ASU

undergraduate & graduate
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Financial Literacy, Behavioral Bias, and Usage of Cash Loans

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In this research, we used the survey data conducted by the National Financial Capabilities Study (NFCS) under Financial Industry Regulatory Authority (FINRA) to investigate the saving and spending behaviors of people in the U.S. In particular, we constructed the financial literacy scores for the survey respondent and also the cognitive biases of them (risk preference and present-bias), and test how these factors could affect their saving and spending behaviors, proxied by retirement deposit and credit card spending, respectively. The analysis was conducted at individual level, as well as at state level. Various regression models were deployed for analysis, e.g. Probit model, OLS model, Tobit model, weighted-sample model, and propensity-score-matching model.

Species diversity and post-departure degradation patterns of airborne eDNA shed by migratory bats in a cave ecosystem

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Department: Biology

The Mexican Long-nosed bat is an endangered nectivorous bat known to seasonally occupy cave in the southwestern U.S. The endangered status of *L. nivalis* necessitates regular assessments of population size, habitat use, and roosting behaviors. However, disturbances by researchers may have a negative impact on bat species. In recent years it has been shown that it is possible to characterize a terrestrial vertebrate community using environmental DNA (eDNA) collected from the air, particularly in an enclosed environment such as a cave. Recent studies have surveyed roosts occupied by a small number of bats but haven't done so in high-occupancy roosts or when the roost is not occupied. Our objectives were to use airborne eDNA from Emory Cave to evaluate eDNA retention inside a bat roost over time and characterize the vertebrate community inside the cave. We hypothesized that even in their absence, this highly sensitive method would be able to detect *L. nivalis* and identify other species utilizing this roost. We identified five bat species, four non-bat mammal species, and two bird species known to be in the area. Our results suggest that the amount of eDNA recovered is related to the length of time since departure ($r = 0.68$), the depth samplers are placed ($r = 0.48$) and the placement of samplers ($p = 0.0003$). We detected *L. nivalis* DNA 255 days after the bats had vacated. These results indicate airborne eDNA sampling can provide useful information about cave-roosting species, particularly if used in conjunction with other monitoring methods.

Examining the Role of Body Appreciation it the Relationship of Appearance Concerns to Gym Avoidance

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Research has demonstrated a wide range of psychosocial barriers to physical activity, including body dissatisfaction (More et al., 2019), weight stigma (Thedinga et al., 2021), and fear of negative appearance evaluation (Bevan et al., 2021). In particular, such variables may contribute to avoiding opportunities for social exercise or avoiding places where others may see a person exercising, such as the gym. To examine this possibility, we tested the hypothesis that fear of negative appearance evaluation predicts gym avoidance, and we examined whether appreciation for one's own body could reduce any observed association between these variables. As part of a larger online study, N = 122 undergraduate students (78.3% Women, 21.7% Men; M_{Age} = 20.17, SD = 3.93) completed self-report measures of fear of negative appearance evaluation (Lundgren et al., 2024), body appreciation (Tylka & Wood-Barcalow, 2015), and gym avoidance (Levinson et al., 2013). We tested whether fear of negative appearance evaluation related to gym avoidance, and whether body appreciation mediated this association. Results showed that greater fear of negative appearance evaluation significantly predicted lower body appreciation and greater body appreciation predicted less gym avoidance. The indirect effect of fear of negative appearance evaluation on gym avoidance through body appreciation also was significant, suggesting that body appreciation may provide a buffer against gym avoidance that stems from a fear of being evaluated negatively based on one's appearance. Future experimental studies should manipulate fear of negative appearance evaluation or body appreciation to test whether they directly cause people to avoid the gym.

Evaluation of linseed meal on ovarian follicular development after synchronization in preovulatory small ruminants during seasonal anestrus.

