

ISCAP

INDEPENDENT SCHOLARSHIP
& CREATIVE ACTIVITIES PRESENTATIONS



MAY 1, 2023

ISCAP Day

Monday, May 1, 2023

Science and Technology Building

1:00 PM – 2:45 PM

Schedule at a Glance:

1:00-1:30	Set up: please hang your posters by 1:30	Atrium/Lobby
1:30-2:30	ISCAP Poster Session	Atrium/Lobby
2:30-2:45	Clean up: Please remove your posters by no later than 2:45	

Planned by the URSA Committee:

Kerrie Sendall, Chair
Hee Young Kim
Phillip Lowrey
Bhesh Mainali
Jane Rosenbaum
Kelly Ross
Jay Stern



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May 1, 2023

Dear Students, Scholars, Faculty and Families,

This week the Rider University community will hear about the remarkable scholarship, research, and creative endeavors of our students as they apply their college education in innovative ways. To those students who are presenting their work at ISCAP Day or URSA Awards Night, I extend congratulations on your achievements. To all those who supported these students in their academic adventures, I offer appreciation and thanks. These activities exemplify the many valuable opportunities and resources students enjoy at Rider to enrich their learning experience. Frankly, our students could not have done their work without you.

Special congratulations to this year's Undergraduate Research and Scholarship Award winners. These students proposed detailed independent projects to be carried out in the following academic year and will each receive a \$5,000 tuition scholarship. You will hear about the wide variety of projects they will be undertaking in the awards session on Wednesday, May 3rd.

Whether you conducted research or helped to make it happen, your efforts send a strong message about the academic excellence students can achieve at Rider.

Congratulations to everyone involved!

Sincerely,

Gregory G. Dell'Omo, Ph.D.
President



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May 1, 2023

Dear Students, Faculty, and Family Members,

Today is the start of honoring and showcasing the creative works and research of Rider University students in collaboration with their faculty mentors. Each year, the Undergraduate Research Scholar Awards (URSA) Committee hosts ISCAP (Independent Scholarship & Creative Activities Presentation) Day in an effort to display student originality and contributions to their fields of interest. ISCAP Day is also meant as a forum for members of the Rider community—both faculty and students—to come together in an interdisciplinary dialogue focused on students' creative projects.

Another very important spring event hosted by the committee announces the new URSA scholarship recipients, as well as to hear about the progress made among last year's URSA award winners on their year-long projects. This evening event is particularly important as we honor some of the most gifted undergraduates at Rider. We congratulate our URSA students on their outstanding accomplishment.

Please join us as we celebrate these student achievements and honor their creative works.

Congratulations on a job well done!

