the norm within the Humanities, by primary methodology was reading and critically analyzing the material. Since the time frame between the onset of Covid and my initial investigation was very short, only a handful of academic studies had been

published. Hence, my source material was mainly internet news sites and general publications (church newsletters, blogs, diocesan magazines, etc.) which addressed how religious groups and individuals were responding to the challenges of Covid. The information I discovered ran the gamut from sensationalist to serious theological reflection. With this variety of information I was then able to draw my conclusions.

**Findings:** I found that churches who kept their doors open during lockdown justified their decision with one simple principle: religious freedom. They believed that in order to properly minister to their congregants, they had to be physically available, and the constitutionally protected right to religious freedom allowed them to do so. Those who did choose to close their doors emphasized a very different but equally simple religious principle: Love your neighbor as yourself. These churches saw their responsibility toward others having priority over religious freedom. In regard to refusing the Covid vaccine, people's reasons were more complex and myriad, but ultimately, the fundamental principle was, again, religious freedom coupled with bodily autonomy. Those who chose to get the Vaccine did so primarily for health reasons, not religious. Moreover, in examining these issues, I also found that the media tended to focus on what could be called "sensational" examples of religious defiance while often missing or glossing over the steady, difficult, quiet work of religious organizations as they responded to Covid. Perhaps unsurprisingly, the Pew Research Center has found that a full 25% of Americans thought religious organizations had done more harm than good during Covid.

*WATER T-MAZE SPATIAL LEARNING TEST TO ASSESS COGNITIVE FLEXIBILITY IN AGED MICE*

Susan Greene, PhD; Gloria-Andrea Alcalá, Biochemistry; Isabella Bustamante<sup>1</sup>; Blanka Bordas<sup>2</sup>; Alexia Johnson<sup>3</sup>; Georgianna G Gould, PI<sup>4</sup>

**Purpose:** Alzheimer's disease is a debilitating disease affecting a significant portion of the older population. However, screening methods for this disease are underdeveloped and often the first signs of the disease are missed. Literature reports an earlier onset in females but a faster progression in males. Therefore, the lack of screening and diagnosis methods makes early treatment unlikely. This can lead to poorer health outcomes for affected individuals. Mice are an ideal animal model to test the onset of cognitive decline as they age much quicker than humans and their genome has been sequenced, allowing a variety of mouse models to be developed. For this project we focused on a general model to test natural aging. Older mice were expected to experience more cognitive and social deficits than younger and middle aged mice.

**Rationale:** The use of mice as a model for Alzheimer's is an excellent way to develop treatments and screening methods to catch early onset cognitive decline. This project has highlighted the sex differences present in the onset of cognitive decline which are often ignored, leading to devastating health outcomes in the older population. By focusing on social and cognitive deficits we are able to look at which symptoms may be useful in developing tools to diagnose cognitive decline and begin early treatments of the disease before it has a chance to progress further.

**Methodology:** C57BL6 male and female mice of various ages (2, 9-15, and 24 months) were tested for 9 days in a water T-maze apparatus. Mice first chose a side of the

T-maze. Then trained for 5 days to swim to an escape platform on the opposite side of the T-maze from the first choice side. On day 6 mice were trained to swim to the opposite side of the acquisition side, which was the same as the first choice side. This continued until day 9. Trial time and errors were measured for each trial, and mice performed 10 trials a day. All trials were capped at 3 minutes, and mice were shown to the platform to avoid excess fatigue. Additionally, mice were tested in a 3-chamber apparatus to measure social behavior. All mice were preconditioned to the chamber for 20 minutes before the test for social interaction began. A stranger mouse was placed under an empty cup cage in one area while an empty cup was placed in another and interaction was recorded for 10 minutes. The test was then repeated for social novelty with the addition of a stranger mouse placed under the empty cup.

**Findings:** No social behavior deficits were found for any mice. Female mice aged 24 months did poorly during the water T-maze test. They had increased trial times and errors compared to younger mice and males aged 24 months. Additionally, when measuring the strength of conditioning to the platform location 24 month old female mice were the only group that did not have strong conditioning. In order to account for locomotor deficits chamber entries were measured for each mouse in the 3-chamber test. All older mice showed locomotor deficits, yet only females showed cognitive deficits in the Water T-Maze. The onset of Alzheimer's disease is often missed, and literature reports an earlier onset in females which is shown here in mice.

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*AMBULATORY PHARMACY OUTCOMES IN A DIABETIC POPULATION: BASELINE DATA FOR QUALITY IMPROVEMENT*

Jessica Navarrete; Hughes Bailey, P1<sup>1</sup>; Mathew Garber, PharmD, PhD; Joanne C. Fazio-Gosser, R.Ph; Norbert Rosario, PharmD, BCPS

**Purpose:** This quality improvement project will evaluate the new clinical service and how it assisted in obtaining the HEDIS goal A1c of <8%.

**Rationale:** According to the American Diabetes Association (ADA), the annual cost of diabetes for Texas is 25.6 billion dollars, making it one of the top four states with the highest costs for diabetes<sup>1</sup>. 90% of the nation's \$4.1 trillion in annual health care expenditures are for people with chronic conditions and mental health conditions<sup>2</sup>. Ambulatory care pharmacists have been proven to help patients manage their diabetes and gain control of their disease<sup>3</sup>. Glycated hemoglobin (A1c) gives an estimate of a patient's average glucose over three months<sup>4</sup>. Patients that have lower A1c measures have better outcomes in their diabetes<sup>5</sup>. Ambulatory care pharmacists with prescriptive authority can aid patients in gaining control of their disease state and help them reach a desired A1c goal.

**Methodology:** The patient sample was drawn from an insured patient population recommended to see an ambulatory care pharmacist in an outpatient clinic setting regarding their diabetes. Excel was used to generate a random sample of a total of 100 patients by assigning all patients an ID number. Methods for data collection were done by an ambulatory care pharmacist and baseline A1c was established during the initial visit. If there was a loss of follow-up, the last appointment was considered the final A1c evaluated by the ambulatory care pharmacist. Patients selected in the sample size were under the ambulatory care pharmacists for a range between 1 month, 28 days to 25 months. The majority of the visit was spent reinforcing patient education, decreasing pill burden, and optimizing therapies. Baseline goal of <8% will determine progress throughout the treatment.

Exclusion criteria: (1) seen solely for another condition other than DM, (2) never showed for initial appointment or follow-up, (3) no follow-up labs. (4) nonadherence to medical visits or treatment plans, short follow-up to see outcome.

**Findings:** The majority of patients under the supervision of an ambulatory care pharmacist lowered their A1c. Patients with baseline A1c >10% saw the most significant decrease in A1c values. Patients whose baseline values were closer to the goal value saw a modest decline in their A1c. A total of 72 patients reached the goal of A1c < 8%. Out of the 100 patients in the sample size, 28 patients had an A1c of < 8% at the end of the study and did not reach the desired goal. However, some of the patients that did not reach the goal still had a significant reduction in A1c. The results of the study showed that the mean A1c level of the patients decreased from 9.3 at the start of the study to 7.4 at the end, indicating a significant improvement in their overall glycemic control. Discussion: Patients were referred to an ambulatory care pharmacist for diabetes medication management and optimization. The initial A1c values ranged from 6.4 to 14, with 68 patients having an initial A1c of more than 8%. At the end of the study the final A1c values ranged from 5.2 to 12.6, with 72 patients ending with a final A1c of less than 8%. Some patients that did not reach the goal of < 8% still had a significant reduction in A1c that is underrepresented by those patients not reaching the goal of < 8%. The quality improvement plan will consist of evaluating the startup of a new clinical service to assist a multidisciplinary team with co-management of patients with chronic conditions under collaborative practice with full prescriptive authority given to the ambulatory care pharmacist.

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*DISCHARGE OUTCOMES WITH TICAGRELOR VS PRASUGREL IN PATIENTS WITH ACUTE CORONARY SYNDROME FOLLOWING PERCUTANEOUS CORONARY INTERVENTION*

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**Purpose:** To compare the safety and efficacy of ticagrelor versus prasugrel in patients with acute coronary syndrome (ACS) who undergo percutaneous coronary intervention (PCI).

**Rationale:** Previous randomized controlled trials are heterogenous in nature and have failed to provide a consensus on the superiority of ticagrelor versus prasugrel in patients requiring dual antiplatelet therapy post-PCI. Meta-analyses have also failed to demonstrate significant differences in outcomes between the two agents. In a recent head-to-head randomized controlled trial, prasugrel showed superiority over ticagrelor in both efficacy and safety outcomes. However, the open-labeled study design and high rate of P2Y12 inhibitor discontinuation or crossover led to reduced validity of the results.

**Methodology:** A single center, retrospective cohort study of patients who were  $\geq 18$  years old, hospitalized for ACS, and underwent PCI was conducted at an academic medical center. ACS was defined as unstable angina (UA), non-ST-elevation myocardial infarction (NSTEMI), or ST-elevation myocardial infarction (STEMI). Patients were stratified into two cohorts based on receipt of either ticagrelor or prasugrel. The primary endpoint was a composite of death, myocardial infarction, or stroke within 12 months of P2Y12 inhibitor

initiation. Secondary endpoints were a composite of death, myocardial infarction, or stroke within 30 days of P2Y12 inhibitor initiation, and the rate of stent thrombosis within 12 months of P2Y12 inhibitor initiation. Safety events were evaluated based on thrombolysis in myocardial infarction (TIMI) criteria. An exploratory analysis evaluating prasugrel dosing was performed.

**Findings:** 132 patients met inclusion criteria of which 127 were discharged with ticagrelor and five with prasugrel. The primary outcome occurred in 4.7% of ticagrelor patients and 0.0% of prasugrel patients (RR, 0.95; 95% CI, 0.92-1.00;  $P = 1.00$ ). At 30 days, the secondary outcome occurred in 4.7% of ticagrelor patients and 0.0% of prasugrel patients (RR, 0.98; 95% CI, 0.96-1.01;  $P = 1.00$ ). Stent thrombosis was not observed in either group. Incidence of any bleed occurred in 15.1% of ticagrelor patients and 60.0% of prasugrel patients. All patients who received prasugrel were dosed appropriately. Based on these findings, there was no statistically significant difference in efficacy or safety between the use of ticagrelor versus prasugrel in patients with ACS following PCI. A randomized controlled trial that accounts for P2Y12 inhibitor crossover and discontinuation rates and utilizes intention-to-treat design for safety events is still warranted.

*INTERACTIONS BETWEEN GLUCOSE AND METFORMIN ON ALPHA-CRYSTALLIN GLYCATION*

**Nadia Higgins, BS; Tamara Williams, PharmD; Cynthia Franklin, MS; Adeola O. Coker, Ph.D**

**Purpose:** To compare the short-term and long-term effects of metformin on the glycation of alpha-crystallin protein using multivariate analysis.

**Rationale:** One of many comorbidities of chronic diabetes is the development of diabetic cataracts, which degrade the vision of patients who have spent years in a hyperglycemic state. Glycation of alpha crystallin, a molecular chaperone, in eye lens over years promotes cataract formation. Metformin is a commonly prescribed and widely available first line medication used in the treatment of diabetes and is currently only available in an oral dosage form. If metformin can prevent or reduce the glycation of alpha crystallin proteins in the eye, perhaps an ophthalmic formulation of metformin could be developed for the prevention or treatment of diabetic cataracts.

**Methodology:** Data was collected to assess the effect of various combinations of glucose (GLC) and metformin (MF) on the glycation of  $\alpha$ -crystallin protein at 37°C over time using multivariate analysis. Glycation was measured using ultraviolet (UV) and fluorescence

spectroscopy. Aggregation was monitored using size-exclusion high-pressure liquid chromatography (SE-HPLC) with fluorescence and UV detection. Samples were analyzed to determine the effect of metformin on AC glycation over time. JMP software was used for statistical analysis.

**Findings:** Previously presented data showed a benefit of metformin when incubated with  $\alpha$ - crystallin and glucose for 35 days, decreasing the glycation of the protein significantly (\* = p-value <0.05). Over time, however, the data shows a significant interaction between metformin and glucose, resulting in increased aggregation. This suggests that metformin and glucose could be reacting to form an entirely new substance with chronic exposure to the drug, leading to crystallin aggregation, which can inhibit the chaperone activity of the protein. Further study is required to determine the exact product of this reaction and to delineate the clinical significance of its formation.

*LIFELONG ORAL ANTICOAGULANT AND P2Y12 INHIBITOR THERAPY IN A PATIENT WITH ATRIAL FIBRILLATION FOLLOWING PERCUTANEOUS CORONARY INTERVENTION: A CASE REPORT*

Harneal Diocee, PharmD; Amanda Kitten, PharmD, MSc, BCPS; Kathleen A. Lusk, PharmD, BCPS, BCCP

**Purpose:** Following percutaneous coronary intervention (PCI), patients are indicated to receive dual antiplatelet therapy (DAPT), consisting of aspirin and a P2Y12 inhibitor. After 3-12 months of DAPT, the P2Y12 inhibitor is discontinued and aspirin is continued indefinitely. Most patients with atrial fibrillation (AF) have an indication for oral anticoagulation for stroke prevention. Patients with AF who undergo PCI require a period with triple antithrombotic therapy (TAT), usually for one month, then transition to a direct oral anticoagulant (DOAC) and a P2Y12 inhibitor for the remainder of what would have been DAPT. Following this period, standard practice is to discontinue the P2Y12 inhibitor and initiate aspirin alongside the DOAC, both of which are continued indefinitely. The purpose of this case report is to examine a patient who was treated for one month with TAT followed by lifelong DOAC and P2Y12 inhibitor use.

**Rationale:** Balancing duration of TAT and subsequent therapy of aspirin or a P2Y12 inhibitor requires weighing the risks of bleeding versus prevention of stent thrombosis. Most patients require lifelong therapy with a DOAC and aspirin; however, in this unique case, the patient utilized lifelong therapy with apixaban and clopidogrel. In the time since his PCI, he has not needed revascularization and has denied episodes of chest pain during follow up. Considering an extended period with a more potent anti-platelet agent, this is to be expected. The patient's history of TIA likely drove the decision to continue clopidogrel lifelong, instead of transitioning to aspirin after twelve months. The WOEST trial supports lower rates of bleeding with a DOAC and P2Y12 inhibitor compared to TAT. Unfortunately, there was no comparison of a DOAC and P2Y12 inhibitor compared to a DOAC and aspirin. In patients who have AF and at high risk for recurrent myocardial infarction, stroke, or vascular related death, prolonged therapy with a DOAC and P2Y12 inhibitor may be considered.

**Methodology:** A preliminary finding from a single center, retrospective chart review of patients from an academic medical center in San Antonio, TX.

We present a case of a 65-year-old male with a history of AF (CHA2DS2-VASc 5, HAS-BLED 3), hypertension, dyslipidemia, and transient ischemic attack, who presented to the hospital with complaints of intermittent chest pain for the three days.

- 65-year-old male with a medical history of AF, hypertension, dyslipidemia, and transient ischemic attack
- Presented with intermittent chest pain for 3 days.
- Global ST-depressions and ST-elevations in the aVR lead
- 2 drug eluting stents placed.
- Indicated for DAPT following stents.
- CHA2DS2-VASc score was 5, indicating an OAC for stroke prevention.
- HAS-BLED score was 3.

**Findings:** Labs demonstrated a troponin peak of 22.7 and electrocardiogram findings of global ST-depressions and ST-elevations in the aVR lead. He was immediately taken for left heart catheterization where two drug-eluting stents were placed. Because his CHA2DS2-VASc score was greater than one, he was indicated for stroke prevention for AF with a DOAC. TAT was prescribed for one month. After one month, he was transitioned to lifelong apixaban and clopidogrel rather than apixaban plus aspirin. He was followed closely by his cardiologist post-discharge and through to the present. At present day, he has not needed revascularization, has denied episodes of chest pain during follow up, or had any bleeding events documented.

- CAPRIE trial, comparing clopidogrel to aspirin found lower cumulative risk of ischemic stroke, myocardial infarction, or symptomatic atherosclerotic peripheral artery disease.
- WOEST trial supports lower bleeding with an OAC and P2Y12 inhibitor compared to TAT.
- No comparisons of an OAC and P2Y12 inhibitor compared to an OAC and aspirin.
- In patients with AF and high risk for recurrent myocardial infarction, stroke, or vascular related death, extended therapy with an OAC and P2Y12 inhibitor may be warranted.



*SYNTHESIS, CHARACTERIZATION, AND SAR STUDY OF CALLYSPONGAMIDE A AND SIPHONELLAMIDE A & B*

**Brianna Brooks Medina; Matthew Valdez, Ph.D., Postdoc; Paulo Carvalho, M.Sc., Ph.D., Associate Professor**

**Purpose:** Given the unique molecular architecture and biological activity of Callyspongamide A and Siphonellamides A & B, we devised a synthetic route to produce all three natural products using cost-effective and readily available commercial chemicals. We also sought to confirm the structure and further evaluate and enhance the medicinal properties of these promising molecules.

**Rationale:** Polyacetylenic structures have been isolated from several natural sources, often from marine organisms, such as sponges from the Callyspongiidae family. They are often structures with a long hydrocarbon chain, sometimes presenting hydroxyl or carboxyl functionalities, but rarely amides. The cytotoxic polyacetylene amides, Callyspongamide A and Siphonellamides A & B were recently isolated from *Siphonochalina siphonella*, a member of the Callyspongiidae family. These were shown to be more cytotoxic to HeLa cells and MCF-7 cells than 5-fluorouracyl, a known chemotherapy drug. These natural products were synthesized and subjected to thorough characterization studies by NMR and MS, thus confirming the proposed structures previously reported. This efficient synthetic route was used to prepare structural analogs based on this class of natural products aiming to improve their cytotoxic and physicochemical

properties. Modifications to the synthetic route have resulted in greater efficiency via reducing the nine-step synthesis to a four-step synthesis. In addition, probe compounds are being prepared to assist in biological studies to elucidate the mechanism of action associated with these compounds.

**Methodology:** An efficient nine-step synthesis utilizing retrosynthetic analysis from the parent structure was used to produce the desired compounds, Callyspongamide A and Siphonellamide A & B. The compounds allowed for the manipulation of various functional groups thereby enabling further studies of SAR activity and the mechanism of action. Additionally, thorough biological activity studies are underway to determine cytotoxicity (against HeLa and MCF-7 cells) and physicochemical properties of desired compounds.

**Findings:** Callyspongamide A and Siphonellamide A & B, isolated from marine sponges, were synthesized in nine steps in higher quantities than originally obtained from their natural sources. Biological testing and medicinal chemistry studies are underway to confirm the biological activity with regard to cytotoxicity and physicochemical properties of these molecules, as well as elucidate their mechanism of action.

*USE OF PHENYLEPHRINE IN A HEMODYNAMICALLY UNSTABLE PATIENT WITH AORTIC STENOSIS*

Nikala Royal; Sarah E. Berman, PharmD, BCCCP; Amanda Kitten, PharmD, MSc, BCPS

**Purpose:** Aortic stenosis (AS) is a disease characterized by calcification and narrowing of the aortic valve leading to reduced cardiac output (CO). The prevalence of AS increases as a person ages, with a 1.3% incidence in patients ages 60-69. If AS remains untreated, it may lead to heart failure and death. Aortic valve replacement is the standard of care. However, until the patient undergoes valve replacement, treatment of comorbidities such as hypertension and coronary artery disease (CAD) must be optimized to minimize symptoms. As AS severity progresses, stroke volume (SV) and CO decline, maintenance medications are no longer effective, and some patients become hemodynamically unstable. Unfortunately, there are currently no guideline recommendations for stabilization and management of shock states induced by severe aortic stenosis.

**Rationale:** This case report highlights a patient with severe AS requiring aortic valve replacement. The patient was a 62-year-old male with a past medical history of CAD status post three-vessel coronary artery bypass grafting and percutaneous coronary intervention, critical AS, moderate mitral stenosis, type II diabetes mellitus, peripheral vascular disease status post femoral popliteal bypass, and end stage renal disease requiring dialysis. The patient presented with intermittent jaw and neck pain with palpitations described as occasional fluttering that began 2 weeks prior to admission. The patient denied dyspnea on exertion, orthopnea, syncope, presyncope, and chest pain. Upon arrival, physical examination revealed a regular heart rate and rhythm, late peaking systolic murmur with absent S2 sounds, and no jugular venous distention or lower extremity edema. The patient was alert and oriented with a blood pressure (BP) of 102/36 mmHg, mean arterial pressure (MAP) of 53 mmHg, heart rate of 98, and lactic acid of 1.4 mmol/L. However,

a few hours later, the patient endorsed a headache with a drop in BP and MAP to 63/24 mmHg and 34 mmHg, respectively. The patient's lactic acid increased to 3.4 mmol/L, suggesting the development of cardiogenic shock. Intravenous phenylephrine was initiated for hemodynamic support.

**Methodology:** Phenylephrine is a potent, systemic arterial vasoconstrictor with direct alpha-adrenergic activity, which results in increased systemic vascular resistance (SVR). Two trials detail the use of phenylephrine in AS and resultant hemodynamic response. Both studies included patients who received elective procedures, including coronary artery bypass grafting or valve replacement, and found that phenylephrine improved left ventricular filling dynamics in hypotensive patients without chronotropic side effects. The mechanism through which phenylephrine mediates these effects was suggested by Kalmar, et al., who found that administration of phenylephrine increased preload and cardiac output in patients who are preload dependent, making this an ideal choice for patients with severe aortic stenosis who are known to be heavily preload dependent.

**Findings:** Our patient received a continuous phenylephrine infusion with doses ranging from 0.1 to 3 mcg/kg/min over the course of four days, titrated to a MAP goal of 65 mmHg. After phenylephrine initiation, MAPs ranged from 59 to 88 mmHg with a corresponding resolution in lactic acidosis. Heart rates ranged from 84 to 91 beats per minute. The patient remained hemodynamically stable and received a transcatheter aortic valve replacement. Though the use of phenylephrine in patients with AS and cardiogenic shock is not well studied, the use of phenylephrine resulted in hemodynamic stabilization of our patient.

## HEB SCHOOL OF BUSINESS ADMINISTRATION

### *STUDENT MANAGED INVESTMENT FUNDS - THE VALUE OF THE ALTERNATIVE CLASS MODEL FOR STUDENTS AND INSTITUTIONS*

**Fabio Cattolico; Jose Moreno, Ph.D., Professor, Finance**

**Purpose:** This research project aims to analyze the value and outcomes of student-managed investment funds as an alternative classroom method for students and institutions. This poster explains how student-managed investment funds evolved, how these funds tend to be structured, and what factors contribute to the enhanced learning experience.

**Rationale:** Student-managed investment funds have become a more and more prominent part of business curriculums at various institutions worldwide. These classes provide an alternative form of learning centered around a more collaborative and hands-on experience instead of simply a passive and individual lecture-based delivery.

**Methodology:** The methodology used in this research includes two components. First, we made a survey of previous research on student-managed funds in the U.S. Second, a collection of responses using a questionnaire designed to assess the student profile, their learning experience, overall enjoyment, their perceived feeling of real-world relevance, the benefits they gained from participating in the student-managed investment fund, and the institutions perspective on some of these factors.

This qualitative analysis includes responses collected by interviewing 17 people affiliated with the fund in some way. So far, the responses collected include 14 students and alumni participating in these funds and three faculty members from different institutions.

**Findings:** The results showed that employers value the experience students received from their participation, and the students perceived the learning experience as more relevant and enjoyable than a lecture-based class.

The institutions felt pride in implementing innovative approaches for the students that benefited the school financially and allowed them to pass some of these benefits on to selected students through financial assistance for a degree or career-related expenses. Overall, feedback was positive, making the concept of collaborative and experiential class design more attractive to replicate for other courses. However, the results also showed that there is still room for improvement in the students' experience outcome.

*“The class differed in a variety of ways, but the hands-on approach to learning was by far the most valuable. Realizing the decisions we made had real-life consequences was another aspect that made the class very different.”*

*“I absolutely received more valuable and relevant knowledge in this format. Again, it gave me real experience with managing funds that didn't belong to me. It gave me the best ‘in-classroom experience’ from college for the role I am in currently.”*

*ATHLETIC PERFORMANCE AND POTENTIAL PERFORMANCE-INHIBITING FACTORS*

Hannah Walsh; Co-author: Benjamin C. Garza, Master's Nutrition; Terah Ege, MS CSCS<sup>1</sup>; Julianne L. Damico, Rehabilitative Sciences; Brittanie L. Lockard, PhD, Faculty, Kinesiology

**Purpose:** To assess various potential performance-inhibiting factors on Division-1 athletes' perception of recovery and performance.

**Rationale:** Collegiate athletes have complicated requirements to maximize performance. These requirements vary for each athlete depending on their unique need; and likewise, there may be several performance-inhibiting factors.

**Methodology:** A small sample of endurance athletes [N=16, Male=13, Age=19.44 ± 1.50, Wt (kg)=70.77 ± 8.29, LBM (kg)=63.76 ± 10.72] were recruited to complete the following tests: body composition (InBody), inflammatory symptoms screening questionnaire, perceived recovery status scale, and the sports performance satisfaction questionnaire. Correlations and linear regression models were used to elucidate any predictive relationship between InBody metrics (BMI, PBF, LBM, SMI) and primary performance outcomes – including inflammatory symptom scores, perceived recovery, and performance questionnaires.

**Findings:** Various correlations between InBody metrics and primary outcomes were found, albeit weak and inconsistent in their predictive ability. BMI (22.18 ± 1.55)

was highly related to inflammatory symptom scores (8.93 ± 6.23;  $r=.784$ ,  $p<.001$ ) and significantly predicted inflammatory symptom outcomes ( $R^2=.614$ ,  $p<.001$ ). Further, performance satisfaction questionnaire scores were significantly correlated and predicted by skeletal muscle index ( $r=.526$ ,  $p=.044$ ;  $R^2=.277$ ,  $p=.044$ ) and trending towards significance with percent body fat ( $r=-.475$ ,  $p=.073$ ) and lean body mass ( $r=.506$ ,  $p=.054$ ). None of the metrics measured were significantly related to perceived recovery.

The limited findings and weak correlations are likely attributed to the small sample size. These findings suggest skeletal muscle index is key to physical performance even for endurance athletes. However, the inconsistent relationship between inflammatory symptoms, perception of performance, and body composition metrics (SMI, PBF, LBM) necessitates further examination of additional physical factors that may impede performance. Further research will be conducted to gain an n-size of 60 athletes. Additionally, these athletes will be followed for 10 weeks with varying post-practice protein supplementation to assess changes over time in symptomology, recovery, and perceived performance.

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<sup>1</sup> Research Assistant, Fit Therapy of Texas, San Antonio

*EFFECTIVENESS OF MIXED REALITY SIMULATION IN NURSING EDUCATION: ABSN NURSING STUDENTS' PERCEPTIONS*

**Daniel Lovasz, PhD HA, MSN, RN, CNE; Samantha Smeltzer, DNP, RN, CHSE, Director, Simulation & Integrated Simulation Operations; Alexis M. Carter, MSN, RN, CNEcl, CHSE, Clinical Lab Faculty/ Coordinator, IFMSON ABSN; Claire Vita, Simulation Operation Specialist**

**Purpose:** Availability of clinical placements for nursing students in psychiatric courses is scarce and challenging. To promote safety for clients and students, clinical sites must limit clinical experiences to observation, thus diminishing the opportunities to practice skills, improve competency, and develop therapeutic alliances with hospitalized clients (Choi et al., 2022). Simulation is a valid alternative to inpatient setting, as it offers similar experiences in an environment that is safe and engaging. A well-developed simulation will maximize educational outcomes and promote fundamental nursing skills (therapeutic communication, therapeutic alliance, and assessment/observation) (Stephen et al., 2020). In hospitals, nursing skills are developed by engaging clients in conversations, while in simulation the clients are replaced by standardized patients (SD). Finding quality SDs is difficult and costly. After Pandemic, novel approaches to simulation, such as mix reality (MR) and virtual reality (VR) methods, have been adopted and implemented successfully by nursing school in an attempt to substitute hospital-based clinical. MR simulation involves the efficient use of virtual reality technology, which is cost efficient, user-friendly, fun to use, and engaging. This approach is currently used by an Accelerated Bachelor of Science Nursing (ABSN) program located in San Antonio, Texas.

**Rationale:** The rationale for this project is to examine the feasibility and acceptability of MR in nursing simulation, specifically in the ABSN psychiatric mental health course. With the emergence of mixed reality (MR), there is an opportunity to substitute the current standardized patients approach and hospital-based clinical with a virtual reality-based patient that provides a safer and more engaging experience for nursing students. The validity of MR simulation must be examined to ensure that it aligns with the concept-based curriculum and maximize students' educational outcomes. Therefore, it is of utmost importance to explore students' perceptions of self-efficacy, skill development, and ability to provide

psychiatric care following MR simulation. The findings may support the adoption of the MR simulation in other courses and in the traditional BSN program.

**Methodology:** This study uses a descriptive research design. Participants are nursing students enrolled in an accelerated nursing program (ABSN) at a private U.S. university. Data was collected via a web-based survey tool, the Simulation Effectiveness Tool - Modified (SET-M). Participants were asked to complete the twenty questions of SET-M survey assessing the effectiveness of MR simulation. Some 50 students completing the MR simulation have responded to SET-M web-based survey, voluntarily and anonymously. Data Analysis: The data collected with SET-M questionnaire was analyzed using descriptive and inferential statistics. Ethical Considerations: This project followed the ethical guidelines for human subjects' research in an educational setting.

**Findings:** The findings provide insights into the acceptability and effectiveness of using MR simulation as a valid substitute to traditional simulation. The results indicated that students perceived the simulation as being effective and instrumental in the improvement of their nursing skills, and self-efficiency. Obtained results offer support for making effective changes to program's curriculum, incorporate MR technology, and guide future implementations in this area. MR and VR simulations are novel methods and valid alternatives to hospital-based clinical experiences and traditional simulations. The findings also support our decision of adopting the MR simulation for our traditional BSN program. References: Choi, J., Thompson, C. E., Choi, J., Waddill, C. B., & Choi, S. (2022). Effectiveness of immersive virtual reality in nursing education: systematic review. *Nurse Educator*, 47(3), E57-E61. Stephen, L. A., Kostovich, C., & O'Rourke, J. (2020). Psychological safety in simulation: Prelicensure nursing students' perceptions. *Clinical Simulation in Nursing*, 47, 25-31.

*FOOD SENSITIVITIES IN ATHLETES: WHEY MORE COMMON THAN YOU MAY EXPECT?*

Eve Clarkson; Co-author: Benjamin C. Garza, Master's Nutrition; Terah Ege, MS CSCS, Fit Therapy of Texas; Julianne L. Damico, BS, Rehabilitative Sciences; Brittanie L. Lockard, PhD, Faculty, Kinesiology

**Purpose:** To assess the prevalence of whey protein sensitivity in NCAA Division I athletes at the University of the Incarnate Word.

**Rationale:** Food sensitivities, which differ from food allergies, are caused by digestive problems to foods that may lead to symptoms such as bloating, diarrhea, constipation, fatigue, headache, joint pain, and sleep disturbances, among other issues. It is estimated that food sensitivities affect 15-20% of the US population. These are IgG antibody-mediated responses that may develop from a variety of causes such as enzymatic defects in the digestive system. Research suggests that IgG-based tests produce clinically meaningful results that aid in the development of a targeted elimination diet. In a non-athletic sample with food sensitivities, our lab previously reported that 70% of the population demonstrated a sensitivity specifically to whey protein. Athletes are not impervious to these individualized food sensitivities. Some researchers have stated 30-50% of endurance athletes complain about gastrointestinal issues that impair performance and/or recovery.

**Methodology:** A small sample of endurance athletes [N=16, Male=13, Age=19.44 ± 1.50, Wt (kg)=70.77 ± 8.29, LBM (kg)=63.76 ± 10.72] performed a food sensitivity test at the beginning of the Spring 2023 semester. Frequency and descriptive analyses were run to assess prevalence of food and whey sensitivity.

Additional food sensitivity data from a partner study involving a public sample with high inflammatory symptoms [N=20, Male=20, Age=26 ± 7.6, Wt (kg)=88.43 ± 20.74, LBM (kg)=67.44 ± 10.15] were included for comparative analysis via t-test and chi-square test of independence.

**Findings:** Frequency distributions for the athlete sample indicated 75% positive for a whey sensitivity and 93.8% positive for any food sensitivity. The current sample tested moderate-severe for 40 unique foods, with the greatest frequencies for whey, cow's milk (68.8%), gluten (62.5%), wheat (50%), cheddar cheese (50.0%), and casein (43.8%) to name a few. Further, inflammatory symptom scores did differ between the athlete (8.93 ± 1.60) and public sample (17.96 ± 1.38; t=4.279, p<.001). Although, the proportion of subjects with a whey sensitivity did not differ in the athlete (75%) versus public sample groups (70%; X<sup>2</sup>= .111, p = .739).

**CONCLUSION:** Whey protein is commonly used as a protein supplement because it is a complete protein that is high quality and typically very digestible. However, if an athlete has a sensitivity to whey protein this supplement may be causing more harm than good. Moving forward these athletes will receive 4 weeks of whey protein versus 4 weeks of plant protein daily after practice to assess changes in performance, recovery, and inflammatory symptoms.

*PRELIMINARY FINDINGS: RELATIONSHIP BETWEEN IGG-BASED FOOD ELIMINATION AND WHOLE-BODY INFLAMMATION*

**Benjamin C. Garza; Brittanie L. Lockard, PhD, Faculty, Kinesiology; Terah Ege, MS CSCS, Research Assistant, Fit Therapy of Texas, San Antonio; Fabio Cattolico, School of Business, Business Administration**

**Purpose:** To assess measurable changes in primary outcomes, hsCRP and inflammatory symptomology, within subjects following an IgG targeted-food elimination diet compared to standard diet.

**Rationale:** High levels of whole-body inflammation are associated with increased risk of poor health outcomes and chronic disease. Inflammatory symptoms (e.g., digestive, psychological, and whole-body irritation) are commonly addressed via food elimination diets, yet individual differences may exist for persons with unique immunoglobulin-G (IgG) mediated food sensitivities. Few studies have examined IgG food sensitivities using an understood biomarker of inflammation, high-sensitivity C-Reactive Protein (hsCRP). Identification of IgG mediated food sensitivities may be a feasible means for targeted-food elimination seeking to address inflammatory symptoms.

**Methodology:** From 2021-2023, 20 subjects (male: n=20, Age=26  $\hat{\pm}$  7.6, Wt (kg)=88.43  $\hat{\pm}$  20.74, LBM (kg)=67.44  $\hat{\pm}$  10.15) underwent both a 4-week standard diet and 4-week IgG-targeted elimination diet, in a cross-over design ordered by random assignment. Body composition (InBody 570, BIA), inflammation (hsCRP blood draw), and symptomology (Inflammatory Symptom Screening Questionnaire) were assessed at baseline. Participants completed hsCRP and symptom screeners at the following appointments: start and end of baseline (days 1, 8), after week one and week four of first (days 15, 36) and second diet assignment (days 43, 64). Food logging was done throughout the duration of

the study. Correlations and ANOVAs were run to assess relationships between demographics and hsCRP and symptom screener scores, as well as any interaction between diet condition, time point, or diet order. Data are reported as mean  $\hat{\pm}$  standard error.

**Findings:** No meaningful correlations were found between InBody assessments and primary outcomes. No differences were found in hsCRP measurements between any of the time points in the standard and elimination diet conditions ( $p=.810$ ). On the contrary, differences in inflammatory symptom scores were dependent on diet condition ( $p<.001$ ). During their standard diet, participants reported increased symptom frequency at week one (20.40) and week four (20.33). Greater differences in inflammatory symptomology were found the longer participants eliminated food; after one week of elimination (15.20) compared to one week of standard diet (-5.20,  $p=.001$ ) and four weeks of standard diet (-5.13,  $p=.003$ ). Differences were magnified by the fourth week of elimination (10.67) compared to week one (-9.73,  $p<.001$ ) and week four of standard diet (-9.667,  $p<.001$ ).

This study suggests targeted IgG-based food elimination diets significantly reduce inflammatory symptoms despite finding no detectable changes in whole body inflammation via hsCRP. The results presented here influenced a subsequent study examining the effect of plant versus animal protein on athletic performance in individuals with and without whey IgG sensitivities.

*RELATIONSHIPS BETWEEN NURSES' EXPERIENCE OF ENVIRONMENTAL TURBULENCE AND PATIENT SAFETY*

Jennifer Browne, PhD

**Purpose:** The introduction of health information technology (HIT) in hospitals had an obvious impact on nursing workflow. Utilizing HIT, it often took a nurse extra steps or time to complete processes such as documentation. The HIT protocols and rules illuminated new and existing incongruences between hospital systems, nursing work and practice protocols. In response to technology and workflow mismatches nurses developed workarounds.

Workarounds are reported to have a negative impact on patient safety. It was hypothesized that nursing workload and technology would be primary triggers to workarounds and patient safety risk, but an additional variable, turbulence, was identified that impacted patient safety.

**Rationale:** Research on HIT workarounds has failed to provide a sound base for sustainable measures and interventions. A common assumption in nursing is that workarounds are intended acts of non-compliance and inherently dangerous, yet aside from anecdotal evidence, this has not been substantiated.

This original dissertation study was designed to explore nursing workarounds in intensive care, but a confounding variable, turbulence, was identified during the pilot. The variable turbulence provided improved clarity to mapping of the workaround phenomenon. Turbulence was defined as: "The degree to which a nurse's attention to task is diluted or redirected by thought diversions, resource inadequacy, communication breakdowns and/ or interpersonal relationships".

**Methodology:** 307 nurses voluntarily responded to an email survey distributed by the American Association of Critical Care Nurses. (AACN). The study was approved by the UT Health IRB. A cover letter served as an invitation to participants and completion of all or part of the survey indicated consent. Detail on methods, variable definitions/ measures, and model design and development have been previously published. (Browne & Braden, 2021). Respondents were asked if any of 15 turbulence items were present or impacted work on their unit during their

workaround experience. Responses were on a Yes (1)/ No (0) scale. Workload was measured using acuity, staffing ratio, and the nurse's perception of workload (light, moderate and heavy). Patient safety issues were ranked to describe the degree of safety (hazard) risk on a 0 to 4 scale. The scoring criteria was developed from The Joint Commission's sentinel event policy.

Complex adaptive systems (CAS) theory was selected to guide the research, using multiple methods to explain how and why phenomenon evolve. Rather than use linear approaches, we used multiple methods to identify and clarify findings. Switching between quantitative and qualitative methods was designed into this study. A CAS approach understands that in complex environments subjects learn. So, a workaround a nurse uses today, may be a different workaround in one month. Using CAS thinking allowed us to consider variables that might be independent or dependent or both simultaneously depending on the context.

**Findings:** Respondents (n=307) were 87% female and 13% male. 58% of the nurses were 45 years old or older. Almost 50% of the nurses had a bachelor's degree in nursing, and 20.6% an associate degree. Nurse experience ranged between a proficient and expert level. Distribution characteristics of turbulence supported 15 items. Turbulence was most strongly correlated with patient safety risk ( $r = .41, N = 293, p = .000$ ) whereas the association between workload and patient safety risk ( $r = .16, N = 294, p = .005$ ) had the weakest relationship. HIT problems and workload were both positively associated with turbulence and, indirectly, with patient safety risk.

Regression analysis was used to test for a moderating effect between workload, turbulence, and safety. The interaction plot showed that as problems and turbulence increased, patient hazard risk increased. Analysis showed the relationship between total problems and patient safety hazard is moderated by high levels of turbulence. The range of influence of the moderating variable turbulence is twice the range with high problems/high turbulence.



*SYNDEMICS AND HARM REDUCTION: STATE OF THE SCIENCE*

John Kane, MSN, RN; Viola G. Benavente, PhD, MSN, RN, Associate Professor

**Purpose:** To identify the best evidence in the published literature that describes the syndemic characteristics of Harm Reduction clients in order to potentially maximize recovery programs while respecting the humanistic tenants of Harm Reduction.

Syndemic is operationally defined as the aggregation of two or more concurrent or sequential epidemics or disease clusters in a population with biological interactions, which exacerbate the prognosis and burden of disease.

(Reference: <https://encyclopedia.thefreedictionary.com/syndemic>)

**Rationale:**

- Humanistic principles of Harm Reduction yield a client-initiated/driven recovery process.
- Understanding of the syndemic characteristics of homelessness, depression and substance use may impart knowledge and a sense of urgency to the Harm Reduction clients and staff in treatment progression.
- A Syndemic Approach departs from the biomedical approach toward diseases to diagnostically isolate, study, and treat diseases as distinct entities separate from other diseases and independent of social contexts.

In the last two years, the South Alamo Regional Alliance for the Homeless reported a 77% increase in chronicity of the population, operationalized as more than a year unsheltered. Harm reduction has two facets comprised of maintaining homeless clients in-place and interactions with recovery coaches to initiate counseling and treatment. At the present time, the process of counseling and treatment is strictly based on client self-referral, which is averaging under 10% of the client base. This percentage justifies a dire need to assess readiness for change and harm reduction of the homeless population in our city.

**Methodology:**

- A 200-hour clinical immersion at Corazon Harm Reduction Ministries was completed for data collection and direct observations

- A literature review was conducted utilizing the Cochrane Library, Cumulative Index to Nursing and Allied Health Literature, Joanna Briggs Institute and PubMed
- 23 studies were included with 15 Level IV and higher and 4 systematic reviews
- Search Terms: Depression, Harm Reduction, Homeless(ness), Overdose, Opioid Use-Associated Infections, People Who Inject Drugs and Readiness to Change.

**Findings:**

- In the homeless and socio-economically disadvantaged, syndemic rates of 72% have been reported between depression and injecting drug use.
- Depression and injecting drug use are ubiquitous with overall prevalence rates for depression at 68-74% and injecting drug use rates as high as 88%.
- Harm reduction humanistic tenants included Pragmatism, Individualism, Autonomy, and Incrementalism.

Tenants and themes of Harm Reduction with a humanistic core are well recognized and include principles of individuality, autonomy, and incrementalism. Global prevalence rates for depressive symptoms have been established in the homeless and the frequent co-occurrence of homelessness, depression and drug use is syndemic (perversely synergistic). Readiness to change by the homeless within the rubric of the Integrative Model of Change has been found to be non-linear and non-predictive. The utilization of the PHQ-9 with the homeless has been established nationally and internationally. Conclusion and Implications: An intervention that can increase the rate of self-referrals for counseling by homeless clients in harm reduction through improved self-awareness will be based on the self-administration of a standardized mental health screening tool, specifically the PHQ-9. This approach re-enforces that the onus of treatment success is primarily on the client and is respectful of the Harm Reduction underpinnings of individualism, autonomy, and incrementalism.