Cameron Poole

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Department: Agriculture

Seasonal estrous of small ruminants can hinder overall reproductive efficiency of holistic management strategies involving sheep and goats. The objective of this study was to quantify the effect of increased melatonin containing feed ingredients on ovarian function during seasonal anestrus. Ovarian follicle number and follicle sizes were evaluated on Spanish × Boer cross does and Rambouillet ewes amounts of lineseed meal in the

treatment diet (P30DIET) or an isocoloric and isonitrogenous control diet (CON). The P30DIET contained 2.5% linseed meal which contained increased melatonin (Manchester et al. 2000). At d -18 ewes and does were stratified by age into treatment groups and the P30DIET and CON diets were supplemented (0.91 kg and 0.68 kg per animal per day for sheep and goats, respectively). Synchronization protocols were administered at d 0 for both groups and ovarian ultrasound measures were collected 48 h after the removal of the controlled internal drug release device (CIDR). Mixed model procedures of SAS were used to analyze the number of dominant follicles that were present following the synchronization protocols. The number of dominant follicles observed in the P30DIET goats was significantly greater than the CON consuming goats ($P < 0.05$). Least Squares Means estimates (LSMEANS) in the P30DIET were 1.5 ± 0.20 as compared with CON goats (0.91 ± .21). These data suggest that flushing small ruminants with greater linseed meal during the seasonal anestrus period can increase the number of dominant follicles therefore implying an improvement in reproductive efficiency in holistic management strategies of small ruminants. Keywords: follicular, linseed meal, synchronization.

Vegetation Response to Repeated Defoliation of Salt Cedar by Goats

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Salt Cedar (*Tamarix* spp.) readily invades mesic sites and reduces plant diversity and overall habitat quality. Both sheep and goats readily consume salt cedar. However, it is not known if repeated defoliation of the plant will affect salt cedar viability or promote additional plant establishment and plant diversity. For this study, recently weaned female Spanish cross goats were placed in individual pens and fed salt cedar daily for 10 days. Goats were offered salt cedar for 30 min each day with intake recorded daily. In addition, goats were provided alfalfa pellets (2.5% BW), a trace mineral mix, and fresh water daily to meet maintenance requirements. Following 10 days of exposure to salt cedar in individual pens, goats were placed 4 by 4 m plots dominated by salt cedar. Canopy cover of salt cedar and other shrubs were measured before and after each exposure. In addition, percent bare ground, litter cover, and herbaceous cover were recorded both before and after each exposure. Plots were subjected to 0, 1, or 2 exposures of goat browsing roughly 3 weeks apart. Salt cedar intake increased daily during the conditioning phase. After one exposure, goats reduced ($P < 0.05$) herbaceous cover and other shrub cover. Percent canopy cover of salt cedar, percent bare ground, and percent litter cover were similar after a single exposure to goats. After two exposures, salt cedar cover and herbaceous cover were lower ($P < 0.05$). The amount of bare ground increased ($P < 0.05$) as well.

Effects of overcoming isometrics vs. heavy-slow resistance training on patellar tendon thickness, stiffness, and muscle function

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Department: Health Science Professions

Background/Purpose:

To compare the effect of overcoming isometric training (OI) vs. heavy-slow resistance training (HSR) on patellar tendon thickness, stiffness, knee extensor strength, and maximal voluntary isometric contraction (MVIC). The results from this study may help clinicians provide better in-season care for athletes suffering from tendinopathy.

Method:

13 Subjects (3 males, 10 females) completed a 4-week intervention consisting of HSR on the right leg and OI on the left. The HSR protocol involved 4 sets of 8 repetitions at 80% of one repetition maximum (1RM). The OI protocol involved 4 sets of 4 repetitions at a 3-second build-up followed by a 3-second maximal isometric contraction at a 60-degree knee extension angle with 15 seconds of rest between repetitions. Pre- and post-study measurements of tendon stiffness (kPA), thickness (mm), 1RM (lbs), and MVIC (N) were recorded in the first and final weeks. 1RM and MVIC measures were collected at the midpoint to ensure an appropriate training load. Descriptive statistics and two-way ANOVA were used to analyze pre- and post-intervention data.

Results:

13 healthy participants aged 20-27 were included in this study. At the study's midpoint, the OI group showed MVIC and 1RM increases of 18.5% and 10.5%, while the HSR group saw gains of 16.4% and 14.3%, respectively. Pre-post-training comparison will be available upon completion of the study.

Conclusion:

Conclusions will be drawn upon completion of the study in late March.