Sincerely,

DonnaJean A. Fredeen
Provost and Vice President for Academic Affairs

Poster Session

Science and Technology Building Atrium, 1:30 PM – 2:30 PM

1. **Diamond Diaz** (Psychology) and **Cece Cream** (Psychology); Advisor: **Cara DiYanni**
The Effects of Outdoor Education on Children
2. **Aeryn Gilmore** (Psychology); Advisor: **Cara DiYanni**
Play-Based Learning Scale: Development and Validation of a New Measure for Play-Based Learning
3. **Megan Grimshaw** (Psychology); Advisor: **Jennifer King**
Social Media and Alcohol Use as Predictors of Poor Sleep Quality
4. **Danielle Spalding** (Elementary Education and Psychology); Advisor: **Bhesh Minali**
The Relationship between Mathematics Anxiety, Mathematics Performance, and Field Placements in Preservice Teachers
5. **Dominique White** (Psychology); Advisor: **Michael Carlin**
Active Music Medicine's Impact on Internalized Disorders
6. **Bailey Adams** (Environmental Science) and **Ashley Murphy** (Environmental Science); Advisor: **Dan Druckenbrod**
Restoration of Rider's Big Woods
7. **Robby Arpaio** (Marine and Environmental Science); Advisor: **Dan Druckenbrod**
Forest in Pembu Bhutan, and its Sensitivity to ENSO Climate Events and Teleconnections
8. **Stessie Chounoune** (Environmental Science); Advisor: **Dan Druckenbrod**
Nepal Streamflow Reconstruction Using Dendrochronological Data and Implications for Future Water Resources Management Initiatives
9. **Jacquelyn Cook** (Environmental Science and Sustainability); Advisor: **Hongbing Sun**
Sources of Sodium and the Geochemical Environment in the Centennial Lake Watershed
10. **Ashley Murphy** (Environmental Science); Advisor: **Kathy Browne**
Restoration of Rider University's Wildlife Website
11. **Ashley Murphy** (Environmental Science); Advisor: **Kerrie Sendall**
Using Deer Enclosures to Aid in Forest Restoration at Rider University
12. **Kiki van Ommeren** (Marine Science); Advisor: **Gabriela Smalley**
Effect of Benzalkonium Chloride on Chlorophyll Fluorescence and Growth of Freshwater Phytoplankton Species
13. **George Afoakwah** (Biochemistry); Advisor: **Todd Weber**
Effects of Maternal Circadian Disruption and High-Fat Diet on Offspring Susceptibility to Diabetes
14. **Alessia Bradley** (Biochemistry); Advisor: **Todd Weber**
The Effects of Extended Light Pulses on Fos Protein Expression in the Circadian Clock of BALB/cJ and C57BL/6J Mice

- 15. Sanesh Ketkar** (Biochemistry); Advisor: **Bryan Spiegelberg**
Analyzing the Kinetics of NAD(P)H Quinone Oxidoreductase 1
- 16. Allison Koopman** (Chemistry); Advisor: **Alex Grushow**
The Study of CdSe Quantum Dots in Relation to Quantum Mechanics
- 17. Ashley Perez** (Chemistry); Advisor: **Danielle Jacobs**
Integration of Nanome into Organic Chemistry
- 18. Sherlin Narayanan** (Computer Science and Biology); Advisor: **Md Ali**
Study of Sentient Analysis Through a Machine Learning Perspective
- 19. Amanda Zambrana** (Computer Science), **Loreen Fanek** (Computer Science), **Pablo Solar Carrera** (Mathematics); Advisor: **Md Ali**
Machine Learning Algorithms for Diabetes Prediction
- 20. Madison Doran** (Biology) and **Kerry Opperman** (Biology); Advisor: **Jim Riggs**
Effect of Antibiotics on Immune Cell Composition of WT vs Mutant Mice
- 21. Derian Stianche** (Health Science); Advisor: **Drue Stapleton**
The Effect of Iron Supplementation on Athletic Performance in Endurance Runners
- 22. Alayna Rubach** (Dance Science); Advisor: **Drue Stapleton**
A Retrospective Review of the Dance Performance and Injury Prevention Program at Rider University

PROJECT ABSTRACTS

Adams, Bailey; Murphy, Ashley

Restoration of Rider's Big Woods

The Rider Big Woods restoration project has been developed in the past and halted due to the pandemic in 2020. The project was picked up this year with the intention to finish the trail plan with minimal disruption to the ecosystem in the woods, as well as to implement a digital network of information for students to access to better understand the benefit of the woods on campus. The streams of information are based on three categories: history of the land, health science, and the natural ecology of the woods. This is a collaborative effort among departments on campus, and is planned to be showcased with a grand opening during the fall '23 semester. So far, multiple departments have been notified in efforts of collaboration. Rider's own green team will be assisting in carving out our final trail as well as laying down mulch during the summer '23 months. A GIS map of the trails will be created and accessible through BroncNation for students, faculty and staff to follow. (Advisor: **Dan Druckenbrod**)

Afoakwah, George

Effects of Maternal Circadian Disruption and High-Fat Diet on Offspring Susceptibility to Diabetes