## OLLU COLLEGE OF PROFESSIONAL STUDIES

### *POSITIVE PARENTING TO PREVENT ADVERSE EFFECTS OF CORPORAL PUNISHMENT IN HISPANIC FAMILIES*

Rebecca Donato, OLLU; Kristin L. O'Donnell, PhD, Our Lady of the Lake University

**Purpose:** Spanking is a harmful parenting practice prevalent among U.S. citizens. As Hispanic families adapt to U.S. acculturation, spanking becomes an adopted practice in Hispanic households. Spanking is a form of physical punishment involving a parent “striking a child on the bottom with an open hand” intended to cause physical pain in response to child misbehavior (Gershoff, 2018, p. 626). Over 80% of American parents continue to spank their children despite “decades of research have consistently linked physical punishment with risks of harm to children” (Gershoff, 2018, p.626). The adverse effects of spanking are warned against by countless studies and professional associations such as the American Pediatric Association, which suggests that the reactive approach of spanking produces “negative child outcomes such as increased aggressiveness and potential physical harm to the child” (Ferguson, 2013, p. 197). Positive parenting is an evidence-based approach that establishes a safe, positive learning environment, realistic expectations, parental warmth, and change to a child’s needs. Positive parenting serves as a buffer for adverse effects of spanking as the implications of a positive parent-child relationship manifest in “non-coercive behavior strategies such as planned ignoring and quiet time provides an alternative to harsh discipline strategies” (Criss et al., 2021).

**Rationale:** This study aims to examine the influence of parenting on child development and its effect in adulthood. The research will also examine the implications of positive parenting used, if any. Positive parenting refers to a healthy parent-child dynamic and is characterized by guidance and support from the parent with patience, love, and effective parental discipline.

**Methodology:** As spanking is prevalent among Hispanic culture, it is essential to discover how spanking is introduced and preserved in Hispanic culture despite its ineffectiveness. Using the ethnography approach assists in examining the culture and values of the Hispanic community. The two groups divided for cluster sampling are abused and non-abused groups which involves participants who have experienced physical, emotional,

psychological abuse or harsh corporal punishment by their parents. Data validity in this study is classified as consistently reproducible results that establish causality of physical abuse and the adverse effects manifested throughout early adulthood. Thematic analysis was used in this study to analyze the qualitative data in this study which were the responses derived from participants responses to the original questionnaire. Thematic analysis identified the responses in depth to indicate recurring themes such as parenting styles, attachment styles, and parental presence in the students’ lives. Participants were recruited via physical flyer and school email. Participants then read the consent form and agreed to participate in the study then completed the survey. The survey was administered to all students at a small private university located in South Texas. The recruitment verbiage in the email included the same details included in the flyer.

**Findings:** The adverse outcomes following a childhood of spanking is evident throughout the participants responses. Adulthood outcomes for participants vary from a positive impact such as love and respect for one or both parents to the persistence of anxiety, anger, and incompetence. Ethnography examining the Hispanic culture reveals the cultural dynamics of Hispanic familial expectations, values, and intergenerational influences. The overall recurring themes were neglect and lack of parental support and warmth regardless of if one parent or both parents were present in their life. Some adults who participated in this survey are living robust lives with emotional resilience, healthy boundaries and supportiveness, and trust in themselves and others. For future research, questions should be narrowed down to a feasible number for a high completion rate. A shortcoming of the questionnaire was the number of total questions which results in a decline of the completion rate and a longer run-time. Participants who experienced positive parenting have better childhood outcomes than those who have experienced spanking. Thus, proves that positive parenting serves as a buffer to prevent the adverse effects of spanking.

*IMPACT OF OPIOID DEPENDENCE AND WITHDRAWAL ON ECONOMIC DEMAND FOR FENTANYL, COCAINE, AND METHAMPHETAMINE IN RATS*

Kelly Anne Salinas, OLLU; Robert Seaman Jr; Christina George; Gregor Collins

**Purpose:** Nationwide estimates suggest ~50% of individuals who overdose on opioids were using stimulants at their time of death. 1 ~20 million people in the United States suffer from a substance use disorder. 2,3,4 Despite its prevalence, relatively few studies have evaluated the impact of opioid dependence and withdrawal on the reinforcing effectiveness of opioids and stimulants in rodent models.5,6,7 The goal of the current study was to determine how states of opioid dependence and withdraw impact economic demand for opioid and stimulants.

**Rationale:** Consistent with previous work, 20-h morphine deprivation resulted in loss in body weight, mechanical hypersensitivity, and increases in somatic signs of opioid withdrawal. 20-, but not 12-h, morphine deprivation significantly increased economic demand for fentanyl, relative to non-dependent control rats. 20-h morphine deprivation significantly reduced economic demand for methamphetamine. Both 12- and 20-h morphine deprivation reduced economic demand for cocaine. Free consumption (i.e., Q0) systematically altered by states of opioid dependence and withdrawal.

**Methodology:** Acquisition and Induction of Dependence Following femoral catheterization, fentanyl (0.0032 mg/kg/inf), methamphetamine (0.1 mg/kg/inf), or cocaine (0.32 mg/kg/inf) self-administration was established in 24 male, Sprague-Dawley rats. To initiate opioid dependence, rats were injected subcutaneously, twice- daily, for four days with escalating doses of morphine (10- 40 mg/kg). Subsequently, to maintain

opioid-dependence, rats were injected once-daily with 40 mg/kg morphine. Control rats were only ever injected with saline. Economic Demand Self-administration sessions were conducted either 12-h (MD) or 20-h (MW) following morphine injections. Response requirements incremented across sessions under a fixed-ratio schedule until no infusions were earned. Demand curves were generated for fentanyl (0.01 mg/kg/inf), cocaine (1 mg/kg/inf) and methamphetamine (0.32 mg/kg/inf), counterbalanced across rats. Data were fit using equation:  $\log Q = \log Q_0 + 1.76(e^{-aQ_0C} - 1)^8$  to generate a readout of elasticity ( $\log(a)$ ). Q0 represents the number of infusions earned under a fixed ratio 3. Quantification of Opioid Withdrawal Mechanical hypersensitivity and somatic withdrawal signs were quantified week

**Findings:** Taken together, these data suggest that motivations to use opioids increases as a function of opioid withdrawal, whereas motivations to use stimulants can be differentially modified in those who are in states of opioid dependence or withdrawal. Differential effects of opioid dependence and withdrawal on economic demand for stimulants might be better understood through investigation of pharmacokinetic interactions between opioids and stimulants, in non-dependent, opioid- dependent, and opioid-withdrawn states. Future studies can evaluate how different states of opioid dependence and withdrawal can impact the relative reinforcing effects of opioids and stimulants in a drug-vs-drug choice paradigm.

## ROSENBERG SCHOOL OF OPTOMETRY

### *A NEW TEST OF PARA-FOVEAL SENSITIVITY WITH APPLICATION TO PLAQUENIL TOXICITY*

Erica L. Poole, OD; Jeffrey Rabin OD PhD MS, RSO, Professor & Assistant Dean for Graduate Studies, Research & Assessment

**Purpose:** We developed a test to rapidly compare the fovea to the parafovea. The patient simply matches the perceived contrast of a foveal target (straight ahead) to that of a surrounding parafoveal ring (just off to the side of center). In addition to a luminance stimulus, this test includes stimuli which are specific for red (L), green (M) and blue (S) sensitive cones. This approach has potential to rapidly reveal hydroxychloroquine (HCQ)-associated parafoveal sensitivity loss.

**Rationale:** Long-term usage and/or over-dosing with the anti-inflammatory drug Plaquenil (hydroxychloroquine, HCQ) can produce toxic parafoveal effects, referred to as bull's eye maculopathy, impacting central vision and best revealed with visual field testing, ocular coherence tomography, multifocal electroretinograms (mfERGs) and fundus autofluorescence.

HCQ can be stored in the retina for years after patients stop using the medication. The best way to definitively diagnose and manage Bull's Eye Maculopathy relies on these tests which take considerable time and requires several other tests for confirmation. While this battery of tests can prove invaluable for HCQ toxicity diagnosis, some of these tests require specialized equipment which is not widely available.

**Methodology:** We collected data from subjects between 18-40 years old with no history of disease, nor history of color vision deficiency, with best corrected visual acuity of at least 20/25 in each eye (N=30). After informed consent, corrected visual acuity (VA) and small letter contrast sensitivity were measured at 4m, using the Super Vision Test. Each subject then was tested in a dark room on the Parafoveal Sensitivity Test (PFST) at 40 cm from a calibrated Microsoft Surface display. Each subject underwent training and was instructed to maintain fixation on the small cross in the center of the circular foveal target throughout the testing. During each trial the experimenter used the method of limits to adjust the central contrast down or up (in 0.03 log contrast steps) to reach the point at which the central target matched the "brightness and visibility" of the parafoveal ring. Four trials were repeated for each color and

the mean was computed as that subject's match point. Each subject was tested with individual eyes on each of the four conditions (red, green, blue cones, grey luminance) with the order of eye tested and order of color tested randomized across subjects to minimize any order effects.

**Findings:** Repeated measures ANOVA across eye tested and stimulus type showed no significant difference between eye ( $F=0.06$ ;  $p>0.81$ ) nor between stimulus type ( $F= 1.28$ ;  $p>0.28$ ). Since OD and OS were not significantly different, we assessed PFST repeatability by computing the coefficient of repeatability (COR) based the difference between eyes. The COR is the standard deviation of the differences multiplied by 1.96 yielding the 95% CI for within subject change. The COR was 0.05 log CS indicating that a patient who shows a difference  $>.05$  on two occasions is showing significant change.

This study provides a matching threshold range across four stimuli colors for a young, healthy population. Our findings confirm that in our sample, small foveated objects are perceived as 2% brighter than parafoveal objects regardless of stimulus color. This study quantifies the decrease in parafoveal CS compared to foveal CS (mean .05 log units; 1.12 times lower). The same results were observed across L, M, and S cone stimuli, with a slightly lower decrease for grey luminance stimulus.

Phase 2 of this research includes direct evaluation of HCQ patients as well as validation of this test. Funding for this research was received from our NIH/NEI T35 TrainingGrant [T35EY032441].

*CHOROIDEREMIA UNCOVERED: THE SUSPECT, THE VERDICT, AND ITS REHABILITATION*

**Brandon La, OD; Joyce Zhang, OD, Low Vision Rehabilitation; Stephanie R. Schmiedecke-Barbieri, OD, FAAO, Dip LV, Low Vision Rehabilitation; Patricia Sanchez-Diaz, DVM, PhD, FAAO, Genetics; Jeffrey C. Rabin, OD, MS, PhD, DipVS, Visual Neurophysiology Service**

**Purpose:** 31-year-old African American male presents with nyctalopia and previous diagnosis of retinitis pigmentosa. Genetic testing confirms choroideremia with low vision rehabilitation to follow.

**Rationale:** Case History: Demographics: 31-year-old African American male CC: nyctalopia, trips easily and injured shin in the past HPI: diagnosed with retinitis pigmentosa OU in 2015 POH/PMH: retinitis pigmentosa, depression, sleep apnea FOH/FMH: unremarkable Meds: Ibuprofen, Vitamin A 10,000 unit capsule, Sertraline Goals: Genetic testing to confirm diagnosis Low vision goals: glare reduction, improve mobility, continue passion of working on 18 wheelers Pertinent Findings: scDVA OD: 20/25-2, OS: 20/25 scNVA OD & OS: 0.4m/0.8M & unaided reading VA OU: 0.4m/0.5M-2 Contrast sensitivity: slightly reduced OD/OS- log 1.68 Refraction: OD: +0.50-0.75 x115 DVA 20/20-2 OS: +0.75 -1.00 x070 DVA 20/20 Arc Perimetry: significant constriction OU DFE: OD/OS: pigmentary changes posterior pole & periphery, bone-like spicule pigmented spots midperiphery, extensive retinal degeneration 360 degrees FAF: OU: hyper- and hypo-autofluorescent areas consistent with fundus appearance of extensive choroidal atrophy, black pigment spots and migration ERG: OU: non recordable full field flash ERGs under dark and light adapted conditions, grossly abnormal mfERGs with minimal amplitudes and delayed latencies Dark Adaptometry: 1000x (3 log unit) decrease in rod and cone sensitivity HVF 120: OU: reduced peripheral vision loss to less than 20 degrees Genetic Testing: MRT panel - hemizygous for a pathogenic nonsense variant in CHM

**Methodology:** Diagnosis of choroideremia was based on the patient's history, exam findings, and genetic testing results. Prevalence of choroideremia is estimated to be between 1 in 50,000 to 100,000. Choroideremia is a

progressive X-linked chorioretinal dystrophy that primarily affects males with common symptoms of night blindness and peripheral visual field loss, however cystoid macular edema and posterior subcapsular cataracts have been reported. Nyctalopia occurs as early as the age of 4. Central vision remains intact in the earlier stages but is impaired by 50-70 years old. Female carriers are generally asymptomatic but can show atrophy or depigmentation of the retinal pigment epithelium as well as ERG reduction. Clinical findings upon fundus examination include patchy areas of chorioretinal degeneration leading to loss of the retinal pigment epithelium and choriocapillaris. Function and structure of the macula is preserved until later in the disease process. ERGs show progressive decrease resembling rod-cone dystrophy making early differential diagnosis from RP difficult without genetic testing. Visual field loss generally correlates with the chorioretinal degeneration noted on fundus appearance and can manifest with a ring scotoma.

**Findings:** Early diagnosis of choroideremia is essential to maximize a patient's remaining functional vision and provide services to assist with activities of daily living as soon as possible. Genetic testing allows for early diagnosis and to identify additional risk factors linked to patients with a given genetic variant. With genetic results, patients can be updated for the future regarding new therapies along with now being informed when family planning. Having the right diagnosis is critical to rehabilitation and giving the patient information needed to develop an appropriate rehabilitation plan for their life. Our patient was relieved to know that his sons would not be affected. Knowing how to meet your patient where they are at emotionally and to provide accurate information at the appropriate times is crucial to rehabilitation success.

*THE COCKPIT COLOR IDENTIFICATION TEST: A REAL-WORLD METRIC OF COLOR DISCRIMINATION*

William Price, BS; Erica L. Poole OD, PhD Candidate; Jeffrey C. Rabin, MS, OD, PhD

**Purpose:** Our purpose was to establish normative data and initial findings from color vision deficient subjects on the "Cockpit Test", a highly repeatable and real-world program to assess accurate color identification and response time.

**Rationale:** The difficulty in identifying certain colors because of color vision deficiency (CVD), can have a detrimental impact on an individual's quality of life. Furthermore, CVDs make errors in performance particularly when the visual environment is devoid of cues other than color alone. Moreover, CVDs show longer response times and combined with detection and discrimination errors, CVD can threaten safety and has contributed to several large-scale accidents in transportation and related fields. Moreover, CVD can be acquired as an early sign of ocular systemic and neurologic disease making assessment of color vision important on many fronts. Herein we used a real-world color identification task measuring both accuracy and response time. Herein we describe normative results for this test as well as results from an initial sample of CVDs. In addition to accuracy and response time, results were quantified using a novel metric combining accuracy and time: Throughput = Number correct / Response time.

**Methodology:** The Cockpit Color Identification Test (CCIT) displays 35 randomized airplane symbols on a desktop computer display. The symbols are depicted in seven colors (red, green, blue, purple, yellow, gray, and orange) with five symbols per color. The colors all have the same luminance (brightness) against a black background. Subjects viewed the display binocularly at

40 cm. At the start of each trial the test administrator would tell the subject to eliminate a color (e.g., "eliminate red") signaling the subject to use the mouse to click on each red airplane symbol as fast as possible. Each of the five symbols disappeared with the mouse click. The screen then refreshed back to 35 symbols and the subject completed the next trial until all seven colors were complete. The program tabulated the amount of time required per trial, total time, and number of errors (e.g., choosing green when asked to eliminate red). CCIT scores were obtained from 15 color vision normals (CVN) and 7 CVDs. Each subject provided written informed consent in accord with our IRB approved protocol (IRB # 2022-1191-EXP) prior to testing. CVN and CVD data were distributed normally (Jarque-Bera test). Descriptive parametric statistics were used to calculate means and 95% confidence intervals to specify normative values and t-tests with Bonferroni correction for multiple comparisons.

**Findings:** Mean total CCIT total response time for CVDs (112 sec) was significantly increased compared to CVNs (30 sec,  $P < .0001$ ). Mean CCIT error rate for CVDs (9) was significantly increased compared to CVNs (0,  $P < .0001$ ). Throughput: number correct/response time, was significantly higher for CVNs (mean 1.2) vs. CVDs (0.41,  $P < .0001$ ). Sensitivity of all metrics for CVD detection was 90%. Insofar as throughput combines both error rate and response time, we believe it holds more potential in occupational settings and for earlier detection of various diseases. Additional research is needed to corroborate the efficacy of throughput for CVD occupational use and disease detection.

*COMPARISON OF CONE SPECIFIC METRICS: CONTRAST SENSITIVITY VS. PARA-FOVEAL SENSITIVITY*

Gurjiv Kaur, BS; Erica L. Poole OD, PhD Candidate; Jeffrey C. Rabin, MS, OD, PhD

**Purpose:** To determine if foveal contrast sensitivity (CS) predicts parafoveal sensitivity in visually normal subjects.

**Rationale:** The human fovea contains the maximum density of cone photoreceptors (>200,000 per mm<sup>2</sup>) providing superior perception of object details and color discrimination. However, numerous ocular diseases (age-related macular degeneration, AMD; hereditary retinal dystrophies like Stargardt disease, cone and cone-rod dystrophy, ocular toxicity from the anti-inflammatory drug Plaquenil used to treat arthritis and many other auto-immune systemic conditions) initially cause vision loss around the fovea (para-foveal). Hence it is incumbent upon us to monitor para-foveal visual loss which may precede overt visual loss producing patient symptoms. Hence, we developed a simple matching task which quantifies parafoveal sensitivity loss compared to foveal sensitivity loss (para-foveal sensitivity test, PFST, Fig. 1). Herein we compared PFST results to standard measures of foveal contrast sensitivity in visually normal subjects to help interpret anticipated results from patients with ocular disease.

**Methodology:** 30 subjects (mean age  $\pm$  SD: 26  $\pm$  6 YO, range 18- 40 YO, 18 females, 12 males) participated after providing written informed consent in accord with our UIW IRB approved protocol. All subjects reported no history of ocular, systemic, neurologic disease, or color vision deficiency and had distance visual acuity of at least 20/25 in each eye. We used the Super Vision Chart (PrecisionVision®, [\[vision.com/products/contrast-sensitivity-tests/peak-contrast-sensitivity/rabin/rabin-super-vision-test/\]\(https://www.precision-vision.com/products/contrast-sensitivity-tests/peak-contrast-sensitivity/rabin/rabin-super-vision-test/\)\)](https://www.precision-</a></p></div><div data-bbox=)

which presents small 20/25 letters which vary in black-white luminance contrast by 0.25 log CS per row, .05 per letter read correctly (small letter CS, SLCS, Fig. 2). SLCS values were compared to red, green, blue cone and luminance (B/W) PFST CS scores enabling direct comparison of parafoveal sensitivity to an established measure of foveal sensitivity. Data was distributed normally (Jarque-Bera test). Regression analyses were used to determine if foveal SLCS predicted PFST para-foveal sensitivity (Microsoft Excel version 2211).

**Findings:** There was no difference between right and left eyes for the PFST ( $P > 0.8$ ) or for SLCS ( $P > 0.8$ ). Hence the mean of subjects' right and left eyes were used for data analyses. There was no relation between SLCS and green cone PFST ( $r^2 = .01$ ,  $P > 0.7$ ) or blue cone PFST ( $r^2 = .02$ ,  $P > 0.8$ ). There was a positive relation between SLCS and red cone PFST ( $r^2 = .17$ ,  $P < .05$ ) but the slope of the relationship did not reach clinical significance (only .0002 log units PFST/log CS). However, an inverse relationship was observed between SLCS and luminance PFST ( $F = 7.04$ ,  $P < .02$ ,  $r^2 = .20$ ; .03 log units/per log CS, Fig. 3). These findings indicate that for a luminance foveal CS target (SLCS) para-foveal-sensitivity decreases with increasing foveal sensitivity. This may reflect that the preponderance of neural connectivity directed toward the fovea can decrease peripheral sensitivity in normal patients. Further studies are needed to determine if such a relation exists in ocular disease.

*COMPARISON OF MONOCULAR TO BINOCULAR SENSITIVITY OF THE HUMAN INTRINSICALLY PHOTOSENSITIVE GANGLION CELL PATHWAY*

**Brazil Andrews, BS; Erica L. Poole OD, PhD Candidate; Jeffrey C. Rabin, MS, OD, PhD**

**Purpose:** Both a ganglion cell and a photoreceptor, intrinsically photosensitive retinal ganglion cells (ipRGCs) are the only ganglion cell that responds directly to light. In prior research we measured putative brain waves and eye-waves from ipRGCs using selective chromatic adaptation.<sup>1</sup> Our purpose was to develop a method to measure the human subjective visual response from ipRGCs and compare the monocular (one eye) to binocular (both eyes together) to determine if binocular enhancement occurs in the ipRGC pathway as it does in the conventional visual pathway.

**Rationale:** Although directly implicated in the human functions of circadian rhythm, mood, pupil response, and visual perception, most ipRGC studies have been done on rodents and primates. Capable of self-phototransduction and through coupling with blue sensitive cones,<sup>2</sup> ipRGCs are interestingly the first light-sensitive cells to appear in the developing retina.<sup>3</sup> In multiple species, ipRGCs have shown both visual and non-visual functionality. Remarkably, it has been found that some of the ipRGC functionality, such as their pupil responses and photoentrainment persist after blindness in animal models and humans. Two functions often affected by many diseases or acquired brain injury are sleep-wake cycles and mood, both associated with ipRGCs. This study aims to achieve better understanding of retina-cortical ipRGC human pathway and how it may contribute to visual perception, potentially useful for earlier detection of trauma and disease.

**Methodology:** Subjects were recruited from students, staff, and faculty at the Rosenberg School of Optometry. All subjects reported no history of ocular, systemic and/or neurological disease. Each subject provided written informed consent in accord with our UIW IRB approved protocol (##2022-1187-EXP). The FST<sup>®</sup> (Diagnosys, LLC) was used to determine the ipRGC visual threshold (lowest intensity light detectable). The FST<sup>®</sup>

uses a Ganzfeld (full-field bowl stimulator) to illuminate the entire retina with 200 msec. blue flashes (460 nm peak) superimposed on a constant amber rod, red, and blue cone saturating (desensitizing) background (590 nm, 560 cd/m<sup>2</sup>). Subjects viewed the stimulus through a short wavelength blocking filter (Rosco GamColor #480) to minimize stimulation of deep blue sensitive cones but isolate the ipRGC pathway which responds to a higher wavelength blue color. Each subject's right eye, left eye, and both eyes were tested (order randomized across subjects) with the FST<sup>®</sup> adaptive staircase to determine thresholds. Thresholds were distributed normally and two-tailed paired t-tests were used for parametric analysis (Microsoft Excel version 2211).

**Findings:** A total of 39 subjects (mean age  $\pm$  SD: 30.6  $\pm$  9.2 years old, range 18 – 48) participated each in a single session after written informed consent. Because there was no difference between subjects' right and left eyes ( $P > 0.5$ ), the mean of right and left eye thresholds were used to compare to binocular thresholds. The mean monocular threshold (0.13 log cd/m<sup>2</sup>) was higher than the binocular threshold (-0.01 log cd/m<sup>2</sup>) which indicates lower sensitivity with one eye vs. two since more light was required to elicit a threshold with one eye being tested. The difference between monocular and binocular thresholds was highly significant (mean difference = 0.14 log cd/m<sup>2</sup>, 95% confidence interval: 0.04 – 0.22,  $P < .004$ ). The 0.14 log improvement in sensitivity with two eyes vs. one represents a 38% improvement virtually identical to the classic work of Campbell and Green showing a 40% improvement in binocular vs. monocular contrast sensitivity.<sup>4</sup> The authors proposed that this enhancement with two eyes is a form of physiological summation involving binocular cortical cells.<sup>4</sup> Apparently the ipRGC pathway operates in a similar fashion. It is conceivable that a reduction in binocular sensitivity could signify early ocular or neurological disease, TBI or impaired binocular function.



*CONE SPECIFIC VISUAL ACUITY: A NEW METRIC OF COLOR VISION*

Rathanart Somphruek, BS; Erica L. Poole OD, PhD Candidate; Jeffrey C. Rabin, MS, OD, PhD

**Purpose:** Computer-based cone specific contrast sensitivity testing has proven to be a sensitive metric of both hereditary and acquired color vision deficiency (CVD). Our purpose was to develop and provide initial validation of cone specific visual acuity (VA) tests as a new metric of color vision.

**Rationale:** Hereditary “red-green” CVD is a non-progressive X-chromosome condition impacting performance in many occupations requiring accurate, rapid color discrimination. It affects 8% of males and 1/200 females. CVDs show errors in color identification, discrimination and prolonged response times threatening safety. Moreover, CVD can be acquired as an early sign of disease leading to impaired color vision even before loss of visual acuity (VA) or visual field. Hence many occupations require normal color vision (aviation, transportation, military specialties, law enforcement). While CVD “book” tests are highly sensitive for detection, most fail to identify type (red, green, blue) or severity of CVD, important for: (i) matching CVD abilities to occupational requirements, (ii) early detection of various diseases. Large letter cone specific contrast sensitivity tests

(<https://www.innovasystemsusa.com/rabin-cone-test/rabin-cone-contrast-test/>) have been adopted by DOD, government agencies (FAA), clinicians, clinical trials assessing disease, and for assessing impact of color vision correcting lenses. To expand this effort, we developed computer based red, green, and blue cone specific VA charts (i.e., smallest letters one can read) as an adjunctive new metric of color vision. Herein we report initial normative values and results from a small sample of CVDs.

**Methodology:** Computer-generated VA letter charts were developed on a calibrated Microsoft Surface display to generate letters visible only to red, green, or blue sensitive cones based on CIE chromaticity and luminance. Each letter chart was designed using five

letters per row and a log progression in size (0.1 log units or 25% change in size per row). The red and green cone charts varied from 20/190 (0.98 log MAR) to 20/15 (-0.12 log MAR) with 16% letter contrast. The blue cone charts were designed with larger letters to account for the lower acuity of the blue cones due to their lesser density in the retina (only 10% of cones; blue cone VA range: 20/240 to 20/50, 1.08 to 0.38 log MAR, letter contrast 64%). Subjects were tested binocularly in a dark room at 91.3 cm. Scoring was based on letters read correctly (0.02 log MAR per letter) using VA as an outcome measure. Data were distributed normally and descriptive parametric statistics were used to calculate cone-specific normative means and 95% confidence intervals for each VA test. Between and within subject t-tests (with Bonferroni correction) were used to compare normal cone scores to CVD cone scores.

**Findings:** Mean ( $\pm$  2SD, 95% CI) red cone log MAR VA was  $0.15 \pm .22$  log MAR (20/28), green cone VA was  $0.17 \pm .18$  (20/30), and blue cone VA  $0.45 \pm .8$  (20/56). Since there was no significant difference between red and green CVN VA ( $P > 0.2$ ), the overall red and green mean was compared to CVDs. Mean VA from the abnormal cones of CVDs (0.53 logMAR, 20/68) was significantly less than CVNs (0.16 logMAR, 20/29,  $P < .001$ ). Moreover, VA from CVD cones (20/68) was significantly less than their normal cones (20/26,  $P < .009$ ). Mean VA results  $\pm$  2SE are shown for the CVN cones and for both CVD defective cones in the figure below illustrating the significant decrease in cone specific VA in CVDs.

These findings indicate that cone VA charts may significantly enhance CVD detection and monitoring both in occupational settings and acquired CVD. We recently developed a composite cone CS and VA score to provide a unique metric spanning several letter sizes as well as derivation of cone specific CS functions (manuscript under review).

*DECIPHERING VISION LOSS IN PATIENTS WITH RETINAL DYSTROPHIES*

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**Purpose:** Inherited retinal disease (IRD) has an important impact on patient's quality of life. This study aimed to discover the genetic variants driving vision loss in patients from South Texas.

**Rationale:** Retinal dystrophies are classified as rare diseases with an incidence below 1:2000. However, retinal dystrophies are estimated to cause devastating vision loss in up to 400,000 patients in the USA. In addition, most retinal dystrophies are progressive in nature, heterogeneous in their presentation, and affect young patients. An accurate and early diagnosis will help patients and their family members to initiate early rehabilitation programs, to accept and to plan for the evolution of the disease, and to enroll in targeted clinical trials that aim to delay vision loss. As of today, variants in over 300 genes have been identified in the context of inherited retinal disease (IRDs) and a molecular diagnosis is achieved for almost 70% of patients tested. Genetic testing for IRDs is not covered by most insurances, which limits the access to a definitive diagnosis for many patients and, in addition, prevents the discovery of novel targeted therapies that will benefit them. Sponsored initiatives like My Retina Tracker Registry, are instrumental to advance our knowledge in the genetics of IRDs and to increase the representation of patients from diverse backgrounds in genetic databases like the Genome Aggregation Database (gnomAD), ClinVar, ClinGene, or OMIM, and decrease health disparities.

**Methodology:** We performed a retrospective analysis of the results from 94 patients enrolled in My Retina Tracker (MRT) Registry. All patients were identified as

candidates based on clinical diagnosis and familial history of vision loss and tested with the most current version of the IRD Panel from Blueprint Genetics (82 patients) or Invitae (12 patients).

**Findings:** Clinical diagnosis: The most frequent clinical diagnoses in our cohort were retinitis pigmentosa (30 cases), macular dystrophy (24), cone-rod dystrophy (13), and atypical retinal dystrophy (12). Additional clinical diagnoses included syndromic IRDs (i.e., Usher's, Bardet-Biedl, Batten's; 7 cases), optic neuropathy (3), Leber's congenital amaurosis (2), choroideremia (2), achromatopsia (1), and enhanced S-cone syndrome (1).

Molecular diagnosis: Our sample was 53 females (56.4%), 45 Hispanics (47.9%), and ages ranged from 7 to 81. A molecular diagnosis was achieved in 59 of the patients (~63%). Novel genetic variants were identified in 50 patients (53.75% of patients) and some of them have been reclassified from "variants of uncertain significance" to "likely pathogenic" or "pathogenic" since testing. Pathogenic variants in ABCA4 gene provided a molecular diagnosis to 13 patients (22% of cases diagnosed). Pathogenic variants in SAG, CRB1, and USH2A genes were found in 15 patients (25.4% of cases). Autosomal recessive conditions were identified in 37 patients, autosomal dominant in 16, and X-linked in 6 (i.e., 62.7%, 27.1%, and 10.2% of cases respectively).

In conclusion, almost 85% of our patients expressed novel genetic variants. Accurate and early diagnosis will allow therapies to be effective. Socioeconomical barriers to genetic testing and counseling can be detrimental.

*EVALUATING STUDENT SLEEP PATTERNS AND THEIR IMPACT ON ACADEMIC PERFORMANCE*

**Matt Valdes, OD, FAAO; Emilio Saenz, BS, Student Researcher; Deidre Rios, MS, PhD, AHIP, Librarian; Sandra Fortenberry, OD, FAAO, Research Assistant**

**Purpose:** Sleep is widely recognized as being critical for optimal cognitive function. Many sleep studies have looked at self-reported metrics such as average time to bed (TTB), wake time (WAKE) or sleep duration (DUR). This study uses passively collected sleep data, through wrist-based accelerometers, and compares day to day variations in sleep behavior and their relation to academic performance, which is defined by the end of semester GPA during which the study took place.

**Rationale:** Insufficient sleep can result in a number of negative effects on physical and mental health. The broad implications for chronic insufficient sleep have been closely linked to impaired cognitive function, decreased immune systems, increased risk of obesity and cardiovascular disease. Studies focused on sleep duration and sleep/wake indices have closely linked student learning capacity and academic performance with sleep quality. Professional school students facing greater academic pressure, social challenges and technological distractions often develop irregular sleeping habits which can directly affect mental health and academic success.

A better understanding of student sleep patterns may be facilitated by improved self-awareness and drives the purpose of our study. Prior sleep studies required expensive equipment, relied heavily on sleep journals/self-reported sleep habits, or were limited in days monitored. By integrating self-reported sleep habits with 30 days of objectively recorded wrist-based accelerometer data (WBA) this study's design looked to minimize personal bias, broaden our view of subject sleep behavior, and improve data analysis of variations within bedtimes, wake times and sleep duration for individualized sleep profiles.

**Methodology:** This longitudinal study was conducted during the 2022 Summer semester at the UIW, Rosenberg School of Optometry. 22 Full-time (greater than 16 credit hours) graduate students wore a wrist-based accelerometer (WBA) for 30 days (21- day minimum). Exclusion criterion included anyone pregnant, nursing or caring for a newborn. Sleep data was passively collected with the use of WBA (Mi Band 5 [Taipei, TW]). All subject data was de-identified and unique identification numbers (UINs) were used to track each participant. Data was stored on password protected cloud systems. Data was collected

and analyzed using Google Sheets (Mountain View, CA) and XLMiner.

Analysis Tookpak (Incline Village, NV) Pearson Linear Regression determined correlations between sleep patterns and GPA. Paired t-test was performed to compare student perceptions on sleep habits and recorded sleep patterns.

Statistical Analysis Various metrics were used to create subject sleep profiles and then compared to semester grade point averages (GPA) to determine their impact on academic performance.

- Time-to-Bed (TTB)
- Wake Time (WAKE)
- Sleep Duration (DUR)
- Weekday Sleep Patterns (WKD)
- Weekend Sleep Patterns (WKE)
- Consistency in sleep metrics (i.e. Standard Deviation [StDev])

**Findings:**

- On average students receive 7h25m [42m] of sleep per night. They also received significantly less sleep during the week than the weekend (7h07m vs 7h51m, respectively [ $P < 0.001$ ]).
- Total sleep was found to have a positive association with academic performance, but failed to reach statistical significance ( $R = 0.293$ ,  $P = 0.184$ ).
- Earlier WKD, WKE and Total time-to-bed values were all significantly correlated with academic performance ( $R = -0.511$ ,  $p = 0.015$ ,  $R = -0.586$ ,  $P = 0.004$ , and  $R = -0.567$ ,  $P = 0.006$ ).
- Delayed WKD, WKE and Total WAKE values were negatively associated with academic performance, but failed to reach statistical significance ( $R = -0.387$ ,  $p = 0.076$ ,  $R = -0.327$ ,  $P = 0.137$ , and  $R = -0.393$ ,  $P = 0.070$ ).
- Time-to-bed values were significantly correlated with academic performance for five of the seven days of the week.

Our data suggests student academic performance is greatly influenced by their average bedtimes for most days of the week. Future studies should consider interventions aimed at improving bed times for students throughout the week.

*EVALUATION OF ACUTE AND CHRONIC SLEEP PATTERNS ON EXAMINATION PERFORMANCE*

**Emilio Saenz, BS; Matt Valdes, OD, FAAO; Deidre Rios, MLS, PhD, AHIP; Sandra Fortenberry, OD, FAAO; A. Jose, BS**

**Purpose:** This study investigates the correlation between short, intermediate and long term deep sleep patterns and academic performance among a cohort of 3rd year optometry school students.

**Rationale:** Sleep is an important component in mental and physical health. Unfortunately professional students often leverage sleep for productivity to manage an ever-increasing workload. Such behavior has been known to disrupt the normal sleep cycle, which in humans transitions through various stages.

These stages include light sleep (stage 1), deeper sleep (stage 2), deep non-rapid eye movement sleep (Stage 3) and rapid eye movement (REM). Reductions in the amount and quality, specifically REM sleep has been linked with disorders such as sleep apnea, Parkinson disease, narcolepsy, depression and memory. Prior research has shown greater sleep duration prior to examination was positively correlated with academic performance.

Insufficient sleep has been labeled a public health crisis in the United States, with many adults receiving less than the Center for Disease Control and Prevention's (CDC) recommended 7-8 hours of sleep per night. Our study looks to investigate how sleep quality (i.e., deep sleep) and quantity may be associated with exam performance.

**Methodology:** This longitudinal study was conducted during the Summer semester of 2022 with optometry school students (OPT III, n = 20) who were enrolled in at least 19 credit hours. Academic performance was measured using the subjects' midterm exam scores from a third year vision therapy course they were enrolled in during the study. All scores were confirmed through student affairs, with subject consent. Wrist based accelerometers (MiBand 2. Beijing, China) were used to measure total sleep and deep sleep duration:

- Short-term: 1 day prior to the mid-term exam
- Intermediate: 7 days prior to the mid-term exam

- Long-term: 21 days prior to the mid-term exam

Exclusion criteria included anyone pregnant, nursing or caring for a newborn. The study protocol was approved by the Institutional Review Board (1168-31168). Data was collected and analyzed using Google Sheets (Mountain View, CA) and XLMiner Analysis Tookpak (Incline Village, NV). Pearson Linear Regression determined correlations between deep sleep patterns and exam performance.

**Findings:** 20 optometry school students completed this study.

- Results 1 day before: Students with earlier WAKE times the day of the exam performed significantly better than their peers ( $r = -0.61$ ,  $p = 0.005$ ).
- Students who received less deep sleep performed significantly better than their peers ( $r = -0.45$ ,  $p = 0.047$ ).
- Greater sleep duration was correlated with better examination performance but failed to reach statistical significance ( $r = -0.39$ ,  $p = 0.086$ ).
- 7 days before: Students who were more consistent in receiving light and deep sleep over the seven days prior to the exam performed better than their peers ( $r = 0.48$ ,  $p = 0.032$  and  $r = 0.46$ ,  $p = 0.041$ , respectively)
- More consistent sleep duration over the 7-day period leading up to the examination was correlated with better examination performance ( $r = 0.42$ , [ $p = 0.062$ ]), but failed to reach statistical significance.
- Students slept significantly less the night prior to the examination than the measured 7- and 21-day sleep totals (6h50m, 7h25m [ $p = 0.016$ ], 7h17m [ $p = 0.038$ ], respectively).
- 21 days before: Other than deep sleep consistency ( $r = 0.38$ ,  $p = 0.08$ ), no measured sleep metrics were substantial predictors of academic performance 21 days prior to taking their midterm exam.

Less variation of intermediate sleep patterns is more closely related to better examination performance. Our data does not support other studies which found acute sleep duration to be a significant predictor of examination performance. Future studies should consider interventions related to improved sleep hygiene 7 days leading up to examination.

*THE HUMAN VISUAL THRESHOLD OF THE MELANOPsin GANGLION CELL PATHWAY*

Jeffrey C. Rabin, OD, MS, PHD; Erica L. Poole, OD; Brazil Andrews, BS; Kiana Hall, BS; Gurjiv Kaur, BS; William Price, BS; Venessa Sailors-Machac, BS; Rathanart Somphruek, BS

**Purpose:** Human retinal photoreceptors (rods: night, cones: daytime) absorb light energy transducing it to neural signals conveyed to ganglion cells which form the optic nerves sending signals to the brain. Intrinsically photosensitive retinal ganglion cells (ipRGCs), discovered 20 years ago, absorb blue light directly and control myriad functions: photo-entrainment and circadian rhythms, pupil responses, sleep, alertness, cognition, mood, and even conscious visual perception. In prior research we characterized retinal and cortical responses from ipRGCs (<https://doi.org/10.1038/s41433-020-01185-3>). Our purpose was to refine this technique to measure the human visual threshold to full-field stimulation of ipRGCs

**Rationale:** Measures of ipRGC dysfunction can help detect, diagnose, and monitor ocular disease as well as non-visual disorders impacting sleep, mood, and cognition. ipRGC metrics can also monitor the efficacy of new gene therapies to treat retinal diseases. Since these conditions can impact overall retinal function, and since ipRGCs comprise only ~7,000 of 1 million ganglion cells per eye, new tests which quantify overall, full-field stimulation of ipRGCs are needed for better identifying existing disease and to act as outcome measures for gene therapy in hereditary diseases (e.g., night blindness, retinitis pigmentosa). Selective chromatic adaptation, in which blue stimuli are presented against a very bright amber background, was used to suppress sensitivity of red and green cones and rods, isolating the response to ipRGCs and blue cones, both sensitive to blue light. Since blue cones are most sensitive to shorter wavelengths (peak 426 nm) than ipRGCs (peak 480 nm), testing was combined with a blue cone blocking filter (BCBF) which restricted stimulation to ipRGCs.

**Methodology:** The Diagnosys FST® (Diagnosys, LLC) uses a validated technique to determine the lowest intensity light seen 50% of the time specified as threshold. Subjects use a yes-no button box to report detection or

non-detection. Each test commenced with 30 sec. adaptation to the amber field followed by 200 msec. presentations of the blue stimulus presented against the amber background. A beep signaled each stimulus onset with 3 sec. to respond. Testing was conducted on right, left and both eyes with and without the BCBF in randomized order. Monocular results from subjects whose responses showed high validity based on software quality scores (2 and 3) were included. Nineteen healthy adults (mean age  $\pm$  SD: 30 years old  $\pm$  10, range: 18 – 45 YO) participated after providing written informed consent in accord with our IRB approved protocol (IRB #2022-1187-EXP). Data analyses were conducted with Microsoft Excel (version 2211). Thresholds were distributed normally (Jarque-Bera test). Two-way repeated measures ANOVA was used to compare data across filter vs. no filter and right and left eyes, with post-hoc two-tailed t-tests with Bonferroni correction to confirm individual differences. Regression and Bland Altman analyses were used to substantiate data validity.

**Findings:** FST® thresholds were significantly higher with the BCBF compared to without ( $F = 418, P < .001$ ) with no difference between right and left eyes ( $F=.01, P>.94$ ), hence mean thresholds of right and left eyes were used for analyses. Mean with BCBF filter ( $0.19 \log \text{cd/m}^2$ ) was significantly higher than without ( $-1.42 \log \text{cd/m}^2$ , mean difference  $1.61 \log \text{cd/m}^2$ , 95% CI: 1.38-1.84,  $P < .001$ ). Linear regression between right and left eyes showed high predictability ( $F=39, P<.001, r^2=0.7$ ). Bland-Altman analysis showed no inter-ocular bias with thresholds within 95% confidence intervals substantiating measurement validity. Finally, there was a significant correlation between putative ipRGC thresholds and age ( $r^2=0.4, F=10.5, P<.006$ ). Our findings indicate that this new technique quantifies the ipRGC visual threshold for potential application for enhanced detection of various diseases and as an outcome measure for the efficacy of gene therapy for retinal diseases.