Keywords: diagnostic ultrasound, maximal voluntary isometric contraction, knee extensor strength

Performance differences in Y-balance test between male and female division II collegiate basketball athletes and their relationships with chronic ankle instability

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Department: Health Science Professions

Background: Because of different epidemiology profiles, such as sex differences, with ankle injuries among collegiate basketball athletes, this study aimed to compare male and female athletes using lower Y-balance testing (YBT) and Cumberland Ankle Instability Test (CAIT).

Methods: 85 Division II athletes (43 males: 84.91±9.61kg, 193.44±8.69cm; 42 females: 69.07±5.74kg, 176.95±6.84cm) participated in pre-season LYBT from 2022-2024. Outcomes: maximum, average, and variability directional performances in anterior (ANT), posterior-medial (PM), posterior-lateral (PL) directions, CAIT scores, and LYBT composite scores (CS). Independent t-tests assessed sex differences, Pearson correlations and linear regression analyzed relationships between LYBT performance and CAIT scores.

Results: Significant differences included: PM reach distance (maximum: p=0.01, male=111.46±12.12%, female=105.33±8.59%; average: p=0.03, male=106.98±11.47%, female=102.28±8.85%; variability: p=0.02, male=3.43±2.01, female=2.50±1.59). Significant correlations included: CAIT and LYBT in males (maximum ANT: r=0.35, p=0.01; average ANT: r=0.35, p=0.02), and combined sexes (maximum ANT: r=0.24, p=0.02; average ANT: r=0.21, p=0.04). Regression model for males:(y=14.9+0.17x(average ANT), p=0.02) and combined sexes (y=17.2+0.14x(average ANT), p=0.04).

Conclusion: Males demonstrated higher LYBT CS in PM. Females showed less variability in ANT and PM. Weak positive correlations between CAIT and ANT performance for combined sexes and males. Keywords: Single leg reach, Stability, Gender, and Lower b

The Effects of Dual Tasking on the Modified 30-Second Sit-to-Stand Test

Carissa Garza, Savanna Gunn, Areli Torres, Molly Voskamp

Faculty Mentor: Dr. Heather Braden, Dr. Ashley Araiza

Department: Physical Therapy

This study investigated the effects of verbal fluency as a dual task on older adults' ability to rise from a chair using the Modified 30-Second Sit-to-Stand Test (m30STS). It is the first study to utilize the m30STS, which allows for rising from a chair with arm support,

while incorporating the dual task of verbal fluency. This approach enables the assessment of older adults who are unable to cross their arms over their chest while rising from a chair and sitting back down, as required in the original 30STS. Results showed that compared to baseline, participants' physical performance declined by 8.08% (completed significantly fewer STS repetitions) and verbal fluency declined by 11.64% (listed significantly fewer words during dual tasking). This study demonstrates the potential of the m30STS as an effective measure for assessing both cognitive and physical decline in older adults.

Student Perceptions Versus Professional Realities

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Department: Health Science Professions

Context

Limited research exists examining the differences between perceptions of aspiring students, current students, and new professionals in the specialty fields of athletic training (AT) and physical therapy (PT).

Objective

To compare how perceptions related to expectations in the fields of athletic training and physical therapy change as individuals matriculate into their programs of study and the workforce.

Design

Qualitative study.

Participants

The participants included four current Health Science Professions (HSP) students, two current Master of Athletic Training students and two graduates, and two Doctor of Physical Therapy (DPT) students and two graduates.

Method

Participants completed an in-person semi-structured interview that was video recorded. A Consensual Qualitative Research (CQR) approach was applied when reviewing the transcripts and videos.

Results

During their early matriculation into academic programs and the profession, individuals faced challenges in demonstrating confidence, experienced a lack of instructional preparation for clinical and professional roles, and struggled with setting boundaries. They also reported feeling role overload and difficulties in communicating with patients, parents, and administration. The AT and PT participants noted that they relied on mentors for guidance and support, in addition to assistance from co-workers and classmates. Perceptions of daily tasks varied between academicprograms and the workforce. Participants nonverbal reactions emerged when discussing compensation, expectations, and interpersonal experiences.

Conclusion:

When comparing students and new professionals within the two specialties, similarities in experiences, confidence, and preparedness were found.