Obesity and diabetes are major health concerns. A relationship between maternal obesity and offspring susceptibility to type-I-diabetes has been established. The transgenerational consequence of maternal obesity is passed epigenetically. The literature also shows a connection between chronic maternal circadian disruption (CD) and offspring health outcomes. We investigated the effects of maternal diet and circadian disruption on offspring susceptibility to diabetes. Dams were exposed to a high-fat diet (HFD), or control diet (LFD) with either a 12:12 light-dark cycle or 8:8 light-dark cycle (CD). We found that both maternal obesity and CD negatively impacts birth rate. When dams were exposed to both HFD and CD, the birth rate was nearly zero. Additionally, dams on HFD produce offspring with elevated glucose intolerance in adulthood even when the offspring had LFD in its lifetime. When animals raised by dams on LFD are fed a HFD, they develop elevated glucose intolerance comparable to their HFD raised cohorts on LFD. Our findings indicate that maternal HFD predisposes the offspring to a higher risk of diabetes in adulthood regardless of the offspring's dietary choices. We were unable to show the effects of circadian disruption on risk of diabetes due to poor birth rates. (Advisor: **Todd Weber**)

Arpaio, Robby

Forest in Pembu Bhutan, and its Sensitivity to ENSO Climate Events and Teleconnections

Trees can record climate through their rings. Correlating tree rings to a climate time series enables reconstructions of past climate more accurately. Showing that a forest is connected to teleconnections on a global scale can also help in accurately predicting past climate. This study investigates the sensitivity of a Bhutan forest to climate. Additionally, are there any teleconnections that are connected to this forest in Bhutan? The location of the site is Pembu, Bhutan. The chronology dates from 2005 to as late as 1484. Although the chronology is converted using standard correlation and residual correlation which only goes from 2005-1880. Chronology was correlated with various fields and time series on KNMI Climate explorer. There are significant correlations between Southern Oscillation Index (SOI) in October using residual data, North Atlantic Oscillation (NAO) in February and May using standard data, and NIÑO 3 in March using standard data. These climatic variabilities are part of ENSO which is involved in seasonal changes in ocean surface temperature and atmospheric circulation. SOI usually can indicate developing or severe El Niño events. This study found teleconnections that correlate significantly with the chronology that

connects the ENSO in February to tree growth sensitivity in Bhutan in February. (Advisor: **Dan Druckenbrod**)

Bradley, Alessia

The Effects of Extended Light Pulses on Fos Protein Expression in the Circadian Clock of BALB/cJ and C57BL/6J Mice

Studies have shown that light induces expression of the intermediate-early gene, c-Fos, in the suprachiasmatic nucleus (SCN, the “clock” for the circadian system) of nocturnal rodents. Our previous work investigated the time course of c-Fos expression in C57BL/6J mice when given a short light pulse. C57BL/6J mice entrain to phase shifts of light-dark cycles slower than BALB/cJ mice, which demonstrate faster re-entrainment to shifts in the light-dark cycle. In this experiment, the intensity and kinetics of light-induced c-Fos expression are utilized as a measure to deduce the sensitivity of the SCN to long light exposure in the slow-shifting C57BL/6J and the fast-shifting BALB/cJ. Mice were exposed to a 2, 4, or 6-hour light pulse, and c-Fos expression in the SCN is currently being analyzed using immunohistochemical staining. However, preliminary evidence indicates that c-Fos proteins in BALB/cJ will be expressed longer in the SCN than in C57BL/6J. These results may indicate why BALB/cJ mice entrain light-dark cycles faster than C57BL/6J.