*THE IMPACT OF EYE DOMINANCE AND PREFERENCE ON HUMAN VISUAL PERFORMANCE*

Kiana Hall, BS; Erica L. Poole OD, PhD Candidate; Jeffrey C. Rabin, MS, OD, PhD

**Purpose:** To assess the impact of eye dominance and preference on visual acuity (VA) and contrast sensitivity (CS) and the implications for ocular disease detection and monitoring.

**Rationale:** Eye dominance can be specified as motor dominance, typically based on a sighting test in which the individual uses one or both hands to make a small circle at arm's length, views a distant object, and alternately closes each eye to determine which eye is used for viewing the distant object. This often correlates with the eye used for firing a rifle or viewing through a telescope. Sensory dominance is more difficult to ascertain since it is manifested by which eye is used more of the time when separate stimuli are shown to each eye simultaneously. A related concept is the self-reported preferred eye which may include both sensory and motor dominance and may differ from the dominant eye. In our normative research on para-foveal sensitivity, subjects identified their dominant and preferred eyes during initial testing. Herein we evaluated eye dominance, preference, and visual performance in these normal subjects free of ocular, systemic and/or neurologic disease.

**Methodology:** All subjects (n = 29, mean age  $\pm$  SD: 26  $\pm$  11 YO, range 18- 40, 22 females, 7 males) participated in our UIW IRB approved protocol (#2022-1171-EXP) on para-foveal sensitivity after providing written informed consent. During testing of VA and small letter (20/25 letter size) CS, subjects reported their dominant and preferred eye which helps ensure there is no unreported history or eye preference related to prior mild trauma or disease.

The Super Vision Test (SVT, PrecisionVision®, <https://www.precision-vision.com/products/contrast-sensitivity-tests/peak-contrast-sensitivity/rabin/rabin-super-vision-test>)

was used to assess VA (smallest letters seen) and CS (lowest contrast seen). The SVT is a back-illuminated letter chart viewed at 4 meters in a darkened room. VA letter range: 20/32 to 20/5, 0.1 log VA/row, 5 letters/row, .02 log VA per letter correct. CS range: 0.25 to 1.50 log CS, 0.25 log CS/row, 5 letters/row, .05 log CS per letter correct. VA and CS were measured from subjects' right and left eyes with habitual optical corrections. Data were distributed normally (Jarque-Bera test) and parametric Z tests were used to quantify dominant (D) and preferred eye (P) eye proportions and t-tests to compare performance differences (Microsoft Excel ver. 2211).

**Findings:** Percent of subjects in which D and P eyes were the same (heretofore DP: 66%) was significantly higher than those wherein D and P eyes differed (heretofore DIF: 34%; two-tailed Z test for proportions, Z=2.59, P<.01). 79% of DP subjects showed better VA in DP eyes (mean log VA .05) vs. fellow eyes (.03) but the difference was not significant (P>0.25). Mean VA for all DP subjects (.04 log VA) was not different from DIF subjects (.04 log VA, P>.87), and there was no VA difference between P and D eyes in the DIF group (P>0.17). 68% of DP subjects showed improved log CS DP eyes (.20) compared to those showing improvement in fellow eyes (.10) but the difference did not reach (P>0.09). Mean CS improvement in all DP subjects (.16) was not different from DIF (.21, P>.33), and there was no difference between D and P eyes in the DIF group (P>0.26). Notwithstanding the greater proportion of matching D and P eyes, exacting measures revealed no performance differences between D and P eyes, important for interpreting results in eye disease. Additional research in eye disease is needed to support this claim.

*IMPACT OF GAME BASED LEARNING STRATEGIES IN STUDENT ENGAGEMENT IN HEALTH PROFESSIONS EDUCATION*

Lourdes Alarcón Fortepiani, MD, PhD

**Purpose:** The aim of this study was to develop game based educational resources and assess their impact in student engagement and learning in Optometry students

**Rationale:** Learning is enhanced when students are involved and engaged<sup>1</sup>; however, the most common teaching practices include a passive role for the students while the teacher delivers information, which is not typically associated with engaging teaching. Exacerbated with the pandemic, there has been an increase in student disengagement in the past years.<sup>2</sup> Class attendance is decreasing and students do not complete their assignments or turn in work on time

Research has demonstrated that engagement allows the student to develop higher-level critical thinking, which is essential in Health Professions. Providing opportunities for this intellectual engagement is necessary to capture the student's attention and numerous technologies have surged to meet this goal. One of the teaching resources utilized as an engagement tool in the classroom are game-based learning strategies. Game-based learning pedagogical approach focuses on student engagement by making deep connections between class content and gaming elements. During the game, students must relate to content knowledge in order to generate solutions for the game. These strategies are rapidly becoming a trend in health professions education; however, their impact in Optometry has not been described. In this study, we developed game based educational resources and assessed their impact in student engagement and learning in Optometry students.

**Methodology:** A total of 66 students were enrolled in a Systemic Pathology course. The course used flipped

instruction and students were asked to watch pre-recorded lectures or videos on a topic before the on-site session, where they worked in groups on a clinical case based on that topic. The game-based learning approach was used for some of the course cases and consisted in using multiple games facilitated by the instructor to provide a short answer for the case questions in an escape room format. The software used for escape rooms was BreakoutEdu and for interactive activities BookWidgets. We created puzzles, crosswords, matching activities and used lock boxes to escape the room while answering the questions. At the end of the semester, all the students completed a feedback questionnaire.

**Findings:** The students reported that solving cases during class, independent of the use of games, was beneficial to their learning (79%). Despite the minimal use of games, they perceived the use of games as enjoyable (68%) and reported an improvement in their learning (69%) when compared to the traditional cases without the game component. Furthermore, we compared this cohort to the same course offered the previous year with the same format except for the game-based activities to determine the impact on student performance. We found that the two groups obtained similar scores in the course average but in contrast with the previous year where 3 students failed the course, every student obtained a passing grade average.

In conclusion, the use of game-based learning strategies increased the engagement of the students and their perception of what they learned, however, did not seem to improve their academic performance in the course.

*LARGE & SMALL LETTER CONE CONTRAST SENSITIVITY: A NEW METRIC OF COLOR VISION*

Venessa Sailors-Machac, BS; Erica L. Poole OD, PhD Candidate; Jeffrey C. Rabin, MS, OD, PhD

**Purpose:** Computer-based cone contrast sensitivity (CS) is a sensitive metric of hereditary and acquired color vision deficiency (CVD). It uses large letters to assess CS near peak sensitivity of each cone type. Our purpose was to extend cone CS by adding small letter CS to enhance sensitivity and develop a composite score for quantifying color vision.

**Rationale:** Hereditary “red-green” CVD is a non-progressive X chromosome linked condition impacting performance in many occupations requiring accurate, rapid color discrimination. It affects 8% of males, 1/200 females. Males receive the X-linked mutation from their mother. Many occupations require normal color vision (CVN), including aviation, railroad, military specialties, and law enforcement. CVDs show increased errors in color identification, discrimination and prolonged response times This can threaten safety evidenced by fatal and non-fatal transportation accidents. Moreover, CVD can be acquired as an early sign of ocular, systemic and/or neurologic disease. While “book” tests of CVD are highly sensitive for detection, most fail to identify type (red, green, blue) or severity of CVD, important for matching CVD abilities to occupational demands, and providing early detection of diseases. Large letter tests ([www.innovasystemsusa.com/rabin-cone-test/rabin-cone-contrast-test/](http://www.innovasystemsusa.com/rabin-cone-test/rabin-cone-contrast-test/)) are used by DOD, FAA, in clinical trials to evaluate disease and the impact of color correcting lenses. To expand this effort, we developed cone specific large & small letter CS charts with potential to develop composite score.

**Methodology:** Computer-generated CS letter charts were developed on a calibrated Microsoft Surface display to generate letters visible only to red, green, or blue sensitive cones based on CIE chromaticity and luminance (doi: <https://doi.org/10.1167/iovs.10-6283.nd>). Each letter chart consisted of 10 rows with contrast varying from 16% to 1% for red and green cone charts in 0.15 log CS/row, and from 128% to 8% for blue cone charts. Large letter CS was measured with 20/324 letters for red and green cones and 20/430 letters for blue cones. Small letter CS was measured with 20/68 letters for red and green cones and 20/180 letters for blue cones (higher contrast, larger letters used for blue

cones due to their sparse retinal distribution). The charts were administered binocularly in a dark room at 91.4 cm from the display. Scoring was based on the number of letters read correctly in accord with FDA clinical trials (5 letters per row, 0.03 log CS per letter). Data were distributed normally (Jarque-Bera test) and descriptive parametric statistics were used to calculate red, green, and blue cone normative values. Repeated measures ANOVA followed t-tests to assess within subject and between group with Bonferroni correction to control for alpha inflation with multiple comparisons. Fifteen CVN and 7 CVDs were tested in accord with our IRB approved protocol (IRB # 2022-1191-EXP) after providing written informed consent

**Findings:** Mean ( $\pm$  2SD, 95% CI) CVN large letter log CS: red cone  $1.98 \pm .06$ , green cone  $1.97 \pm .06$ , blue cone,  $1.20 \pm .15$ ; small letter CS red cone  $1.52 \pm .28$ , green cone  $1.48 \pm .38$ , blue cone,  $0.95 \pm .32$ . Repeated measures ANOVA across letter size and cone type revealed a significant difference in log CS between letter size ( $F = 237$ ,  $p < .0001$ ) and cone types ( $F = 287$ ,  $P < .0001$ ).

There was no difference between red and green cone log CS for large and small letters ( $P > 0.25$ ). Hence CVDs were compared to the mean for CVN red and green cones. Mean large letter CVD CS (1.18) was less than CVNs (1.50,  $P < .00001$ ) and less than the CVD normal cone ( $P < .001$ ). Mean small letter CVD CS (1.18) was less than CVNs (1.50,  $P < .00001$ ) and less than the CVD normal cones ( $P < .001$ ).

Sensitivity for detecting CVD was higher for large vs. small letters CS, but a composite score (sum of CVN red & green large and small letter CS; mean 3.48 log CS) was significantly higher than the CVD composite score (mean 2.35,  $P < .00001$ ) showing 100% sensitivity for CVD detection in all subjects with at least 4 SDs below the CVN mean.

This CS metric combining large and small target CS, may prove useful for occupational and disease related color vision testing. CVN means  $\pm$  2SE are shown with results for CVDs for defective cones.



*LIBRARIANS AS RESEARCH COLLABORATORS: CHANGING THE KNOWN*

Deidre Rios, MS, PhD; Lindsay Blake, MLIS, UAMS Library, University of Arkansas for Medical Sciences

**Purpose:** The purpose of this research is to explore how health science librarians find collaborative research partners, how they build these relationships, and what scholarly products are produced.

This research project focused on three main questions:

- How do librarians find collaborative relationships for scholarly pursuits?
- How do librarians build on these relationships?
- What kinds of scholarly products are produced from these collaborations?

**Rationale:** There is significant literature on librarian and faculty educational collaborations and the librarian roles in co-curricular partnerships, however, there is still much to be learned about librarian research collaborations. Librarians receive research requests and inquiries in many modes, such as virtual chat questions, reference questions, and more in depth research consultations, making the act much more transactional. The exchange is completed when the answer is attained. Publishing trends in library literature show an increase in co-authored research.

Knowing more about research collaboration partnerships, perspectives on their level of success, and identifying obstacles to success will aid librarians in creating new collaborations.

**Methodology:** Authors selected mixed methods research design to provide both a basic overview and an in depth interpretation of how health sciences librarians approach research collaborations. IRB permission was obtained from both authors affiliated institutions. After a review of the literature, an online survey was designed, peer-reviewed, and distributed via Qualtrics through various professional library and academic

listservs during Fall 2021. The survey was a combination of multiple choice questions for quantitative analysis and open-ended questions for qualitative analysis.

Descriptive quantitative responses were analyzed with Qualtrics and the authors hand coded the qualitative responses. Health sciences librarians were queried about locating and cultivating research partnerships, their perspective on what made collaborations successful or unsuccessful, and what these collaborations produced.

**Findings:** The survey returned 142 overall survey responses. Most respondents found collaborators within their institution and had collaborated both with librarians and other discipline faculty in their careers. Librarian/Librarian collaborations more frequently produced conference presentations followed by publications, while collaborations with other discipline faculty showed the opposite trend, more publications and less conference presentations. Most collaborative partnerships were maintained through regular communication, having defined roles, and forming interpersonal relationships. Successful projects relied on a common topics of interest, frequent communication, good team dynamics, and strong project management. Conflicts were reported; however, many were resolved through communication, and projects were completed. Also for discussion,

- Health sciences librarians are involved in research collaborations and can help in multiple ways throughout the research cycle.
- Librarians have expertise that will save researchers time and effort.
- Health sciences librarians are motivated to collaborate and have excellent success rates.

*STRABISMUS SIMULATION USING PRISMATIC GLASSES IN OPTOMETRIC CLINICAL EDUCATION*

**Narges Kasraie, OD; Allan McCleary, Yutaka Maki, Allison Cronin, Srihari Narayanan, Sandra Fortenberry**

**Purpose:** To investigate the effectiveness of strabismus simulation glasses as a teaching tool for improving the proficiency of the UIWRSO optometry interns at performing cover test.

**Rationale:** One of the challenges in optometry preclinical laboratory teaching is exposing students to abnormal ocular conditions. Usually, students practice preclinical skills on each other who often have normal ocular conditions, therefore, limiting their learning experience in laboratory settings. Their experience can be enhanced, and they will be better prepared for clinic if they can experience ocular abnormalities through simulation from early on. There have been many attempts to create such clinical simulations using various techniques and technologies, and such simulations generally provide a greater understanding of the ocular abnormality and benefited students' learning. Therefore, this study aims to evaluate the effectiveness of our simulation glasses for better teaching a clinical skill named cover test which helps detect and quantify any possible misalignment of the eye, which in some cases could lead to amblyopia, and therefore, permanent reduction in best corrected vision.

**Methodology:** Students who were registered in the second-semester first year clinical optometry course at the University of Incarnate Word Rosenberg School of Optometry participated in this prospective parallel study. This study was approved by the UIW Institutional Review Board. Informed Consent was obtained from all

participants. The participants learned the cover test skill in their previous clinical optometry course and had passed basic proficiency assessments. In this study, they were instructed to take an online cover test assessment in which they were asked to evaluate and diagnose a series of different ocular alignments by watching cover test videos. Those students were then divided into two groups: control and experimental groups. In the control group, cover test skill was reviewed and retaught in a traditional approach where students practiced with each other. In the experimental group, cover test skill was taught using prismatic glasses which simulated strabismus. At the end of the lab, students took another online cover test assessment to see how each group's assessment score improved.

**Findings:** Our study indicated that the experimental group showed a greater gain in their interpretation and evaluation skills of cover test findings. Although the control group also showed an improvement in their assessment performance, their improvement was smaller and not statistically significant. This may be explained by the fact that the subjects were already exposed to traditional lab experience and reviewing cover test under the same conditions had no significant impact. In conclusion, the strabismus simulation glasses were found to be an effective tool in teaching optometry students cover test, which proves to be a beneficial teaching addition to our preclinical laboratories in order to better train our future eye doctors.

*ALISOL B 23-ACETATE TARGETS SHH SIGNALING IN MED12 KNOCKDOWN BREAST CANCER CELLS TO INHIBIT ONCOGENESIS*

**Samanew Annaluru; Cristian Gonzalez, Med Student, University of Pittsburg School of Medicine**

**Purpose:** For this study, we aimed to uncover a novel natural compound treatment strategy for MED12 mutant breast cancer. Since a large proportion of breast cancers harbor MED12 mutations, we first set out to investigate the effect of MED12 mutations on breast cancer oncogenesis. Next, we aimed to discover natural compounds that can effectively target MED12 mutant breast cancer cells.

**Rationale:** Breast cancer currently ranks second in leading causes of death in women in the United States. It is estimated that one in eight women will develop breast cancer over the course of their life, so finding treatment options for this disease is critical. Current treatment strategies include chemotherapy, radiation, and surgery, all of which cause harmful side effects that are damaging to the patient's overall health. Furthermore, these strategies are not always effective, so personalized treatment has become an area of interest to those who are searching for alternative treatment options. Interestingly, it has been found that Mediator subunit MED12 is mutated in up to 67% of breast cancer tumors. Our results from previous experiments show that mutations in MED12 can promote GLI3-dependent Sonic Hedgehog (SHH) signaling, thus indicating that tumor cells could potentially use this pathway to proliferate when MED12 is mutated. With these findings we hypothesize that MED12 mutations promote hyperactivated SHH signaling in breast cancer cells and that certain novel compounds can potentially target SHH signaling in these cells to suppress oncogenesis. The results of these study can play a major role in finding enhanced treatment options for patients suffering from MED12 mutant breast cancer.

**Methodology:** To study the effects of MED12 mutation, the MCF-7 breast cancer cell line was infected with a lentivirus carrying a shRNA targeted against MED12. To test for the effects of this knockdown on cell growth, proliferation assays were first conducted. Next, quantitative PCR was conducted to determine the effects of MED12 knockdown on the expression of GLI3 target genes. MTT assays were then performed to determine the effects of natural compound treatment on both MCF-7 control and MCF-7 MED12 knockdown cells. After selection of the natural compound alisol B23-acetate, quantitative PCR analysis was done to determine the effect on GLI3 target gene expression. Finally, an in vitro colony formation assay was employed to study the effect of compound treatment on tumor formation ability.

**Findings:** Our initial findings showed that MED12 knockdown promotes MCF-7 cell proliferation and enhanced GLI3 signaling. Through the MTT screening strategy, we found that the natural compound alisol B23-acetate selectively targets MED12 knockdown cells and that treatment with this compound blocks GLI3 signaling. Finally, our colony formation assay showed that alisol B23-acetate treatment leads to a drastic reduction in the colony forming abilities of MED12 knockdown cells. Thus, our results overall show that MED12 knockdown promotes breast cancer oncogenesis by hyperactivating the GLI3 signaling pathway and that alisol B23-acetate can effectively inhibit oncogenesis in these cells by targeting the GLI3 signaling.

*BACTERIOPHAGE INFECTION: IS IT BETTER TO GRAM-NEGATIVE?*

Minahil Humayun, BS; David E. Starkey, Ph.D. , Biology

**Purpose:** Bacteriophages (phages) are the most common organisms found in nature. Phages can differ greatly in morphology, size, and genome organization. One of the most important attributes of Phages is their use in selectively targeting and killing bacteria. In addition, phages can transfer genes between themselves and their target bacteria using a process called Transduction. These properties have made them targets for use against antibiotic resistant bacteria. As a result of the growing importance of phages in medicine, the present study was undertaken to determine the frequency at which common gram-positive and gram-negative bacteria are infected with phages.

**Rationale:** Under most circumstances, phages only infect a single species of bacteria. Therefore, it is critically important to determine what type of phage is capable of infecting bacteria particularly those that cause common human diseases. Therefore, we undertook this study to determine how frequently phages infect bacteria and if there is a difference between the rates of infection in disease-causing gram-positive and gram-negative bacteria.

**Methodology:** Twenty-five common disease-causing gram-positive and gram-negative bacteria were randomly selected for this study. In instances where a bacterial species contained multiple strains only isolates from a single strain of that species were utilized. Complete genomes sequences were downloaded from GenBank and input directly into the program PHASTER

(phaster.ca). This program determined the presence/absence of phages in the bacterial sequence. For sequences containing phages, the size, location, and g/c content were determined. After generating the complete data set, basic statistics (mean, X<sup>2</sup>, and correlation) were analyzed to determine if there were differences between gram-positive and gram-negative bacteria.

**Findings:** Overall, 24/25 (96%) gram-positive and 21/25 (84%) gram-negative bacteria were infected with phages. However, complete (or intact) phages were only present in 17/25 (68%) gram-positive and 20/25 (80%) gram-negative bacteria. In gram-positive bacteria 29 of 92 total phages (32%) were complete whereas 67 of 143 total phages (47%) found in gram-negative bacteria were complete. On average, Gram-positive bacteria were infected with 1.16 complete phages. In contrast, gram-negative bacteria were infected with 2.68 complete phages. In addition, there was a negative but insignificant correlation between the number of intact phages and bacterial %GC or genome size (-0.3752 and -0.4426). These correlations were positive but still insignificant for gram-negative bacteria (0.2589 and 0.5789). Overall, the gram-negative bacteria examined in this study were more likely to be infected with complete phages whereas gram-positive bacteria were more likely to be infected with incomplete phages (p=0.021) and carry a higher complete phage load, ~57% increase, than the gram-positive bacteria.

*BEHAVIORAL INTERACTIONS BETWEEN AFRICAN GIRAFFES (GIRAFFA CAMELOPARDALIS) AT THE SAN ANTONIO ZOO*

Katelynn Duron; Rachel Walker, Ph.D., Psychology

**Purpose:** In this study, the social behavior of three African male giraffes (*Giraffa camelopardalis*) were observed at the San Antonio Zoo. Specifically, the types of behavior included positive and negative social interactions between the males and the duration of these behaviors were examined. The purpose of this study was to observe the displayed behaviors of all three giraffes in the Savana exhibit. The information provided will enhance a better understanding of the daily interactions between all three males.

**Rationale:** Giraffe behavior can change due to seasonal changes, environment, and social hierarchy. For instance, one study showed individual giraffes displaying stronger social connections in a specific season. Behavioral changes linked to seasonal changes are likely linked to changes in breeding and abundance of food in the environment (Prehn, et. al., 2019). Additionally, another study discovered social rank in captive giraffes is primarily dependent on age and sex. Adult giraffes were dominant to subadults, which were dominant to juveniles (Horová, Brandlová, & Gloneková, 2015). Previous research indicated that examining different types of giraffe behavior provides detail information their social connections. This supports continuing research in a zoo setting to gain a better understanding of each male's overall behavioral social activity.

**Methodology:** Over the course of several months, three male giraffes were observed at the San Antonio Zoo. The

three giraffes included were named Alan, the oldest giraffe, Cosmo, and Brayden. A software titled, Animal Behaviour: The Professional Solution, was used to record various behaviors of a single giraffe applying continuous 10-minute intervals. During various hours of the day, the data was collected through direct observations by trained researchers. Behaviors that were measured included: solo behaviors and social behaviors. Social behaviors were further specified as social positive behaviors, such as social rubbing, and social negative behaviors, such as posturing.

**Findings:** Within 9 hours of observing solo and social behaviors, Alan spent most of his time engaging in solo behaviors (90%), such as standing or walking. We also investigated the percentage of time Alan engaged in social positive and social negative behaviors. Data indicated that most of Alan's social behaviors were positive behaviors (82%). Alan was more likely to engage in the positive social behaviors with the entire group of giraffes (68%), followed by negative social behaviors with Cosmo (19%), positive social behaviors with Brayden (12%), and negative social behavior with Brayden (< 1%). Because the behavioral patterns of these giraffes often fluctuate, additional information through observations are needed to provide a better understanding of their natural and daily demeanor. For this reason, this research is ongoing.

*BIOSTIMULANT POTENTIAL OF MICROALGAE FROM THE BLUE HOLE*

Lauren Bomer

**Purpose:** In this study, a microalgae (nicknamed BlueC) has been isolated from the source of the San Antonio River (the Blue Hole) and evaluated for its impact on tomato seedling emergence and growth.

**Rationale:** Microalgae and cyanobacteria have recently become a focus for the development of agricultural products for soil improvement, crop production, and plant disease prevention, including biofertilizers, organic composts, biostimulants, biocontrol agents, and soil conditioners. Numerous examples of microalgae biostimulants involving a small number of microalgal species have been reported but have yet to spark widespread farm development of microalgal biostimulants and soil additives.

**Methodology:** To examine the impact of BlueC as a soil conditioner and as a biostimulant in tomato seedling and emergence, tomato seedlings have been grown in pot culture with endpoint measurements of seedling

growth and development metrics as well as soil pH, nutrient levels, and microbial diversity.

**Findings:** Compared with water-treated tomato seedlings, seedlings treated with BlueC were more advanced at 9 weeks post-emergence, with increased seedling height and more widespread compound leaf development. Seedling emergence was not impacted by the presence of BlueC, and seedling failure before 9 weeks was slightly increased by BlueC treatment. However, BlueC treatment resulted in more efficient emergence under drought conditions and faster seedling rebound in rehydration than the water only control. BlueC increased the carbon sources used by soil microbes in the absence of plant roots, but did not impact soil nutrient levels, pH, or salinity. Preliminary evaluation of BlueC has indicated it to be a community of bacteria, microalgae, and fungi and isolation of its component organisms is ongoing.

*BLOOD ALCOHOL: MATHEMATICAL MODELING OF SOBER*

Emily Saenz; Mercedes Mares, Mathematics; Dia Jackson, BS, Meteorology; Dr. Suleyman Tek (Advisor), Ph.D., Faculty, Mathematics, Meteorology

**Purpose:** In this research, we study the mathematical modeling of the consumption of alcohol concerning the consequences of over-drinking for public safety.

**Rationale:** In efforts to enforce public safety, one of the most difficult challenges that remain at hand is finding a solution to reduce injuries and fatalities caused by alcohol consumption, particularly from drunk driving. The number of deaths due to drunk driving incidents is high and continues to increase. Moreover, most of these accidents are attributed to the irresponsibility of people overestimating their limits and becoming inebriated.

**Methodology:** We provide background on how our bodies absorb and metabolize alcohol can help us

further understand the link between drinking and drunk driving. We will provide background on how our bodies absorb and metabolize alcohol can help us further understand the link between drinking and drunk driving.

In this study, we will construct a mathematical model reflecting a hypothetical situation that portrays and answers the question of how long it takes for the subject to become sober enough to drive home legally.

**Findings:** Our model will highlight whether or not the patient's blood alcohol concentration will reach a level at which the subject will go into a coma or die from alcohol poisoning.

*CALCIUM-DEPENDENT DUAL OXIDASE 2 IS A NOVEL SOURCE OF REACTIVE OXYGEN SPECIES IMPLICATED IN GLOMERULAR MESANGIAL CELL FIBROTIC RESPONSE TO ANGIOTENSIN II*

**Kaitlyn Velasquez; Jacqueline Hecker, Biology; Kiana Cleveland, Biology; Bridget M. Ford, Ph.D., Faculty, Biology, Medicine/Division of Nephrology, UT Health San Antonio**

**Purpose:** In this study, we demonstrate Duox2 upregulation in response to angiotensin II (Ang II) and high concentrations of glucose (HG). The role of calcium was also analyzed in relation to Ang II-mediated Duox2 activation and the resulting fibrotic response in glomerular mesangial cells. This research potentially identifies and helps to establish the role of Duox2 in diabetic nephropathy (DN) and helps to identify future therapeutic strategies to prevent or improve any damages caused by DN.

**Rationale:** The vasoactive peptide angiotensin II (Ang II) and hyperglycemia contribute to the initiation and the progression of glomerular fibrosis via activation of glomerular mesangial cells (MCs) and subsequent extracellular matrix expansion. We have previously shown that oxidative stress is critical for MC fibrotic response to Ang II or high concentrations of glucose (HG). Here, we demonstrate that Dual oxidase 2 (Duox2), a member of the Nox/Duox family of NADPH oxidases, is present in MCs and that its protein expression, along with its associated maturation factor, DuoxA2, are upregulated by Ang II and HG.

**Methodology:** Rat mesangial cells were grown to confluency in Dulbecco's modified Eagle's medium. After 24 h serum deprivation, cells were exposed to vehicle (control) or 1mM angiotensin II. Small interfering RNA (siRNA) were used to inhibit expression of Duox2 and hydrogen peroxide production was determined using an Amplex Red assay. Western blot analysis was used to

observe differential protein expression and Fura2 fluorescence was used to show calcium mobilization.

**Findings:** siRNA-mediated downregulation of Duox2 reduces Ang II-induced increase in reactive oxygen (ROS) generation and prevents the stimulatory effect of Ang II on MC fibrotic injury (as assessed through  $\alpha$ -smooth muscle actin and fibronectin expression). Similar results were obtained using HG (25 mM D-glucose) along with enhanced expression of the dual oxidase maturation factor, DuoxA2.

To demonstrate Duox2 activation is Ca<sup>2+</sup>-dependent, we show that the extracellular Ca<sup>2+</sup> chelator, BAPTA, prevented Ang II-induced ROS generation and the stimulation of MC fibrotic injury by Ang II. Treatment of MCs with ionomycin resulted in increased ROS production and enhanced MC fibrotic injury. These effects were abrogated by siRNA targeting Duox2. Fura-2 fluorescence was utilized as well to show calcium mobilization in response to Ang II and this effect was abrogated with siDuox2 transfection. These data indicate that Ang II-stimulated Duox2 activation and ROS generation subsequently lead to MC fibrotic injury.

In summary, we have identified a role for Duox2 and its cognate maturation factor, DuoxA2, as a major source of ROS in response to Ang II and HG and established the significance of Duox2 in Ang II-mediated MC activation and fibrotic injury. Therapeutic targeting of this pathway may prevent or reverse renal fibrotic diseases.



*CHROMATOGRAPHY-FREE SYNTHESIS OF MONO DMT DERIVATIVES OF GLYCOLS AND DIOLS*

**Anthony Castro; Mark Mchlanan, Jr.; Dr. Ashok Khanal, Professor in charge of research**

**Purpose:** The purpose of our research is to create mono-tosylates diols and glycols using green synthesis which is a cheaper alternative route compared to the synthesis in commercial pharmaceutical companies.

**Rationale:** This research will help in the pharmaceutical and organic chemistry industries. The Tosylate group is a great leaving group and interacts with molecules to serve as a site for functional groups. This plays a key role on the impact it has when mixed with natural products and other organic compounds in the synthesis of pharmaceutical products. Tosylate also plays important roles used in oligonucleotide and amino acid chemistry.

**Methodology:** To collect data from the experiment the following was done in order to have tangible results. We used acidic extraction, precipitation, TLC, cannula transfer, Mass Spec, and flash column chromatography.

**Findings:** The goal was achieved as we successfully synthesized the substrates with the tosylate group attached. Further work will be done to purify the compounds and collect more data pertaining to our findings.

*COMBATING DRUG-RESISTANT FUNGAL BIOFILMS USING A HEAT SHOCK PROTEIN 90 INHIBITOR*

Ana Cristina Alvarez; Christopher Pierce, PhD, Faculty, Biology

**Purpose:** The opportunistic pathogenic yeast, *Candida albicans*, can cause a variety of infections ranging from mucosal to life-threatening systemic candidiasis. For the three major classes of antifungal drugs, resistant strains of *C. albicans* are routinely reported. Furthermore, *C. albicans* ability to switch morphologies, as well as form biofilms on biological and inert surfaces heightens this issue of resistance as biofilms are intrinsically less susceptible to commonly used antimicrobials and host immune responses. Currently, echinocandins are the only class of antifungals that are shown to be effective in the treatment of *C. albicans* biofilm infections. Fully mature *C. albicans* biofilms are a complex network of yeast and filamentous hyphae. It has been demonstrated that filamentation is an essential element for providing the structural integrity and multilayered architecture characteristic of fully developed biofilms. Thus, biofilm formation and filamentation, due to their central role in virulence, represent potential targets for the development of new drug therapies. The purpose of this project is to characterize the effects of a novel heat shock protein 90 (Hsp90) inhibitor on *C. albicans* growth and biofilm development.

**Rationale:** Hsp90 is a stress-induced protein involved in many cellular signal transduction processes in eukaryotic cells. In *C. albicans*, Hsp90 has been implicated as a key regulator of cellular responses crucial for resistance of planktonic cells to azoles and echinocandins. While the role of Hsp90 in resistance is well established in the planktonic growth form, little, but promising results, has been reported on the role of Hsp90 in *C. albicans* biofilms. Notably, Hsp90 regulates

the morphogenetic transition between yeast and filamentous growth, a trait important for virulence and essential for biofilm formation. Depletion of Hsp90 reduces glucan levels in the biofilm matrix, suggesting Hsp90 might regulate biofilm drug resistance through the extracellular matrix. Taken together, inhibition of Hsp90 represents a novel target for the development of much needed anti-biofilm treatment strategies targeting the pathogenic fungus, *C. albicans*.

**Methodology:** Our lab previously screened 600 novel compounds from a commercially available Hsp90 Inhibitor Library to identify compounds with anti-biofilm activity. One Hsp90 inhibitor with promising activity was, 2-iodo-6-methoxy-4-{9-methyl-2H,3H,4H,4AH,5H,6H,10BH-pyrano[3,2-C]quinoline-5-yl}phenol. The effects of this compound on *C. albicans* biofilm formation, filamentation, early adhesion, and planktonic growth was determined using the 96-well microtiter plate models for susceptibility. Current studies in the lab are focused on testing this compound for synergistic effects with echinocandins and fluconazole, as well as for in vivo activity in the *Galleria mellonella* waxworm model of candidiasis.

**Findings:** The Hsp90 inhibitor, 2-iodo-6-methoxy-4-{9-methyl-2H,3H,4H,4AH,5H,6H,10BH-pyrano[3,2-C]quinoline-5-yl}phenol, inhibited biofilm formation by more than 60 percent at a concentration of 128  $\mu$ M and inhibited filamentation at 64  $\mu$ M. This novel Hsp90 inhibitor represents a potential antifungal drug candidates against *Candida* biofilm-associated infections.

*CODON BIAS IN THE KINOSTERNIDAE (MUD AND MUSK TURTLES)*

Verena Sorial, BS; David E. Starkey, Ph.D., Biology

**Purpose:** Kinosternidae are small to medium sized turtles that range throughout the new world. Morphological and protein analyses categorized these turtles in 2 genera Kinosternon (mud turtles) and Sternotherus (musk turtles). When genetic data were used to examine this group, it was determined that Kinosternon was not monophyletic. Instead, one group of Kinosternon (primarily gulf coast drainages in Mexico, Central, and South America) were not the sister group to the remaining Kinosternon. This novel group was renamed *Cryptochelys*.

**Rationale:** Currently, genetic data (mitochondrial and nuclear DNA) is routinely utilized to determine species boundaries. The basis of these analyses lies in the fact that closely related species share a common ancestor and should exhibit similarities in the DNA sequences of their genes. If species are not closely related, they are not expected to show high levels of similarity in their DNA sequences. However, patterns of codon usage are largely ignored in these analyses. As a result, information supporting, or refuting a given hypothesis may be lost when not examining how often a specific codon is utilized in a gene. Therefore, the present study was undertaken to determine if there are patterns of codon usage (codon bias) in the mitochondrial gene *Cytochrome B* that support/refute this novel hypothesis i.e., *Kinosternon* should be split into 2 genera *Kinosternon* and *Cryptochelys*.

**Methodology:** Coding sequences for Cytochrome B were pasted into the Sequence Manipulation Suite: Codon Usage ([www.bioinformatics.org/sms2/codon\\_usage.html](http://www.bioinformatics.org/sms2/codon_usage.html)) and individual patterns of codon usage were calculated for each species using the "Vertebrate Mitochondrial" genetic code. The 6-fold and select 4-fold degenerate amino acids were examined using ANOVA analyses to determine if codon usage patterns were different among these 3 genera.

**Findings:** All taxa showed a significant bias for the codon pattern "NNA" for the 6-fold degenerate amino acids, Leucine and Serine, and the 4-fold degenerate amino acids, Valine and Proline. In contrast, all taxa exhibited an equal preference for the codon patterns, "NNA" and "NNC", in the 4-fold degenerate amino acid Alanine. In the 4-fold amino acid, Valine, all taxa preferentially utilize the pattern "NNA". However, *Cryptochelys* was the only genus where utilization of this codon was significantly different from other patterns. In addition, there were instances in which the second most widely utilized codon differed between genera. For example, *Sternotherus* and *Kinosternon* utilize the pattern "NNC" whereas *Cryptochelys* utilized the pattern "NNT" for the 4-fold degenerate codon Glycine. Overall, these data suggest that codon bias does exist in the *Cytochrome B* gene. Moreover, if found in other Mitochondrial or Nuclear genes, this information should be incorporated in phylogenetic analyses as it could provide vital information regarding species relationships.

*DESIGN OF AN ADAPTIVE FAILSAFE DEVICE BASED ON UBIQUITOUS SENSING FOR SELF-OPERATING SYSTEMS*

**Christian J. Mathis; Sean A. Stanton; Bernabe N. Lopez; Okan Caglayan, Ph.D., Engineering**

**Purpose:** The goal of this project was to design an adaptive lightweight failsafe device based on a ubiquitous sensor network that can be integrated into self-operating systems. The intent of the proposed device is to have an independent modular design capable of terminating the operation of a system in the event that a malfunction or other undesired event occurs. This supports R&D environments where untested algorithms and hardware are being implemented.

**Rationale:** In engineering, a fail-safe is a design feature or practice that, in the event of a specific type of failure, inherently responds in a way that will cause minimal or no harm to other equipment, to the environment or to people. Furthermore, fail-safe condition monitoring, together with predictive maintenance, provides an early warning that prevents machine breakdown and the costly consequences of stopping production.

Self-operating systems rely on various types of sensor technologies to perceive the environment and to make logical decisions based on the gathered information similar to humans. Under ideal operating conditions, the onboard sensor networks provide enough information to enable self-operational transportation and mobility. In practice, there are still several challenges that can impede the sensors' operability in physical environment and reliance on functional safety standards to avoid software errors, hardware faults or failures.

**Methodology:** The main goal is to have an independent device capable of terminating the operation of a self-operating system if a malfunction or other undesired event occurs. This supports the Research and Development environment where untested algorithms and hardware are being implemented. The system must be small and light weight to accommodate various types of system integration. The proposed system was designed and implemented by using Arduino microcontrollers and multiple sensors.

- Ubiquitous Sensing: The usage of omnipresent technical, human sensors and geo-sensor networks and their ability to inquire surroundings in real time.
- "Fail-safe" in a System: Disconnect Device that takes care of power type of failure causing minimal or no harm to other equipment, to the environment or to people.

**Findings:** The self-operating system and Zero device are shown in the figures provided. The prototype testing overview is illustrated in the block diagram. The field testing of the Zero device was successful as an integrated fail-safe system.

This project was funded by Southwest Research Institute (SwRI) to provide undergraduate Engineering students an opportunity to apply their existing technical knowledge, improve their time management, communication skills, and work as a team on a real-world problem.

*EFFECTS OF BOKASHI AND OLIVINE ON POTTED PLANT GROWTH*

John Hooker, PhD; Manuel Venegas, Jr., Environmental Science; Megan M. Weiss, Environmental Science; David E. Starkey, PhD, Biology; Benjamin C. Miele, PhD, College of Humanities, Arts, & Social Sciences, English

**Purpose:** We tested the effects of bokashi flakes and olivine sand as soil additives during growth of potted collard greens, kale, and radishes in a laboratory setting. Concurrent aims were to see whether these additives helped with plant growth and whether plant growth accelerated breakdown of mineral olivine.

**Rationale:** Plant growth forms the basis of all terrestrial food webs; plants also draw down atmospheric carbon, filter air and water pollutants, and moderate temperatures. Anthropogenic increases in atmospheric carbon dioxide are a major driver of climate change. We hypothesize that bokashi and olivine in soil can promote plant growth while dissolving olivine.

Olivine ( $[\text{Mg,Fe}]_2\text{SiO}_4$ ) is a mineral that is abundant in Earth's mantle but rare in the crust, owing in part to its instability at surface temperature and pressure. Olivine weathering releases cations, especially magnesium, which can bond with carbonate and ultimately sequester atmospheric carbon dioxide.

This process is natural but geologically slow; our motivation is to find natural and environmentally beneficial ways to accelerate olivine weathering.

**Methodology:** We performed growth experiments on collard greens, radishes, and kale to test the effects of

bokashi flakes and olivine sand as soil additives. We stimulated a single plant-growth cycle in a controlled indoor environment in soils having varying amounts of bokashi [0, 10 wt%] and olivine sand [0, 25, 50 wt%]. We monitored plant size and pH. We imaged and measured olivine grains before and after growth experiments using a scanning electron microscope with a secondary electron detector.

**Findings:** Including bokashi resulted in marked decrease in plant size. Pots having both bokashi and olivine produced a higher pH. An increase in pH can theoretically result from olivine weathering, but the experiment produced only subtle changes in olivine grain size distributions, with minimal apparent weathering of grain surfaces apparent on scanning electron microscopy images. These preliminary results suggest that bokashi has the potential to accelerate mineral weathering in soils, though these benefits must be weighed against potential deleterious effects on plant growth.

- 10 wt% bokashi additive stunts plant growth ( $p < 1\%$ )
- Bokashi plus 50 wt% olivine results in high pH ( $p < 1\%$ )
- Subtle differences in surface roughness and grain size distribution most apparent in lower-pH samples

*THE EFFECTS OF EXCESS FOOD-NUTRIENT CONTENT ON THE COEXISTENCE OF COMPETING CONSUMER SPECIES*

**Brenda Diaz Martinez; Gabriella Valdez; Asik Lale, Ph.D; Tek Suleyman, Ph.D., Mathematics & Statistics**

**Purpose:** Recent discoveries in ecological stoichiometry have indicated that food quality in terms of the phosphorus: carbon (P:C) ratio affects consumers whether the imbalance involves insufficient or excess nutrients. This phenomenon is called the "stoichiometric knife edge." In this study, we develop and analyze two consumers feeding on one producer model, which captures this phenomenon.

**Rationale:** This study enlighten new perspectives in ecology.

**Methodology:** Criteria for local stability and instability of the non-negative equilibria are obtained.

**Findings:** The co-existence of the three species is also discussed. Finally, computer simulations are performed to investigate the dynamics of the system.

*THE EFFECTS OF pH ON HUMAN MALATE DEHYDROGENASE CATALYSIS*

Silvia Summers; Alicia Howard, PhD, Instructor, & Chemistry & Biochemistry; Rachell Booth, PhD, Chair, & Chemistry & Biochemistry

**Purpose:** Malate Dehydrogenase (MDH) is a vital enzyme in the citric acid cycle that is responsible for the reversible oxidation of malate to oxaloacetate from the reduction of NADH to NAD<sup>+</sup>. MDH levels are stable in healthy individuals across gender and age groups but with some cancer and diseased cells, activity levels were found to be elevated. There are known cases of mutations within the MDH gene that result in changes to MDH protein's functionality. Research on possible drug designs and treatment geared towards the enzyme is important. The goal of the current research is to study the kinetic parameters of MDH from humans by applying changes to the physiological conditions. The Michaelis-Menten constant ( $K_m$ ), maximum velocity ( $V_{max}$ ), and turnover rate ( $K_{cat}$ ) of MDH were determined through kinetic assays with the oxaloacetate substrate and NADH cofactor. Altering the pH showed to regulate MDH by either increasing or decreasing the activity. The combination of results and the inhibition profiles provide a closer look into the catalysis properties of MDH.