Keywords: athletic training, physical therapy, confidence, mentors, peers

The Impact of Ankle Instability on Physical and Perceived Single-leg Balance Control in Individuals with Chronic Ankle Instability

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Department: Physical Therapy

Objective: The first objective of this study was to examine if individuals with chronic ankle instability (CAI) perform significantly worse than individuals without CAI in static/dynamic balance tests, functional performance, and visual analog scale (VAS). The second objective was to examine the correlation between ankle stability and other balance tests.

Methods: Fifty-one individuals (aged 19-30) participated in the study. All participants completed the Cumberland Ankle Instability Tool (CAIT), Time-in-Balance Test, Lower Quarter Y-Balance Test, Side Hop Test, and the Athletic Single-leg Stability Test. Participants also completed the VAS after the completion of each test.

Results: The CAIT score of participants with CAI was significantly lower than participants without CAI ($p < .001$). In addition, participants with CAI perceived significantly worse stability (higher VAS score) than those without CAI in the Lower Quarter Y-Balance Test and the Athletic Single-leg Stability Test ($p = .040$ and $.026$ respectively). None of the other tests showed a significant difference between those with and without CAI. Correlation coefficient analysis showed none of the physical and perceived balance test scores has a high correlation with the CAIT score (Pearson r ranges from .002 to .415).

Discussion: Compared to participants without CAI, individuals with CAI did not exhibit a significant balance control deficit in balance tests and functional performance. In addition, ankle stability conditions (CAIT score) did not have a high correlation with any physical and perceived balance scores. Therefore, the CAIT score alone might not accurately represent static, dynamic, and functional balance control in young adults.

Evaluating Bat Communities Across Three West Texas Mountain Ranges Using Mobile Acoustic Surveys

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Faculty Mentor: Dr. Loren Ammerman

Department: Biology

Acoustic mobile transects are very useful for tracking bat communities by being less invasive. Different computer programs have been used to help analyze the bat species on these acoustic recordings, such as Kaleidoscope Pro. The goal of this study was to analyze the bat diversity found within three West Texas mountain ranges and to compare these data to known species distributions. For this study, recordings were taken in the three major sky islands of west Texas - the Chisos mountains, the Guadalupe mountains, and the Davis mountains. A highway transect was chosen in each mountain range. Each transect was sampled two nights in June, July, and August. These data were processed in Kaleidoscope Pro in order to separate out bat echolocation calls. Across all three months over 3,184 calls were recorded. Most calls were detected in July. No one location continuously saw the highest species diversity. The Davis mountains saw the highest species diversity across all months and locations in the month of July. However, Kaleidoscope Pro does seem to have made some mistakes with the auto identification identifying bats not ranging into these areas despite the classifier being set to bats only found in Texas. The next steps for this study include manually confirming the identifications produced by auto ID, manually identifying the calls not classified to species level, adding in highway data to look at

correlations between species diversity and highway traffic along the mobile transects, and comparing these data to other surveys done in these areas.

Master of Athletic Training Student Study Habits and Their Effects on GPA

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Department: Health Science Professions

Background:

Study practices are acquired throughout a student's academic journey. Limited research exists on the study habits of Master of Athletic Training (MAT) students and their effect on academic performance. This research examines the effect of study practices on the grade point averages (GPA) of graduate athletic training students at Angelo State University (ASU).

Methods:

Participants included nine of the 16 MAT students at ASU. The Palsane Sharma Study Habit Inventory (PSSHI) administered via PsychData was emailed to all MAT students. The inventory included 47 questions consisting of 8 domains related to study practices. SPSS descriptive analysis of frequency, mean, and standard deviation were examined. A total score related to study habits was computed for each participant and a linear regression analysis was completed to determine if study score habits directly impacted GPA.

Results:

The mean of GPA for the participants was 3.6689. The participants scored highest (3/3) in understanding the importance of attending class. The next highest scores related to understanding the importance of homework for their future career and reviewing their own notes before an exam (2.89/3). Due to small sample size, the regression analysis revealed no significant effect on GPA.

Conclusion:

This study serves as a useful pilot study related to the impact study habits can have on GPA. The MAT students appear to recognize the importance of showing up to class, taking and reviewing their own notes, and that the information presented in class has a significant impact on their future profession as an athletic trainer.