Understanding the c-Fos profile of C57BL/6J and BALB/cJ will be useful in future studies to analyze other crucial proteins that affect the circadian clock. (Advisor: **Todd Weber**)

Chounoue, Stessie

Nepal Streamflow Reconstruction Using Dendrochronological Data and Implications for Future Water Resources Management Initiatives

Recent scientific research has stressed the importance of incorporating long-term streamflow reconstructions to assess how to respond to hydrological events that may not be recorded in the shorter-term historical records. Streamflow reconstruction can be helpful to water resource managers in countries like Nepal where water scarcity and food insecurity have led to the need to develop strategies that will help conserve freshwater ecosystems and promote the health and diversity of terrestrial ecosystems. As Meko and Woodhouse indicated the reliability of dendrochronological records for streamflow reconstruction, this project aimed to use tree-ring measurements obtained from *Tsuga dumosa* cores to extend Nepal's streamflow records. Preliminary results from plots generated on R suggested that streamflow and ring-width values were negatively correlated. Using data provided by the KNMI Climate Explorer, I also found that *T. dumosa* growth patterns correlated negatively with precipitation but positively with temperature during the summer. This may be due to denser cloud cover during the summer monsoon season causing a decrease in light penetration, thus preventing photosynthesis and growth. Even with a negative correlation, the significant correlation of these tree-ring records to streamflow enable a long-term reconstruction of streamflow in Nepal. (Advisor: **Dan Druckenbrod**)

Cook, Jacquelyn

Sources of Sodium and the Geochemical Environment in the Centennial Lake Watershed

Cold winters in the Northeast drive communities to apply winter de-icing salts to roads and walkways. While this method is effective, there is still much research to be done to investigate the effects these salt applications will have on the local and regional ecosystems. The purpose of my research was to understand the interaction of sodium with water and soil in the Centennial Lake Watershed, which is a part of the larger Delaware River Watershed that supplies potable water to Pennsylvania (mainly Philadelphia), North Jersey, and New York State. To keep track of water

quality, the conductivity, pH, and temperature were measured from three location sites (upstream, lake, and downstream) on a weekly basis. Additionally, the samples were processed for sulfates and nitrates using a colorimeter and were run through an ICP machine for elemental solutes. Two soil transects were collected near the watershed and they were measured using X-ray powder diffraction and the USGS ROCKJOCK program to determine mineral weight percentages. Results indicate that almost every water sample is above the EPA standard of 20 ppm for sodium, and that the rise in sodium levels are not due to significant contributions from the soil. (Advisor: **Hongbing Sun**)

Diaz, Diamond; Cream, Cece

The Effects of Outdoor Education on Children

Since play has changed and children seem to spend less time outdoors and more time on screens, it's important to demonstrate the benefits of outdoor play and exploration. We had access to a series of outdoor education classes for children ages 5-8 and examined how the nature-centered learning classes impacted 5 categories. These categories include self-reliance, self-regulation, curiosity and risk-taking, motor skills, and appreciation of and connection to the natural world. We did this by observing the frequency of the behaviors for each category that the children exhibited. At the end of the 6-week classes, the children were interviewed and asked questions that self-assessed them for the aforementioned categories. In addition to interviewing the children enrolled in the nature-centered learning class, we also interviewed children who have never participated in these classes to compare their data. Parent surveys were also administered in a pretest-posttest style to determine their perspective of their children in the before mentioned categories as well. (Advisor: **Cara DiYanni**)

Doran, Madison; Opperman, Kerry

Effect of Antibiotics on Immune Cell Composition of WT vs Mutant Mice

The human gut microbiome, a conglomerate of microorganisms of the gastrointestinal tract, plays a critical role in human health. Dialogue between the immune system and our microflora maintains immune homeostasis and detects changes in the normal flora. Antibiotics can severely harm one's microbiome, by depleting beneficial bacteria and leaving room for harmful bacteria to expand and reproduce. The effects of ampicillin, a broad-spectrum penicillin that inhibits bacterial cell wall synthesis, neomycin, a broad-spectrum aminoglycoside that inhibits protein synthesis, and vancomycin, a broad-spectrum glycopeptide that also inhibits bacterial cell wall synthesis, were observed in these experiments. Immune cell subsets of wild-type (WT) mice were compared to toll-like receptor 2 and 4 knock-out mice (TLR-4KO, TLR-2KO). TLRs are pattern recognition receptors, which detect pathogen associated molecular patterns, which are consistently present in the microbiome. The aim of this study is to better understand how the interaction between mice lacking TLR-2 and TLR-4 and the addition of antibiotics influence the dialogue between the microbiome and our immune system. Flow cytometry data of B cell subsets has shown that both strains of mutant mice exhibit a level of protection against the antibiotics not observed in the WT mice. (Advisor: **Jim Riggs**)