**Rationale:** Malate Dehydrogenase has been shown to be a critical enzyme in cancer metabolism and can be the main foundation for NAD<sup>+</sup>. It has also been linked to Alzheimer's disease, Amyotrophic Lateral Sclerosis (ALS), and parasitic diseases with its exact contribution to cancer cell survival and other ailments not clearly defined. The structure of the Human MDH protein has been elucidated, but with very little functional data and information available, studies have failed to clearly

identify inhibiting factors. With MDH playing a vital role in the progression and development of certain cancers and diseases, any strategy to disrupt the enzymes activity could lead to the discovery of alternative therapies. Current drug treatments are limited to resistance and toxic side effects so more knowledge on how to regulate and disrupt catalysis of the enzyme may have important commercial implications as a potential target for drug development studies.

**Methodology:** Human malate dehydrogenase was expressed in bacteria cells and purified using nickel affinity chromatography. Purified protein was assayed by monitoring the rate of malate formation which is dependent on the rate of NADH conversion to NAD<sup>+</sup>. The activity of MDH was measured by following the conversion of the cofactor, NADH through its absorbance at 340 nm. When malate dehydrogenase is added to a mixture of oxaloacetate and NADH, there is a time-dependent loss of absorbance. Through the plot of absorbance vs time, the Michaelis Constant,  $K_m$ , the Maximum Rate of the catalyzed reaction with saturating substrate concentrations,  $V_{max}$ , and the turnover number,  $K_{cat}$  were calculated. The kinetic assays were then repeated with a range of pH values from 6.2 to 8.2.

**Findings:** Human MDH samples were assayed at various pH values and the absorbance of NADH was plotted against time. The optimal pH value for the activity of MDH was determined to be a pH between 7.5- 8.0

*THE EFFECT OF THE SAN ANTONIO RIVER DAM ON WATER PROPERTIES*

Nicholas Metcalf; Gabriela Hernandez, Biology; Karen Michail, Biology; Kylie Scott, Biology

**Purpose:** The effect of the San Antonio River Lock and Key Dam on the physical properties of the river water (temperature, pH, dissolved oxygen, turbidity, conductivity) will be determined through Vernier gauge testing. As water traverses through the dam, we expect temperature and pH to remain constant, with an increase in turbidity and a decrease in dissolved oxygen and conductivity values.

**Rationale:** Dams and other structures can have a profound effect on urban water quality as well as aquatic ecosystems. This study focuses on an example close to UIW in a heavily urbanized setting. Gaining an understanding of the lasting effects of urban development, more specifically on its impact on water and its uses, can allow for more sustainable development that favors greater water quality.

**Methodology:** Prior to experimentation, two sample collection sites equidistant from the San Antonio River Lock and Key Dam (one upstream, one downstream)

were determined. Upon sample collection, temperature and dissolved oxygen values were collected on site to avoid potential bias with collection and transport. Samples were then taken to the lab to determine pH, conductivity, and turbidity values. Following the eight-week study, we determined that the San Antonio River Lock and Key Dam had a profound effect on the Riverwalk water quality.

**Findings:** Following experimentation, we found that water samples after the dam saw increase in dissolved oxygen, as well as a decrease in turbidity and conductivity compared to samples before the dam. Temperature and pH values of water samples remained constant, with little to no variation found.

This study was performed as part of BIOL/ENSC 4460 Research in Water Quality. We would like to thank Dr. John Hooker for guidance in developing this research project.



*ELEMENTS OF DISEASE IN A CHANGING WORLD: MODELLING FEEDBACKS BETWEEN INFECTIOUS DISEASE AND ECOSYSTEMS*

**Lale Asik, PhD**

**Purpose:** An overlooked effect of ecosystem eutrophication is the potential to alter disease dynamics in primary producers, inducing disease-mediated feedbacks that alter net primary productivity and elemental recycling. Models in disease ecology rarely track organisms past death, yet death from infection can alter important ecosystem processes including elemental recycling rates and nutrient supply to living hosts. In contrast, models in ecosystem ecology rarely track disease dynamics, yet elemental nutrient pools (e.g. nitrogen, phosphorus) can regulate important disease processes including pathogen reproduction and transmission.

**Rationale:** Thus, both disease and ecosystem ecology stand to grow as fields by exploring questions that arise at their intersection. However, we currently lack a framework explicitly linking these disciplines.

**Methodology:** We developed a stoichiometric model using elemental currencies to track primary producer biomass (carbon) in vegetation and soil pools, and to track prevalence and the basic reproduction number ( $R_0$ ) of a directly transmitted pathogen. This model, parameterised for a deciduous forest, demonstrates that anthropogenic nutrient supply can interact with disease to qualitatively alter both ecosystem and disease dynamics.

**Findings:** Using this element-focused approach, we identify knowledge gaps and generate predictions about the impact of anthropogenic nutrient supply rates on infectious disease and feedbacks to ecosystem carbon and nutrient cycling.

*EVALUATION OF EUSTIGMATOS VISCHERI AND PICOCHLORUM OKLAHOMENSIS AS BIOSTIMULANTS IN EARLY TOMATO SEEDLING DEVELOPMENT.*

**Giselle Espinoza Perez**

**Purpose:** To evaluate two terrestrial microalgae, *Eustigmatos vischeri* and *Picochlorum oklahomensis*, for their ability to promote growth in tomato seedlings.

**Rationale:** Microalgae are of particular interest in developing agricultural products for soil improvement, crop production, and plant disease prevention, including biofertilizers, organic composts, biostimulants, biocontrol agents, and soil conditioners. Scattered information about a small number of microalgal species and their dynamics on soil and plants continues to limit widespread development of farm uses for microalgae.

**Methodology:** The impact of *E. vischeri* and *P. oklahomensis* on growth and development of tomato seedlings grown in pots under greenhouse conditions has been examined using seedling emergence, true leaf development, and stalk height as metrics. To examine soil conditioning effects, endpoint testing of soil pH, nutrient levels, and microbial diversity have been

examined in potting soil treated with each algae and compared to control (treated with water only).

**Findings:** Compared with water-treated tomato seedlings, seedlings treated with either *E. vischeri* or *P. oklahomensis* were more advanced at 9 weeks post-emergence, with increased seedling height and more widespread compound leaf development. Seedling emergence was not impacted significantly by the presence of either microalga, but treatment with either species resulted in more efficient emergence under drought conditions and faster seedling rebound in rehydration than the water only control. Neither species made a significant impact on soil pH or salinity or on nitrogen, phosphorous, or potassium levels. However, both *E. vischeri* and *P. oklahomensis* increased nutritional diversity in soil microbes with and without seedlings present. Taken together, these preliminary results provide a basis for further evaluation of *E. vischeri* and *P. oklahomensis* as biostimulants and soil conditioners for use on crop plants.

*GLYCOALKALOID SOLASONINE AS A NOVEL THERAPEUTIC STRATEGY FOR MED12 MUTANT BREAST CANCER*

Sophia Kermet; Shivani Akula; Dr. Marieke Burleson, Dept of Biology

**Purpose:** The purpose of this study is to uncover novel treatment strategies for a specific subtype of breast cancer. A large subset of breast cancers harbor a mutation within the Mediator subunit MED12. Our aims of this study are thus to investigate the effect of MED12 on breast cancer oncogenesis and to find novel treatment strategies for this specific type of cancer.

**Rationale:** As breast cancer is the second leading cause of cancer deaths among American women, there is a strong need to find improved treatment strategies for this disease. Through prior studies, it has been found that up to 67% of breast cancer tumors carry a mutation in the Mediator subunit MED12 thus indicating that MED12 likely has a critical tumor suppressive role in the breast. Interestingly, previous results from our lab, and others, have indicated that MED12 plays a role in restricting GLI3-dependent SHH signaling. This finding is of importance to this study as hyper-activated SHH signaling is known to play a role in promoting breast cancer oncogenesis. We thus hypothesize that MED12 mutations cause breast cancer oncogenesis through hyperactivated SHH signaling, and furthermore, that drugs which target the SHH signaling pathway could prove to be beneficial for MED12 mutant breast cancer. The outcome of this study can have a drastic impact on improved treatment strategies for patients suffering from MED12 mutant breast cancer.

**Methodology:** For our study, we first utilized a lentiviral shRNA delivery system to generate a stable MED12 knockdown breast cancer cell line. Our cell line was used to perform proliferation assays to confirm that MED12

knockdown enhanced breast cancer cell proliferation. Furthermore, we performed quantitative PCR to determine the effect of MED12 knockdown on GLI3 signaling. Next, a MTT screening strategy was employed to find natural compounds that selectively target our MED12 knockdown cell line. Upon selection of the compound, quantitative PCR was performed to investigate the effect on GLI3 signaling after treatment with the compound. Finally, colony formation assays were performed to determine the effect of compound treatment on the in vitro tumor formation ability of our cells.

**Findings:** We were able to conclude that MED12 mutations, as mimicked by a MED12 knockdown setting, enhance breast cancer cell growth and promote GLI3-dependent SHH signaling. Furthermore, we found that the natural compound Solasonine can differentially target MED12 knockdown breast cancer cells. Solasonine is a known glycoalkaloid that has previously been shown to potentially target anti-inflammatory signaling pathways. Interestingly, we found that Solasonine treatment significantly decreased the expression of GLI3 target genes thus suggesting that Solasonine could target the GLI3-dependent SHH signaling pathway to block breast cancer oncogenesis. Finally, solasonine treatment led to a significant reduction in the formation of colonies in vitro. Overall, our results demonstrate that natural compounds could prove to be an effective targeted therapy for MED12 mutant breast cancer by targeting the GLI3-mediated SHH signaling pathway.

*GREEN SYNTHESIS OF TRITYL ETHER DERIVATIVES FROM GLYCOLS AND DIOLS*

Mark McLachlan; Stephanie Chong-Macias; Ashok Khanal, Ph.D., Associate Professor, Chemistry

**Purpose:** The purpose of the research conducted was to use a cost-effective, green synthesis using tritylation and tosylation of alcohols, primarily glycols and diols.

**Rationale:** Trityl-protected analogs are utilized for a variety of uses such as the solid-phase automatic synthesis of DNA, RNA, and peptides, photochemical reactions, dye chemistry, and more. Tosylation transforms the stable alcoholic group into a fragile leaving group of sulfonic ester/tosylate. Tosylate has a huge impact on natural products and pharmaceuticals and plays an important role in both oligonucleotide chemistry and amino acid chemistry. In this project, both protecting groups were synthesized under basic conditions and were coupled together through nucleophilic substitution.

The research conducted is significant because it yielded a significant amount of product compared to leading pharmaceutical yields at high purity >90%. This level of purity, in concurrence with the methods used, could result in cheaper processes for synthesizing pharmaceuticals and lower the cost for consumers.

**Methodology:** Under controlled and mild conditions, glycols and diols were mono tritylated leaving a tritylated alcohol hybrid. Ditritylated byproducts,

pyridine, salts, and excess starting materials were removed with extraction followed by precipitation. The mono tritylated product was then subjected to tosylation in the presence of sodium hydroxide. Trityl-ether tosyl derivatives of glycols and diols were synthesized with a higher overall yield. Products were analyzed with TLC and ESI and did not require expensive purification processes.

**Findings:** Green synthesis of trityl ether tosylate derivatives was achieved. This was made possible by controlling the rate of the reaction via drop-wise addition of solvent and temperature control. The resulting purity of the compound was >90%, on par with that of leading pharmaceutical companies charging significantly elevated prices for minuscule amounts of the product for use in processes such as solid-phase automatic synthesis of DNA, RNA, peptides, etc.

As our goal of green synthesis of trityl ether tosylates was achieved, the future of this experiment now focuses on compiling all collected data, preparing the manuscript for publication, and finally publishing our results.

*IN VITRO EXAMINATION OF THE ANTIOXIDANTS, OSAJIN AND POMIFERIN, IN HUMAN PROXIMAL TUBULAR EPITHELIAL CELLS*

**Marcella Pineda; Paulo Carvalho, Ph.D., Faculty, Pharmacy; Bridget M. Ford, Ph.D., Faculty, Biology**

**Purpose:** The goal of this study was to identify concentrations of osajin and pomiferin, purified compounds originating from *Maclura pomifera*, that work as effective antioxidants while maintaining cell viability in cultured human proximal tubular epithelial cells.

**Rationale:** Diabetic nephropathy (DN) is a serious complication faced by type 1 and type 2 diabetic patients alike. Oxidative stress has emerged as an important pathogenic mechanism in the development of glomerular and tubular injury in DN. Identifying novel antioxidants found in natural compounds could serve as an effective treatment in DN to prevent renal cell damage.

**Methodology:** Human proximal tubular epithelial cells (HK2) were grown to confluency in Dulbecco's modified Eagle's medium/Nutrient mixture F-12 with 10% fetal bovine serum and 1x antibiotic/antimycotic. HK2 cells

were exposed to vehicle (control) or varying concentrations of pomiferin or osajin. MTT cell survival assays were used to assess cell viability for the selected concentrations. Antioxidant status was assessed using the Total Antioxidant Capacity Assay from Sigma-Aldrich and quercetin was selected as a positive control.

**Findings:** Data from MTT cell viability assays demonstrated several concentrations (25, 50, and 100 mM) of both osajin and pomiferin maintained cell viability in HK2 cells. Antioxidant capacity assay plans will be discussed as this is an ongoing project and we hope to identify the total antioxidant capacity and antioxidant response in HK2 cells. Future plans also include moving forward with selected concentrations to identify the effectiveness of osajin and/or pomiferin in preventing high glucose-induced damage to proximal tubular epithelial cells and glomerular cells as this will be essential for investigating the benefit of using either compound in diabetic nephropathy.

*MAMMALIAN TARGET OF RAPAMYCIN MEDIATES EXPRESSION AND ACTIVITY OF ADAM 17 IN DIABETIC KIDNEY DISEASE*

**James Mack; Najwa Faiz, SOM; Sachin Abraham, SOM; Bridget M. Ford, Ph.D., Faculty, Biology, Medicine/Division of Nephrology, UT Health San Antonio**

**Purpose:** Previous data have illustrated a role for the matrix metalloprotease A Disintegrin And Metalloprotease 17 (ADAM17), known to cleave growth factors and cytokines, in renal cell injury in diabetes. The goal of this study was to identify upstream regulators of ADAM17 in the cascade of events contributing to extracellular matrix accumulation in diabetic nephropathy.

**Rationale:** Diabetic kidney disease is a serious complication faced by type 1 and type 2 diabetic patients alike. Albuminuria and extracellular matrix accumulation are prominent features of the disease and this accumulation of extracellular matrix is a contributing factor to renal fibrosis and decline in renal function. The mechanisms involved in the pathogenesis of diabetic kidney disease have not been completely identified.

**Methodology:** Age and weight-matched Sprague Dawley rats were obtained from Harlan Laboratories (Indianapolis, IN). Type 1 diabetes was induced through tail vein injection of streptozotocin. After rats were determined to be diabetic by blood glucose

measurement, rapamycin treatments were administered intraperitoneally for two months. Both kidneys were removed and frozen in liquid nitrogen for microscopy and experimental analyses or formalin fixed for morphometric imaging at the experimental endpoint. Kidney cortex homogenates were used for western blot analyses and enzymatic activity assays.

**Findings:** Using the mTOR complex 1 inhibitor rapamycin, it was determined that increased ADAM17 enzymatic activity and ADAM17 protein expression is dependent on mTORC1 in streptozotocin-induced type 1 diabetic rats. Inhibition of mTORC1 with rapamycin abrogated the increase in collagen IV  $\alpha$  2 protein expression observed in diabetic rat cortex. Additionally, this study is the first to provide evidence that mTOR complex 1 activates ADAM17 contributing to extracellular matrix accumulation in diabetic nephropathy.

Studies are continuing looking at the molecular mechanisms involved in mTOR activation of ADAM17 resulting in downstream effects in cultured human proximal tubular epithelial cells.

*MATHEMATICAL MODELING OF BISON POPULATION IN YELLOWSTONE NATIONAL PARK*

Hannah Esqueda; Katelyn Simonsen, BS in Meteorology, Meteorology; Christian Schnell, BS in Meteorology, Meteorology; Dr. Suleyman Tek (Advisor), Ph.D., Faculty, Mathematics, Meteorology

**Purpose:** In this study, we work on mathematical modeling of the bison population in Yellowstone National Park.

**Rationale:** Yellowstone National Park is home to the nation's largest bison population.

Over the years, the bison population has seen multiple effects on the population's birth and death rates. Our research aims to understand the modeling and reasons for a changing bison population.

**Methodology:** Past studies have looked into specific factors, such as diseases, and how it impacts the population of bison.

However, these studies do not look at the overall change in the bison population. Our study on bison at Yellowstone will help to find a relation between the causes and effects of population biology.

**Findings:** The model we develop and the analysis we provide scientists and citizens a deeper understanding of the bison population in Yellowstone.

*METHOD OPTIMIZATION AND VALIDATION OF THE SIMULTANEOUS DETERMINATION OF MINOR AND TRACE METALS IN WATER BY ICP-OES*

**Matthew White, BS; Stephanie Chong-Macias, M.S., Chemistry & Biochemistry; Alakananda Ray Chaudhuri, Ph.D., Professor, Chemistry & Biochemistry.**

**Purpose:** The aim of this study was to optimize the measurement parameters and validate an inductively coupled plasma optical emission spectroscopic (ICP-OES) method for the simultaneous and quantitative determination of minor and trace metals, namely Ag, As, Ba, Ca, Cd, Cu, Mn, Al, Cr, Sn, Zn, Co, and V in groundwater, surface water, and recreational water.

**Rationale:** Method validation is a critical component of an analytical process that is performed to assure that reliable analytical data will be produced. The primary goal of validation is to demonstrate that a new or existing analytical method is suitable for its intended purpose, will produce accurate and precise results, and is selective over the specified range that an analyte will be analyzed. The specific aim of this study was to optimize the measurement parameters and validate a method for the quantitative determination of selected metals in surface and drinking water by using inductively coupled plasma optical emission spectrometry (ICP-OES).

**Methodology:** The analysis of 13 elements was performed using a dual view inductively coupled plasma optical emission spectrometer, Agilent 5110 coupled with SPS 4 autosampler. Twelve replicate measurements were used to quantify the analytical signals of both the axial and radial views for each element and compared for matrix interference and sensitivity. A calibration blank solution in 5% (v/v) nitric acid was used to calibrate the ICP-OES instrument. The multi-element calibration standards were prepared by diluting the ICP-

grade standard stock solutions of Ag, As, Ba, Ca, Cd, Cu, Mn, Al, Cr, Sn, Zn, Co, and V in 2.5% (v/v) nitric acid and used to calibrate the instrument response with respect to analyte concentration. The validation of the method was performed by evaluating selectivity, instrument detection limit (IDL), method detection limit (MDL), minimum level (ML), limit of quantitation (LoQ), and linear dynamic range (LDR) of each element.

**Findings:** The linearity results obtained were  $R^2 > 0.9990$  for all elements. The IDL values of the analyzed elements were in the ranges of 0.12-17 ppb and 5.6-80 ppb in the axial and radial views, respectively. The MDL values of the analyzed elements were in the ranges of 0.09-18.9 ppb and 0.50-51.8 ppb in the axial and radial views, respectively. The LDR studies showed linearity in the concentration ranges of  $> 25$ -275 ppm for different elements. No possible interferences were observed at the wavelengths selected, and a good baseline was observed compared to other wavelengths. For all the elements analyzed, the analytical signals in the axial view showed better sensitivities than in the radial view. Our initial results show that the method is selective and can be applied to determine the desired elements in the presence of other elements with regulatory acceptance limits determined by the EPA and the Texas Commission on Environmental Quality standards. Further validation experiments will include spike recovery studies and analyses of standard reference drinking water materials for successful application of the studied method for the quality control of surface water and drinking water.



*MIXED LIGAND COPPER(II) COMPLEX OF 4,7-DIMETHOXY-1,10-PHENANTHROLINE AND 4'-CHLORO-2,2';6',2''-TERPYRIDINE: SYNTHESIS, STRUCTURE, NONCOVALENT INTERACTIONS AND IN VITRO ANTIPROLIFERATIVE ACTIVITY*

Amanda Le; Dr. Betsy Leverett, Ph.D., Faculty, Chemistry & Biochemistry; Dr. Hadi D. Arman, Ph.D., Faculty, UTSA, College of Sciences, Chemistry; Dr. Rafael A. Adrian, Ph.D., Faculty, Chemistry & Biochemistry

**Purpose:** The purpose of this study is to synthesize and characterize a mixed ligand copper(II) complex containing 4,7-dimethoxy-1,10-phenanthroline and 4'-chloro-2,2';6',2''-terpyridine (4'-chloroterpyridine) and to evaluate their antiproliferative activity against breast cancer cell lines. The specific research aims for this project are: 1) To synthesize a copper(II) complex containing 4,7-dimethoxy-1,10-phenanthroline and 4'-chloroterpyridine as chelating ligands. 2) To characterize the synthesized complex and to evaluate noncovalent interaction in its solid-state structure. 3) To evaluate the antitumor activity of the complexes against MCF-7 cancer cell lines. This project plans to answer the following research questions: 1) Could the proposed methodology be used to synthesize copper(II) complexes containing different chelating ligands? 2) What unique structural features are present in this copper(II) complex? 3) Does having mixed ligands improve the antiproliferative activity of copper(II) complexes when compared with copper(II) complexes with only one ancillary ligand? Our Hypotheses for this project based on our previous knowledge of copper(II) phenanthroline complexes are: 1) Copper(II) complexes of 4,7-dimethoxy-1,10-phenanthroline and 4'-chloroterpyridine could be successfully synthesized by the reaction of copper(II) chloride, with the two ligands in acetonitrile. 2) The antiproliferative activity of this mixed ligand complex will be comparable to the observed in other copper (II) phenanthroline or terpyridine complexes.

**Rationale:** Ovarian cancer is a severe and widespread health issue that affects many women worldwide. One of the most effective drugs used for treating advanced ovarian, testicular, and breast cancers is platinum-based Platinol. While Platinol and other platinum-based drugs have high efficacy in treating cancer, they can also have significant side effects that impact the quality of life of cancer patients and may limit the effectiveness of these drugs in some cases. In this context, the present study investigates using two different nitrogen-donor ligands, 4,7-dimethoxy-1,10-phenanthroline, and 4'-chloroterpyridine, to chelate a copper(II) ion, synthesizing a mixed ligand metallic complex. The planar and symmetric structure of terpyridine and phenanthroline allows them to intercalate between base pairs in the DNA double helix, distorting the DNA structure and affecting its function. Damaging the cancer cell DNA leads to the inhibition of DNA replication and transcription, ultimately resulting in cell death. Overall, this study represents a significant step towards

developing more effective and less toxic alternatives to platinum-based drugs in cancer therapy. By exploring the use of copper(II) complexes with nitrogen-donor ligands, the study sheds light on the potential of copper as an effective antitumor agent and provides new insights into developing novel anticancer agents.

**Methodology:** In this study, the copper(II) complex was synthesized using a two-step process. First, an acetonitrile solution of copper(II) chloride dihydrate was prepared, and 4,7-dimethoxy-1,10-phenanthroline was added in a 1:1 molar ratio. After stirring this solution for 30 minutes, silver triflate was added to the mixture to remove the chloride ions. The silver chloride from this reaction was removed by filtration using a PTFE membrane syringe filter to yield a clear green solution. The second ligand, 4'-chloroterpyridine, was added to the green solution in an equimolar ratio with copper. This new solution was then heated for 30 minutes to reduce the volume, and after cooling down, diethyl ether was added to precipitate the mixed ligand complex as a green solid. Crystals suitable for X-ray diffraction were grown by vapor diffusion of diethyl ether over an acetonitrile solution of the complex. The crystallographic file (.cif) generated from the X-ray crystal structure was then used as input for the Hirshfeld Analysis using the freeware Crystal Explorer software suite. Finally, the cytotoxicity of the synthesized mixed ligand copper(II) complex was measured using MCF-7 breast cancer cell lines and an MTT cell viability assay.

**Findings:** The proposed methodology produced the mixed ligand copper(II) complex with a reasonable percent yield. The crystal structure of the complex showed a fivefold coordinated copper(II) ion in a distorted square pyramidal geometry, with one molecule of 4,7-dimethoxy-1,10-phenanthroline and one molecule of 4'-chloroterpyridine occupying the inner coordination sphere of the metal. Additionally, two triflate ions and an acetonitrile molecule completed the other coordination sphere, balancing the oxidation state of the metal. Noncovalent interactions stacking interactions between 4,7-dimethoxy-1,10-phenanthroline ligands in different molecules held the structure together in the solid state and are responsible for the formation of columns in the complex's unit cell. The newly synthesized mixed ligand complex demonstrated less cytotoxicity than other copper(II) phenanthroline complexes previously studied by our research group. However, its cytotoxicity was similar to that of copper(II) terpyridine complexes.

*MIXED-LIGAND PALLADIUM(II) COMPLEXES OF 1,2-BIS(DIPHENYLPHOSPHINO)ETHANE: SYNTHESIS, CHARACTERIZATION, AND CYTOTOXICITY*

**Brittney Vargas; Betsy Leverett, Ph.D., Chemistry & Biochemistry; Hadi Arman, Ph.D., College of Sciences, Chemistry, UTSA; Rafael A. Adrian, Ph.D., Chemistry & Biochemistry**

**Purpose:** The purpose of this study is to synthesize and characterize mixed-ligand palladium(II) complexes containing 1,2-bis(diphenylphosphino)ethane (known as dppe) and to evaluate their cytotoxicity against MCF-7 breast cancer cells. **Aims:** To synthesize mixed-ligand palladium(II) complexes containing dppe as an ancillary ligand and an additional N-donor ligand. To characterize the synthesized complexes using infrared spectroscopy, proton NMR, and single-crystal x-ray diffraction. To evaluate the cytotoxicity of the complexes against MCF-7 breast cancer cells. **Research Questions:** Could palladium(II) dppe complexes be synthesized using the proposed methodology? What is the coordination environment around the palladium(II) metal center in these complexes? How does the structure of the novel palladium(II) dppe complexes affect their cytotoxicity against MCF-7 breast cancer cells? **Hypotheses:** The mixed-ligand palladium(II) complexes containing dppe and different N-donor ligands will have a square planar geometry around palladium(II) with an inner coordination sphere that includes dppe and a second N-donor ligand. The cytotoxicity of the mixed-ligand palladium(II) complexes will depend on their structure and the type of N-donor ligand used in their synthesis.

**Rationale:** Cancer remains a significant health challenge worldwide, and developing more effective anti-cancer agents is a high priority for the scientific community. In recent years, palladium(II) complexes have received increasing attention as potential anti-cancer agents due to their structural and reactivity similarity to platinum(II) complexes. The mixed-ligand palladium(II) complexes of 1,2-bis(diphenylphosphino)ethane (dppe) are exciting due to their potential to interact with the DNA of cancer cells by a couple of different mechanisms of action. This study aims to synthesize and characterize these complexes and evaluate their cytotoxicity against MCF-7 breast cancer cells, providing new insight into the structure-activity relationships of these complexes and their potential as anti-cancer agents. The results of this study will contribute to the growing body of knowledge on mixed-ligand palladium(II) complexes as potential anti-cancer agents, providing new information on the structure-activity relationships of these complexes and their potential as drug candidates for the treatment of breast cancer. This study will advance our understanding of the mixed-ligand palladium(II) complexes chemistry, playing an essential role in the continuous advancement of cancer

research and the developing of new and effective treatments for this devastating disease.

**Methodology:** The synthesis of mixed-ligand palladium(II) complexes of 1,2-bis(diphenylphosphino)ethane was carried out using a well-established synthetic protocol. In a typical reaction, one mol of dichloro 1,2-bis(diphenylphosphino)ethane palladium(II) is suspended in 40 mL of acetonitrile, and two mol of silver nitrate is added to this mixture. After 30-60 minutes, the mixture is then filtrated using a syringe filter. Two mol of the additional N-donor ligand is added to the resulting solution and then heated with stirring until the volume is reduced to about 10 mL. The ligands used in this project include 4,4'-dimethoxy-2,2'-bipyridine, 4,4'-dimethyl-2,2'-dipyridyl, 2,2'-bipyridine, 1,10-phenanthroline, 4,7-dichloro-1,10-phenanthroline, and 5-chloro-1,10-phenanthroline. A solid of our new complex is obtained by adding diethyl ether over the reduced acetonitrile solution. The synthesized complexes were characterized using infrared spectroscopy, proton NMR, and single-crystal x-ray diffraction. These techniques were chosen to provide comprehensive information on the structure of the complexes and their inner coordination sphere. The cytotoxicity of the complexes was evaluated against MCF-7 breast cancer cells using standard cytotoxic assays. The results were analyzed and compared to determine the relationship between the structure of the complexes and their cytotoxicity against MCF-7 breast cancer cells.

**Findings:** The results of this study have shown that the proposed methodology is ideal for synthesizing mixed-ligand palladium(II) complexes of 1,2-bis(diphenylphosphino)ethane. The use of infrared spectroscopy and proton magnetic resonance allowed the prediction of the coordination environment, but not the geometry, around the palladium(II) metal center. The x-ray crystal structures of the new complexes proved that the palladium(II) metal ion is fourfold coordinated in a distorted square planar geometry, with a nitrate ion acting as a counterion. The new complexes show a remarkable cytotoxicity against MCF-7 breast cancer cell lines, although the values obtained are inferior to the commercially available cisplatin. In conclusion, the results proved our hypotheses for the project and demonstrated the potential of mixed-ligand palladium(II) complexes as a promising area for future cancer research.

*NATURAL COMPOUNDS AS A PROMISING THERAPEUTIC AGENT FOR SPOP DOWNREGULATED BREAST CANCER*

Patricia Augustine, student; Mariana Araujo Rincon, student; Marieke Burleson, faculty, Dept. of Biology

**Purpose:** A large fraction of breast cancer patients show to have a downregulation of SPOP, a substrate binding subunit of an E3 ubiquitin ligase. The significance behind SPOP downregulation is currently unclear and, furthermore, there is no effective treatment for patients with SPOP altered breast cancer. The purpose of this study is thus to determine the effect of SPOP downregulation on breast cancer oncogenesis and also to find a novel treatment strategy for patients suffering from this subset of breast cancer.

**Rationale:** Breast cancer is the second most deadly type of cancer for women in America. Due to this, there is a pressing need to investigate and develop a better treatment plan for those afflicted by it. There are numerous studies that show a downregulation of the E3 ubiquitin ligase Type POZ Protein (SPOP) in up to 70% of breast cancer patients. This demonstrates that, in breast cancer, SPOP is a vital tumor suppressor gene. In previous research projects, our lab has shown that SPOP targets GLI3 for ubiquitination and degradation which subsequently places a restraint on SHH signaling. Furthermore, we have shown that SPOP mutations lead to an upregulation of GLI3 and subsequent hyperactivated SHH signaling in prostate cancer. Since SPOP is downregulated in a large number of breast cancer patients, we hypothesize that SPOP downregulated breast cancer tumors would also display hyperactivated SHH signaling. Additionally, we hypothesize that SPOP downregulated breast cancer

patients will benefit from therapeutics that specifically target the SHH signaling pathway. If we are successful in finding a novel therapeutic treatment strategy, it will greatly benefit patients who suffer from this disease.

**Methodology:** To characterize the effect of SPOP downregulation in breast cancer, we used a lentivirus with shRNA complementary to SPOP to generate a stable MCF-7 SPOP knockdown cell line. Proliferation assays were utilized to determine the effect of SPOP knockdown on cell proliferation. Next, quantitative PCR was used to analyze the effect of SPOP knockdown on the expression of GLI3 target genes. To find a novel treatment strategy for SPOP downregulated breast cancer, a natural compound library was used to perform an MTT based screening method. Finally, quantitative PCR was performed to determine whether selected natural compounds target the GLI3 signaling pathway.

**Findings:** We first confirmed that SPOP knockdown enhanced cell proliferation as well as GLI3 signaling in MCF-7 cells. Through our screening strategy and subsequent quantitative PCR analysis, we identified novel therapeutic natural compounds that specifically target SPOP downregulated MCF-7 cells in a manner that involves disruption of GLI3-dependent SHH signaling. Our findings thus give necessary insight into novel treatment strategies for patients suffering from SPOP downregulated breast cancer.

*NOVEL HSP90 INHIBITOR REPRESENTS PROMISING TREATMENT STRATEGY FOR TARGETING CANDIDA ALBICANS VIRULENCE TRAITS*

**Raul Lechler, BS; Christopher Pierce, PhD, Biology**

**Purpose:** The purpose of this project is to determine the effects of a novel Hsp90 inhibitor, commercially available from ChemDiv, on *Candida albicans* biofilm formation and filamentation.

**Rationale:** *C. albicans* is a common opportunistic fungal pathogen and is capable of causing disease ranging from superficial infections, such as oral candidiasis, to life-threatening systemic infections. Two important virulence traits associated with these infections are the formation of biofilms on the surfaces of host tissues and implanted biomaterials, as well as the ability of the organism to filament. Biofilm-associated infections are harder to treat as they are more resistant to antifungal drugs and host immune defenses. *C. albicans* filamentation has been intimately linked to increased virulence in the murine model of disseminated candidiasis and the morphological transition from yeast to filamentous cells is critical for biofilm development. Thus, targeting biofilm formation and filamentation represents a viable alternative to treat *C. albicans* infections. The molecular chaperone, Hsp90, has been reported to play a role in *C. albicans* virulence and is linked to the morphological switch in *C. albicans* from yeast to filamentous growth.

**Methodology:** The compound, N-(4-nitrophenyl)-1-(pyridin-4-yl)-1H,2H,3H,4H-pyrrolo[1,2-A]pyrazine-2-carbothioamide, was tested against *C. albicans* biofilm growth using the microtiter plate model of biofilm formation coupled with the metabolic XTT reduction assay. Current experiments are aimed to characterize the efficacy of this compound using the *Galleria mellonella* waxworm animal model of disseminated candidiasis.

**Findings:** The Hsp90 inhibitor tested inhibits *C. albicans* biofilm formation by more than 90 percent at 64  $\mu\text{M}$  concentration. Furthermore, this compound inhibited fully mature pre-formed biofilms by more than 50 percent at the same concentration. Based on secondary assays performed, the inhibition of biofilms at higher concentrations ( $>64 \mu\text{M}$ ) is due to inhibition of growth, whereas inhibition at lower concentrations (16-32  $\mu\text{M}$ ) is a result of the compound's effect on filamentation and early adhesion. Overall, this study addresses the urgent need for the development of novel treatment strategies against drug-resistant *C. albicans* infections.

*NOVEL ROLE OF DUAL OXIDASE 2 AS A MEDIATOR OF PODOCYTE INJURY IN THE DIABETIC ENVIRONMENT*

**Aracely Castro; Jacqueline Hecker, Biology; Sachin Abraham, SOM; Bridget M. Ford, Ph.D., Faculty, Biology; Medicine/Division of Nephrology, UT Health San Antonio**

**Purpose:** The goal of this study was to characterize the role of dual oxidase 2, Duox2, as a mediator of podocyte injury in diabetic nephropathy (DN). Our study demonstrates, for the first time, that Duox2 is responsible for increased ROS generation and subsequent alteration of podocyte function in response to HG. Our work serves as proof of concept to demonstrate the utility of targeting Duox2 as a future therapeutic intervention to reduce diabetes-mediated glomerular lesions.

**Rationale:** Glomerular injury is a prominent pathological feature of diabetic nephropathy (DN). In glomerular epithelial cells, or podocytes, hyperglycemia alters slit diaphragm proteins and causes foot process effacement, apoptosis and cell detachment. Oxidative stress has emerged as an important pathogenic mechanism in the development of glomerular injury in DN. However, the mechanisms by which these factors exert their action remain poorly understood.

**Methodology:** Rat podocytes, courtesy of Dr. Jeffrey I. Kreisberg, were grown to confluency in Dulbecco's modified Eagle's medium. After 24 h serum deprivation, cells were exposed to 5 mmol/l glucose (control) or 25 mmol/l glucose (mimics diabetic environment of

hyperglycemia). Small interfering RNA (siRNA) were used to inhibit expression of Duox2 and hydrogen peroxide production was determined using an Amplex Red assay. Western blot analysis was used to observe differential protein expression.

**Findings:** We provide evidence that the NADPH oxidase of the Nox family, Dual oxidase 2 (Duox2), is present in cultured glomerular cells, including podocytes. Exposure of cultured podocytes to high concentrations of glucose (HG) elicited a rapid upregulation of Duox2 protein expression. Inhibition of Duox2 with specific siRNA prevented the HG-induced increase in intracellular reactive oxygen species (ROS) generation and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) production in cultured podocytes.

In additional experiments, we established a functional link between Duox2-derived ROS generation and podocyte injury in response to HG. Impairment of Duox2 function nearly abolished HG-mediated DNA fragmentation, apoptosis and decrease in/reorganization of slit diaphragm protein expression in podocytes, indicating that Duox2 is required for the deleterious effects of glucose in podocytes.

*PALLADIUM(II) COMPLEXES CONTAINING 4,7-DICHLORO-1,10-PHENANTHROLINE: SYNTHESIS, STRUCTURE, NON-COVALENT INTERACTIONS AND ANTIPROLIFERATIVE ACTIVITY*

**Nalani Rose; Dr. Betsy Leverett, Ph.D., Faculty, Chemistry & Biochemistry; Dr. Hadi D. Arman, Ph.D., Faculty<sup>1</sup>; Dr. Rafael A. Adrian, Ph.D., Faculty, Chemistry & Biochemistry**

**Purpose:** The purpose of this research is to synthesize and characterize novel palladium(II) complexes that incorporate 4,7-dichloro-1,10-phenanthroline as an ancillary ligand and to evaluate the cytotoxic activity of these new complexes against human breast cancer cells (MCF-7). The research aims for this project are: To synthesize novel palladium(II) complexes by the reaction of (4,7-dichloro-1,10-phenanthroline)palladium(II) chloride with nitrogen-based ligands including acetamide, imidazole, theophylline, 4-cyanopyridine, and isonicotinamide. To characterize the structure of the new complexes through infrared spectroscopy, <sup>1</sup>H NMR spectroscopy, single-crystal X-ray diffraction, and elemental analysis. To evaluate the cytotoxic activity of the new complexes against MCF-7 human breast cancer cell lines. The research questions that this research aims to address are: Could the proposed research methodology synthesize palladium(II) complexes of 4,7-dichloro-1,10-phenanthroline? Are palladium(II) complexes of 4,7-dichloro-1,10-phenanthroline cytotoxic against MCF-7 cancer cell lines? Our research hypothesis is that the new palladium(II) complexes of 4,7-dichloro-1,10-phenanthroline will exhibit cytotoxicity against human breast cancer cells and that the structural features of the complex will have an impact on its cytotoxicity.

**Rationale:** The American Cancer Society reported that in 2021, approximately 9,470 men and 21,410 women were newly diagnosed with testicular and ovarian cancer, respectively. Cisplatin and carboplatin, both platinum-based therapeutic agents, are the most effective in treating these cancers. However, platinum-based drugs have negative side effects that include anemia, dizziness, difficulty breathing, loss of balance and hearing, and nausea, which can harm the patient.

Palladium and copper have been identified as highly successful alternatives to platinum-based drugs. Palladium complexes have similar chemical and physical properties to platinum, but without harsh side effects. In a study conducted, five nitrogen-based ligands, namely isonicotinamide, 4-cyanopyridine, theophylline, imidazole, and acetamide, were utilized, along with 1,10-Phenanthroline as the ancillary ligand. These ligands can N-coordinate with the metal Palladium and attack the DNA of cancer cells, working as intercalator agents.

**Methodology:** The starting material, 4,7-dichloro-1,10-phenanthroline)palladium(II) chloride, was synthesized according to the literature. To synthesize the new complexes, the starting material was suspended in acetonitrile. Silver trifluoromethanesulfonate was added to this suspension to remove the chloride ions as silver chloride. The solid precipitate of silver chloride is then removed by syringe filtration with a PTFE membrane filter. In a 1:1 molar ratio with copper, the secondary N-donor ligand is added to the resulting clear solution and stirred at 50 degrees Celsius for 30 minutes. The secondary ligands used in this project include acetamide, imidazole, theophylline, 4-cyanopyridine, and isonicotinamide. After cooling the solution to room temperature, adding diethyl ether yields the new complexes as a light beige solid. The structure of the new complexes is first elucidated using infrared spectroscopy to understand if the new ligand is coordinated to the metal, and proton nuclear magnetic resonance, to determine how many of the ligands are coordinated. Crystals suitable for X-ray crystallography are obtained by vapor diffusion of ether over a saturated acetonitrile solution of the complexes. An MTT cell viability assay is used to determine the antiproliferative activity of the complexes in MCF-7 breast cancer cell lines.

**Findings:** The proposed methodology produced novel palladium(II) complex with an acceptable percent yield. The crystal structure of the complexes showed, in all cases, a fourfold coordinated palladium(II) ion in a distorted square planar geometry, with one molecule of 4,7-dichloro-1,10-phenanthroline as chelating ancillary and two molecules of the secondary ligands completing the inner coordination sphere of the metal. Two triflate ions and solvent molecules are found in the outer coordination sphere. Noncovalent interactions stacking interactions between 4,7-dichloro-1,10-phenanthroline ligands in different molecules hold the structure together in the solid state and are responsible for the formation of layers in the unit cell of the complexes. The newly synthesized mixed ligand complex demonstrated less cytotoxicity than other copper(II) phenanthroline complexes previously studied by our research group. However, its cytotoxicity was similar to that of copper(II) terpyridine complexes.

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*PALLADIUM(II) COMPLEXES OF ETHYLENEDIAMINE CONTAINING PHENANTHROLINE-BASED LIGANDS: SYNTHESIS, CHARACTERIZATION AND CYTOTOXICITY STUDIES.*

Liam Faubert; Dr. Betsy Leverett, Ph.D., Faculty, Chemistry & Biochemistry; Dr. Hadi D. Arman, Ph.D., Faculty, UTSA, College of Sciences, Chemistry; Dr. Rafael A. Adrian, Ph.D., Faculty, Chemistry & Biochemistry

**Purpose:** The purpose of this research is to synthesize novel palladium(II) complexes and study their potential as antitumor drugs against MCF-7 breast cancer cells. The aims of this research are to:

1. Synthesize palladium(II) complexes by reacting (ethylenediamine)palladium(II) chloride with phenanthroline-based ligands.
2. Elucidate the structure of the synthesized complexes using infrared spectroscopy, <sup>1</sup>H NMR spectroscopy, and single-crystal X-ray diffraction.
3. Assess the in vitro cytotoxic activity of the synthesized complexes against MCF-7 breast cancer cells.
4. Compare the cytotoxic activity of the synthesized complexes to other known metal complexes to determine their potential as antitumor drugs.