Keywords: Palsane Sharma Study Habit Inventory, academic performance, graduate athletic training

Transformative Leadership with your School Board

Glen HIll

Faculty Mentor: Dr. Amy Murphy

Department: Teacher Education

Explore how school leaders can strengthen school board relations through transformational leadership, with a focus on communication and servant leadership. This session will provide practical strategies for fostering trust and transparency, leveraging social media for community engagement, and aligning leadership goals with school board expectations. Ideal for leaders seeking actionable insights to enhance collaboration and drive meaningful change in their schools. Join us to discover how "Pirate Leadership" can navigate these challenges and build stronger school board partnerships.

Factors Affecting Return-to-Play Following Sports-Related Concussion

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Department: Health Science Professions

Background:

Growing interest has motivated recent studies to examine differences in recovery after sport-related concussion (SRC) by age, level of play (LOP), sport contact-level, and past medical history (PMHx) of concussion(s). However, heterogeneity in study design, participants, and recovery outcomes has led to mixed findings. This study aimed to investigate whether concussion recovery timelines differ by age, level of play (LOP), sport contact-level, and past medical history (PMHx) of concussion(s).

Methods:

Using data from the Shannon Sports Medicine Concussion Clinic, we included SRCs reported across three academic years; August 2019-May 2022. A One-Way ANOVA was used to identify statistical significant differences in return-to-play when analyzing four factors: (1) age, (2) level of play, (3) sport contact-level, and (4) past concussion history.

Results:

Middle school and collegiate athletes differ significantly in the number of days until return to play (P= .008). Additionally, age may be used to predict the number of days to return-to-play following a sport-related concussion (P= .001). The average age of subjects was 15.58 years (SD= 2.49) and average time to return-to-play was 17.93 days (SD= 19.07).

Conclusions:

Based on the analyzed data, age may be used to estimate an individual's time to return-to-play. Differences considering level of play, were evident and may be important clinically and in future studies. These findings along with additional qualitative investigation help to elucidate sport-related concussion recovery.

Search Engine for Mission Integration & Operations Data

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Faculty Mentor: Dr. Erdogan Dogdu

Department: Computer Science

In high-stakes environments like the International Space Station, rapid access to comprehensive flight data is crucial for effective decision-making. Currently, key datasets—Flight Rules, Anomaly Reports, and MER-Failure Investigation Team (MER-FIT)—reside in separate systems, limiting searchability and delaying critical responses during emergencies. This project aims to bridge that gap by developing an integrated search engine that aggregates these disparate sources into a single, user-friendly web application.

A Python-based crawler continuously performs Extract-Transform-Load (ETL) operations to consolidate updated datasets into a target PostgreSQL database, while PostgreSQL's full-text search capabilities underpin the core search functionality. Users, including NASA Flight Directors, can enter a keyword terms or phrase to retrieve all relevant data across multiple sources, with future plans to incorporate natural language processing and TensorFlow models to generate actionable summary statistics—such as frequency trends and event correlations—that support rapid operational assessments.

This multi-semester initiative not only streamlines access to critical flight data but also lays the groundwork for advanced analytics, enhancing situational awareness and supporting informed decision-making during flight operations.

Moreover, the platform's scalable architecture and robust analytical capabilities present a clear pathway for commercialization. In the future, this solution can be adapted for other space companies managing ISS-like resources, providing a unified, data-driven platform that enhances mission-critical insights, operational efficiency, and safety in the growing commercial space industry.

Mirroring Phantoms and Deaths: The Battle of Superiority Between Morality and the Macabre

Veida Dima

Faculty Mentor: Dr. Linda Kornasky

Department: English and Modern Languages

The advancement of the Romantic Era steered literature from the rationalism of industrialization to an emerging epoch fueled by emotion, nature, and individualism. Edgar Allan Poe and Nathaniel Hawthorne – with their mirroring gothic elements – emerged as key leaders of Dark Romanticism as they explored the complexity of human nature. Poe's psychological horror and macabre tones are comparatively analyzed to Hawthorne's moral allegories and critiques of human frailty. Both authors use elements of phantoms, isolation, and a mirroring struggle with morality and the macabre to guide readers as they question the shadows of the human psyche. Their mutual influence is noticeable in borrowed thematic elements, similar storytelling techniques, and critical reviews. Through comparative literary analysis, Poe and Hawthorne's rivalry relationship is examined as the source that propelled both authors as classic authors of American Gothic literature.