Gilmore, Aeryn

Play-Based Learning Scale: Development and Validation of a New Measure for Play-Based Learning

The global intention to provide all children access to quality primary education sparked an influx of new curricular demands and innovations. As an attempt to integrate the most holistic learning approach to early childhood education (ECE), play-based learning (PBL) curricula have gained immense popularity over the past two decades. Despite the vast research supporting play's positive

effects on development, there is scant quantitative evidence measuring the use and effectiveness of PBL curricula in educational settings. To remedy this important issue, the present research aimed to create and validate a psychometrically sound instrument for assessing the implementation and outcomes of PBL. A qualitative pre-survey was used to extract experiences and observations of learning through play from ECE teachers. The data was coded and used to generate items on the new measure. The new measure showed there is ample opportunity for students to participate in playful experiences which enhance skills in core subject areas (math, English, science, and physical activity), as well as for the students to exhibit social, emotional, physical, and cognitive skills or knowledge during play. (Advisor: **Cara DiYanni**)

Grimshaw, Megan

Social Media and Alcohol Use as Predictors of Poor Sleep Quality

The purpose of this study was to examine the effects of social media use and alcohol use on sleep quality. College undergraduate students (N =128) completed a survey that examined student's a) social media use, such as in terms of daily frequency, and use around bedtime, b) alcohol use, such as motives for drinking, and using social media while drinking, and c) sleep quality in terms of trouble sleeping. Frequencies, correlations, and t-tests were used to analyze the data. 72.3% of students reported using social media very often, and 52.3% of students reported they use social media in bed every night. A majority of participants also reported falling asleep at 12:00 am or later. Using social media in bed and using social media while drinking were significantly positively correlated with trouble sleeping. Those who participate in Greek life or Division 1 athletics reported significantly more trouble sleeping or staying awake throughout the day compared to those not in Greek life or in Division I athletics. The results showcase how college students' sleep quality is affected by social media use and alcohol use. Interventions to improve sleep quality are needed on college campuses. (Advisor: **Jennifer King**)

Ketkar, Sanesh

Analyzing the Kinetics of NAD(P)H Quinone Oxidoreductase 1

NAD(P)H quinone oxidoreductase 1 (NQO1) is a human enzyme that detoxifies reactive oxygen species and other reactive compounds that damage biological molecules. The catalytic functionality of NQO1 is not well understood; thus, it is important to measure the enzyme's activity in vitro. I worked to determine the kinetics with which recombinant human NQO1 interacts with the reducing agent NADH and with two other co-substrates: menadione (vitamin K3) and the redox indicator 2,6-dichlorophenolindophenol (DCPIP). These reactions can be followed spectrophotometrically: NADH and the product NAD⁺ differentially absorb UV light, and oxidized and reduced DCPIP differentially absorb visible light. Because menadione and DCPIP are both reduced by NQO1, I hypothesized that menadione would act as a competitive inhibitor of the reduction of DCPIP but that menadione would actually speed up the oxidation of NADH. Initially, in the absence of menadione, I saw that after DCPIP was reduced by NQO1, it slowly became oxidized again. My preliminary analyses of this anomaly suggested that this re-oxidation did not depend on either NAD⁺ or NQO1 and likely occurred non-enzymatically. In addition, I have preliminary evidence that the inclusion of menadione indeed slows the reduction of DCPIP by NQO1. These results provide confidence that these in vitro assays can be used to probe the biochemical activity of NQO1. (Advisor: **Bryan Spiegelberg**)