Through our research, we seek to find an answer to the following questions: 1. What is the in vitro cytotoxic activity of the novel palladium(II) complexes synthesized in this research against MCF-7 breast cancer cells, 2. How does it compare to other known metal complexes?

Our project hypothesizes that novel palladium(II) complexes synthesized in this research will have in vitro cytotoxic activity against MCF-7 breast cancer cells and be more effective than other known metal complexes.

**Rationale:** The use of metal complexes as potential antitumor drugs has gained significant attention in recent years due to their unique biological and pharmacological properties. Palladium(II) complexes, in particular, have shown promising results as they can selectively target and inhibit the growth of cancer cells. However, there is still a limited understanding of the structure-activity relationship of these complexes and their potential as antitumor drugs.

This research seeks to contribute to the field by synthesizing novel palladium(II) complexes and studying their potential as antitumor drugs against MCF-7 breast cancer cells. The study will use a combination of spectroscopic techniques and X-ray diffraction to determine the structure of the synthesized complexes and assess their in vitro cytotoxic activity. This information will provide valuable insight into the structure-activity relationship of these complexes and their potential as antitumor drugs.

The study's results could have important implications for the development of new and improved antitumor drugs. By synthesizing and characterizing these new complexes, this research will contribute to the growing body of knowledge in the field and help to advance the development of new and more effective treatments for cancer.

**Methodology:** The research design for this study will be experimental in nature, utilizing a combination of synthesis, spectroscopic, and biological evaluation techniques. The following steps will be followed in this research:

1. Synthesis of novel palladium(II) complexes: The reaction of (ethylenediamine)palladium(II) chloride with phenanthroline-based ligands including 1,10-phenanthroline, 4,7-dimethoxy-1,10-phenanthroline, 4,7-dichloro-1,10-phenanthroline, and 5-chloro-1,10-phenanthroline will be carried out to synthesize the novel palladium(II) complexes.
2. Characterization of the synthesized complexes: The structure of the synthesized complexes will be elucidated using infrared spectroscopy, <sup>1</sup>H NMR spectroscopy, and single-crystal X-ray diffraction techniques.
3. Cytotoxic activity evaluation: The in vitro cytotoxic activity of the synthesized complexes against MCF-7 breast cancer cells will be assessed using a cell viability assay.
4. Comparison to other known metal complexes: The results of the in vitro cytotoxic activity of the synthesized complexes will be compared to other known metal complexes to determine their potential as antitumor drugs.

This experimental design will allow for the synthesis, characterization, and evaluation of the potential antitumor activity of the novel palladium(II) complexes. The combination of techniques used in this study will provide a comprehensive and in-depth understanding of the properties of these complexes and their potential as antitumor drugs.

**Findings:** The synthesis of palladium complexes of ethylenediamine has been successfully achieved using the proposed methodology, yielding reasonably good results. The X-ray structure analysis of these new copper complexes showed that the Pd metal ion is in a distorted square planar geometry, coordinated by one ethylenediamine ligand and one phenanthroline-based ligand.

The newly synthesized palladium complexes of ethylenediamine were tested for cytotoxicity on MCF-7 breast cancer cells. The results showed that all the complexes showed cytotoxicity, similar to other phenanthroline compounds previously synthesized. These findings suggest that the palladium complexes of ethylenediamine may potentially be therapeutic agents for breast cancer treatment. In conclusion, the synthesis of palladium complexes of ethylenediamine using the proposed method has been successful, with reasonably good yields and desirable X-ray structure results. The cytotoxicity testing of these complexes on MCF-7 breast cancer cells showed promising results, making them potential candidates for further investigation as therapeutic agents for breast cancer treatment.

*PALLADIUM(II) COMPLEXES OF TERPYRIDINE AND 4-CHLOROTERPYRIDINE: SYNTHESIS, CHARACTERIZATION, AND CYTOTOXICITY STUDIES*

Austin Wayne; Betsy Leverett, Ph.D., Chemistry & Biochemistry; Hadi Arman, Ph.D., College of Sciences, Chemistry, UTSA; Rafael A. Adrian, Ph.D., Chemistry & Biochemistry.

**Purpose:** The purpose of this study is to synthesize and characterize new palladium(II) complexes containing both a terpyridine ligand and an antimetabolite ligand and to investigate their antiproliferative activity. The aim of the study is to determine the structure of these new complexes using various spectroscopic techniques and compare their cytotoxic activity against MCF-7 breast cancer cells with other known metal complexes. The research questions that we look forward to answering with this project are: What is the structure of the new palladium(II) complexes containing a terpyridine ligand and an antimetabolite ligand? How does the structure of the new complexes affect their antiproliferative activity against MCF-7 breast cancer cells? How do the cytotoxic activities of the new complexes compare to those of other known metal complexes? The hypotheses for this study are: Palladium(II) complexes can be synthesized by a two-step reaction involving dichloro(1,5-cyclooctadiene)palladium(II) and terpyridine in the first step, followed by the removal of chlorides with silver triflate and the addition of a secondary antimetabolite ligand. Palladium(II) terpyridine complexes will show significant antiproliferative activity in MCF-7 breast cancer cells. The antiproliferative activity of the new palladium(II) complexes will vary depending on the type of antimetabolite ligand used.

**Rationale:** Several studies have shown that platinum terpyridine complexes exhibit significant antiproliferative activity against various cancer cell lines, including breast, lung, ovarian, and colon cancer. The antiproliferative activity of these complexes is believed to be due to their ability to inhibit DNA synthesis and induce cell cycle arrest. However, platinum complexes can also be toxic to healthy cells, especially rapidly dividing ones, such as bone marrow and gastrointestinal cells. This toxicity can result in side effects such as nausea, vomiting, and anemia. To mitigate these side effects, researchers are exploring different strategies to reduce toxicity to healthy cells, including using other metals like palladium, gold, and copper. Palladium has some advantages that make it an excellent choice to replace platinum in antitumor drugs, including similar chemical properties, less expensive and more abundant, different modes of action that can potentially overcome resistance mechanisms, and higher selectivity towards cancer cells and low toxicity towards healthy cells. By investigating palladium(II) complexes based on terpyridine, this study offers valuable insights into the potential effectiveness of palladium as an antitumor agent.

**Methodology:** The starting materials, chloro(2,2';6',2''-terpyridine)palladium(II) and chloro(4'-chloro-2,2';6',2''-terpyridine)palladium(II) were synthesized following a well-known procedure that uses dichloro(1,5-cyclooctadiene)palladium(II), the terpyridine ligand and methanol as the solvent. In a typical reaction, the starting material is suspended in acetonitrile, followed by the addition of silver triflate. Silver triflate is used to remove the chloride ion of the starting material to speed up the reaction and improve the crystallization of the final product. The produced silver chloride is then removed by filtration to produce a yellow solution containing the palladium(II) ion chelated by the terpyridine. The secondary antimetabolite ligand is added to this solution as a solid; the reaction is then heated to 55 degrees Celsius to reduce the volume. Once the volume is reduced to about 15 mL, the solution cools down, and diethyl ether is added to precipitate the new complex. The synthesized complexes are then characterized by infrared spectroscopy, proton NMR, and single-crystal x-ray diffraction. The cytotoxicity of the complexes was evaluated against MCF-7 breast cancer cells using a standard MTT cell viability assay. The results were analyzed and compared to other known complexes to determine the structure's and antiproliferative activity's relationship.

**Findings:** The results of this study have shown that the proposed methodology is suitable for synthesizing palladium(II) terpyridine complexes. The use of infrared spectroscopy and proton magnetic resonance allowed the prediction of the coordination environment, but not the geometry, around the palladium(II) metal center. The x-ray crystal structures of the new complexes proved that the palladium(II) metal ion is fourfold coordinated in a distorted square planar geometry, with two triflates acting counterion. The new complexes show remarkable antiproliferative activity against MCF-7 breast cancer cell lines that depend on the antimetabolite used as a secondary ligand. However, the values obtained are inferior to the commercially available cisplatin and copper(II) phenanthroline compounds previously synthesized by our research group. In conclusion, the results proved our hypotheses for the project and demonstrated the potential of palladium(II) terpyridine complexes as a promising area for future cancer research.



*PROJECT SURGE: SUPER SENSITIVE NONCONTACT WEARABLE HAPTIC DEVICE FOR HIGH VOLTAGE (HV) DETECTION*

Emily Saenz; Aidan C. Quinn, Lucas A. Bryand, Okan Caglayan, Ph.D., Engineering

**Purpose:** To design a multisensor wearable device that can detect voltage through its electromagnetic field and measure environmental conditions to protect individuals working on power lines.

**Rationale:** High-voltage transmission lines are necessary for delivering electricity over long distances – from generating plants to distribution substations. Overhead high-voltage transmission lines are not insulated; therefore, it is a good practice to be cautious while working near transmission lines with any equipment or personnel. Electricity can arc, or flash, over a large distance, so any equipment or people in close proximity to the power lines can still be in danger of damage, injury or death – even without making direct contact with the power lines.

**Methodology:** The proposed wearable smart device was developed and implemented by using an Arduino microcontroller with multisensor framework with TinyML algorithms to provide rapid delivery of output data. The sensor data consisted of temperature, humidity, magnetometer to warn the user through tactile output with a visual display of information.

**Findings:** This project is fully funded by Power Engineering Services (PES). This project provided the undergraduate Engineering and Biology students an opportunity to apply their existing technical knowledge, improve their time management, communication skills, and work as a team on a real-world problem.

*REGULATION OF LOCOMOTOR BEHAVIOR BY A NOVEL GENE, IMPAIRED MOBILITY*

Natalie De La Cerda; Manzoor Bhat, MS, Ph.D, Professor & Chairman<sup>1</sup>; Swati Banerjee, Ph.D., Associate Professor<sup>1</sup>

**Purpose:** *Drosophila* is known to have rapid responses to stimuli as well as show sophisticated motor behaviors which include walking, jumping, climbing, and of course flying. These complex behaviors are controlled by a nervous system composed of the same basic neural circuitry with neuromuscular junctions and motor and sensory neurons similar to humans. (Lloyd et al. 2011) In addition, *Drosophila* is also used to study mobility disabilities resulting from the natural phenomena of aging or a variety of neurological/neurodegenerative disorders. For this reason, *Drosophila* was chosen for this project after a recent genetic EMS screen encoding WD-40 domain containing protein, in which there was the discovery of a new gene which was later aptly named iMob (short for Impaired mobility). Knockdown of iMob in neurons resulted in severe locomotor and motor coordination deficits. Locomotion is one of the most basic behaviors in most organisms that is required for survival and quality of life. At this point in time, the vertebrate homolog of the *Drosophila* iMob is uncharacterized and there are no available knockouts. With the previous observations, it was hypothesized that Impaired mobility regulates locomotion and motor coordination in *Drosophila*.

**Rationale:** This gene is conserved in flies, mice, and human beings. Upon complete deletion of the gene in *Drosophila*, it was observed that there was 90% lethality in the embryonic stage with the remaining 10% passing away within a matter of hours after hatching. Considering that this gene is also present in human beings, this suddenly presents itself as an important

gene to characterize due to its possible impacts on human life and well-being.

**Methodology:** The *Drosophila* lines used in this study included wild-type control, iMob[E110/E110], iMob[E110/HSC], VGlut>mCD8-GFP, iMob-RNAi /5HT 2B-Gal4, iMob-RNAi /VGlut - Gal4, and iMob-RNAi /5HT7-Gal4. Methodologies included conducting survival assays of females and males with varying genotypes. Larval Locomotor Assays such as grid crossing assay, righting assay, and peristalsis contraction assay were conducted to observe mobility. The adult behavioral assay known as RING, adult leg stainings, and adult brain stainings were used to observe effects in adult *Drosophila*.

**Findings:** To conclude, knockdown of Impaired Mobility in neurons resulted in severe locomotion disabilities. It was hypothesized that iMob regulates locomotion and motor coordination in *Drosophila*. Four different methodologies were used to support this hypothesis including survival assay, Larvae locomotion assay, adult behavioral assay, and immunohistochemistry staining of the brain and legs. Results from these methods have supported the hypothesis and even provide evidence that knockdown of Impaired Mobility is not responsible for affecting musculature but rather a neuronal circuit problem. Results concluded that the homozygous iMob knockdown showing reduced life span, heterozygous iMob[E110/HSC] Larva showed larval locomotor deficits, and knockdown of iMob in Serotonergic and Glutamate Receptors resulted in progressive locomotor deficits

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*SPOP MUTATIONS LEAD TO GLI3 STABILIZATION AND ENHANCED SHH SIGNALING IN BREAST CANCER*

**Jazmin Chavarria**

**Purpose:** Studies have found that SPOP, the substrate binding subunit of an E3 ubiquitin ligase, is frequently mutated in breast cancer. It is currently unclear what the mechanistic basis is behind SPOP mutant-driven breast cancer. Thus, the purpose of this study is to determine the mechanistic interplay between SPOP and GLI3 and how mutations within SPOP can drive breast cancer oncogenesis.

**Rationale:** Cancer is the second leading cause of deaths worldwide, following in close proximity behind cardiovascular disease. Though radiation and chemotherapy have been the frontline choice of treatment for cancer, personalized treatment is rapidly rising as a superior treatment method. Personalized treatment relies on identifying specific mutations that a patient harbors, so that a treatment regimen can be designed that will only target the oncogenic signaling pathways affected by the mutation. It is thus critical to not only identify novel cancer genes, but also to investigate the signaling pathways affected by these cancer genes. One gene that has been identified as commonly mutated in many cancers, including breast cancer, is SPOP, a substrate binding subunit of an E3 ubiquitin ligase. We have previously shown that SPOP targets GLI3 for degradation and that stabilized GLI3 in a SPOP mutant setting can drive prostate cancer progression. Our aim for this study is to investigate the relationship between SPOP and GLI3 in breast cancer so that we can better understand the mechanistic basis behind SPOP mutant breast cancer oncogenesis. The outcome of this study would ultimately allow for the identification of a personalized treatment strategy for patients suffering from SPOP mutant breast cancer.

**Methodology:** For our methodology, we first carried out co-immunoprecipitation assays in MCF-7 breast cancer cells to determine a physical interaction between SPOP and GLI3. Next, SPOP knockdown, by siRNA, or SPOP overexpression, by transfection, was performed followed by western blotting to investigate the relationship between SPOP and GLI3 expression levels. We also used MG132 treatment to determine involvement of the proteasome pathway. Finally, several SPOP mutant constructs were transfected followed by co-immunoprecipitation with GLI3 and ubiquitin to determine that SPOP binds to and targets GLI3 for degradation in a manner that is disrupted by SPOP mutations.

**Findings:** We found that endogenous GLI3 and SPOP form a physical connection in MCF-7 breast cancer cells. Furthermore, GLI3 was overexpressed upon knockdown of SPOP and degraded upon overexpression of SPOP. Furthermore, the degradation of GLI3 was dependent on activity of the proteasome pathway. Finally, we showed that three different SPOP mutant variants were unable to bind to and ubiquitinate GLI3 thereby causing GLI3 stabilization. All of these results indicate that SPOP binds to GLI3 in breast cancer cells to target it for degradation and that mutated SPOP leads to GLI3 stabilization. This indicates that the GLI3 signaling pathway would be hyperactivated in SPOP mutant breast cancer and that targeted drugs for this signaling pathway could prove to be beneficial for patients suffering from this disease.

*SYNTHESIS, CHARACTERIZATION, AND ANTITUMOR ACTIVITY OF DINUCLEAR COPPER(II) COMPLEXES WITH 2,2'-BIPYRIMIDINE AS BRIDGING LIGAND*

**Marcela Gutierrez; Dr. Betsy Leverett, Ph.D., Faculty, Chemistry & Biochemistry; Dr. Hadi D. Arman, Ph.D., Faculty, UTSA, College of Sciences, Chemistry; Dr. Rafael A. Adrian, Ph.D., Faculty, Chemistry & Biochemistry.**

**Purpose:** The purpose of this research is to synthesize novel dinuclear copper(II) complexes with potential biological applications. This study aims to synthesize a series of dinuclear copper(II) complexes with N-donor ligands and evaluate their cytotoxic activity against MCF-7 breast cancer cells. The study will provide insights into the structure-activity relationship of these dinuclear copper(II) complexes and their potential as antitumor drugs. The research question that we seek to answer with this research are: Can dinuclear copper(II) complexes be synthesized by the reaction of copper(II) chloride dihydrate and 2,2'-bipyrimidine? Is it possible to incorporate a secondary N-donor ligand in these complexes? What will be the cytotoxic activity of the resulting dinuclear copper(II) complexes against MCF-7 breast cancer cells? How will the cytotoxic activity of the resulting dinuclear copper(II) complexes compare to other known metal-based antitumor drugs? The hypothesis for this research is that the novel dinuclear copper(II) complexes synthesized by the reaction of copper(II) chloride dihydrate, 2,2'-bipyrimidine, and N-donor ligands will show cytotoxic activity against MCF-7 breast cancer cells and have potential as antitumor drugs.

**Rationale:** The study of novel dinuclear copper(II) complexes and their potential as antitumor drugs is important to the field of medicinal chemistry and cancer research. Cancer is a major public health issue, and there is a need for new and effective treatments to combat this disease. Metal-based complexes have shown promise as potential antitumor drugs due to their ability to target specific cancer cells and disrupt their growth and proliferation. Copper(II) is a transition metal with unique chemical and biological properties that make it an attractive candidate for developing new antitumor drugs. The use of N-donor ligands in the synthesis of dinuclear copper(II) complexes is of particular interest as it has been shown to increase their cytotoxicity against cancer cells. By synthesizing novel dinuclear copper(II) complexes and evaluating their cytotoxicity against MCF-7 breast cancer cells, this study will provide important insights into the structure-activity relationship of these complexes and their potential as antitumor drugs. This information will contribute to the development of new and more effective treatments for cancer, and it is important to the discipline of medicinal chemistry and cancer research.

**Methodology:** In our study, a multi-step process was utilized to evaluate the novel dinuclear copper(II) complexes synthesized from the reaction of copper(II) chloride dihydrate, 2,2'-bipyrimidine, and N-donor ligands. The process included synthesis, characterization, and in vitro evaluation of the cytotoxicity of the complexes against MCF-7 breast cancer cells. For the synthesis of the dinuclear copper(II) complexes, copper(II) chloride dihydrate reacted with 2,2'-bipyrimidine in acetonitrile for about 30 minutes. Silver triflate was then added to remove the chloride ions to free the metal to coordinate with the new N-donor ligands and to facilitate crystallization. After the removal of the silver chloride produced by filtration using a syringe filter, an N-donor ligand including was added to the resulting solution to yield the desired complexes. The resulting complexes were characterized by infrared spectroscopy and single-crystal x-ray diffraction, which provided valuable information on their structures. The in vitro cytotoxicity of the complexes was evaluated against MCF-7 breast cancer cells using a standard cell culture method. The cell viability was measured, and the IC50 values were determined. The results were compared to other known metal complexes, providing valuable information on the potential of the novel dinuclear copper(II) complexes as antitumor drugs.

**Findings:** The proposed synthetic scheme for the synthesis of dinuclear copper(II) complexes was successful, yielding the desired dinuclear complexes. The X-ray structure analysis of these complexes revealed the presence of the Cu metal ion in a distorted trigonal bipyramidal geometry, where the 2,2'-bipyrimidine acts as a bridging ligand. Furthermore, it was also observed that additional N-donor ligands could be incorporated into the resulting dinuclear complex. The newly synthesized dinuclear copper(II) complexes were tested for their cytotoxicity on MCF-7 breast cancer cells. The results showed promising cytotoxicity, suggesting the potential of these complexes as therapeutic agents for breast cancer treatment. In conclusion, the synthesis of dinuclear copper(II) complexes according to the proposed synthetic scheme have been successful. The structure analysis of these complexes revealed a distorted trigonal bipyramidal geometry and the ability to incorporate additional N-donor ligands. Furthermore, the promising cytotoxicity results on MCF-7 breast cancer cells make these dinuclear copper(II) complexes promising candidates for further investigation as therapeutic agents for the treatment of breast cancer.

*SYNTHESIS, CRYSTAL STRUCTURE, HIRSHFELD ANALYSIS, AND DFT CALCULATIONS OF A NOVEL MIXED LIGAND COPPER(II) COMPLEX OF 5-CHLORO-1,10-PHENANTHROLINE*

Malya Breen; Dr. Betsy Leverett, Ph.D., Faculty, Chemistry & Biochemistry; Dr. Hadi D. Arman, Ph.D., Faculty, UTSA, College of Sciences, Chemistry; Dr. Rafael A. Adrian, Ph.D., Faculty, Chemistry & Biochemistry

**Purpose:** The purpose of this study is to synthesize and characterize a mixed ligand copper(II) complex containing 5-chloro-1,10-phenanthroline and to evaluate their antitumor activity against a panel of cancer cell lines. The specific research aims for this project are: To synthesize a copper(II) complex containing 5-chloro-1,10-phenanthroline as an ancillary ligand. To characterize the synthesized complex and to evaluate non-covalent interaction in its solid-state structure. To evaluate the antitumor activity of the complexes against MCF-7 cancer cell lines. This project plans to answer the following research questions: Could the proposed methodology synthesize copper(II) complexes containing 5-chloro-1,10-phenanthroline and an antimetabolite as a secondary ligand? What structural features are present in this type of copper(II) complexes? How does including a chloro atom in the phenanthroline ring affect the cytotoxicity of copper(II) phenanthroline complexes? Our Hypotheses for this project based on our previous knowledge of copper(II) phenanthroline complexes are: Copper(II) complexes of 5-chloro-1,10-phenanthroline will be successfully synthesized by the reaction of copper(II) chloride, 5-chloro-1,10-phenanthroline, and an antimetabolite, producing square pyramidal coordination complexes. The antitumor activity of the copper(II) complexes with 5-chloro-1,10-phenanthroline as ancillary ligand will be lower than the obtained results for complexes with 1,10-phenanthroline

**Rationale:** According to the National Cancer Institute, 19,880 US women will receive an ovarian cancer diagnosis this year, and 12,810 US women will die from ovarian cancer this year. The most effective drugs considered the standard of care in advanced ovarian, testicular, and breast cancers are all platinum-based. While these drugs have high efficacy, their side effects frequently outweigh the benefits. Recently, copper(II) complexes have emerged as a promising alternative for antitumor therapy. Compared to other metals, copper is less toxic to humans due to its natural occurrence in small amounts in the human body. Recent studies have shown that copper(II) complexes using nitrogen-donor ligands are very effective in killing cancer cells, making them great candidates for antitumor therapy. The present study uses two different nitrogen-donor ligands, 5-chloro-1,10-phenanthroline and 2,2':6',2"-terpyridine, to chelate the copper(II) ion yielding a mixed ligand metallic complex. Due to its planar and symmetric structure, terpyridine and phenanthroline can intercalate between base pairs in the DNA double helix, distorting the DNA structure and affecting its function. This can lead to the inhibition of DNA replication and transcription, ultimately leading to cell death.

**Methodology:** The mixed ligand copper(II) complex described in this study was synthesized by adding one mol of 5-chloro-phenanthroline to an acetonitrile solution of copper(II) chloride dihydrate. After stirring this mixture for 30 minutes, a stoichiometric amount of silver triflate was added to replace the chloride ions in the copper salt resulting in the precipitation of silver chloride. Removal of the silver chloride by filtration with a PTFE membrane syringe filter affords a clear blue solution to which the second ligand, terpyridine, is added in a 1:1 ratio with the copper. The resulting solution was then heated for 30 minutes to reduce the volume; after the mixture had cooled down, diethyl ether was added to yield the mixed ligand complex as a dark green solid. Crystals suitable for X-ray diffraction were grown by vapor diffusion of diethyl ether over an acetonitrile solution of the complex. After the x-ray crystal structure was determined, the crystallographic file (.cif) generated was used as input for the Hirshfeld Analysis using the Crystal Explorer suite and DFT calculation using Gaussian 16. Cytotoxicity was measured using well-known assays for MCF-7 cancer cell lines.

**Findings:** A mixed ligand copper(II) complex was synthesized using the proposed methodology with good yield. The crystal structure shows that the copper(II) metal center is fivefold coordinated in a distorted square pyramidal geometry, with one molecule of 5-chloro-1,10-phenanthroline and one molecule of 2,2':6',2"-terpyridine occupying the inner coordination sphere of the metal; two triflate ions and an acetonitrile molecule complete the other coordination sphere and balanced the oxidation state of the metal. Non-covalent interactions stacking interactions between the terpyridine ligands in different molecules held the structure together and are responsible for the formation of the "sheets" in the unit cell of the complex. The newly synthesized mixed ligand complex is less cytotoxic than other copper(II) phenanthroline complexes previously studied in our research group, presumably due to the presence of the chlorine atom in the phenanthroline ligand.

Conclusions:

- Copper(II) complexes can be synthesized by the proposed synthetic scheme using 5-chloro-1,10-phenanthroline. (Figure 2)
- The X-ray crystal structure of complex 2 shows Cu<sup>2+</sup> metal ion sixfold coordinated in a distorted octahedral geometry, with two triflate ions in the axial elongated positions.
- All complexes show cytotoxicity in our first test on MCF-7 breast cancer cells (Figure 5); further studies are needed to determine the mechanism of action.

*TARGETING THE MOLECULAR CHAPERONE, HSP90, TO INHIBIT CANDIDA ALBICANS BIOFILM FORMATION*

**Leah Sterling; Christopher Pierce, PhD, Faculty, Biology**

**Purpose:** The purpose of this project is to characterize the effects of a novel Hsp90 inhibitor on *C. albicans* biofilm formation and determine the efficacy of the compound in treating disseminated candidiasis.

**Rationale:** *Candida* species represent a leading cause of opportunistic fungal infections worldwide, and *C. albicans* is the most common etiological agent of candidiasis. These infections are typically associated with unacceptably high morbidity and mortality rates, mainly due to the limited arsenal of antifungal drugs. Two important virulence factors associated with candidiasis are the formation of biofilms on the surfaces of host tissues and implanted biomaterials, and the ability of the organism to filament. Biofilms are highly structured communities of cells that are surrounded by a self-made exopolymeric matrix. The ability of *C. albicans* to switch morphologies, from yeast to hyphae (filaments) is key to biofilm formation. Considering the role of biofilm formation and filamentation in *C. albicans* infections, these processes represent a possible target for developing anti-virulence treatment strategies. Hsp90, a molecular chaperon, manages the folding and function of proteins. In *C. albicans*, Hsp90 enables drug resistance and virulence by stabilizing various signal

transducers. Inhibiting Hsp90 in *C. albicans* countermands drug resistance, reduces the tolerance to many stresses, reduces the transition from yeast to filamentous growth, and reduces virulence.

**Methodology:** The novel Hsp90 inhibitor, N-(4-nitrophenyl)-1-thiophen-2-yl)-1H,2H,3H,4H-phrrolo[1,2-A]pyrazine-2-carbothioamide, purchased from ChemDiv, was tested against *C. albicans* biofilms using the 96-well microtiter plate model. Current experiments are aimed to characterize the effects of this compound against the various stages of biofilm formation, including early adhesion and biofilm maturation, as well as its ability to inhibit planktonic growth and filamentation. In addition, the Hsp90 inhibitor will be tested using the *Galleria mellonella* waxworm animal model of disseminated candidiasis.

**Findings:** N-(4-nitrophenyl)-1-thiophen-2-yl)-1H,2H,3H,4H-phrrolo[1,2-A]pyrazine-2-carbothioamide inhibited biofilm formation by more than 60 percent at concentrations of 128  $\mu$ M. Considering the role of Hsp90 in drug resistance and biofilm formation, targeting Hsp90 represents a valuable strategy for the treatment of *Candida* biofilms.

*TLC AND LC-MS MONITORING CHROMATOGRAPHY FREE SYNTHESIS OF MONOTOSYLATION OF GLYCOLS AND DIOLS*

Adamina Arias; Ashok Khanal, Ph.D., Associate Professor, Chemistry

**Purpose:** The purpose of the experiment was to use tosylation for organic synthesis for a functional group interconversion. The alcohol functional group is converted into monotosylate. The Tosyl group also plays an important role in bioconjugation like oligonucleotide chemistry and amino acid chemistry. Glycols and diols were tosylates under controlled and mild conditions. The complete consumption of tosyl chloride was monitored by TLC then the reaction mixture was extracted to remove excess glycols or diols and pyridinium salt. The majority of ditosylated bi-product and remaining pyridine were removed by precipitation. Tosylate derivatives of glycol and diols were synthesized with a higher overall yield. Products were analyzed with TLC and ESI. The product does not require any expensive flash column chromatographic separation.

**Rationale:** Tosylation transforms the stable alcoholic group of the substrate into a fragile leaving group consisting of sulfonic ester/tosylate. The tosylate group

is a site for a variety of functional group interactions hence it has a huge impact on natural products and pharmaceutical applications. Tosyl group also play an important role in oligonucleotide chemistry and amino acid chemistry.

**Methodology:** The method used for the experiment was to set up the reaction in inert atm. The reaction would then be monitored until finished running. After, we proceeded with extraction to remove any water soluble impurities. The next step was precipitation and to analyze the results through TLC and/or Mass Spectrometry.

**Findings:** The goal of this experiment was achieved as we successfully synthesized the substrates with the tosylate group attached. Future work of the experiment will include purifying the compounds, collecting data for publications as well as finding more efficient ways to produce the same product.

*THE TREPIDATIOUS RETURN TO IN-PERSON INSTRUCTION DURING THE COVID-19 PANDEMIC: VALUABLE LESSONS APPLIED FROM ONLINE TEACHING USING LT IN THE FACE-TO-FACE CLASSROOM*

**Bridget M. Ford, PhD**

**Purpose:** The speed at which educators have embraced new technologies during the COVID-19 pandemic has been remarkable. Effective combinations of both online and face-to-face instruction must be investigated to help accommodate the convenience that online approaches offer students as we adjust to the return to in-person modalities. The anatomy and physiology lab curriculum at the University of the Incarnate Word (UIW) has adapted to this varied set of needs by adopting the use of the web-based laboratory software platform, Lt, from ADInstruments.

Utilizing end-of-semester student surveys, we asked students about the ease of use, facilitation of learning, alignment of course requirements with course level, enhancement of knowledge, and overall satisfaction while using Lt in the virtual and in-person laboratory space. We hypothesized that Likert scores for all questions and statements rated would improve for in-person sections when compared to online sections.

**Rationale:** The pivot to virtual instruction has been particularly difficult in courses where hands-on experiences are the norm, such as in anatomy and physiology laboratory courses. Adapting pedagogical approaches in the virtual landscape is not a new phenomenon for anatomy and physiology educators with many successful reports providing best practices to adapt didactic and laboratory methods to online or hybrid learning long before the COVID-19 pandemic.

Now with the transition back to mostly in-person instruction, the anatomy and physiology lab environment has faced a new set of challenges where the want to return to a strictly hands-on experience is being met with the need to still maintain flexibility and accessibility for students placed in quarantine.

**Methodology:** Twelve laboratory activities were selected from pre-built modules and lessons available in

Lt for human anatomy and physiology for both BIOL 2121 (Anatomy and Physiology I Lab) and BIOL 2122 (Anatomy and Physiology II Lab). We used the selected pre-built lessons as an outline for each lab and edited material to accommodate an online lab experience or a hands-on lab experience using Lt sensors to record physiological data.

A survey was designed using Microsoft Forms and administered to students at the end Fall 2020, Spring 2021, Fall 2021, Spring 2022, and Fall 2022. A five-point Likert scale was used to record student responses. Scores ranged between 1 and 5; '1' indicated 'Strongly Disagree' and '5' indicated 'Strongly Agree'. Survey results were used to adjust lab offerings and fine-tune the activities that were used again in proceeding semesters.

**Findings:** Students were surveyed every semester beginning fall of 2020 to fall of 2022. Ratings regarding ease of use remained high from semester-to-semester, but ratings regarding overall satisfaction, enhancement, and extension of knowledge above what is covered during lecture, and facilitation of learning improved as laboratory sections transitioned back to in-person learning. This helps to support the widely held belief that students perform best, and that instruction is more effective, with face-to-face laboratory courses.

While students appear to prefer in-person lab instruction, the flexibility provided by the online Lt lab platform still allows for the inevitability of students in quarantine who are unable to attend in-person labs. With our continued use of Lt, we are finding an effective combination of virtual and in-person instruction that best fits our course outcomes while still supporting the flexibility and accessibility our students require to best serve our students and maintain the rigor expected of an undergraduate anatomy and physiology lab experience.



*UNLOCKING THE POTENTIAL OF BEYOND VISUAL LINE OF SIGHT OPERATIONS: OBTAINING BVLOS WAIVERS FOR PART 107 sUAS LICENSES*

**Gabriel Davila, Orion Jones, Dr. Michael Frye, Autonomous Vehicle Systems (AVS) Research Laboratories, GEMS AEOP**

**Purpose:** The rapid expansion of sUAS applications has highlighted the need for flexible regulations that can accommodate evolving technology and operational requirements. While Part 107 regulations have facilitated the integration of sUAS into the national airspace, the BVLOS restrictions have limited their full potential. Obtaining a BVLOS waiver enables operators to leverage the advantages of extended range operations, enhancing efficiency and expanding possible use cases. This paper aims to provide a comprehensive guide to the waiver process and discuss the benefits of BVLOS operations, while also addressing potential future developments in the field.

**Rationale:** The integration of small Unmanned Aircraft Systems (sUAS) into the national airspace has seen remarkable growth in recent years. To ensure safety and efficiency, the Federal Aviation Administration (FAA) introduced Part 107 regulations, which include restrictions on operating sUAS beyond visual line of sight (BVLOS). This paper discusses the process of obtaining a BVLOS waiver for Part 107 sUAS licenses, highlighting the benefits and implications of such waivers. We present a comprehensive methodology, encompassing safety risk assessments, mitigation strategies, and performance monitoring. Furthermore, we discuss the potential benefits of BVLOS operations, including increased efficiency, cost reduction, and broader applications. Finally, we explore future developments in BVLOS technology and regulation and their implications for the sUAS industry.

**Methodology:** To obtain a BVLOS waiver, operators must demonstrate to the FAA that their proposed operations can be conducted safely. This process involves several key steps: Safety Risk Assessment: Identify potential hazards and risks associated with the proposed BVLOS operations. This includes assessing risks to people, property, and other airspace users. Mitigation Strategies: Develop and implement safety measures to minimize identified risks. This may involve advanced

onboard technology, such as sense-and-avoid systems, redundant communication links, and reliable power sources. Operational Procedures: Establish detailed operational procedures that ensure safety, including contingency plans for emergencies, lost link scenarios, and equipment failures. Performance Monitoring: Outline a plan for monitoring and evaluating the performance of the sUAS during BVLOS operations, including maintenance schedules, incident reporting, and data analysis.

**Findings:** Obtaining a BVLOS waiver for Part 107 sUAS licenses unlocks the full potential of sUAS operations by enabling more efficient, cost-effective, and diverse applications. By following a comprehensive methodology that addresses safety risks, mitigation strategies, and performance monitoring, operators can demonstrate to the FAA that their proposed BVLOS operations can be conducted safely and responsibly.

Discussion: BVLOS waivers provide significant benefits to sUAS operators, including - Increased Efficiency: BVLOS operations enable sUAS to cover larger areas and travel greater distances, reducing the need for multiple deployments or manned aircraft. Cost Reduction: BVLOS operations can decrease operational costs by reducing manpower requirements and enabling more efficient resource allocation. Expanded Applications: BVLOS capabilities open new opportunities for sUAS applications, such as infrastructure inspection, precision agriculture, and search and rescue operations.

Future Work: As the sUAS industry continues to evolve, advancements in technology and regulation will shape the future of BVLOS operations. Research and development in areas such as sense-and-avoid systems, artificial intelligence, and communication technology will enhance the safety and capabilities of BVLOS sUAS. Furthermore, ongoing collaboration between industry stakeholders, regulators, and policymakers will be crucial in refining regulations and fostering a supportive environment for the growth of BVLOS operations.

*USING SATELLITES TO UNDERSTAND HOW SAHARAN DUST IMPACTS THE ATLANTIC OCEAN*

**Katelyn Simonsen**

**Purpose:** The purpose of this research is to investigate how the multiple features of satellites and sensors can aid in tracking the Saharan Air Layer and discovering the impacts to tropical development. It looks at how the Lower-Level Water Vapor, Split Window, Dust Aerosol Optical Thickness, Meridional Wind and Caribbean Soundings show the movement and impacts of Saharan Dust. The Split-Window appears to show the clearest distinction between clouds and the Saharan Air Layer. This information will help in future studies and predictions of hurricane development.

**Rationale:** The year 2022 was forecasted to have a great amount of tropical activity throughout the Atlantic Ocean. However, the Atlantic Hurricane Season saw little tropical development. One major reason for the decrease in tropical storms can be attributed to the Saharan Dust Storm which becomes prominent between the months of June through October. Over the past few decades, improvements to satellites and sensors have allowed researchers to gain a better understanding into how the Saharan dust moves across the Atlantic and the implications the Saharan Air Layer (SAL) has to the Atlantic tropical season. This research will take a closer look into how improvements to satellites and sensors increase the ability to both track Saharan Dust movement across the Atlantic Ocean and grow the understanding of impacts to tropical storm development. The resources used will investigate which satellites provide optimal viewing and tracking information, what data can be collected about the SAL, and the direct correlations of Saharan Dust to tropical development. With this information, future studies and predictions of hurricane development can be developed.

**Methodology:** The data used for this research into Saharan Dust is pulled from a variety of satellite imagery and models. Sources include the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Association (NOAA), the National Weather Service (NWS), and the University of

Wisconsin-Madison. The period this research covers is from the beginning of June 2022 to the middle of October 2022. During these five months the movement of the Saharan Dust across the Atlantic Ocean is most prominent. The satellite images used will be of the GOES-16 SAL tracking product, which will allow for the tracking of the Saharan Dust across the Atlantic. The GOES-16 SAL Low Level Water Vapor uses wavelength of 7.3  $\mu\text{m}$ . This band will help in visualizing the amount of dry and moist air throughout the five month period. Other important satellites include the GOES-16 Low-Level winds and the Aerosol Optical Thickness. Each of the bands listed above use Infrared sensors to view the moisture content and the dust particles in the atmosphere. Several Caribbean Soundings are used to show the percentage of dust over the period of five months. The satellite imagery is viewed from the 15th of each month at 12 zulu.

**Findings:** The SAL Low-Level Water Vapor shows the moisture content throughout the whole Atlantic Ocean. This product shows more extensively where the dry air is and where there is less possibility of tropical development. The next data element used was the SAL Split-Window. While this product does not show the transition between dry and moist air, it does clearly show a distinction between clouds and the dry dusty air. This product more accurately shows what part of the dry air has the Saharan Dust within it. Dust Aerosol Optical Thickness then specifies where the dust is in the atmosphere regardless of the moisture content. Learning about the impacts of Saharan Dust on tropical development is important especially after the 2022 hurricane season. This year was predicted by the National Hurricane Center to have many named storms, however the total of named storms remained at 14 with the first named storm developing in June. The fourth storm, first to reach hurricane status, formed late into the season during the month of September (NHC, 2022). If the movement of Saharan Dust is further understood, then scientists can incorporate this knowledge into predictions for future hurricane seasons.

*ZINC(II) COMPLEXES OF 2,2':6',2''-TERPYRIDINE: SYNTHESIS AND CHARACTERIZATION*

Amore Gonzalez; Betsy Leverett, Ph.D., Chemistry & Biochemistry; Hadi Arman, Ph.D., College of Sciences, Chemistry, UTSA; Rafael A. Adrian, Ph.D., Chemistry & Biochemistry

**Purpose:** The purpose of this study is to synthesize and characterize zinc(II) complexes containing 2,2':6',2''-terpyridine as triflate and nitrate salts. The specific aims of this research are: 1) To synthesize zinc(II) complexes containing terpyridine as an ancillary ligand plus an additional N-donor ligand, including isonicotinamide, acetamide, imidazole, 4-cyanopyridine, and theophylline. 2) To characterize the synthesized complexes using infrared spectroscopy, proton NMR, and single-crystal x-ray diffraction. The research questions to be answered by this project are: 1) Could the proposed methodology synthesize zinc(II) terpyridine complexes reliably? 2) What is the coordination environment around the zinc(II) metal center in these complexes? 3) Does the choice of counterion, triflate or nitrate, play a role in the structure obtained for the new complexes? The Hypotheses used for this study are: 1) Zinc(II) terpyridine complexes can be reliably obtained, using methanol as solvent, following the proposed synthetic methodology. 2) Different counterions will create different inner sphere environments around the new complexes' zinc(II) ion.

**Rationale:** Terpyridine and its derivatives are widely utilized chelating ligands with various applications, including catalysis, supramolecular design, and drug development. Zinc has proven to be a good alternative to heavy metals like platinum for biomedical applications for several factors, including: it is widely available, inexpensive, and less likely to cause adverse effects than other metals because it is naturally present in our bodies as an essential metal. Additionally, it can form stable complexes with ligands N-donor and O-donor ligands, which can enhance their bioactivity and specificity, allowing for precise delivery to biological targets. As part of our research on metal complexes with biological applications, our research group is currently focused on synthesizing zinc(II) complexes with biological applications. Although previous attempts carrying out similar synthesis using acetonitrile as a solvent have yielded a multitude of complexes, these

complexes are not stable and disproportionate to less desirable species. Our intention with this project is to figure out synthetic conditions using methanol as a solvent, making it possible to isolate more stable zinc(II) terpyridine complexes.

**Methodology:** The zinc(II) terpyridine complexes will be synthesized following the methodology previously used to synthesize these compounds in acetonitrile. In a typical synthesis, zinc(II) chloride and terpyridine will be mixed in methanol for about 30 minutes with heating. Silver nitrate or silver triflate will be added to the resulting suspension to remove the chloride ions from the zinc(II) and facilitate the coordination of the terpyridine ligand. A precipitate of silver chloride is then removed by filtration using a PTFE membrane syringe filter. The secondary ligand is added to the clear remanent solution to yield the proposed compound after adding diethyl ether. Crystals suitable for X-ray diffraction were grown by vapor diffusion of diethyl ether over a methanol solution of the complexes. The solid sample is analyzed by infrared spectroscopy to verify the coordination of the ligands to the zinc(II) metal ion and by proton NMR to establish the number of coordinated terpyridine and secondary ligands.