Koopman, Allison

The Study of CdSe Quantum Dots in Relation to Quantum Mechanics

CdSe quantum dots were synthesized and observed with fluorescence and UV/vis spectroscopy. When doing both of these instrumental techniques it was discovered through doing multiple trials

that the nanoparticles change in each sample taken due to the extractions varying in time and that the quantum dots do not have a long shelf life. We studied various synthetic procedures to determine a method that gives consistent results. The extraction samples were done at various times and had a progression of clear yellow to deep orange color variations. The overall objective of this research was to be able to produce varying sized CdSe quantum dots that gradually progressed from the microscopic to macroscopic scale. This variation of sizes was analyzed through absorption as well as fluorescence spectroscopy, and from there physical chemistry concepts pertaining to populations at different energy states were then applied. (Advisor: **Alex Grushow**)

Murphy, Ashley

Restoration of Rider University's Wildlife Website

During my time restoring Rider University's Wildlife Website during the spring '23 semester, I have updated the format, images, and information that past students have added to the site. I met with multiple faculty members on campus who provided me with images of species found in our community. I've met with Rider's marketing team to ensure the website is accessible to everyone with supplemental alternative text, which is critical for users who are using screen readers. I also plan on meeting with Dr. Curt Elderkin for further species identification of invertebrates in late April. Showcasing the final website will be rewarding for those who have helped out on the website in the past. I also hope to promote this website at ISCAP day so current professors can show their students species that call Rider their home. (Advisor: **Kathy Browne**)

Murphy, Ashley

Using Deer Enclosures to Aid in Forest Restoration at Rider University

Deer overpopulation has been negatively affecting the growth and biodiversity of understory vegetation in forests. Since there are currently no natural predators for the white-tailed deer, they have been consuming understory vegetation at an unsustainable rate. Many native plants are favored by deer, including trees, shrubs, lianas, herbaceous plants and seed banks, and do not have a chance to reach maturity. This will alter the composition of forests over time, reducing numbers of native plants while allowing non-native, invasive plant species to thrive. A one-acre plot of Rider University's forest was enclosed with a ten-foot-tall fence to prevent deer from entering. This land has been surveyed to understand which plant species the forest understory could be composed of if the deer population was under control. Within the fencing, four transect lines are marked with flags, and plants will be identified and counted in a 70cm space on either side of each transect. Along with this survey of native species, invasive species such as burning bush and oriental bittersweet will be removed from the root to prevent regrowth. Transect lines will also be marked outside of the deer fence, to collect data on what growth is found in the presence of deer. (Advisor: **Kerrie Sendall**)

Narayanan, Sherlin

Study of Sentient Analysis Through a Machine Learning Perspective

When a person is scrolling through their social media feed, YouTube feed, or Google, they are shown a variety of websites, posts, and ads. If that information is randomly presented, it does not benefit the company presenting the data or the user viewing the data. However if data is analyzed respectively to the users to see what data users seem to like and do not like, then both parties benefit. The emotions of users will be analyzed with respect to the information being presented in an analysis known as Sentiment Analysis to display products or info that users like and will likely purchase. Therefore, if companies rely on such analysis, appropriate methods must be used to conduct them. In this research, different machine learning algorithms were analyzed and compared

to highlight the best ways to benefit internet users through sentiment analysis. Multinomial and Complement Naive Bayes, Passive Aggressive, Logistics Regression, Support Vector Machine, and Decision Trees were the classifier algorithms that were analyzed through three different ngrams in this study. Accuracy was the metric used for comparison. At the culmination of the analysis, logistics regression with unigrams was found to have the highest accuracy of 63.76% in sentiment analysis. (Advisor: **Md Ali**)

Perez, Ashley

Integration of Nanome into Organic Chemistry

In Organic Chemistry, one of the greatest difficulties for students is envisioning the structure and reactivity of three-dimensional molecules in a two-dimensional space. This can greatly impede their ability to understand and predict molecules' physical and chemical properties, particularly with regard to three-dimensional stereochemistry, the arrangement of atoms, molecular geometry, and the relative conformation of a molecule's bonds. Despite having molecular modeling sets for Organic Chemistry, these are often insufficient and inconvenient. This project represents ongoing efforts to overcome this perpetual challenge by creating tutorials and developing immersive activities using Nanome, an interactive molecular modeling software designed for virtual reality headsets. By integrating modern technologies that allow students to manipulate organic molecules in a three-dimensional space, we believe that such activities will improve overall student engagement, learning, and comprehension. (Advisor: **Danielle Jacobs**)

Rubach, Alayna

A Retrospective Review of the Dance Performance and Injury Prevention Program at Rider University

Pre-participation musculoskeletal screening provides an opportunity to identify potential areas for concern with a dancer's functional movement that may impact performance and/or injury development. In the Fall of 2018, a screening program, the Dance Performance and Injury Prevention© (DPIP) Program, was implemented into the Rider Dance program. Since its inception there has not been a comprehensive review of the screening nor related injury data. The purpose of this investigation was to describe the outcomes of the DPIP© by evaluating the pre-participation screening data and to explore the relationships between measures of musculoskeletal function. The results revealed injuries to the lower extremities (ankle, knee, hip) were the most prevalent among incoming dancers. Movement screening revealed reduced control of the lumbopelvic-hip complex and restrictions in hip movement from multiple screening measures. The results provide a framework for further investigation to identify specific impairments and develop interventional strategies to both improve performance and mitigate injury risk. (Advisor: **Drue Stapleton**)

Spalding, Danielle

The Relationship between Mathematics Anxiety, Mathematics Performance, and Field Placements in Preservice Teachers

This study aims to investigate the relationship between preservice teachers' mathematics anxiety, mathematical performance, and factors associated with math anxiety. 29 participants enrolled in a mathematics, field-based course completed the abbreviated mathematics anxiety rating scale (A-MARS) questionnaire, wrote a personal statement regarding their mathematics anxiety, and created a mathematics anxiety concept map which were analyzed to compare mathematics anxiety among preservice teachers. The preliminary findings suggested that most sources of mathematics anxiety in preservice teachers are teaching mathematics, having experience with mathematics, particular areas of mathematics, and memorization/testing. 13 out of the 29 students scored above average in their level of anxiety, with scores ranging from 0 to 58 and the mean being 28.9. Most

students who indicated having lots of experience with mathematics and confidence tended to have lower anxiety scores, and students who indicated memorization and testing to be sources of anxiety tended to have higher anxiety scores. (Advisor: **Bhesh Minali**)

Stianche, Derian

The Effect of Iron Supplementation on Athletic Performance in Endurance Runners

Iron deficiency is common among endurance athletes, reducing oxygen carrying capacity, and potentially reducing athletic performance. Iron supplementation is effective in increasing iron levels, but the effects of supplementation on running performance is not clear. The purpose of this critical appraisal of the literature was to determine the effect of iron supplementation on measures of athletic performance in distance runners. A computerized literature search (Academic Search Premier, CINAHL, MEDLINE, PUBMED, & SPORTDiscus) was conducted in January 2023 to identify papers published between 2014 and 2023 investigating the effects of iron supplementation (I) on performance (O) in runners (P). The search resulted in 36 possible studies. After review and application of inclusion and exclusion criteria, three studies (1 prospective cohort and 2 RCTs) were appraised. Results of the appraisal revealed inconsistency in improved athletic performance after iron supplementation. This CAT did reveal questions as to the optimal dose, duration of treatment, and method of administration that are most efficacious. Given the importance of iron in overall health and wellness, assessing iron status in runners may be warranted as a part of a comprehensive athletic health and wellness program. (Advisor: **Drue Stapleton**)

van Ommeran, Kiki

Effect of Benzalkonium Chloride on Chlorophyll Fluorescence and Growth of Freshwater Phytoplankton Species