**Findings:** The proposed methodology provides an efficient and reliable way to synthesize zinc(II) terpyridine complexes; using methanol improves the synthesis and increases the percent yield of the reaction. Infrared spectroscopy is a valuable tool to determine if the ligands are coordinated with the zinc(II) metal ion. The proton NMR spectra suggest a structure where the zinc(II) metal center is coordinated by one terpyridine ligand and at least one secondary ligand. Although we have obtained suitable crystals for x-ray crystallography, at this time, the results of that analysis are inconclusive. However, infrared and nuclear magnetic resonance point to differences in the structure of the complexes when switching the counterion.

## SCHOOL OF MEDIA AND DESIGN

### *SERIOUSLY, WHY ARE GIRLS IN SONGS ALWAYS 17?*

Adriana Rodriguez

**Purpose:** This research paper focuses on the question: Why are girls in songs always seventeen? To answer it, I conducted a rhetorical analysis of three songs from three different artists. I examine these songs through a feminist lens, which begins with the assumption that we live in a male-dominated society, where there is gender inequality between men and women (Brummett, 2018). The three songs include "If I Knew," by Bruno Mars (December 7, 2012), "1980's Horror Film," by Wallows (2018), and "Girls" by The 1975 (October 23, 2013).

**Rationale:** In this paper, I identify three main themes across these three songs: teenage innocence as desirable, a coming-of-age theme, and the over-sexualization of young teenage women. I argue this topic is important because if we analyze the way women are portrayed in the media (in this case through music lyrics), we can gain insights into issues of gender inequality, such as double standards that women and men are subject to.

**Methodology:** I conduct a rhetorical analysis of the lyrics of three songs to interpret their views on seventeen-year-old women. I will support my arguments with scholarship that discusses how women are over-sexualized in the media, portrayed as passive and innocent, and with storylines that follow the typical coming of age theme that is frequently shown in films. I highlight some of my theoretical sources below:

Myriam Denov (2003) argues that women in the media have long been portrayed as sexually passive and innocent, while Monique Ward (2016) finds that female sexuality has become commonplace across media representations.

Sarah Sheppard (2022) demonstrates that when young girls are exposed to unrealistic media standards, they develop problems such as internal-conflict that affect their mental health.

Sam Kench (2022) identifies a coming-of-age film as one that centers around the act of growing up, maturation, and has a strong focus on character arcs.

**Findings:** These songs provide evidence that we have built a society where the media is obsessed with over-sexualizing women. Continuing to project these ideas onto young women, especially minors, is damaging to their mental health. I argue that these media representations encourage young men to treat women in an objectifying way and normalize this type of behavior within our society. From news articles, to films, to music, we can find numerous examples of media that has participated in objectifying women and teenagers. I argue that these three songs are not outliers, but representative of a music industry that sexualizes teenage girls.

## SCHOOL OF OSTEOPATHIC MEDICINE

### *ANNUAL PROVIDER EVALUATION AND PROGRAM FIDELITY EVALUATION OF THE DREAM INITIATIVE COMMUNITY HEALTH WORKER (CHW) INTERVENTION FOR DIABETES PREVENTION*

**Sadia Mohaimin; Shahmir Ali, Jennifer Zanowiak, Shinu Islam & Nadia Islam**

**Purpose:** Test the effectiveness of an integrated EHR-based intervention plus CHW-led health coaching of registered patients compared with usual care.

Research Questions: Implementation - What are the barriers and facilitators to the DREAM CHW led intervention? How can CHW programs be sustained within primary care practices? How should the intervention and results be disseminated for use among PCPs and the community? Feasibility - What is the feasibility and acceptability of the transition to a remote intervention? How can future interventions effectively utilize in-person remote components?

Hypothesis: Providers will note barriers regarding time constraints, space, communication, and challenges related to the COVID-19 Pandemic. Shift to a virtual recruitment and intervention delivery created challenges but also opportunities to recruit and engage South Asians at-risk for diabetes. Transition to a virtual curriculum can have high levels of fidelity and patient satisfaction.

**Rationale:** Growing evidence suggests that the addition of community health workers (CHWs) to the primary care team is a low-cost and cost-effective approach to improve care and adherence for patients with chronic diseases. DREAM Initiative is a CHW intervention for South Asian patients at-risk for diabetes at primary physician (PCP) sites and the aim of this intervention is to test the effectiveness of an integrated EHR-based intervention plus CHW-led health coaching of registered patients compared with usual care.

**Methodology:** Surveys and qualitative interviews with providers guided by the consolidated framework for implementation research (CFIR) framework. Development of an interview guide. Conduct and translate interviews with study participants to understand satisfaction, barriers, and facilitators to participation. Code and analyze the data using a constant comparison approach. Examine data in our online research database related to in-person and virtual intervention components including the transition to remote context as a result of the COVID-19 pandemic.

Consolidated Framework for Implementation Research. Commonly used determinant framework in implementation science, consists of:

- Inner setting (organizational context)
- Outer Setting (policy, community setting)
- Characteristics of Individuals
- Intervention Characteristics
- Processes (what's in place to support it)
- Different levels we want to think about & understand when planning for implementation.

**Findings:** Research Findings:

- Inner setting: Relationship between all stakeholders have evolved significantly throughout the intervention and is demonstrated within the final year data results as well
- Outer Setting: CAB members noted community collaborations to be a significant aspect in assuring intervention successes
- Intervention Characteristics: CHWs play a central role in adapting the intervention to fit the needs of patients
- Processes: Continued fidelity assessments allowed for continued consistency
- Characteristics of Individuals: Individuals' current situation (family, technological capacity) were important factors in implementation

Key Findings and Implications for Provider Engagement-Engagement/Communication: Preliminary findings show that some providers felt less engaged in the project during the remote phase. Those that were happy with engagement reported their assigned CHWs regularly followed up with patients via phone call, set up meetings with the patients, focused greatly on diet and exercise with their patients and patients reported back to their physicians on progress. Strategies to improve provider communication/engagement are important for future interventions that use a hybrid or remote delivery model. Trainings: Providers found the EHR trainings to be highly useful and helped change the practice's workflow. Future interventions can increase the number of HER trainings and tailor to the specific wants of the practice.

*ANTI-CANDIDA ACTIVITY OF NOVEL COPPER PHENANTHROLINE COMPLEXES*

**Keith Kern**

**Purpose:** Previous studies have examined complexes of Cu (II) with a variety of phenanthroline ligands as anti-microbial agents employed against *Pseudomonas*, *Staphylococcus*, and *Candida* biofilms. In this study, a series of novel copper complexes containing isonicotinamide and phenanthroline ligands has been evaluated in vitro for their impact on established biofilms, biofilm formation, and fluconazole sensitivity in *Candida albicans*.

**Rationale:** Copper-phenanthroline complexes have demonstrated toxicity against *Candida* species, and metal-based agents have recently been employed to enhance fluconazole sensitivity in biofilm formations of *Candida albicans*, an increasingly drug-resistant fungal pathogen. Transition metal complexes of antifungal and antimicrobial ligands, especially those containing copper and zinc, offer advantages over other metal-based agents and combination treatments currently in clinical

use, including (i) the relative ease of synthesizing copper and zinc complexes; (ii) the lower cost of copper and zinc starting materials; and (iii) the reduced systemic toxicity of these metals.

**Methodology:** In this study, a series of novel copper complexes containing isonicotinamide and phenanthroline ligands has been evaluated in vitro for inhibition of *C. albicans* film formation, cytotoxicity in established *Candida albicans* (strain sc5314) biofilms, and in vitro enhancement of fluconazole sensitivity in established biofilms of *C. albicans*.

**Findings:** Copper complexes containing phenanthroline and substituted phenanthroline demonstrate statistically significant cytotoxicity in established *C. albicans* biofilms and some limited inhibition of biofilm formation. However, enhancement of fungicidal activity in fluconazole treated biofilms was not observed.

*BACKGROUNDS AND PERSPECTIVES OF SAN ANTONIO STREET SLEEPERS*

Christopher Paulo, OMS-III; Amy Moore, PA-C, DSc; Anastasia Abbott, OMS-III; Logan Bruntmyer, MA, OLLU; Ui Lee, OMS-III; Hannah Redwine, OMS-III

**Purpose:** To hear from the population personally as to why someone has become homeless and what keeps them there. The ultimate goal is for such research to help guide outreach services and legislation related to PEH.

**Rationale:** The question of what brings someone to homelessness and keeps them there has many varied and complex answers. The authors believe that the answer lies within the persons experiencing homelessness (PEH).

Walking Market Street in San Francisco, primary author noted large unsheltered population. In 2018, began seeking answers to questions about why and how the homeless become homeless in a place like San Francisco. The primary author collaborated with the Head of Psychology and Sociology at NDNU and assembled the original research proposal, *The Enigma of Homelessness*. Initial literature review was limited to few variables in scope. The primary author was curious about a more global view of how the homeless become homeless. Identified 7 categories of research under the mentality of exhaustive intent.

1. One-on-one interviews
2. Legislative factors
3. Interactions between homeless and healthcare workers
4. Interactions between the homeless and citizens
5. Interactions between the homeless and police
6. Economic factors
7. Ethnographic study

**Methodology:** This is an interpretive approach study based on convenience sampling of the unsheltered population in San Antonio, TX, utilizing semi-structured interviews from January 2022 through November 2022. N of 28 - Each member of the investigative group

interviewed 4-6 unsheltered individuals at various locations in San Antonio using a semi-structured interview format informed by a standardized questionnaire. The focus was to allow the homeless individual to speak their mind and describe their story. Interviews were recorded, transcribed and coded using Grounding Theory to identify themes.

Through a PubMed and Google Scholar search with the key term "interviews with the homeless," primary articles were identified that utilized one-on-one type information gathering. Interview topics spanned from homeless individuals' access to technology (Harris, 2019) to the prevalence of abuse in early life of young adults (Tyler, 2006). The scope and limitations of the primary studies shaped the questionnaire used in this study. Other factors examined PTSD associated with military service (Harris, 2017), and addiction (Polcin, 2015).

**Findings:** Initial coding to assess age, ethnicity, marital status, physical and mental health disorders, and access to technology. Through the coding process we identified nearly 30 themes we thought were relevant, then grouped them. Six of the most common themes were then identified. The six most common themes that emerged from the subjects' backgrounds were:

1. Jail or prison time or other personally significant legal issues
2. Personal substance abuse or addiction struggles
3. Physical and mental health challenges as an adult
4. Disdain of shelters and preference for rough sleeping
5. Experienced a difficult childhood.
6. Did not enjoy school as a child or young adult.

**Conclusion:** To gain more insight into any situation, especially one as complex as the state of homelessness, researchers should go to the source and meet with those on the frontline of this epidemic and hear first-hand personal histories, challenges, successes, and suggestions.

## SCHOOL OF OSTEOPATHIC MEDICINE

### *BILATERAL EXTRA-RENAL PELVISES AND CALYCES WITH VASCULAR VARIATIONS IDENTIFIED IN TWO MEDICAL SCHOOL DONOR CADAVERS*

**Ressiel Nicole Villegas, MPH, OMS-II; Denise Nemeth, MPAS, OMS-II; Robert Chalk; Terrence McGarvey, Ph.D.**

**Purpose:** The purpose of our study is to bring awareness to anatomical variations within the human body. Anatomical variations can pose a danger to both the surgeon and the patient during invasive procedures. Documentation of such anatomic variations in prosected donor bodies can further inform medical students, physicians, and surgeons-in-training of the need for imaging prior to various surgical procedures and can contribute to positive outcomes. Anatomical variations should be a part of the medical school curriculum and should be introduced early on rather than as a part of Graduate Medical Education. Dissection and prosection are both valuable parts of medical education and introduce students to many of the possible anatomic variations encountered in clinical practice. Incorporating this into medical school curricula will better train future clinicians to have a keen eye for anatomical variations that can significantly impact patient outcomes and safety, especially during surgery.

**Rationale:** Often, anatomical variations can be under-reported in the literature. In this specific case, we present a myriad of congenital kidney and urinary tract anomalies. Congenital kidney and urinary tract anomalies have been reported to occur in between 3.3 to 11.1 % of patients in various imaging studies. Anecdotally, we have encountered that these are not as rare as the literature suggests. While imaging plays a vital role in early diagnosis and proper management, some variations have been reported to be missed. Additionally, it is not uncommon to mistake a variation for pathology, leading to unnecessary workup and even treatment. Anatomical variations within patients can be of no significance or turn a routine surgical procedure into a hazardous process if unrecognized at the time of intervention. Further documentation of such anatomical variations in prosected donor bodies can further inform surgeons of the need for imaging before various surgical

procedures. We believe that these variations should be a part of the medical education curriculum.

**Methodology:** Routine dissections of two donor cadavers were performed at the University of the Incarnate Word School of Osteopathic Medicine Anatomy Department. The following findings were incidental. Careful dissection was done to preserve the anatomy. Anatomical variations were recorded and photographed for further documentation.

**Findings:** Donor #1: Bilateral extra-renal pelvises including multiple extra-renal major and minor calyces. We found multiple venous/arterial variations including one in a major artery. With regards to the arterial supply to the kidneys, there were multiple additional hilar and polar arteries found. There was a markedly long left common iliac artery compared to the right common iliac artery. Donor #2: Right kidney with an extra-renal pelvis and both extra-renal major and minor calyces. Left kidney with an extra-renal pelvis including multiple extra-renal major and minor calyces, as well as a superior polar renal artery and a large anterior renal cyst. Bilaterally, there was extra-hilar segmental branching of the renal arteries.

**Discussion:** Anatomical variations can pose a danger to both the surgeon and the patient during invasive procedures. Documentation of such anatomic variations in prosected donor bodies can further inform physicians and surgeons of the need for imaging prior to various surgical procedures and can contribute to positive surgical outcomes. Anatomical variations should be a part of the medical school curricula. Exposure to variations is beneficial at an early stage in learning rather than only as part of Graduate Medical Education.



*COMBATTING HEALTH INEQUITY AMONG MARGINALIZED POPULATIONS WITH CHRONIC PAIN THROUGH THE UTILIZATION OF THE FOUR TENETS OF OSTEOPATHIC MEDICINE*

**Alan Truong, OMS-II; Cassandra Millan, MPH, OMS-II; Jevaughn Henry, MS, OMS-II; Emily Truong, OMS-II; Sachin Abraham, OMS-II; Blaine Jacobs, PhD; Carol Browne, DO**

**Purpose:** To assess healthcare providers' behaviors and biases that drive health disparities toward marginalized populations with pain conditions and develop a framework utilizing the four tenets of osteopathic medicine to improve these health disparities. Marginalized communities with chronic pain experience inadequate healthcare. Osteopathic medicine is underutilized in areas of these marginalized communities due to health inequity. The four tenets of osteopathic medicine, used as a framework for care, can be implemented in such communities.

**Rationale:** Chronic pain is the leading cause of disability in the United States, with 40 million Americans experiencing severe pain and approximately 20 million dealing with pain that regularly prevents daily life and work activity. Marginalized communities with chronic pain, limited to socioeconomic and racial/ethnic minority populations for this study, are particularly susceptible to inadequate healthcare. Furthermore, this inadequacy in care may put them at risk for continued socioeconomic disadvantages, perpetuating a cycle of disparities that may be passed onto subsequent generations. Osteopathic medicine provides a cost-effective, integrated approach to addressing the needs of these marginalized communities. This can be accomplished through the utilization of the Four Tenets of Osteopathic Medicine. This model provides a framework to improve health outcomes in these marginalized populations by educating providers about barriers faced by these communities to allow for more effective care. The implications of these findings could provide a benefit to the residents of San Antonio and reduce the inadequacies that currently exist in patient care.

**Methodology:** Snowball sampling technique was used to identify articles from PubMed, JAMA, Cochrane Library, and MedLine-EBSCO databases discussing healthcare providers' behaviors and perceptions toward disadvantaged patient populations with pain conditions.

Relevant articles included were based in the United States and published within the last 10 years. Qualitative analysis was performed relating themes to the four tenets of osteopathic medicine. Generation of an osteopathic tenet framework was guided by this analysis.

**Findings:** A total of 10 relevant studies were selected for analysis. Themes related to osteopathic tenets were ranked from most observed to least observed in this order: Tenet #1, Tenet #4, Tenet #2, and Tenet #3 (with Tenets #4 and #2 being equal with 3 observations each). The findings support the general acceptance of a holistic approach to medicine yet demonstrate potential provider biases in practice. Utilization of a healthcare approach directed by osteopathic tenets is suggested to diminish the biases directed towards patients of marginalized communities.

**Conclusion:** Despite limitations of small literary sample size, findings of this study serve as a call to action for healthcare providers to recognize and address their role in perpetuating health inequities for disadvantaged patients. Application of the four tenets of osteopathic medicine allows providers an approach to reduce these inequities.

**Future Directions:** Future research can focus on other aspects of an individual, including culture, religion, gender identity, and sexual orientation, that prove to be barriers to patients receiving holistic care. Following this, extending the opportunity for bias training with physicians practicing in Bexar County would ideally allow for more equitable care throughout the San Antonio Metropolitan area. In conjunction with this, also offering opportunities for these providers to learn about alternatives to treating chronic pain, including osteopathic manipulative treatments and how their patients can be referred for this care at free clinics such as the UIWSOM COMC clinic, would be another way to streamline care for marginalized communities, with a focus on District 3.

## SCHOOL OF OSTEOPATHIC MEDICINE

### *COMMUNITY GARDENS: A TOOL FOR PUBLIC HOUSING COMPLEXES TO COMBAT FOOD INSECURITY*

**Sarah Suhood, MS, OMS-II; Carmel Tovar, OMS-II; Chayanne Robinson, OMS-II; Sydney Love, OMS-II; Bridgette Keilhack, OMS-II**

**Purpose:** Community Gardens can play an integral role in addressing food insecurity amongst the older adult population within public housing include musculoskeletal, dermatologic, mental and gastrointestinal health.

**Rationale:** Food Insecurity continues to plague underserved communities in the United States and worldwide. With the interconnectedness of the social determinants of health, at-risk populations experiencing other barriers to health, such as homelessness and poverty, will further suffer from food insecurity to a greater degree. In San Antonio, Texas, because of the large population of people suffering from homelessness, many community members depend on public housing resources. With a shortage of public housing, food insecurity can be experienced to a greater degree by older adults and disabled populations that depend most on such resources. Locally, food insecurity can be improved by implementing community gardens.

**Methodology:** A literature review was performed gathering information on the relevance of this issue to

the San Antonio regarding food insecurity and the local public housing program. Further research was done to provide evidence on the benefits for the older adult population.

**Findings:** The path to bridging health disparities is vast, requiring the participation of the federal and state governments, healthcare networks, small communities and each individual. With federal programs such as the Public Housing Program in place, working to improve such facilities to treat other disparities can further advance their benefits. Community gardens would facilitate the progress to fight against food insecurity in at risk populations residing in government housing.

- Community gardens can combat food insecurity.
- Addressing food insecurity in public housing programs can help at risk populations.
- Multiple health benefits in the older adult population.
- Food insecurity can begin to be addressed on a local scale.

*CROSS-SECTIONAL ANALYSIS OF THE EFFECT OF METFORMIN HYDROCHLORIDE EXPOSURE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS ON THE DEVELOPMENT OF COGNITIVE DECLINE*

**Jessica Fernandez; Liam Campbell, MS, Adam Dryfhout, Jessica Fernandez, Kara Jones, Lauren Ray, MPH; All authors are Candidates at SOM**

**Purpose:** To better understand possible correlations between common T2DM treatments and their effect on cognitive performance in patients diagnosed with T2DM. Hypothesis: T2DM patients using metformin may have better cognitive outcomes with respect to impaired cognition diagnosis than T2DM patients using other T2DM medications, patients with uncontrolled T2DM, and controls without T2DM.

**Rationale:** Type 2 Diabetes Mellitus (T2DM) is a significant public health problem for Bexar

County with an estimated 15% prevalence. T2DM represents an epidemic due to changes in dietary habits, increasingly sedentary lifestyles, and a growing elderly population. These factors are also associated with increased risk for dementia, and are both leading causes of cognitive decline in elderly patients. Metformin is a first-line medication for treatment of T2DM that may have beneficial effects on cognitive function. However, the association between well-controlled diabetes with metformin use and risk for dementia has not been well-established, with some literature even supporting metformin use associated with increased risk of dementia.

**Methodology:** A cross-sectional analysis examined the association between adherence to metformin among T2DM patients with the outcome of impaired cognition as the primary endpoint. Data were abstracted from de-

identified electronic health records stored in the publicly available All of Us Research Program database, a public health data repository sponsored by the National Institutes of Health. The association between metformin adherence and outcome of cognitive decline was analyzed with Chi-square testing, odds ratio (OR), and relative risk (RR) determinations.

**Findings:** There were 45,360 (12.2%) patients diagnosed with T2DM, 12,288 (3.3%) were diagnosed with impaired cognition, and 214,040 (57.5%) had exposure to metformin hydrochloride. Control measures included age-matched healthy controls who did not have a diagnosis of T2DM. Hypothesis testing using Pearson's Chi-square test for independence returned a Chi-square statistic ( $\chi^2$ ) of 651.886, compared to a tabulated value of 7.815 at  $\alpha=0.05$  and  $df=3$ . This result is sufficient to reject the null hypothesis of independence, showing that a diagnosis of cognitive decline in our patients was dependent upon exposure group, with  $p<0.001$ . All patients with T2DM had an increased OR and RR relative to the control group without T2DM with regards to a finding of impaired cognition. Within treatment groups, OR and RR were both lowest in the T2DM with Other medication group, indicating that second-line treatments for T2DM may provide slightly better outcomes for patients with regards to the outcome of cognitive decline.

*IDENTIFYING BARRIERS TO PHYSICAL ACTIVITY AND EXERCISE WITHIN THE BEXAR COUNTY COMMUNITY*

Michael Shaffer, MS; Ethan Renfrew<sup>1</sup>; Nancy Kha, MPH<sup>1</sup>; Nicole Villegas, MPH<sup>1</sup>; Michael Naley<sup>1</sup>; Virgil Demario, MS<sup>1</sup>; Kimberly Lince, MS<sup>1</sup>; Bailie Moorhead<sup>1</sup>; Niva Shrestha<sup>1</sup>; Brendon McCullough<sup>1</sup>; Rebecca Sanchez, PhD; Arunabh Bhattacharya, PhD

**Purpose:** The purpose of this study is to identify barriers to participation in exercise within Bexar County, Texas, and compare barriers common to specific communities based on location, age, gender identity, race, education level, and socioeconomic status.

**Rationale:** Regular physical exercise consistently reduces chronic disease and all-cause mortality. Despite this overwhelming evidence, nearly half of Americans do not get the Centers for Disease Control recommended amount of aerobic exercise and resistance training each week. Research also supports that participation in exercise is not equitable as participation disparities based on socioeconomic status, education level, and race exist. Barriers to exercise are well documented in the literature, suggesting that factors such as lack of time, limited resources, lack of motivation, fear of injury, and many others contribute to a lack of participation. Community-based exercise programs are an effective way to improve exercise participation and adherence. However, to successfully implement these types of programs, barriers to participation in exercise within a given community must be identified and mitigated.

**Methodology:** An electronic survey developed in Qualtrics will be distributed throughout Bexar County, utilizing social media marketing, to collect data regarding individuals' identified barriers to participation in exercise. This survey, developed by our research team using previous research precedents, evaluates specific barriers under various domains including safety, time, transportation, resources, and personal factors. Once data is collected, it will be analyzed using a 2-sided Fisher's exact test to assess whether survey variables are

associated with reported barriers to exercise within the Bexar County community.

**Findings:** Our analysis revealed that race was a significant factor in several of the reported barriers to exercising. Specifically, different racial groups reported significantly different levels of barriers related to allergies, lack of transportation, occupational physical activity, access to online exercise resources, feeling unsafe exercising outdoors due to race or lack of lights, feeling unsafe exercising at a gym due to race or sexual orientation, lack of knowledge about generating an exercise plan, lack of enjoyment, not feeling healthy, and religious reasons. These differences were statistically significant with a p-value of less than 0.05 for each statement. Additionally, Total Barrier Score (TBS), or aggregate of Likert scale values for each barrier item, was calculated and analyzed. TBS did not differ significantly based on race or gender. Age was the only demographic factor that showed significant differences in TBS, with younger participants reporting higher TBS, or more barriers to exercise, compared to older participants. Conclusion: Age and race differences to perceived barriers to exercise have been identified in Bexar County. An essential first step in creating exercise opportunities that are diverse, equitable, and inclusive is to understand the perspectives and experiences that relate to exercise and physical activity of the people living within a given community. The barriers elucidated in this study will help direct community leaders and policymakers to implement strategies and community-based programs that reduce the barriers identified by Bexar County residents. In doing so, exercise will become more available to community members and allow for greater participation and adherence to exercise.

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<sup>1</sup> DO Candidate

*THE IMPACT OF FINE ARTS ON THE EMOTIONAL INTELLIGENCE, SOCIAL DEVELOPMENT, AND THE ABILITY TO CREATE MEANINGFUL RELATIONSHIPS IN CHILDREN WITH ADHD*

**Lauren Tatina; Alen Tarboush, Jacqueline Harle, Alissa Roemer, Rachel Hall. All are OMS-II.**

**Purpose:** The purpose of this review was to explore how enrollment in a fine arts program would affect academic achievement through the improvement of the following domains: emotional intelligence, social development, and the ability to create meaningful relationships in school aged children with ADHD. Based on preliminary research and personal experience, we hypothesized that enrollment in a fine arts program would enhance academic achievement through the improvement of the domains discussed.

**Rationale:** *Academic Achievement* - The findings indicate a positive correlation between overall academic success and participation in arts related activities amongst students (including those with ADHD). These accomplishments include increased GPA, higher likelihood of graduating high school, and a more successful college experience.

*Emotional Intelligence* - Emotional intelligence is a function of childhood development that is nurtured via the use of artistic pursuits. Children grow in their understanding of their own emotions along with the emotions of others when expressing themselves through art.

*Social Development* - Social development encompasses notions which are influenced by social integration within a team, self-awareness, and affectivity. An inference can be drawn between fine arts that include athletic components and an increase in cognitive functioning within social realms in children with ADHD.

*Relationships* - Drawing is a form of expression that demonstrated the capability to cultivate relationships, which are key to social development. These relationships fostered by fine arts involvement were especially nourishing to children with ADHD.

**Methodology:** The 10 articles analyzed in this literature review were selected in order to bridge the gap of research between the effects of fine arts on overall development and how that could affect children with ADHD.

**Keywords** - Academic achievement, academic outcomes, activities, ADHD, art, attention disorders, children, dance, development, drawing, extracurricular activities, fine arts, fine arts instruction, high school, learning disability, music, music performance, music therapy, school performance, student achievement, test performance, theatre.

*Inclusion Criteria* - School aged children only, individuals with ADHD, psychosocial development, academic achievement, the relationship of fine arts to childhood development, variety of languages/countries, no limit for sample size.

*Exclusion Criteria* - Development of fine motor skills, standardized test scores as a measurement, studies that highlighted functional neurologic change rather than cognitive changes.

**Findings:** Our comprehensive result based on the evidence provided demonstrates a positive correlation between participation in fine arts and the improvement of the aforementioned domains in children with ADHD. A rapid summary of our findings include:

- Music therapy was shown to increase self-esteem (Sholeh and Supena) and improved mood changes, physical symptoms, & attention (Groß et al.) in children with ADHD
- Participation in music education demonstrated an increase in creativity, critical thinking, and confidence (See and Kokotsaki)
- There was an improvement in academic achievement in children with ADHD and those of lower socioeconomic status who were involved in music programs (Gouzouasis et al.), (Catterall and Dumais) and felt more socially accepted (Dvorsky et al.)
- Students enrolled in fine arts and physical activity schools scored higher on emotional intelligence assessments (Ateş)
- Physical movement helped improve the affect and cognitive functioning (Gawrilow et al.) in children with ADHD, along with focusing their energy (Levin)
- Children highlighted that activity, nature, and their intimate social connections make “their life really good” (Barfield and Driessnack)

*Our findings show that the continued (or increased) support and funding of fine arts programs across school districts and extracurricular endeavors is necessary in order to establish greater outcomes across the student body with a special emphasis on students with ADHD.*

*IMPLEMENTING AND UTILIZING A MOBILE CLINIC IN SOUTH SAN ANTONIO, TX*

**Andrew Meigs, BS; Saira Badar, BSA, OMS-III; Matthew Dear, BS, OMS-III; Brandon O'Connor, BA, OMS-III; Sophiyah Umar BSA, OMS-III**

**Purpose:** The long-term purpose of this study is to determine healthcare services that would best address the burden of chronic illness in the southside of San Antonio, Texas that can be provided through the implementation of a mobile medical clinic. We aim to provide healthcare workers the opportunity to bring services such as annual screenings, vaccinations, and treatment directly to the community with an understanding of the unique socioeconomic and cultural factors seen in this patient population. Our research aim of this study is to create a survey that will be randomly distributed to members of the south San Antonio community in order to determine what type of medical care is most needed.

**Rationale:** According to the Mobile Health Map Project, there are currently 1,500 mobile clinics in North America that serve approximately 6.5 million people. The advantages of a mobile medical clinic include improving continuity of care and adherence to treatments for chronic illness. The relationship between poverty and obesity is evident in District 3 of San Antonio, with almost 50% of adult individuals considered to be obese and 30% having been diagnosed with Type II Diabetes as of 2017. The onset of obesity and diabetes is linked to other co-morbidities, such as metabolic disease and chronic kidney disease. In addition, almost 23% of District 3's community is uninsured. Therefore, implementing a mobile clinic to help with preventative care may help diminish the disease burden on this population.

**Methodology:** The method chosen for gathering this information is an in-person survey of residents in San Antonio, TX. The survey is designed to establish baseline demographic and medical information from the

participants and interest in a mobile clinic. Participant response to a mobile clinic will depend on their knowledge and use of medical care and barriers to accessing a mobile clinic. The survey will be administered in both English and Spanish, and the study protocol is approved by the University of the Incarnate Word Institutional Review Board. Participants of the community survey will include individuals aged 18 and older that reside on the southside of San Antonio. The surveyed area of the southside of San Antonio will be defined by the following zip codes: 78214, 78224, 78235, 78210, 78223, 78211, 78222, and 78263.

**Findings:** The past medical history of survey respondents was collected to evaluate the chronic conditions present in the population. Subjects were asked to identify conditions that affected them, or any immediate family members, and the key concern selected by 60 participants was hypertension. Furthermore, diabetes was selected by 50 participants, obesity by 40 participants, and heart disease and cancer were both chosen by 22 participants. When asked what makes accessing medical care challenging, the majority indicated finances or their work hours/schedule. 87.95% of the surveyed stated interest in a mobile clinic and 85.92% stated they would use a mobile clinic if it were present in their community. The most frequently used medical services were reported to be annual wellness checkups and medication refills. The most requested services for the mobile clinic to offer were screening services selected by 81 participants, vaccination services selected by 71 participants, and blood glucose tests selected by 69 participants. It is concluded from the results that a mobile clinic will be beneficial to the population for routine preventative healthcare and may decrease disease incidence or exacerbation.

*ONE-YEAR OUTCOMES OF SLEEVE GASTRECTOMY IN A SINGLE INSTITUTION: DISCUSSING ITS IMPACT ON CARDIOVASCULAR, RENAL, AND METABOLIC PARAMETERS*

Denise Nemeth, OMS II; Maria Irene Bellini, MD, PhD<sup>1</sup>; Lidia Castagneto Gissey, MD<sup>1</sup>; Vito D'Andrea, MD, Chair<sup>1</sup>; Giovanni Casella, MD<sup>1</sup>

**Purpose:** Hyperbaric oxygenation therapy (HBOT) has recently been shown to be an effective treatment of hemorrhagic cystitis (HC) in several case reports and series. However, this indication is currently not FDA-approved for cyclophosphamide-induced HC, but has been approved for radiation cystitis for many years and is reimbursed under CMS guidelines. The aim of this case study is to describe HBOT as an alternative in the treatment specifically of cyclophosphamide-induced HC and to call attention to the need for advocacy for our patients requiring treatment with modalities not commonly used or authorized by insurance. Here we evaluate the use of HBOT more objectively in the setting of cyclophosphamide-induced hemorrhagic cystitis. We hope through our work to contribute to the data supporting the approval of CI Induced hemorrhagic cystitis as an FDA-approved indication for HBOT, leading to widespread insurance coverage and increased access to patients.

**Rationale:** Hemorrhagic cystitis (HC) is an inflammatory process that can result from multiple etiologies, including drugs such as cyclophosphamide. Cyclophosphamide is an alkylating agent commonly used as a chemotherapeutic agent and immunosuppressant drug that, when administered, is metabolized into its metabolites phosphoramidate mustard and acrolein. Acrolein is toxic to the urothelium and the causative agent of HC. The incidence of cyclophosphamide-induced HC has not been well established but has been reported to be as high as 40%. Typically, prevention of HC is done by concurrently administering Mesna in patients receiving cyclophosphamide. Multiple treatment options are available and range from bladder irrigations and cystoscopies to intravesical instillations of varied substances. Hyperbaric oxygenation therapy (HBOT) has recently been shown to be an effective treatment of HC. However, this indication is currently not FDA-approved, which is a major barrier to the treatment of patients with HC.

**Methodology:** Here we present a case of a 44-year-old female patient with a history of Non-Hodgkin's Lymphoma who developed grade 3 cyclophosphamide-induced HC on the National Cancer Institute Common Terminology Criteria for Adverse Events scale, refractory to all interventions. She underwent 50 sessions of HBOT at 2.4 ATA for 90 minutes with 2, 5-minute air breaks. This intervention resulted in near complete resolution of her HC-related symptoms and marked improvement in her quality of life as measured by the following tools: O'Leary-Sant Voiding and Pain Symptom and Problem Indices, Pelvic Pain and Urinary Urgency Frequency (PUF) Patient Symptom Scale, and Global Response Assessment (GRA) tool.

**Findings:** The O'Leary Symptom Index score decreased from 21 to 8 (a 62% improvement of symptoms). The O'Leary-Sant Problem Index score decreased from 20 to 3 (an 85% improvement). The PUF symptom score decreased from 22 to 4 (an 82% improvement of symptoms). The PUF bother score decreased from 12 to 0 (100% improvement), with a total PUF score reduction from 34 to 4 (an 88.2% improvement). The patient reported she had "Markedly Improved". (+3 on a 7-point scale) after the conclusion of her treatment using the Global Response Assessment. This case, in which we report HBOT as a successful intervention in the treatment of a case of refractory cyclophosphamide-induced HC, will serve as a framework for an upcoming literature review on HBOT as an effective treatment of cyclophosphamide-induced HC. HBOT is well established for radiation-induced cystitis, but not yet so for cyclophosphamide-induced cystitis. Based on our literature review and our patient experience, we recommend consideration of use of HBOT for cyclophosphamide-induced HC as a less invasive and effective treatment.

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*PUBLIC SEARCH TRENDS RELEVANT TO INTERVENTIONAL GYNECOLOGICAL PROCEDURES: A GOOGLE TRENDS STUDY*

**Brandon O'Connor, BA**

**Purpose:** Uterine artery embolization (UAE) for the treatment of fibroids is a minimally invasive treatment with similar mortality, comparable satisfaction, and shorter hospital stays as compared to myomectomy and hysterectomy. Prior studies have suggested that patient's understanding of the available fibroid treatment options is low. Our purpose was to compare the temporal trends of public online searches for terms related to uterine fibroid treatment.

**Rationale:** Educating the public about interventional radiology procedures and educating physician colleagues may help increase public awareness of IR gynecologic techniques. Increasing public knowledge of such interventions, gives patient's more autonomy to make an informed decision when getting treated for uterine fibroids and other gynecologic pathologies.

**Methodology:** A list of applicable, searchable terms was generated, including "Fibroids", "Leiomyoma", "Uterine Artery Embolization", "Fibroid Embolization", "Myomectomy", and "Hysterectomy". Relative search volume (RSV) was obtained from Google Trends for the above search terms and was analyzed for long term (2004 – 2021), US- and worldwide trends.

**Findings:** Trend analysis showed that search term volume for fibroids, leiomyoma, myomectomy, and hysterectomy increased 1.2-, 1.4-, 1.3- and 1.6- fold (all  $P < 0.0001$ ) for the US, whereas search term volume for gynecologic IR-techniques such as fibroid embolization and uterine artery embolization decreased 2.3- and 3.4-fold ( $P < 0.001$  and  $P < 0.00001$ ). Worldwide trend analysis resulted in search term volume for myomectomy and hysterectomy increasing 1.2- and 1.1- fold ( $P = 0.02$  and  $P < 0.0001$ ) and fibroid embolization and uterine artery embolization decreasing 2.9- and 3.2-fold (all  $P < 0.001$ ).



*RISK FACTORS AND RATE OF AMPUTATIONS IN MEDICARE PATIENTS WITH PREMATURE PERIPHERAL ARTERY DISEASE: AN INTERIM ANALYSIS USING THE SURGICAL PREMATURE PERIPHERAL ARTERY DISEASE EVALUATION (SPPADE) REGISTRY*

Gregory Williams, MS; Mohamad Hussain, M.D.<sup>1</sup>, Jessica Feliz M.D.<sup>1</sup>, Patrick Heindel M.D.<sup>1</sup>, Nebil Ahmed, B.S.<sup>2</sup>

**Purpose:** In this study, we sought to better understand risk factors and rates of amputation in medicare patients with premature peripheral artery disease (PPAD). The question our research group put forward was "what are the rates of cardiovascular comorbidities in medicare patients with PPAD and the rate of amputation procedures?" Our hypothesis was that there would be a high rate of cardiovascular risk factors and rates of lower limb amputation in medicare patients diagnosed with PPAD.

**Rationale:** PPAD is an atherosclerotic narrowing of peripheral blood vessels that occurs before the age of 55. PPAD is often under treated and under diagnosed due to challenges in early symptom development, lack of poor young patients' inclusion in quality databases, and low documentation of follow ups. Untreated PAD is strongly associated with adverse lower limb events resulting in amputation. In addition, medicare often does not include coverage for serious cardiovascular complications, resulting in the progression of serious risk factors for highly invasive surgery. These health concerns are more prevalent in low socioeconomic populations that rely on medicare, and this research project will help us to determine risk factors in order to minimize the rate of medical complications.

**Methodology:** We conducted a retrospective cohort analysis of patients enrolled in the Surgical Premature

Peripheral Artery Disease Evaluation (SPPADE) registry. SPPADE is a multi-center registry of patients with an established diagnosis of PPAD (2007-2021) based in the Mass General Brigham Health System in Boston, MA. In this interim analysis, we report baseline risk profiles of PPAD patients on medicare and the rate of lower limb amputations from complications of the disease progression.

**Findings:** At the time of this interim analysis, 251 patients were included in the SPPADE with a confirmed diagnosis of PPAD (mean [SD] age of 48.2 [1], 65%= male). PPAD patients prior to diagnosis had high incidences of hypertension (HTN) (83%), hyperlipidemia (HLD) (72%), coronary artery disease (CAD) (40%), chronic kidney disease (CKD) (33%), congestive heart failure (CHF) (22%), acute limb ischemia (ALI) (29%), and Diabetes mellitus type II (DM II) (51%). Of the patients with DM II, the majority (76%) were on insulin. Prior to enrollment in the registry, 90 amputations had been performed in the population (66% below the knee and 34% above the knee).

This preliminary data analysis demonstrates observable cardiovascular burdens and amputations in PPAD patients. Young patients with a cardiovascular risk profile should be aggressively treated, monitored more vigorously, and under close surveillance in the contralateral extremity.

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*THROMBOCYTOPENIA? THINK ENDEMIC TYPHUS: A CASE REPORT*

**Bailie Moorhead, BS; Niva Shrestha, BA; Nomair Ashraf, MS; Edson González, BA; Gerald Nelson, BA; Farah Farah, MD, Methodist Metropolitan Hospital**

**Purpose:** The spectrum of nonspecific presentation makes *Rickettsia typhi* a diagnostic challenge for physicians. Given *R. typhi*'s over five-fold increase since 2004, we want to educate physicians, especially those practicing in the southern United States, to have a high index of suspicion when patients present with similar symptoms. We also want to emphasize the importance of staying up to date on local epidemiology trends. Awareness of relevant infectious diseases in one's area can aid in earlier diagnosis and treatment and decrease patient morbidity.

**Rationale:** Murine typhus, also known as endemic typhus, is a rare flea-borne infectious disease. It is caused by *Rickettsia typhi* which is transmitted to humans by rat and cat fleas. It is uncommon in the United States but has been primarily documented in suburban areas of Texas, California, and Hawaii. Symptoms of murine typhus include fever, nausea, vomiting, and a central rash that spreads to the extremities while sparing the hands and soles. Laboratory abnormalities may include thrombocytopenia and elevated hepatic transaminases. The treatment of choice is doxycycline, which decreases morbidity and mortality when initiated promptly. Delayed diagnosis and treatment of murine typhus can

lead to severe complications like multi-organ failure. These complications consequently lead to longer hospital stays and increased cost of care for untreated patients. Our hope is that this case study will encourage physicians to remain cognizant of murine typhus, thus preventing delays in diagnosis and treatment when patients present with nonspecific symptoms.

**Methodology:** In this poster, a case of a patient with murine typhus will be presented to demonstrate the features, diagnostic methods, and treatment protocol.

**Findings:** A 62-year-old female with diabetes mellitus, hyperlipidemia, and gastroesophageal reflux disease presented to the emergency department with epigastric abdominal pain, nausea, vomiting, and fever. A petechial rash on her bilateral lower extremities was noted on physical examination. Laboratory results showed severe thrombocytopenia, elevated hepatic transaminases, elevated lactate dehydrogenase, and lactic acidosis. After an extensive bacterial and viral laboratory workup, IgM titers confirmed the diagnosis of murine typhus due to infection by *Rickettsia typhi*. The patient was treated with oral doxycycline which resulted in significant clinical improvement.

*USE OF HYPERBARIC OXYGENATION THERAPY FOR CYCLOPHOSPHAMIDE-INDUCED HEMORRHAGIC CYSTITIS A CASE REPORT WITH A CALL FOR AWARENESS AND COMPASSION*

Denise Nemeth, MPAS, OMS II; Jayesh B. Shah, MD, MHA, Faculty

**Purpose:** Describe Hyperbaric Oxygenation Therapy (HBOT) as an alternative in the treatment of cyclophosphamide-induced HC and call attention to the need for advocacy for our patients' requiring treatment with modalities not commonly used or authorized by insurance.

**Rationale:** Hemorrhagic cystitis (HC) is an inflammatory process that can result from multiple etiologies, including drugs such as cyclophosphamide. The incidence of cyclophosphamide-induced HC has not been well established but has been reported to be as high as 40%. Typically, prevention of HC is done by concurrently administering Mesna in patients receiving cyclophosphamide as a therapeutic agent. Multiple treatment options are available and range from bladder irrigations and cystoscopies to intravesical instillations of varied substances. None have been proven to be uniformly effective. Hyperbaric oxygenation therapy (HBOT) has recently been shown to be an effective treatment of HC in several case reports and series. However, this indication is currently not FDA-approved for cyclophosphamide-induced HC but has been approved for radiation cystitis for many years and is reimbursed under CMS guidelines.

**Methodology:** This intervention resulted in near complete resolution of her HC-related symptoms and marked improvement in her quality of life as measured by the following tools: O' Leary/Sant Voiding and Pain Indices, Global Response Assessment (GRA), Pelvic Pain and Urgency/ Frequency Patient Symptom Scale (PUF Scale).

44-year-old female patient with a history of Non-Hodgkin's Lymphoma who developed grade 3 cyclophosphamide-induced HC as per the National Cancer Institute Common Terminology Criteria for Adverse Events scale, refractory to all interventions. Referred by urogynecology for HBOT. Symptoms included: hematuria, dysuria, urinary hesitancy and

frequency, incomplete voiding, suprapubic and pelvic pain, dyspareunia, anemia, fatigue, weakness, depression, anxiety, and suicidal thoughts as a cause of her intractable symptoms.

Management with HBOT- Delay in treatment secondary to insurance coverage issues. Several peer-to-peer encounters done. Strong advocacy done for patient by physician and staff. Patient with a high level of health literacy also advocated strongly for herself. Authorization obtained. 50 sessions of HBOT at 2.4 ATA for 90 minutes with 2, 5-minute air breaks.

The patient self-reported as "Markedly Better" (+3 on a 7-point scale) after the conclusion of her treatment using the Global Response Assessment

**Findings:** HBOT is well established for radiation-induced cystitis but not yet so for cyclophosphamide-induced HC. HBOT is a safe and effective non-invasive alternative in the treatment of cyclophosphamide-induced HC. Based on a review of the literature and our patient experience, we recommend further investigation and consideration of the use of HBOT for cyclophosphamide-induced HC as a less invasive and effective treatment. We will advocate for approval of cyclophosphamide-induced hemorrhagic cystitis as an indication for HBOT.

Discussion:

- This case vignette, will serve as a framework for a literature review on HBOT as a treatment for HC.
- Many physicians trained in hyperbaric medicine are internal medicine physicians.
- HBOT is often available in rural communities where there is a lack of access to specialty care.
- Awareness of HBOT as a noninvasive alternative therapy for HC is critical for patients' well-being and the resolution of symptoms in cases of refractory HC.
- We must advocate for our patients always. Advocacy can save lives.

*UTILITY OF PULMONARY VENOUS DOPPLER TO IDENTIFY PULMONARY OVER-CIRCULATION IN CONGENITAL HEART DEFECT PATIENTS WITH SHUNT LESIONS*

Yumna Ali; Harinder R Singh, MD<sup>1</sup>; Daniel Nento, MD<sup>1</sup>, Arpit Agarwal, MD<sup>1</sup>

**Purpose:** This study aimed to evaluate the various characteristics of pulmonary venous Doppler in children with HSIS prior to and following surgical repair to analyze its diagnostic utility in detecting pulmonary over-circulation.

**Rationale:** Non-invasive assessment of pulmonary over-circulation in children with congenital heart disease (CHD) and hemodynamically significant intracardiac shunt (HSIS) is challenging due to a lack of reliable and reproducible tools. Echocardiographic assessment of the pulmonary venous Doppler is performed routinely in all patients with CHD. Increased pulmonary vein flow is seen in patients with pulmonary over-circulation; however, due to a lack of data, its utility to evaluate over-circulation is unknown. This study aimed to evaluate the various characteristics of pulmonary venous Doppler in children with HSIS pre- and post-surgical repair to analyze its diagnostic utility in detecting pulmonary over-circulation.

**Methodology:** We retrospectively evaluated echocardiographic data of children with CHD who underwent repair for HSIS in last four years at The Children's Hospital of San Antonio. Patients with HSIS lesions (identified by echocardiograms, magnetic resonance imaging, or cardiac catheterization), such as atrial or ventricular septal defects, atrioventricular canal, or patent ductus arteriosus, were included in the study. Pulmonary vein Dopplers were abstracted from the apical four-chamber and suprasternal

echocardiographic views. Characteristics collected included systolic and diastolic peak velocities, as well as mean velocities and gradients, pre- and post-surgical repair. All statistical analysis was performed on IBM SPSS 27 statistical software.

**Findings:** Ninety-three subjects (N=93) were identified with a median age of 1.1 years (0.37,3.5). Of these, 43 patients had HSIS and echocardiographic data available before and after surgical repair. Median peak pulmonary vein velocity in patients with HSIS was 60 cm/s (53,72) pre-repair and 50 cm/s (44,59) post-repair,  $p < 0.001$ . The median gradient was 0.52 mmHg (0.4,0.73) pre-repair and 0.32 mmHg (0.24,0.45) post-repair,  $p < 0.001$ . Receiver operating characteristic (ROC) analysis was used on various pulmonary vein Doppler parameters to obtain cut-off values for identifying pulmonary over-circulation. The best ROC curves were obtained for right pulmonary vein mean gradients and peak velocities obtained from a four-chamber view. For the mean gradient, the area under the curve was 0.88 and the cut-off was 0.4 mmHg with a sensitivity of 80% and a false-positive rate of 12%. For peak velocity, the area under the curve was 0.85 and the cut-off was 57 cm/s with a sensitivity of 82% and a false-positive rate of 20%. In this cohort of CHD patients, pulmonary venous mean gradient above 0.4 mmHg and peak velocity of 57 cm/s can be used to identify pulmonary over-circulation. Further studies with larger sample sizes can help further define cut-off values.

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*WHO IS UP-TO-DATE? AN ORTHOPAEDIC RESIDENCY SOCIAL MEDIA AND WEBSITE COMPARISON STUDY*

**Jerod McCarrell, BS; Aroob Zaheer, BS, OMS II; Christian Allen BS, OMS II; Victor H. Martinez, BS, OMS III; Tyler K. Williamson MS, OMS IV; Chimobi Emukah, MD, Orthopedic Surgery PGY 2, Orthopaedic Surgery, University of Texas Health Science, Joe & Teresa Lozano Long School of Medicine**

**Purpose:** Compared to many specialties in medicine, the field of orthopaedics generally has a fewer number of residency programs and therefore residency spots for 4th-year medical school applicants. With significantly decreased residency numbers, applicants will have fewer opportunities to engage with residency programs outside of their home medical school institution or residing state. Recent literature has shown the dramatic increase in social media usage and website information by residency programs in order to promote their program and interact with prospective residents. However, no studies have yet determined which programs are attracting applicants by maintaining an up-to-date website and appropriate social media presence. Our main objective was to assess how academic versus community-based orthopedic surgery residency programs compared with respect to access to certain information on their websites and social media accounts.

**Rationale:** With advances in technology and understanding of human physiology, academic institutions have worked to improve medical education at the medical student, resident, and even attending levels. Because of this growing trend, educational endeavors to account for these advancements have progressively arisen, especially within the field of orthopaedics.

**Methodology:** This is a cross-sectional study that examined the official websites and social media accounts for orthopaedic surgery residency programs during September 2022. Features examined for each program includes, but is not limited to, the following: Instagram® and Twitter® account, website resident/faculty/alumni information, detail regarding didactics, rotations,

research, and call schedule, and information for students and those applying. Each program was designated 'Academic' Academic/Community', or 'Community' as per the AMA® FRIEDA website. Descriptive statistics and Analysis of Variance (ANOVA) were utilized to report and compare rates of each feature amongst each program media.

**Findings:** Of the 202 programs included, 83.7% had an Instagram® account, while 67.9% had a Twitter® account. Current resident information was available on 92.2% of the program websites, along with 88.6% including faculty information, while only 77.7% listed the fellowship outcomes. Regarding academics, 81.4% mention didactic schedules, 92.8% highlighted rotations, and 87.6% convey resident research opportunities, but only 35.2% divulge the call schedule requirements. Medical student-related information included: applicant information (75.3%), interview procedure (71.0%). Diversity was mentioned in 52.3% of websites, with 20.2% offering a diversity scholarship for audition rotations. Community programs had lower rates of each feature on their websites, except for rotation and didactics details (all other  $p < .05$ ).

Community-based programs depicted lower rates of each respected category, aside from rotation and didactics. An effective social media presence and in-depth program information on affiliated websites have become vital to the showcasing of an orthopedic residency program, allowing a much broader range of applicants to have access to prospective training locations. Additionally, the use of social media and the active presence of programs can be useful tool for prospective applicants.

## SCHOOL OF PHYSICAL THERAPY

### *CRITICALLY APPRAISED TOPIC: ARE ANKLE SPRAINS PREVENTABLE IN YOUTH SPORTS?*

Tara Alexander, student, Athletic Training; Luz Anguiano, student, Athletic Training; Krystal Ortiz, student, Athletic Training; Joanna Soles, DHs, ATC, faculty, Athletic Training

**Purpose:** The purpose of this research is to critically appraise the evidence surrounding the use of a neuromuscular warm-up to reduce the likelihood of ankle injuries in high school athletes involved in team sports.

**Rationale:** Lateral ankle sprains are one of the most common injuries in sport.<sup>1-4</sup> Athletes who have experienced an initial sprain have a high likelihood of recurring ankle sprains, prolonged symptoms, diminished quality of life, and chronic ankle instability. Ankle injuries also result in a significant amount of time out of sport participation, which can have a detrimental effect on a young athlete's mental and physical health, as well as their athletic development. Therefore, prevention of ankle injuries should be a priority for coaches and athletic trainers working with youth sports.

**Methodology:** A critical appraisal of the evidence was conducted surrounding the following PICO question: "Does participation in warm up protocol that includes neuromuscular training decrease the likelihood of ankle sprains in the youth athletic population compared to athletes who do not participate in neuromuscular training?". Primary key words, such as

ankle sprains, prevention, warm-up, neuromuscular, and athletes were searched using the Medline EBSCO and PubMed databases, as the majority of sports medicine journals are housed there. Results were limited to peer-

reviewed research articles published in the last 10 years, with 11 articles meeting those criteria. Those articles were further limited to exclude research focusing on collegiate athletes and injuries to other body parts. A total of four quality sources were identified and categorized based on the Oxford Levels of Evidence (Table 1), and key results were identified.

**Findings:** All articles included in this critical appraisal found a statistically significant reduction in the prevalence of both ankle and knee injuries in youth athletes who performed a multicomponent, neuromuscular warm-up prior to athletics participation. When a directed warm-up consisting of agility, aerobics, strength, and balance training is performed, up to 38% of noncontact ankle injuries can be prevented.

Research on the effectiveness of multicomponent warm-ups on reducing ankle injuries has primarily been conducted at the collegiate athletic level. There is a need for more research to better understand the

potential of these exercises on younger athletes and the benefit limiting early ankle injuries can have on athletic development and participation. It seems clear from the evidence that warm-up programs that combine a variety of exercise types have a protective benefit well beyond a traditional warm-up.

*THE EXPLORATION OF THE EFFECTS OF COVID-19 IN COMMUNITY-DWELLING OLDER ADULTS: A PHENOMENOLOGICAL STUDY*

Jessica Maxwell, OTD, OTR, ACUE, CEAS; Katelyn Holstun, OTR<sup>1</sup>; Demi Peck, OTR<sup>1</sup>; Brendan Sanchez, OT<sup>1</sup>; Elise Schuyten, OT<sup>1</sup>

**Purpose:** The COVID-19 pandemic significantly impacted the lives of older adults by decreasing their ability to participate in community activities, decreasing physical activity due to state-mandated shutdowns and social isolation, and creating a decline in cognition due to psychological stress from COVID-19 (Batsis et al., 2021; Dhama et al., 2020; Saraiva et al., 2021). COVID-19 pandemic caused a disruption of routines especially for community-dwelling older adults. The pandemic had the potential to affect socialization, mental functioning, and positive emotions. The purpose of this qualitative phenomenological study was to explore the perceptions of community dwelling older adults' mental, physical, and emotional functioning before COVID-19, during COVID-19, and after vaccine availability. Researchers aimed to answer the following questions: 1. To what extent has COVID-19 impacted community-dwelling older adults' physically, mentally, and emotionally?, 2. Are there recurring themes of perceived experiences?, and 3. Was there an increase in physical, mental, and emotional functioning after receiving COVID-19 vaccines?

**Rationale:** Occupational therapists (OTs) and other healthcare professionals work with a variety of conditions and populations, including community-dwelling older adults. OTs help this population remain independent and in their homes for as long as possible. OTs provide holistic and client-centered care and must look at all aspects of the individual. It is important that all healthcare professionals understand the impacts that the COVID-19 pandemic and vaccinations have made on this population to enhance treatment outcomes. This study can serve as a baseline for future studies that wish to further understand the shared experiences of community-dwelling older adults.

**Methodology:** This study used a qualitative, phenomenological approach. Student researchers performed a pilot study on three first-year OT students

prior to conducting the interviews. Using convenience sampling, five participants from a Baptist Church in Alabama aged 65 to 100 years old were recruited. Researchers created a telephone transcript, email transcript, flyer, sign-up sheet, consent, screening, and right to record form, interview questions, and an interview transcript. The demographic data on the screening form included age, gender, living in the Tuscaloosa, AL area, attending the community church, willing to verbally share their experience of the COVID-19 pandemic with student researchers, how many days a week they are active in the community, and having received a COVID-19 vaccination. Semi-structured phone interviews were performed over a two-week period. Interview questions were aimed to explore participants' roles, activity, mental, physical, and emotional health throughout the COVID pandemic, and vaccine confidence. Qualitative data was collected and coded using MAXQDA and then thematically categorized.

**Findings:** The study found that the COVID-19 pandemic can disrupt routines and cause an overall decrease in socialization, mental functioning, and positive emotions. Both positive and negative impacts were identified by these individuals during their experiences throughout the COVID-19 pandemic. Negative impacts during state-mandated shutdowns included a decrease in community activities, mental health, and emotional health. Findings in this area correlate to previous research findings from Saraiva et al. (2021). Positive impacts after participants received COVID-19 vaccinations included an increase in community activities and mental health functioning. All participants report the vaccination gave a sense of confidence to return to normal activities. Three participants reported still finding it necessary to continue to wear masks when outside of the home. Physical health was found to remain essentially unchanged throughout the pandemic, unlike findings from Dhama et al. (2020).

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## SCHOOL OF PHYSICAL THERAPY

### *MALE PHYSICAL THERAPY STUDENTS EXPECT TO HAVE HIGHER EARNINGS ONE AND FIVE YEARS AFTER GRADUATION COMPARED TO THEIR FEMALE COUNTERPARTS*

**Nathaniel Brown, PT, DPT, GCS; James Zertuche PT, DPT; Brady Llewellyn PT, DPT; Phan Nguyen PT, DPT; John Copeland PT, DPT.**

**Purpose:** The purpose of this study is to assess if male vs female Doctor of Physical Therapy Students expect to make differing salaries at one, five, and ten years after graduation.

**Rationale:** A pay gap exists in various professional fields whereas women earn a percentage of their male counterparts' salary. The difference between male and female physical therapy (PT) salary in 2016 was \$8,882, equating to almost a 10% discrepancy. Potential reasons for this pay gap include skill differences, workforce experience, gender roles, and gender discrimination. Another potential reason is that men and women expect to make different amounts, which may impact their actual salaries.

One 2010 study found that male vs female undergraduates had differing salary expectations, although this has not been investigated in health care professional students. Knowing if PT students already expect to make differing salaries before they even start their careers could help us to understand if pay expectation might be playing a role in actual pay disparities by sex.

**Methodology:** Participants/Subjects: Total of 84 participants (42 males and 42 females). Ages ranged from 21-45 years old. Participants were 1st and 2nd year Doctorate of Physical Therapy students at the University of The Incarnate Word (41 year 2 students and 43 year 1 students).

- Study Design: Cross sectional study design
- Procedures: The subjects were recruited through a sample of convenience in the Professional Topics course of the student's current year on the UIW physical therapy campus. The survey consisted of four sections: demographics, 1st year, 5th year and 10th year pay expectations. Options varied from

dichotomous (yes, no) to circling a number for expected salary value.

- Data Analysis: Data was analyzed with multiple analyses of variance (MANOVA) by comparing multiple dependent groups using parametric data (interval, ratio) followed by post hoc analysis to determine where differences lied. The two independent variables are sex (male and female) and year in school (1st year vs. 2nd year DPT students). We examined whether those two variables influence the dependent variable (Pay expectations at 1, 5, and 10 years post DPT school).

**Findings:** When controlling for variables such as cohort, expected managerial position, expected kids and expected residency/fellowship, sex has a significant effect on pay expectations (95% confidence) in year 1 and 5. Besides sex, none of other variables showed significant effect on pay expectations

Medium size effect ( $\eta^2 = 0.57$ ) between expectation of having kids at year 10 and pay expectation but more exploration needed

Average differences in pay expectation between sex:

- Year 1: Males expect to make an average of \$4,404 more than females. ( $P = 0.0187$ )
- Year 5: Males expect to make an average of \$5,714 more than females. ( $P = 0.0149$ )
- Year 10: No discernable difference in expectation

Our findings indicating a significant difference between males and females when it comes to expected income of DPT students after graduation at the 1 and 5 year mark after graduation. Further study is needed to understand if this difference in pay expectation could be playing a role in the actual pay differences between the sexes. Our survey shows that female DPT students expect to make significantly less money 1 and 5 years after graduation compared to males.



*MINDFULNESS PRACTICE TO REDUCE STRESS IN A DOCTOR OF PHYSICAL THERAPY PROGRAM*

Sara Marie Berrett; Mariza Cardenas; Jared. C. May; Jose R. Ruiz; Joshua B. Taylor; Mona Bains, PhD

**Purpose:** We assessed whether student stress could be measured across a 15-week semester and whether mindfulness practice strategies could resolve the stress associated with a rigorous didactic semester.

**Rationale:** In 2021 the UIW School of Physical Therapy curriculum was revised from 33 months to 29 months by removing 1 of the 4 professional practice education experiences and blending 6 didactic semesters into 5 didactic semesters. Removal of the first clinical rotation in the first summer semester of the program allowed for the consecutive flow of 5 didactic semesters, creating a 15-week summer semester. The semester includes an 8-week cardiopulmonary block and a 7-week pediatric and intro to neurology block, making it an intensive summer semester. While the revised curriculum reduced student cost and improved efficiency of content delivery, it is a highly intensive and rigorous 5 semesters. Faculty observations during the semester included stress and anxiety that peaked at midterms and less engagement during the second half of the semester. Given the variables during the 2021 revised curricular rollout (heightened COVID-19 pandemic, transition back to onsite learning and a new learning management system), it is difficult to conclude that faculty observations were specific to the revised curriculum. Regardless of these additional variables there remains an opportunity to address student needs in the areas of stress and well-being over the course of a 15-week summer semester.

**Methodology:** Twenty-two second year DPT students were recruited to participate in a stress measurement and mindfulness pilot study. Participants enrolled in section A of the Foundational Sciences (FS) course served as the control group (n = 9, no mindfulness intervention) and participants enrolled in section B of FS served as the intervention group (n = 13). Stress was measured objectively through blood pressure and heart rate (HR) autonomic responses and subjectively via the

Perceived Stress Scale (PSS) instrument over the course of a 15-week semester, as well as before and after a twice weekly, 5-week in-class mindfulness breathing intervention in the second half of the semester. Objective baseline data collected before the mindfulness intervention occurred at weeks 3 and 10 to represent the start of the semester and post midterm exams, respectively. Subjective PSS data was collected during weeks 3 (baseline), 9 (pre-midterm exam), 10 (post-midterm exam) and 14 (pre-final exam). The mindfulness intervention was conducted during weeks 10 – 14, which was followed by final exam week.

**Findings:** Twenty students participated in the mindfulness study with varying degrees of participation in the objective and subjective data collection. No statistically significant changes were observed for HR, systolic and diastolic measurements at 3 and 10 weeks in the first half of the semester. Paired t-tests showed a statistically significant increase in PSS scores (n=10, p < 0.05) in the first half of the semester prior to the mindfulness intervention at 3 (mean= 17.6) and 9 weeks (mean= 22.4), which resulted in a PSS shift from a “high health concern” to a “very high health concern.” A downward trend was observed with PSS scores at 10 (n=4, mean = 22.50) and 14 weeks (n=4, mean = 16.25) in the mindfulness intervention group following the in-class guided mindfulness breathing exercise, dropping the PSS score from the “very high” to a “high” stress category.

Second year DPT students initiated their third semester with high levels of stress.

Results suggest that inclusion of short duration mindfulness practice in class may impact student perceptions of stress and counterbalance stress peaking early in the semester. Further research using a larger sample of DPT students using mindfulness strategies over the course of a semester is recommended.

*PREDICTORS OF SUCCESS IN A PROBLEM BASED LEARNING DOCTOR OF PHYSICAL THERAPY PROGRAM*

Kathleen Goei, PhD; Shahnaj Alam, DPT; Ammar Alhaidar, DPT; Chan Yu, DPT

**Purpose:** The purpose of this study is to identify pre-admission variables that predict post-graduation success on the Physical Therapy licensure exam in applicants to UIW's Doctor of Physical Therapy (DPT) program.

**Rationale:** Achievement of a doctorate in Physical Therapy (DPT) requires an individual to complete a rigorous academic and clinical curriculum and be fully prepared to pass the National Physical Therapy Licensure Exam (NPTE) as a requirement for entry level professional practice. DPT programs have endeavored to develop strategies which accurately identify applicants who are likely to successfully graduate and pass the NPTE. Despite decades of research, there is no standardized set of admission criteria utilized by accredited DPT programs in the United States. The admissions process typically requires applicants to submit undergraduate degree transcripts and scores from standardized tests such as the Graduate Record Examination (GRE), plus personal essays and letters of recommendation. Many programs, including UIW's DPT program, also conduct personal interviews with the applicants who have the highest academic qualifications. Universities and other professional schools have analyzed their admission processes in order to identify the variables which best predict success in the DPT program and on the NPTE. Variability in findings across, and even within, studies has led experts to suggest that individual programs develop policies that best reflect their priorities. This study is necessary to develop evidence-based admissions criteria that is specific to our program and population.

**Methodology:** This retrospective cohort study utilized a convenience sample of all UIW DPT graduates from the classes of 2018-2021 who completed the NPTE (n =

191). Academic variables and demographic data were downloaded from the Physical Therapy Centralized Application Service (PT-CAS). These data included each applicant's total GPA, prerequisite GPA, GRE scores, race, gender, age at date of application submission, and total observation hours. Admission interview scores were gathered from the files of the Director of Enrollment at the School of Physical Therapy. Results of the NPTE were obtained from the files of the Dean, School of Physical Therapy. Data were analyzed with binary logistic regression analysis using SPSS software.

**Findings:** Overall first time pass rate on the NPTE for the classes of 2018-2021 was 90.6%. The GRE analytical writing (GRE-W) demonstrated the strongest predictive value on first attempt NPTE success with an adjusted odds ratio of 5.2 (p = 0.01). The total GPA demonstrated an adjusted odds ratio of 17.3 but did not achieve statistical significance (p = 0.092). The regression model did not support the predictive value of other academic or non-academic variables, including admissions interview score. Odds of first time NPTE pass did demonstrate variability across racial categories. Using Hispanic race as the reference category, adjusted odds ratio was higher for Whites (1.749) and Blacks (3.018) but lower for Asian/Pacific Islanders (0.456). These results suggest that in our DPT program the analytic writing component of the GRE is more important than other pre-admission academic or non-academic variables. This finding has not been reported in published studies from other DPT programs and could be related to the unique characteristics of UIW's problem based learning curriculum model. Racial differences in first time NPTE success were not statistically significant but certainly merit additional study.

## Podium Presentations

### COLLEGE OF HUMANITIES, ARTS, AND SOCIAL SCIENCES

#### *SIMONE WEIL ON READING AND SELF-TRANSFORMATION*

Chris Edelman, PhD

**Purpose:** To try to articulate part of what we can learn from Simone Weil's account of what she calls "reading." In large part, this is a matter of delineating the concept as she understands it. Then, as space and time allow, it is a matter of suggesting its implications for ethics and pedagogy.

**Rationale:** The discipline has an interest in better understanding human beings' relationships with reality and themselves, for both philosophical and pedagogical purposes. This study aims to contribute in a small way to that end.

**Methodology:** My research method is to apply Aristotle's Dialectical Method. First, I read the primary text and gather the reputable opinions (scholarly essays on the topic); then I critically and creatively evaluate those opinions for strengths and weaknesses; finally, I develop and disseminate an account of my own that builds on what I've learned in the second step of the process.

**Findings:** "Reading" is in fact the best way to describe our default way of relating to the world. It is superior to "sensation," "perception," and "interpretation." Recognizing this makes it easier to understand how we possess very limited control over the way we experience the world (our readings are for the most part automatic; they happen to us as much as we make them happen), and that what meager control we can exercise over our own readings is mostly a matter of creating new habits of attention, slowly and over time. These insights of Weil's have implications for ethics and pedagogy, insofar as the way we conduct ourselves in the world is to a great extent a function of our readings, and the extent to which students learn and profit from their classes is to a great extent a function of their readings, of for instance, "the core," or "science," or "philosophy."

## DREEBEN SCHOOL OF EDUCATION

### *AN EXAMINATION OF SINGLE MOTHER'S PSYCHOLOGICAL CAPITAL IN SEEKING GRADUATE DEGREE IN HIGHER EDUCATION*

Jennifer Stuart, MEd

**Purpose:** Single mothers are becoming more of a marginalized group, higher education does not seem attainable to their own self-perception. A look into their own self-perception may bring an increase in higher education enrollment. There is a need for research on how psychological capital during life experiences as a single mother is managed or addressed in attaining higher education. This examination of psychological capital in single mother experiences has led to the question; How is attaining higher education influenced by psychological capital formed from single mother experiences? The purpose of this qualitative study is to explore key themes identified within single mothers through autoethnography storytelling. This knowledge gained through an analysis of psychological capital from specific experiences as a single mother may bring awareness to increase psychological capital in seeking higher education. How did the experience of a single mother impact self-perception in psychological capital? Does self-perception in psychological capital change with experiences? In what way are perceived experiences of being a single mother to that of a higher education student? How can this reflective knowledge of psychological capital impact or influence single mothers to enroll in higher education?

**Rationale:** Research has shown that there are many known obstacles and stress reactions that single mothers endure and there is more literature on how attaining higher education is impacted by those stressors. Metacognitive vulnerabilities have been studied during stressful experiences, and metacognitive intervention has been shown to benefit mental and physical health issues. However, metacognition focuses on one's thinking about learning and this study focuses on positive perception. There is missing literature on single

mother's psychological capital impacting them in seeking higher education.

**Methodology:** This is a qualitative, autoethnographic research project through a feminist lens where the researcher divulges personal experiences as both a single mother and as a higher education student. With a deep rich connection of personal information, a connection may be formed between researcher and reader which can allow a relatable understanding and awareness to the reader. As focusing on empowering women to take control of their experiences and grow from past negative or traumatic experiences. From the autoethnography data collected, the measure of psychological capital of the researcher will use the instrument designed by Fred Luthens, CPC 12 scale of measuring the four (H.E.R.O.) elements; hope, efficacy, resiliency, and optimism. This testing was designed for organizational development in individual positivity in a group rather than negative. This study was chosen to do the same for single mothers, focusing on specific experiences, and the perception of an individual being both a single mother and a higher education student. This testing will be performed and then analyzed in comparison with specific experiences identified through the autoethnography process.

**Findings:** My hope is this research will be relatable to an already vulnerable population through autoethnographic storytelling and bring awareness of psychological capital and self-perception of single mothers and higher education students to increase attaining higher education. My desired outcome of this evaluation of psychological capital is that single mothers may recognize that they already obtain HERO elements and may use those same elements and apply them to higher education.

*IMPACT OF STEM PROGRAM DESIGN FACTORS ON STEM EDUCATION AND CAREER CHOICES*

**Pamela McCray**

**Purpose:** This instrumental case study aims to identify and examine the influence of program factors that encourage Hispanic middle school (grades 6-8) females to continue their STEM program participation in high school. Program factors may include curriculum design, instructional support, mentoring, and hands-on skill development with robotics and other emerging technologies such as drones and autonomous vehicles. The study findings will improve program resource allocation, activities, processes, and outcomes for an extracurricular female STEM program offered by one private University in San Antonio to middle schools in marginalized San Antonio districts. The study aims to capture the insights and perceptions of a vulnerable student population (Hispanic female adolescents from marginalized areas in San Antonio) with risks of graduating from high school with viable market skills to help break the poverty cycle. The participant's insights will identify program improvements that may help increase the number of Hispanic females graduating from high school and enrolling in college-based STEM programs or choosing STEM-based occupations.

**Rationale:** America's innovation and global competitiveness are fueled through Science, Technology, Engineering, and Math (STEM) investments and occupations. Although women comprise almost half of the U.S. workforce, they are severely underrepresented in the STEM sector, comprising only 27% of this workforce. The census data further highlights the disparities in underrepresented groups in STEM occupations, such as Hispanic females, comprising only 9% of the STEM workforce. The study findings will be used to improve program resource allocation, activities, processes, and outcomes for an extracurricular female STEM program offered by one private University in San Antonio to middle schools in marginalized city districts. The research is important to help close the gender and ethnic gaps in STEM education and occupations which can support improved socio-economic opportunities for underrepresented groups in the San Antonio community and throughout

the U.S. Although studies have explored cultural factors impacting female adolescent STEM participation, there is limited research on how program factors influence continued STEM interest and involvement with Hispanic adolescent females into high school.

**Methodology:** The proposed study design is an instrumental case study focusing on the influence of STEM program design factors on middle-school adolescent female participants. A private liberal arts University in San Antonio, Texas, currently offers a STEM program for no charge to public middle schools in marginalized districts of the city. Currently, two middle schools are participating, and they have minority enrollments of over 98%. Additionally, these schools report over 95% of their students are economically disadvantaged. The student population is primarily Hispanic, and the people for the proposed case study will be drawn from the two participating middle schools and the private University STEM program staff. The case study will include participants from the following groups: 1) middle school STEM teachers from the two participating schools (3), 2) middle school Hispanic females enrolled in their school STEM activities and extracurricular STEM programs (8), and 3) the staff from the private University such as the program manager, instructors, and facilitators delivering the extracurricular STEM program (3). Study data will be collected using multiple sources which may include semi-structured interviews with middle-school STEM faculty and the private University STEM staff, student survey data, program archive documents, website metadata, and extracurricular observations.

**Findings:** The presentation for the Research Symposium will focus on the proposed study plan and the execution steps. These steps include developing the qualitative research question guide, identifying data collection instruments, exploring creative ways to interact with the population to capture their insights and perceptions, and submitting the IRB application by February 15, 2023.

*THROUGH THE EYES OF THE EDUCATOR: UNDERSTANDING THE TEACHER IDENTITY OF NATURE-BASED EARLY CHILDHOOD EDUCATORS*

**Amanda McMickle**

**Purpose:** The purpose of this study is understand the journey towards a teacher identity for nature-based early childhood educators. The aim is to understand the experiences that contribute to the nature-based early childhood educators' professional journey, their confidence in executing this teaching method, and how these experiences might transfer to the traditional school setting.

**Rationale:** Nature-based learning is becoming a popular method of teaching with over 600 reported nature-based preschools in the United States. One avenue in ensuring this is an equitable option for families is incorporating this method of teaching into traditional school settings. In order to do this effectively, it would

be beneficial to understand the professional journey of those in the field. This study will have an impact on advocacy work being in done for outdoor learning in Texas and across the country.

**Methodology:** An exploratory research study using semi-structured interviews will be used to reveal experiences impacting the development of the teacher identity in nature-based early childhood educators. Convenience sampling will be used and transcribed interviews will be analyzed using thematic coding.

**Findings:** This study is my dissertation proposal and therefore does not yet have results to report.

## HEB SCHOOL OF BUSINESS ADMINISTRATION

### *INSPIRED LEADERSHIP AT COMMUNICARE*

#### **Regan Pape**

**Purpose:** The purpose of this study is to share my 6-month experience of goal-inspired business leadership at CommuniCare as outlined in the UIW McGuire Scholarship for Mission-Inspired Leadership.

**Rationale:** I was awarded the 2022-23 UIW McGuire Scholarship for Mission-Inspired Leadership. The scholarship required that I complete a 6-month volunteer internship with a local business and reflect on my experiences using Pope Francis', "Laudato Si' Encyclical letter on Care for Our Common Home" and "Vocation of the Business Leader: A Reflection" as a guide. The experience has allowed me to better understand the importance of "mission-inspired business leaders." A businessperson is a practitioner who turns dreams into reality. A "mission-inspired business leader" is one inspired by the Incarnate Word's Spirit of service to dream good dreams and make them real for others. The UIW McGuire Scholarship for Mission-Inspired Leadership aims to promote the formation of such leaders through experience and research.

**Methodology:** I volunteered 40 hours a month with the CommuniCare Health Centers-East Clinic from June 2022 to November 2022. The Vice President and Chief Clinical Officer, Carlos Moreno, MD, served as my preceptor. My internship was divided into two phases: (1) Rotations; (2) Clinical Study. Reflection served as the foundation for both phases. In phase 1, I rotated among the sections of the clinic. In phase 2, I assisted with a Clinical Study examining CommuniCare's High-Risk Pregnancy Initiative.

**Findings:** The results of my study support that CommuniCare possesses "mission-inspired business leaders" as defined by Pope Francis', "Laudato Si' Encyclical letter on Care for Our Common Home" and "Vocation of the Business Leader: A Reflection." The CommuniCare staff, and clinical staff, leverage the best business practices and the best clinical practices to serve the health needs of the San Antonio community.

*COMBATting HEALTH INEQUITY AMONG MARGINALIZED POPULATIONS WITH CHRONIC PAIN THROUGH THE UTILIZATION OF THE FOUR TENETS OF SOM*

**Huy Tran, OD; Jeannette Wong-Powell, OD, FAAO, Faculty; James Lehmann, MD, Corneal Specialist, Focal Point Vision in San Antonio, TX**

**Purpose:** This case aims to report how corneal endotheliitis secondary to cytomegalovirus can present in a healthy patient and discuss the appropriate management.

**Rationale:** Cytomegalovirus (CMV) Endotheliitis is inflammation of the corneal endothelial cells caused by a CMV infection and can present as a unilateral condition in an immunocompetent patient. Clinical signs of CMV endotheliitis may include anterior chamber inflammation, ocular hypertension, corneal edema, and keratic precipitates. Affected patients most commonly report unilateral reduced vision with photophobia. The infection has been hypothesized to start in the trabecular meshwork and the uvea before eventually infecting corneal endothelial cells. Therefore, long-term complications of CMV endotheliitis include endothelial dysfunction and secondary glaucoma. Persistent CMV disease may worsen long-term prognosis, since both endothelial cells and trabecular meshwork cells are unable to regenerate. Early detection of CMV endotheliitis and timely therapy can preserve endothelial cells and prevent the need for an endothelial transplant. A PCR aqueous tap can be used to confirm CMV diagnosis. An anterior segment OCT can help detect inflammation on the corneal endothelium. The diagnosis of CMV endotheliitis is difficult, as clinical signs may resemble other ocular conditions.

**Methodology:** This is a case report of a 41-year-old white male with a difficult-to-diagnose, blinding

unilateral corneal disorder. A comprehensive work-up including PCR analysis was positive for cytomegalovirus, and anti-viral therapy was initiated with Zirgan (antiviral) combined with Durezol (steroid). This presentation covers the clinical presentation, differential diagnosis, management, and outcome of this unique case.

**Findings:** A 41-year-old white male, with a history of a recurrent unilateral uveitis in his left eye [OS], had a mature unilateral cataract and was referred for cataract surgery. After cataract surgery, the uveitis lingered, causing the vision in his left eye to fluctuate between 20/20 sc and 20/150 sc, while intraocular pressure [IOP] OS fluctuated between 12 and 25. After unsuccessful therapy with topical steroids (Prednisolone Acetate and Durezol), Valtrex, and IOP-lowering drops (Timolol and Combigan), the affected eye also developed persistent corneal edema with anterior chamber inflammation. HLA-B27-related conditions were ruled out by a primary care physician, autoimmune etiologies were ruled out by a rheumatologist, and retinal swelling was ruled out by a retina specialist. As the corneal surgeon performed a Descemet's Membrane Endothelial Keratoplasty [DMEK] surgery to replace the corneal endothelium, 0.2 cc of the aqueous was extracted and sent for PCR analysis. The PCR was positive for cytomegalovirus, and anti-viral therapy was initiated with Zirgan combined with Durezol. The final outcome for the affected eye was resolution with 20/30 uncorrected vision and stable intraocular pressure.



*EVALUATING STUDENT SLEEP PATTERNS AND THEIR IMPACT ON ACADEMIC PERFORMANCE*

**Matt Valdes, OD, FAAO; Emilio Saenz, BS, Student Researcher; Deidre Rios, MS, PhD, AHIP, Librarian; Sandra Fortenberry, OD, FAAO, Research Assistant**

**Purpose:** This study looks to evaluate day to day variations in sleep behavior and their relation to academic performance, which is defined by the end of semester GPA during which the study took place.

**Rationale:** Insufficient sleep has been labeled a public health crisis in the United States, with many adults receiving less than the recommended 7-8 hours of sleep per night. Busy schedules, technology, stress and poor sleeping habits have all contributed to the rise in sleeping disorders. Prior studies have focused on self reported sleep duration and sleep/wake indices and their association with student learning capacity and academic performance. With the use of wrist based accelerometers, we look to quantify various sleep metrics and how they relate to academic achievement among a cohort of professional school students.

**Methodology:** This longitudinal study was conducted during the 2022 Summer semester at the University of the Incarnate Word, Rosenberg School of Optometry. 22 Full-time (greater than 16 credit hours) graduate students wore a wrist-based accelerometer (WBA) for 30 days (21-day minimum). Exclusion criterion included anyone pregnant, nursing or caring for a newborn.

Data Collection:

Sleep data was passively collected with the use of WBA (Mi Band 5 [Taipei, TW]). All subject data was de-identified and unique identification numbers (UINs) were used to track each participant. Data was stored on password-protected cloud systems.

Statistical Analysis: Data was collected and analyzed using Google Sheets (Mountain View, CA) and XLMiner Analysis Toolpak (Incline Village, NV). Pearson Linear Regression determined correlations between sleep

patterns and GPA. Paired t-test was performed to compare student perceptions on sleep habits and recorded sleep patterns.

Statistical Analysis

Various metrics were used to create subject sleep profiles and then compared to semester grade point averages (GPA) to determine their impact on academic performance

- Time to Bed (TTB)
- Wake Time (WAKE)
- Sleep Duration (DUR)
- Weekday Sleep Patterns (WKD)
- Weekend Sleep Patterns (WKE)
- Variations in sleep metrics (i.e. Standard Deviation [StDev])

**Findings:**

- Average TTB was statistically significant ( $r = -0.57$ ,  $[p = 0.006]$ ) in predicting academic performance.
- Average WKD TTB was highly correlated with academic performance but failed to reach statistical significance ( $r = -0.35$ ,  $[p = 0.11]$ ).
- Average WKE TTB was statistically significant ( $r = -0.58$ ,  $[p = 0.004]$ ) in predicting academic performance
- Average TTB was a significant predictor of academic performance for five of the seven days of the week (Mon  $[p = 0.024]$ , Tue  $[p = 0.022]$ , Wed  $[p = 0.036]$ , Fri  $[p = 0.012]$ , Sat  $[p = 0.017]$ )

Our data suggests student academic performance is greatly influenced by their average bedtimes for most days of the week. Other sleep metrics such as WAKE time and sleep duration were not found to be significantly correlated with academic performance as other studies have found. Future studies should consider interventions aimed at improving bed times for students throughout the week.

*EVALUATION OF ACUTE AND CHRONIC SLEEP PATTERNS ON EXAMINATION PERFORMANCE*

Emilio Saenz, BS; Matt Valdes, OD, FAAO; Deidre Rios, MS, PhD, AHIP; Sandra Fortenberry, OD, FAAO

**Purpose:** Insufficient sleep has been labeled a public health crisis in the United States, with many adults receiving less than the Center for Disease Control and Prevention's (CDC) recommended 7-8 hours of sleep per night. Our study looks to investigate how sleep quality (i.e. deep sleep vs light sleep) and quantity (i.e. sleep duration) may be associated with exam performance.

**Rationale:** Sleep is an important component in mental and physical health. Unfortunately professional students often leverage sleep for productivity to manage an ever-increasing workload. Such behavior has been known to disrupt the normal sleep cycle, which in humans transitions through various stages. These stages include light sleep (stage 1), deeper sleep (stage 2), deep non-rapid eye movement sleep (Stage 3) and rapid eye movement (REM). Reductions in the amount and quality, specifically REM sleep has been linked with disorders such as sleep apnea, Parkinson disease, narcolepsy, depression and memory. Prior research has shown greater sleep duration prior to examination was positively correlated with academic performance.

**Methodology:** This longitudinal study was conducted during the Summer semester of 2022 with optometry school students (OPT III, n = 20) who were enrolled in at least 19 credit hours. Academic performance was measured using the subjects' midterm exam scores from a third year vision therapy course they were enrolled in during the study. All scores were confirmed through student affairs, with subject consent. Wrist based accelerometers (MiBand 2. Beijing, China) were used to measure total sleep and deep sleep duration:

- Short-term: 1 day prior to the mid-term exam
- Intermediate: 7 days prior to the mid-term exam
- Long-term: 21 days prior to the mid-term exam

Exclusion criteria included anyone pregnant, nursing or caring for a newborn. The study protocol was approved by the Institutional Review Board (1168-31168). Data was collected and analyzed using Google Sheets

(Mountain View, CA) and XLMiner Analysis Toolpak (Incline Village, NV). Pearson Linear Regression determined correlations between deep sleep patterns and exam performance.