Benzalkonium Chloride (BAC) is a compound used as a preservative in disinfectants, antimicrobials, and surfactants which ends up in the natural environment through wastewater. However, the effects of BAC on freshwater plankton species are not well understood. The effect of BAC on chlorophyll fluorescence and growth of two freshwater species, *Ankistrodesmus falcatus* and *Chlorella* sp., was studied in lab cultures. The cultures were exposed to five BAC concentrations of 0, 50, 100, 200, and 400 µg/L. Abundance and in vivo chlorophyll fluorescence were monitored daily for two days before and five days after BAC addition, for a total of seven days. After the fluorescence reading, the samples were preserved and counted using microscopy. Chlorophyll fluorescence was significantly lower in the treatments containing 200 µg/L of BAC (*Ankistrodesmus*) and 400 µg/L of BAC (*Chlorella*). Similar trends were found for cell counts and chlorophyll fluorescence per cell. Overall *Chlorella* was less sensitive to BAC than *Ankistrodesmus*. Even moderate concentrations of BAC (200 µg/L and higher) cause significant complications to *Ankistrodesmus* and *Chlorella* and could lead to cascading effects throughout the aquatic food web. To limit these negative impacts, stricter rules should be implanted to minimize BAC contamination of water sources. (Advisor: **Gabriella Smalley**)

White, Dominique

Active Music Medicine's Impact on Internalized Disorders

The positive consequences of music intervention on depression and anxiety symptoms were investigated in a small sample of college students randomly assigned to the treatment and control groups. Treatment group participants created music daily using an online program called Soundtrap. A 2 (Group: experimental and control) x 4 (Time: baseline, week 1, week 2, follow-up) mixed factorial design was used. Baseline, midline, and one-week follow-up scores were measured using the Beck Depression Inventory (BDI), State-Trait Anxiety Inventory (STAI), and General Self-Efficacy Scale (GSE). It was expected that there would be a decrease in anxiety and

depression symptoms, as well as an increase in self-efficacy for intervention participants. Results showed that while group and time effect size was not significant for the STAI, .20 and .11 respectively, the correlation coefficient was partially significant, .38. For the GSE, the group effect size was not significant, but the time, .38, and the correlation, .48, was partially significant. These results exemplify a partial positive correlation between active music medicine, a decrease in anxiety and an increase in general self-efficacy. (Advisor: **Michael Carlin**)

Zambrana, Amanda; Fanek, Loreen; Solar Carrera, Pablo

Machine Learning Algorithms for Diabetes Prediction

Diabetes is a chronic metabolic disorder that affects how the body turns food into energy, potentially affecting the entire body system. Worldwide, people are affected by this disease, however, a permanent cure does not currently exist, so it is very important for patients to get the proper treatment. If diabetes is not diagnosed and properly treated to control blood sugar levels, serious health problems such as heart or kidney disease, vision loss, nerve or blood vessel damage, etc., can occur. Therefore, early detection of the disease is imperative for healthcare workers to provide timely distribution of treatment. Presently, hospitals collect large volumes of patient data with various tests and provide appropriate treatment based on diagnoses. With big data analytics, hidden patterns can be found in the data that help to predict diagnosis outcomes. In our paper, we propose a prediction model for classification of diabetes based on patient qualities such as age, gender, smoking/drinking habits, eating habits, and more. We developed and applied six machine learning algorithms on two diabetes datasets to predict patient diagnoses. We found that the Ridge Classifier and Linear Support Vector Machine models work best for prediction, providing 83.11% and 82.46% prediction accuracies respectively. (Advisor: **Md Ali**)