**Findings:**

1 day before:

- Students with earlier WAKE times the day of the exam performed significantly better than their peers ( $r = -0.61$ ,  $p = 0.005$ ).
- Students who received less deep sleep performed significantly better than their peers ( $r = -0.45$ ,  $p = 0.047$ ).
- Greater sleep duration was correlated with better examination performance but failed to reach statistical significance ( $r = -0.39$ ,  $p = 0.086$ ).

7 days before:

- Students who were more consistent in receiving light and deep sleep over the seven days prior to the exam performed better than their peers ( $r = 0.48$ ,  $p = 0.032$  and  $r = 0.46$ ,  $p = 0.041$ , respectively)
- More consistent sleep duration over the 7-day period leading up to the examination was correlated with better examination performance ( $r = 0.42$ , [ $p = 0.062$ ]), but failed to reach statistical significance.
- Students slept significantly less the night prior to the examination than the measured 7- and 21-day sleep totals (6h50m, 7h25m [ $p = 0.016$ ], 7h17m [ $p = 0.038$ ], respectively).

21 days before:

- Other than deep sleep consistency ( $r = 0.38$ ,  $p = 0.08$ ), no measured sleep metrics were substantial predictors of academic performance 21 days prior to taking their midterm exam.

Less variation of intermediate sleep patterns is more closely related to better examination performance. Our data does not support other studies which found acute sleep duration to be a significant predictor of examination performance.

Future studies should consider interventions related to improved sleep hygiene 7 days leading up to examination.

*THE HUMAN VISUAL THRESHOLD OF THE MELANOPsin GANGLION CELL PATHWAY*

Jeffrey C. Rabin, OD, MS, PHD; Erica L. Poole, OD; Brazil Andrews, BS; Kiana Hall, BS; Gurjiv Kaur, BS; William Price, BS; Venessa Sailors-Machac, BS; Rathanart Somphruek, BS

**Purpose:** Human retinal photoreceptors (rods: night, cones: daytime) absorb light energy transducing it to neural signals conveyed to ganglion cells which form the optic nerves sending signals to the brain. Intrinsically photosensitive retinal ganglion cells (ipRGCs), discovered 20 years ago, absorb blue light directly and control myriad functions: photo-entrainment and circadian rhythms, pupil responses, sleep, alertness, cognition, mood, and even conscious visual perception. In prior research we characterized retinal and cortical responses from ipRGCs (<https://doi.org/10.1038/s41433-020-01185-3>). Our purpose was to refine this technique to measure the human visual threshold to full-field stimulation of ipRGCs.

**Rationale:** Measures of ipRGC dysfunction can help detect, diagnose, and monitor ocular disease as well as non-visual disorders impacting sleep, mood, and cognition. ipRGC metrics can also monitor the efficacy of new gene therapies to treat retinal diseases. Since these conditions can impact overall retinal function, and since ipRGCs comprise only ~7,000 of 1 million ganglion cells per eye, new tests which quantify overall, full-field stimulation of ipRGCs are needed for better identifying existing disease and to act as outcome measures for gene therapy in hereditary diseases (e.g., night blindness, retinitis pigmentosa). Selective chromatic adaptation, in which blue stimuli are presented against a very bright amber background, was used to suppress sensitivity of red and green cones and rods, isolating the response to ipRGCs and blue cones, both sensitive to blue light. Since blue cones are most sensitive to shorter wavelengths (peak 426 nm) than ipRGCs (peak 480 nm), testing was combined with a blue cone blocking filter (BCBF) which restricted stimulation to ipRGCs.

**Methodology:** The DiagnosysFST® (FST®, Diagnosys, LLC) uses a validated technique to determine the lowest intensity light seen 50% of the time specified as threshold. Subjects use a yes-no button box to report

detection or non-detection. Each test commenced with 30 sec. adaptation to the amber field followed by 200 msec. presentations of the blue stimulus presented against the amber background. A beep signaled each stimulus onset with 3 sec. to respond. Testing was conducted on right, left and both eyes with and without the BCBF in randomized order. Monocular results from subjects whose responses showed high validity based on software quality scores (2 and 3) were included. Nineteen healthy adults (mean age  $\pm$  SD: 30 years old  $\pm$  10, range: 18 – 45 YO) participated after written informed consent in accord with our IRB approved protocol (IRB #2022-1187-EXP). Data analyses were conducted with Microsoft Excel (version 2211). Thresholds were distributed normally (Jarque-Bera test). Two-way repeated measures ANOVA was used to compare data across filter vs. no filter and right and left eyes, with post-hoc two-tailed t-tests with Bonferroni correction to confirm individual differences. Regression and Bland Altman analyses were used to substantiate data validity.

**Findings:** FST® thresholds were significantly higher with the BCBF compared to without ( $F = 418, P < .001$ ) with no difference between right and left eyes ( $F=.01, P>.94$ ), hence mean thresholds of right and left eyes were used for analyses. Mean with BCBF filter (0.19 log cd/m<sup>2</sup>) was significantly higher than without (-1.42 log cd/m<sup>2</sup>, mean difference 1.61 log cd/m<sup>2</sup>, 95% CI: 1.38-1.84,  $P < .001$ ). Linear regression between right and left eyes showed high predictability ( $F=39, P<.001, r^2=0.7$ ). Bland-Altman analysis showed no inter-ocular bias with thresholds within 95% confidence intervals substantiating measurement validity. Finally, there was a significant correlation between putative ipRGC thresholds and age ( $r^2=0.4, F=10.5, P<.006$ ). Our findings indicate that this new technique quantifies the ipRGC visual threshold for potential application for enhanced detection of various diseases and as an outcome measure for the efficacy of gene therapy for retinal diseases.

*IMPACT OF GAME BASED LEARNING STRATEGIES IN STUDENT ENGAGEMENT IN HEALTH PROFESSIONS EDUCATION*

Lourdes Alarcón Fortepiani, MD, PhD

**Purpose:** Our overall goal is to gain insight in the impact of game-based educational resources such as escape rooms in student engagement and learning in Pathophysiology courses in Optometry.

**Rationale:** Learning is enhanced when students are involved and engaged. However, in the past years there has been an increase in student disengagement. Class attendance is decreasing and students do not complete their assignments or turn in work on time. Research has demonstrated that engagement allows the student to develop higher-level critical thinking, which is essential in Health Professions. Providing opportunities for this intellectual engagement is necessary to capture the student's attention and numerous technologies have surged to meet this goal. One of the teaching resources utilized as an engagement tool in the classroom is gamification and game-based learning strategies. Interestingly, if games present low difficulty to be solved, they will not be very engaging, thus game-based strategies seems to be an ideal candidate to engage students in approaching challenging concepts. One of the games that has been widely used in K-12 and higher education are the Escape Rooms, thus we propose to develop game-based educational resources based on an Escape Room format to assess their impact in student engagement and learning in Optometry students.

**Methodology:** A total of 66 students were enrolled in a Systemic Pathology course. The course used flipped instruction and students were asked to watch pre-recorded lectures or videos on a topic before the on-site

session, where they worked in groups on a clinical case based on that topic. The game-based learning approach was used for some of the course cases and consisted in using multiple games facilitated by the instructor to provide a short answer for the case questions in an escape room format. The software used for escape rooms was BreakoutEdu and for interactive activities BookWidgets. We created puzzles, crosswords, matching activities and used lock boxes to escape the room while answering the questions. At the end of the semester, all the students completed a feedback questionnaire.

**Findings:** The students reported that solving cases during class, independent of the use of games, was beneficial to their learning (79%). Despite the minimal use of games, they perceived the use of games as enjoyable (68%) and reported an improvement in their learning (69%) when compared to the traditional cases without the game component. Furthermore, we compared this cohort to the same course offered the previous year with the same format except for the game-based activities to determine the impact on student performance. We found that the two groups obtained similar scores in the course average but in contrast with the previous year where 3 students failed the course, every student obtained a passing grade average. In conclusion, the use of game-based learning strategies increased the engagement of the students and their perception of what they learned, however, did not seem to improve their academic performance in the course.

*STRABISMUS SIMULATION USING PRISMATIC GLASSES IN OPTOMETRIC CLINICAL EDUCATION*

**Narges Kasraie, OD; Allan McCleary, Yutaka Maki, Narges Kasraie, Allison Cronin, Srihari Narayanan, Sandra Fortenberry**

**Purpose:** To investigate the effectiveness of strabismus simulation glasses as a teaching tool for improving the proficiency of the UIWRSO optometry interns at performing cover test.

**Rationale:** One of the challenges in optometry preclinical laboratory teaching is exposing students to abnormal ocular conditions. Usually, students practice preclinical skills on each other who often have normal ocular conditions, therefore, limiting their learning experience in laboratory settings. Their experience can be enhanced, and they will be better prepared for clinic if they can experience ocular abnormalities through simulation from early on. There have been many attempts to create such clinical simulations using various techniques and technologies, and such simulations generally provide a greater understanding of the ocular abnormality and benefited students' learning. Therefore, this study aims to evaluate the effectiveness of our simulation glasses for better teaching a clinical skill named cover test which helps detect and quantify any possible misalignment of the eye, which in some cases could lead to amblyopia, and therefore, permanent reduction in best corrected vision.

**Methodology:** Students who were registered in the second-semester first year clinical optometry course at the University of Incarnate Word Rosenberg School of Optometry participated in this prospective parallel study. This study was approved by the UIW Institutional Review Board. Informed Consent was obtained from all

participants. The participants learned the cover test skill in their previous clinical optometry course and had passed basic proficiency assessments. In this study, they were instructed to take an online cover test assessment in which they were asked to evaluate and diagnose a series of different ocular alignments by watching cover test videos. Those students were then divided into two groups: control and experimental groups. In the control group, cover test skill was reviewed and retaught in a traditional approach where students practiced with each other. In the experimental group, cover test skill was taught using prismatic glasses which simulated strabismus. At the end of the lab, students took another online cover test assessment to see how each group's assessment score improved.

**Findings:** Our study indicated that the experimental group showed a greater gain in their interpretation and evaluation skills of cover test findings. Although the control group also showed an improvement in their assessment performance, their improvement was smaller and not statistically significant. This may be explained by the fact that the subjects were already exposed to traditional lab experience and reviewing cover test under the same conditions had no significant impact. In conclusion, the strabismus simulation glasses were found to be an effective tool in teaching optometry students cover test, which proves to be a beneficial teaching addition to our preclinical laboratories in order to better train our future eye doctors.

## SCHOOL OF MATHEMATICS, SCIENCE, AND ENGINEERING

### *EMPOWERING MINORITY FEMALES IN STEAM EDUCATION THROUGH ROBOTICS-BASED MENTORING: A CASE STUDY OF THE MINI GEMS PROGRAM*

**Amanda Roberts, PhD; Carrisa Lira, HEB School of Business, Business Management**

**Purpose:** The purpose of this paper is to examine the impact of the miniGEMS program, a robotics-based mentoring initiative, on the education and empowerment of minority females in under-resourced communities. The program aims to build a foundation for STEAM (Science, Technology, Engineering, Art, and Mathematics) education and encourages creativity, innovation, productivity, and teamwork among its participants. Additionally, miniGEMS promotes self-efficacy, knowledge transfer, fresh perspectives, pathway guidance, and networking opportunities for its members. The program aligns with the FIRST LEGO League core values of gracious professionalism and the University of the Incarnate Word's mission of giving back to the community. By examining the miniGEMS program, this paper sheds light on the effectiveness of robotics-based mentoring programs in promoting positive attitudes towards STEM/STEAM studies and careers among young minority females.

**Rationale:** The rationale and significance of this study STEM from the underrepresentation of minority females in STEAM fields. Despite efforts to promote diversity in STEAM education and careers, minority females still face significant barriers that limit their access to resources and opportunities. The miniGEMS program addresses this issue by providing a supportive and inclusive environment for minority females to explore and engage with STEAM topics. By highlighting the effectiveness of the miniGEMS program, this paper can inform the development of similar initiatives that promote diversity and inclusivity in STEAM education and careers. Additionally, this paper contributes to the growing body of literature on the impact of mentoring programs in promoting positive outcomes for underrepresented groups in STEAM fields.

**Methodology:** The methodology used in this study involves a qualitative analysis of the miniGEMS program's impact on its participants. The data collection process includes interviews with program participants, observation of program activities, and analysis of program documents. The data will be analyzed using thematic analysis to identify key themes related to the impact of the miniGEMS program on its participants. The study will also include a comparison of the experiences of program participants with those who did not participate in the program. This comparative analysis will provide insight into the unique benefits of the miniGEMS program and its impact on minority females in under-resourced communities.

**Findings:** This study's findings demonstrate the miniGEMS program's effectiveness in promoting STEAM education and empowering young minority females in under-resourced communities. The program promotes positive attitudes toward STEM/STEAM studies and careers, provides a supportive and inclusive environment for its participants, and encourages creativity, innovation, productivity, and teamwork among its members. The miniGEMS program aligns with the FIRST LEGO League core values of gracious professionalism and the University of the Incarnate Word's mission of giving back to the community. By highlighting the effectiveness of robotics-based mentoring programs, this study can inform the development of similar initiatives that promote diversity and inclusivity in STEAM education and careers. Overall, the findings of this study contribute to the growing body of literature on the impact of mentoring programs in promoting positive outcomes for underrepresented groups in STEAM fields.

*ETHNIC HOMOPHILY AFFECTS VACCINE PRIORITIZATION STRATEGIES*

**Md Rafiul Islam, PhD; Claus Kadelka, PhD, Faculty, Iowa State University, Mathematics**

**Purpose:** People are more likely to interact with other people of their ethnicity-- a phenomenon known as ethnic homophily. We studied how accounting for ethnicity homophily improves outcomes associated with COVID-19 vaccine prioritization strategies

**Rationale:** In the United States, people of color are known to hold proportionately more high-contact jobs and are thus more at risk of virus infection. At the same time, these ethnic groups are on average younger than the rest of the population. This gives rise to interesting disease dynamics and non-trivial trade-offs that should be taken into consideration when developing prioritization strategies for future mass vaccine roll-outs.

**Methodology:** Here, we study the spread of COVID-19 through the U.S. population, stratified by age, ethnicity, and occupation, using a detailed, previously-developed compartmental disease model. Based on historic data from the U.S. mass COVID-19 vaccine roll-out that began in December 2020, we show, (i) how ethnic homophily

affects the choice of optimal vaccine allocation strategy, (ii) that, notwithstanding potential ethical concerns, differentiating by ethnicity in these strategies can improve outcomes (e.g., fewer deaths), and (iii) that the most likely social context in the United States is very different from the standard assumptions made by models which do not account for ethnicity and this difference affects which allocation strategy is optimal.

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*THE IMPACT OF HINDU-ARABIC NUMERALS ON MATHEMATICAL DISCOVERY THROUGHOUT HISTORY*

Orion Jones

**Purpose:** The purpose of this paper is to explore the impact of Hindu-Arabic numerals on mathematical discovery throughout history. This paper will examine the correlation between the adoption of this numbering system and the development of mathematical discoveries. Specifically, this paper will look at the Vedic Period in northern India, the work of al-Khwarizmi in Persia, and the development of calculus and analytical geometry in Europe. By examining these periods in history, this paper will provide insights into the transformative effects of mathematical notations on human progress.

**Rationale:** The rationale and significance of this study lie in the impact of mathematics on human society. Mathematics is an essential tool in science, engineering, technology, and many other fields. The development of new mathematical concepts and tools can lead to significant advancements in these fields. By examining the impact of Hindu-Arabic numerals on mathematical discovery, this paper provides insight into the role of mathematical notation in human progress. Additionally, this paper highlights the importance of cultural exchange and the transfer of knowledge in driving human progress.

**Methodology:** The methodology used in this study involves a historical analysis of the impact of Hindu-Arabic numerals on mathematical discovery. The data

collection process includes a review of historical documents and literature related to the periods examined in this study. The data will be analyzed using a qualitative approach to identify key themes related to the impact of Hindu-Arabic numerals on mathematical discovery. This study will also explore the role of cultural exchange and the transfer of knowledge in driving mathematical progress.

**Findings:** The findings of this study demonstrate the transformative effects of mathematical notation on human progress. The adoption of Hindu-Arabic numerals led to the development of new mathematical concepts and tools, which drove significant advancements in various fields. The Vedic Period in northern India saw the development of large and small infinities, and the work of al-Khwarizmi in Persia led to the development of modern algebra. Finally, the adoption of Hindu-Arabic numerals in Europe led to the development of calculus and analytical geometry. Overall, this paper provides insights into the transformative effects of mathematical notation on human progress and highlights the importance of cultural exchange and the transfer of knowledge in driving progress in mathematics.



*USING SATELLITES TO UNDERSTAND HOW SAHARAN DUST IMPACTS THE ATLANTIC OCEAN*

**Katelyn Simonsen**

**Purpose:** The purpose of this research is to investigate how the multiple features of satellites and sensors can aid in tracking the Saharan Air Layer and discovering the impacts to tropical development. It looks at how the Lower-Level Water Vapor, Split Window, Dust Aerosol Optical Thickness, Meridional Wind and Caribbean Soundings show the movement and impacts of Saharan Dust. The Split-Window appears to show the clearest distinction between clouds and the Saharan Air Layer. This information will help in future studies and predictions of hurricane development.

**Rationale:** The year 2022 was forecasted to have a great amount of tropical activity throughout the Atlantic Ocean. However, the Atlantic Hurricane Season saw little tropical development. One major reason for the decrease in tropical storms can be attributed to the Saharan Dust Storm which becomes prominent between the months of June through October. Over the past few decades, improvements to satellites and sensors have allowed researchers to gain a better understanding into how the Saharan dust moves across the Atlantic and the implications the Saharan Air Layer (SAL) has to the Atlantic tropical season. This research will take a closer look into how improvements to satellites and sensors increase the ability to both track Saharan Dust movement across the Atlantic Ocean and grow the understanding of impacts to tropical storm development. The resources used will investigate which satellites provide optimal viewing and tracking information, what data can be collected about the SAL, and the direct correlations of Saharan Dust to tropical development. With this information, future studies and predictions of hurricane development can be developed.

**Methodology:** The data used for this research into Saharan Dust is pulled from a variety of satellite imagery and models. Sources include the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Association (NOAA), the National Weather Service (NWS), and the University of

Wisconsin-Madison. The period this research covers is from the beginning of June 2022 to the middle of October 2022. During these five months the movement of the Saharan Dust across the Atlantic Ocean is most prominent. The satellite images used will be of the GOES-16 SAL tracking product, which will allow for the tracking of the Saharan Dust across the Atlantic. The GOES-16 SAL Low Level Water Vapor uses wavelength of 7.3  $\mu\text{m}$ . This band will help in visualizing the amount of dry and moist air throughout the five month period. Other important satellites include the GOES-16 Low-Level winds and the Aerosol Optical Thickness. Each of the bands listed above use Infrared sensors to view the moisture content and the dust particles in the atmosphere. Several Caribbean Soundings are used to show the percentage of dust over the period of five months. The satellite imagery is viewed from the 15th of each month at 12 zulu.

**Findings:** The SAL Low-Level Water Vapor shows the moisture content throughout the whole Atlantic Ocean. This product shows more extensively where the dry air is and where there is less possibility of tropical development. The next data element used was the SAL Split-Window. While this product does not show the transition between dry and moist air, it does clearly show a distinction between clouds and the dry dusty air. This product more accurately shows what part of the dry air has the Saharan Dust within it. Dust Aerosol Optical Thickness then specifies where the dust is in the atmosphere regardless of the moisture content. Learning about the impacts of Saharan Dust on tropical development is important especially after the 2022 hurricane season. This year was predicted by the National Hurricane Center to have many named storms, however the total of named storms remained at 14 with the first named storm developing in June. The fourth storm, first to reach hurricane status, formed late into the season during the month of September (NHC, 2022). If the movement of Saharan Dust is further understood, then scientists can incorporate this knowledge into predictions for future hurricane seasons.

## SCHOOL OF MEDIA AND DESIGN

### *OLYMPIC GRAPHICS AND DESIGN EDUCATION: LESSONS ON FORM, SOCIAL TRANSFORMATION AND OVERCOMING THE UNEXPECTED.*

**Teresa Trevino, MFA**

**Purpose:** This presentation covers how Olympic graphics are included in three design courses as subject of study and approached from three different perspectives to achieve unique goals. A first interest relies on the study of form and innovative ways to make it accessible for a diverse audience. An example of this is how permanent and ephemeral identities collide to represent cultural context. A second approach is the historic perspective as evidence of social transformation, where inclusion and representation play a key role exposing the evolution on this matter. Finally, a third and more complex perspective, is the study of Olympic graphics as testimonial of design as a professional practice that demands ethical and resilient designer to successfully face and overcome unexpected events, constant change, public opinion, ethical dilemmas and by this, impact society in a positive way.

**Rationale:** Olympic graphics have served as a pedagogical instrument for design educators. Every four years, when the official upcoming design system goes public, new learning opportunities come along. Due to the scale of these events and its media coverage, design education should pay special attention and be critical of a global design strategy that should reflect design principles, innovation and mostly a message that aligns with social justice and common good.

**Methodology:** Qualitative and Quantitative research.

**Findings:** Olympic graphics are a vast and useful tool for design educators on form and accessibility. In addition, olympic graphic systems continue creating a historic legacy of social transformation, inclusion and representation. Olympic graphics serve as a testimonial that graphic design is a profession that demands ethical and resilient designers.

*READY OR NOT: CHALLENGING THE KNOWN WITH HUMILITY, CURIOSITY, AND PLAY*

Raymond Blanton, M.Div., Ph.D.

**Purpose:** Our UIW Research Week 2023 theme, Challenging the Known, implies something quite interesting. That is, in order to challenge the known, we must know what (and/or whom) we are challenging. In simplest terms, generations cohere around values, beliefs, attitudes, and actions that adapt to their particular times. When new generations emerge with new challenges, the fault lines of these collective ideals shift, causing generational tension. Interestingly, my sense is that if we closely examined the ideals of these varying generations, we would likely find significant overlap. Yet, the media, language, and rituals we use to express these ideals varies to the point that we begin to question not only other's ideas but the people themselves. Thus, we get caught in cynical cycles of distrust and resentment. So, why, how, and when should we challenge the known? I submit there are two attitudes, humility and curiosity, and one fundamental practice, play, that can help guide us through these cycles. In this session, I share a published book chapter on generational differences spanning Baby Boomers to Generations X, Y, and Z. Specifically, I examine the book, film, and cultural phenomena of Ready Player One.

**Rationale:** This project examines the practice of play as a means of challenging known ideals across Generations X, Y, and Z in the context of media and visual culture, most specifically as it pertains to how each is represented culturally, as well as the media designed for and by these generations. In this session, I contend that Ready Player One, both the novel and film, has the unique distinction of representing, simultaneously, the past, present, and future—and thus, functions as an ideal cultural artifact through which to better understand and respond to the issues of representation related to the cynical cycles of generational tension in our society.

**Methodology:** I use rhetoric to closely read and assess how representations of, for, and by these generations

might empower us to confront the tethered nature of our digital dependency. This, in turn, can enhance our ability to assess and respond to the substance of messages from an array of mediums through a critical interrogation of the representative anecdote, Ready Player One. Altogether, I argue that Ready Player One, both novel and film, encourages us to privilege real rather than virtual or socially mediated relationships and that the notion of Sabbath may function as a strategy to actualize such relationships. Moreover, I argue that play, as it manifests in the cultural phenomena of Ready Player One, provides a fundamental practice that can help us learn why, how, and when to challenge the known.

**Findings:** Altogether, this session and chapter has sought to bridge the chasm in the study of media and visual representations of Generations X, Y, and Z, emboldening the need for relational Sabbaths that privilege real rather than virtual relationships in order to confront the tethered nature of our digital dependency and enhance our ability to assess and respond to the substance of messages from an array of mediums through a critical interrogation of the representative anecdote, Ready Player One. Both the novel and the film confront an array of themes relevant to representation, namely, the displacement and disconnection of human bodies (and perhaps souls) and the need to develop a more robust critical consciousness—to get more real. To that end, the nostalgic language and story of Ready Player One helps facilitate our sense of identity and belonging, and in essence, generational representation in a manner that hopefully deepens both our appreciation and understanding of Generations X, Y, and Z by calling us to set limits or Sabbath for the explicit purpose of re-engaging with the real-world friendships that comprise the essence of our identity and belonging. <https://drive.google.com/file/d/1xVz1tsFRER1gkJLD3WDz6g3S-DCXZG-7/view?usp=sharing>

*SERIOUSLY, WHY ARE GIRLS IN SONGS ALWAYS 17?*

Adriana Rodriguez

**Purpose:** This research paper will be centered around the question: Why are girls in songs always seventeen? I conduct a rhetorical analysis of three songs from three different artists from the 2010-2020 time frame of music. I analyze these songs through the lens of Barry Brummett's definition of feminist criticism, which begins with the assumption that there is gender inequality between men and women. The three songs I analyze include a Bruno Mars song titled "If I Knew," a Wallows song titled, "1980's Horror Film," and The 1975's song titled, "Girls." In this paper, I argue that these three songs exhibit the implication of innocence, a coming of age theme, and over-sexualization of young teenage women. I believe this topic is important because if we analyze the way women are portrayed in various ways throughout the media, we can get to the core of the problem as to why women are not as respected as men, where certain double standards are coming from, and how we can fix these problems.

**Rationale:** Barry Brummett states that Feminist Criticism begins with the assumption that there is gender inequality between men and women, while also keeping in mind that we live in a male-dominated society. This means women have expectations to follow, or they will receive criticism that men would not receive. He also gives examples of the denigration of women in the music industry, such as hip hop music and their portrayal of women as "bitches" and "hos" while portraying them as sexual objects. Myriam Denov argues in "The Journal of Sex Research" that women in the media have long been portrayed as sexually passive and innocent, and according to Monique Ward's research on women in the media, that female sexuality is heavily present so much that it is commonplace across media. Laura Vandenberg also proves the intention to push popular mediums towards adolescents, thus making them more exposed to these messages. According to Sarah Sheppard, when the young girls are exposed to unrealistic media standards, they develop problems

such as internal-conflict that affect their mental health. Sam Kench identifies a coming of age film as one that is centered around the act of growing up, maturation, and a strong focus character arcs.

**Methodology:** I am analyzing the lyrics of three artists, Bruno Mars, The 1975, and Wallows, to which they reference a seventeen year old girl. I examine the lyrics of these three songs, use them to interpret their views on seventeen year old women, and explain how they prove my findings that songs mentioning seventeen year old women contain the theme of coming of age, innocence, and over-sexualization with this demographic of women. I will be referring to various scholarly articles that present research of women being oversexualized in the media, portrayed as passive and innocent, and with storylines that follow typical the coming of age theme that is shown in film.

**Findings:** We have built a society where the media is obsessed with over-sexualizing women and continuing to project this idea onto young women who identify as minors, which has resulted in damaging their mental health. It is also encouraging young men to treat women in an objectifying way and also reinforcing the idea that this type of behavior is okay within our society. From news articles, to films, to music, there is always an aspect of the media that has participated in objectifying women, specifically younger women who fall under the category of teenager. These three songs grasp what you can expect from your typical piece of music that mentions a seventeen year old girl; what you see will be either the aspect of innocence, coming of age, and objectification by over-sexualization, or all of these characteristics. With "1980's Horror Film" being an example of displaying a coming of age storyline, "If I knew" implying the expected innocence in seventeen year old women, and "Girls" showcasing how seventeen year old girls are sexualized in the music industry.

*STUDENT ENGAGEMENT IN INTERNSHIP OPPORTUNITIES*

**Melinda Adams, PhD; Jody Jessup-Anger, Ph.D.; Professor of Higher Education; Chair, Educational Policy & Leadership; Coordinator, Student Affairs in Higher Education; Marquette University**

**Purpose:** The purpose of this research is to better understand who engages or does not engage in internships or work placements? How and why they engage or do not engage?

**Rationale:** The literature does not provide a significant amount of literature as to ways students do or do not participate in internships opportunities. The research focuses on gathering more information as to why students do not participate in internships and students perceptions of internships. This information will allow higher education to better understand student's perspectives of internships, why they do or do not complete, and how to better assist students who are seeking these opportunities.

**Methodology:** An on-line survey was developed and randomly distributed to students at the University of the Incarnate Word and Marquette University. Basic descriptive statistics were performed to understand who

participated. Correlations were performed to understand relationships between survey questions.

**Findings:** In keeping with the literature, middle and upper class students were more likely to have completed an internship. Students who had not completed an internship were more likely to already be working 20 or more hours a week. While students who had completed internships worked 20 hours a week or less. There are a variety of reasons student did not or have not completed an internship. These range from course load and insufficient pay at internships to not sure how to find an internship. Other reasons for not participating included lack of childcare, lack of transportation, current job demands, and lack of opportunities in discipline. The majority of students who had completed an internship were not required by their program and did not take for credit. The main reason an internship was completed was to gain experience in a specific career that they plan to pursue as their profession.

*TEJANOS CON GANAS*

**Alicia Caballero, MBA**

**Purpose:** Tejanos Con Ganas is a passion project about stories of migrant workers and the values passed on to the next generations. In addition, there are folklore, food, and music. The stories are the highlight and they narrow in on the values that shaped generations of the workforce and how that diversity adds value today.

**Rationale:** The phrase Tejanos con Ganas is rooted in Tejano values. Tejanos were taught to do everything with maximum strength and effort, or “con ganas.” Generations today received many Tejano values from their ancestors. Tejanos know the value of hard work, determination, entrepreneurship, and respect. It is important to be dedicated to whatever you do and to

pursue an education. Education will allow for new opportunities.

**Methodology:** This project showcased videos from three subjects- a migrant worker who is a fourth-generation, a fifth-generation Tejano, and a sixth-generation. The methodology used was video accounts to retain the subjects' perspectives.

**Findings:** These stories are powerful in explaining their upbringing, culture, and values that not only foster a sense of community but bring notable values to the workforce.

## SCHOOL OF OSTEOPATHIC MEDICINE

### *BACKGROUNDS AND PERSPECTIVES OF SAN ANTONIO STREET SLEEPERS*

Christopher Paulo, OMS-III; Amy Moore, PA-C, DSc; Anastasia Abbott, OMS-III; Logan Bruntmyer, MA, OLLU; Ui Lee, OMS-III, Hannah Redwine, OMS-III

**Purpose:** To hear from the population personally as to why someone has become homeless and what keeps them there.

**Rationale:** To determine if there is a better, more financially responsible way to approach the homeless population

**Methodology:** Interpretive study using convenience sampling of unsheltered in San Antonio in interview like setting

**Findings:** 6 most common themes across 28 interviews: jail/prison time, substance abuse/addiction, physical/health challenges as adult, disdain for shelters/preference for street, difficult childhood, did not enjoy school as child.

*USE OF HYPERBARIC OXYGENATION THERAPY FOR CYCLOPHOSPHAMIDE-INDUCED HEMORRHAGIC CYSTITIS A CASE REPORT WITH A CALL FOR AWARENESS AND COMPASSION*

Denise Nemeth, OMS II; Jayesh B. Shah, MD, Faculty

**Purpose:** The aim of this study is to assess the impact of Bariatric Surgery on the treatment of cardiovascular, renal, and metabolic diseases in the context of obesity, to possibly highlight the pre-emptive damage reversal, by analyzing how structural measures, metabolic parameters, and pre-specified cardiovascular and renal outcomes vary after surgery. The primary outcomes of this study were cardiovascular. The secondary outcomes being assessed were renal and metabolic.

**Rationale:** Cardiovascular and renal diseases represent a major determinant for the morbidity and mortality associated with obesity and type 2 diabetes mellitus (T2DM). Obesity can lead to multiple structural, hemodynamic, and metabolic alterations that have been hypothesized to subsequently cause severe damage to the kidney. These may include glomerular hypertension, hypertrophy, and hyperfiltration. This can eventually lead to progressive glomerulosclerosis and loss of renal function. These renal complications are seen in obesity-related glomerulopathy and represent the expression of more generalized systemic damage reflecting an underlying chronic inflammatory state, as well as a direct effect of adiposity, for which, in the high body mass index (BMI) population, cardiovascular risk significantly increased. Bariatric surgery (BS) interferes with several aspects of the pathophysiology of cardiorenal syndrome seen in obesity and is considered one of the few effective treatments to improve long-term cardiovascular and renal complications. Bariatric surgery has the potential to reverse cardiovascular, renal, and metabolic disease and to increase life expectancy, quality of life and reduce disease burden.

**Methodology:** This is a prospective cohort study that included a total of 24 patients affected by morbid obesity and consecutively undergoing SG. A clinical assessment was proposed to all patients, who were informed about the follow-up benefits, in terms of prevention and early treatment of any detected condition. Participants were followed-up for 12 months to assess the short-term effects of SG on analyzed outcomes. Subjects who underwent revisional bariatric

surgery or who had end-stage renal disease or severe cardiovascular conditions were excluded from the study. Pre- and post-surgery measurements of creatinine, eGFR, glucose, insulin, total, LDL/HDL cholesterol, triglycerides, parathyroid hormone, vitamin D3, C-Reactive Protein (CRP), blood count, weight, body mass index (BMI), bilateral carotid intima-media thickness (IMT), flow-mediated dilation (FMD) and epicardial adipose tissue (EAT) were compared. Variables are presented as mean  $\pm$  standard deviation and compared using a P-paired test. Statistical analysis was performed using IBM® SPSS® Statistics version 27. The confidence interval was set to 95%, and p was considered significant at less than 0.05

**Findings:** Several cardiovascular parameters showed improvement including the following: HDL-cholesterol ( $p=0.002$ ), IMT ( $p=0.003$ ), EAT ( $p<0.001$ ) and FMD ( $p=0.001$ ). Secondary renal outcomes including Vitamin D3 ( $p<0.0001$ ), Calcium ( $p=0.006$ ), RBCs ( $p=0.007$ ), HCO<sub>3</sub>- ( $p=0.05$ ) showed significant improvements postoperatively. Inflammatory markers such as CRP ( $p=0.028$ ), neutrophils ( $p=0.005$ ), lymphocytes ( $p=0.025$ ), and their ratio ( $p=0.03$ ), as well as BMI ( $p<0.001$ ), FMD ( $p=0.001$ ) and EAT ( $p<0.001$ ) also significantly improved. This research study supports that sleeve gastrectomy could halt the progression of cardiovascular, renal, and metabolic diseases in a preclinical stage. In fact, sleeve gastrectomy impacts not only body weight, but also ameliorates systemic inflammation and endothelial dysfunction. Along with that, there is a significant improvement in insulin resistance, cardiovascular disease, and the progression of kidney damage. Pre-morbid conditions such as diabetes and chronic renal disease may undergo partial or complete remission postoperatively when treated pre-emptively by bariatric surgical interventions. In view of the cardiovascular and renal diseases account for a significant proportion of the morbidity and excess mortality associated with obesity and that the timeframe for BS to halt this progression is limited, the ideal intervention should take place before there is clinical evidence of the disease.



## SCHOOL OF PHYSICAL THERAPY

### *INNOVATIVE SENSORY MOTOR SUPPORTS IN THE ELEMENTARY SCHOOL CLASSROOM: LESSONS FROM THE TEXAS EDUCATION AGENCY INNOVATIVE SERVICES GRANT*

**Marcie Campbell, OTD, OTR**

**Purpose:** Students with unique sensory and motor needs often struggle in a traditional-style elementary classroom. Students diagnosed with Autism are often placed in special education classrooms with smaller groups of students, but these classrooms often do not provide any additional supports for their sensory or motor needs. Grand Prairie Independent School District developed innovative approaches to promote healthy development and create spaces that support students' individual needs. The hypothesis proposed that providing specialty training of educators and staff in the special education classrooms, sensory enrichment activities, push in support from an occupational therapist, and sensory motor equipment would improve sensory processing scores on the Sensory Profile 2 (a sensory processing assessment tool) by 11 points.

**Rationale:** The rationale used to support the study is based on research on the unique sensory motor needs of students diagnosed with Autism. One of the criteria for a diagnosis of Autism is related to having unique sensory and motor needs. A review of the literature revealed that educational settings that enforce social norms and expectations for sensory and motor responses that do not account for sensory and motor differences could be harmful to children with unique sensory motor needs, such as those diagnosed with Autism. When considering interventions for children with Autism, the environment and surrounding supports need to be accounted for and adapted instead of enforcing children to adapt. With this approach in mind, the research on these interventions is significant for discovering new ways of developing special education classrooms.

**Methodology:** This applied research study used the Sensory Profile 2- a standardized assessment for evaluating a child's sensory processing patterns in the school context. It has a set of norm-referenced teacher questionnaires. The teachers were provided the Sensory

Profile 2 questionnaires during the first month of school to rate the students' sensory processing patterns. The teachers were provided the Sensory Profile 2 questionnaires during the last month of school to rate the students' sensory processing patterns after the interventions were applied in the classrooms. For the interventions, teachers were provided specialized training on sensory-motor development. It was a competency-based training focused on setting up a classroom to support students' sensory-motor needs. The teachers were provided sensory-motor activities for the students and equipment for the room. The teachers were also provided the support of an occupational therapist who came to their room to assist with activities, training and adaptations. In addition to the sensory-motor supports, teachers were provided visual supports, instructional materials/technology, and training on teaching strategies and behavior. The additional assessments used to measure the success of all interventions were the VB-MAPP, Social Responsiveness Scale 2, and TeachTown Basics.

**Findings:** The average points improved on the Sensory Profile 2 was 14 points. The VB-MAPP measures verbal and behavioral milestones assessment and placement program. Students demonstrated an average of 94% growth in milestones, 39% decrease in barriers to school performance, and 161% growth in transitions. The social responsiveness scale measures the presence and severity of social impairment. The goal was that 75% of students would improve by 1 subscale. The outcome was that 87% of students improved by 1 subscale. TeachTown Basics is an adaptive learning tool that works with errorless learning. It teaches adaptive skills, cognitive skills, language development, mathematics, and social and emotional development. The goal was that 7 out of 10 students would master an average of 27-36 lessons. The outcome was that 8 out of 10 students mastered an average of 39 lessons.

*THE RELATIONSHIP OF MUSCULOSKELETAL SYMPTOMS WITH PHYSICAL ACTIVITY AND SLEEP IN NURSES: A PILOT STUDY*

**Sarah Luna, PT, DPT**

**Purpose:** The purpose of this pilot study is to examine the relationship of musculoskeletal symptoms (MSS) with physical activity and sleep in nurses.

**Rationale:** The physical strain on the musculoskeletal system during patient handling is well-understood, but fewer studies explore the relationship of health behaviors such as physical activity and sleep on MSS in nurses. Musculoskeletal problems and poor self-rated health are two of the most common reasons nurses leave the profession, and nurse attrition is contributing to a global nursing shortage.

**Methodology:** Ten nurses who work in an outpatient surgery center in San Antonio, TX participated in this pilot study. Each nurse wore an ActiGraph (GT9X link, ActiGraph, LLC., Pensacola, FL) on their non-dominant wrist for 3 days to measure step counts and sleep efficiency (ratio of time asleep to time in bed). Nurses reported their musculoskeletal symptom intensity 3 times per day using a Visual Analog Scale.

**Findings:** Nurses had 140% higher musculoskeletal symptom ratings on workdays compared to days off, and the average daily step count was 14,000. Step count was a significant predictor of symptoms. For each additional 1,000 steps on a workday, nurses have, on average, 15% higher symptom rating. Sleep efficiency was not a significant predictor of musculoskeletal symptoms, likely due to all nurses having sleep efficiency scores within the normal range. The nurses who participated in this study are achieving well above the recommended minimum number of daily steps, yet they are still having musculoskeletal symptoms. This pilot study supports the concept of a “physical activity paradox” which means not all physical activity is beneficial. High levels of physical activity at work appear to worsen musculoskeletal symptoms, rather than improve them. More research with a larger sample size is required to confirm these findings.

*STUDENT PHYSICAL THERAPY CONFIDENCE LEVELS IN SERVING CULTURALLY AND LINGUISTICALLY DIVERSE POPULATIONS: KNOWING COMMUNICATION STRATEGIES*

Monica Mendez, PT, DPT; Maria De Lourdes Mendez, Ed.D

**Purpose:** The purpose of this preliminary study is to examine physical therapy student confidence levels in serving culturally and linguistically diverse populations in a clinical setting before and after learning communication strategies.

**Rationale:** Service-learning opportunities are implemented into student physical therapy curriculum to allow the practice of clinical and communication skills while providing a community need. Community based programs are recommended to meet the diverse needs of underserved populations (Austin-McCain, 2015). Physical therapy students at The University of Incarnate Word (UIW) serve at their community clinic 4-6 times a semester. Patients served at UIW Physical Therapy Community Clinic are underserved, many from diverse backgrounds. The number of spoken languages in United States households other than English exceeds 21% (United States Census Bureau, 2021), and let alone in Texas close to 35% (United States Census Bureau, 2021). Currently at the UIW Physical Therapy Community Clinic, 33% of clients' primary language is not English. Language and cultural barriers affect healthcare access, quality of care, and communication. Cultural and linguistic diversity are recognized as contributors to healthcare disparities (Lee, 2003). Effective communication between clients and clinicians with diverse cultural backgrounds implies the use of strategies to provide competent health care (Brach & Fraser, 2000). We hope to narrow healthcare disparities by bringing awareness of communication strategies to physical therapy students who serve culturally and linguistically diverse populations while improving student confidence when serving this population.

**Methodology:** Qualitative data was used to examine the preliminary study of 10 student physical therapists' confidence levels when serving culturally and linguistically diverse populations in a clinical setting.

Students in the study were members of the UIW School of Physical Therapy Spanish Club. Qualitative data was used in this study to focus on the students' perspectives before and after they were introduced to 5 communication strategies (Creswell & Creswell, 2022). Communication strategies were also accompanied by examples of how and when they have been utilized in a physical therapy clinical setting. Physical therapy students were given three guiding questions before being introduced to the communication strategies and the same three questions after learning them. The survey questions consisted of yes and no responses. Questions reflected their confidence in working with this population, the need to speak another language, and knowledge of communication strategies. Students were also asked to list specific strategies that may be used while serving culturally and linguistically diverse populations in a clinical setting after learning explained strategies.

**Findings:** In this preliminary study data revealed, 100% of the participants felt comfortable when working with culturally and linguistically diverse populations after communication strategies were introduced compared to 80% prior to the introduction. 10% of the participants believed proficiency in a second language was necessary to communicate with clients after communications strategies explained compared to 20% before the explanation. 100% of participants were able to identify 5 communication strategies when working with culturally and linguistically diverse populations after they were introduced compared to 30% before the introduction. Participant responses on recalling specific strategies they would find useful when working with culturally and linguistically diverse populations included, "using more body language to communicate with patients," "be confident and use technology to my advantage," and "identifying the language gap between my patient and I."

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