Cyber Threat Intelligence Framework Using Cybersecurity Knowledge Graphs (CSKGs) and AI

Robert Carter

Faculty Mentor: Dr. Erdogan Dogdu

Department: Computer Science

The evolving landscape of cyber threats presents a growing challenge to traditional cybersecurity defense mechanisms. As cyber-attacks become more sophisticated, leveraging zero-day vulnerabilities, polymorphic malware, and multi-vector attack strategies, conventional rule-based systems struggle to provide adequate protection. This research introduces a novel Cyber Threat Intelligence (CTI) framework that enhances Cybersecurity Knowledge Graphs (CSKGs) using Artificial Intelligence (AI) and Machine Learning (ML) techniques.

This approach integrates Graph Neural Networks (GNNs) to enhance the predictive capabilities of CSKGs, allowing for the identification of emerging cyber threats through advanced pattern recognition. Federated Learning is employed to enable decentralized AI model training, ensuring data privacy while improving the model's adaptability across diverse security environments. Additionally, Explainable AI (XAI) techniques such as Local Interpretable Model-agnostic Explanations (LIME) and SHapley Additive exPlanations (SHAP) are incorporated to enhance the transparency and interpretability of AI-driven cybersecurity decisions.

The proposed framework is designed to process large-scale, real-time security data, improving threat detection accuracy, scalability, and decision-making reliability. This research contributes to the cybersecurity field by providing an adaptive, scalable, and interpretable AI-driven threat intelligence system, ultimately strengthening organizational resilience against evolving cyber threats.

Systematic Network Scan for Threat Identification and Prevention

Jordan Wade

Faculty Mentor: Dr. Erdogan Dogdu

Department: Computer Science

Cyber threats are constantly increasing, whether in commercial environments or personal home networks. This project aims to optimize network security by creating a network scanning application based on a knowledge graph of a small private home network. Additionally, this application will pull relevant security data from an existing Unified Cybersecurity Knowledge Graph, developed by a team at ASU, to add security insights and ensure accuracy. The final application will allow users to scan a network and receive a security threat report based on a scoring system, where greater threats will be assigned a higher threat score to denote urgency. Future work on this project will include finding a way to quickly scan a network by discovering all devices and relevant information. One method to accomplish this would be to evaluate combining this tool with an autonomous network exploration and threat-detection system, called AGENT, also developed at ASU, for greater network exploration and data collection.

Nonprofit Turnover Rates " Supervisor/Supervisee Communication Discussions Surrounding Job Satisfaction

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Nonprofit organizations (NPOs) have served sensitive populations for hundreds of years across the globe. In the United States today there are over 1.9 million NPOs registered with the United States Internal Revenue Service resulting in millions of NPO employees in the workforce. Turnover rates in NPOs are notoriously high due to a multitude of factors usually revolving around unequitable pay, low opportunities for career growth, mental health stressors, and poor professional development investments by NPO leadership teams. Through various reviews of previous research and literature, this paper argues that due to inconsistent funding opportunities for highly competitive grant funding, many NPOs do not appropriately build annual budgets to support their employees in pay and career growth. These supervisors also oftentimes shy away from creating open and transparent conversations regarding the difficulties of maintaining a successful nonprofit organization. This paper concludes by detailing suggested ideas for improved communication and actionable ideas for leadership teams like investing in professional development for employees or contributing to Health Savings Accounts for employees and their families. NPO supervisors must steward these difficult conversations to build interpersonal communication that will in turn reduce turnover rates and increase agency-wide retention rates with their employees. Keywords: nonprofit, employee burnout, gender dynamics, social penetration theory, hierarchical communication, workplace dynamics, artificial intelligence

The Immediate Effects of Graded Motor Imagery on Balance in People with Parkinson's Disease: A Scoping Review

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Faculty Mentor: Dr. Heidi Moyer

Department: Physical Therapy

This scoping review aimed to determine the immediate effects of Graded Motor Imagery on balance in people with Parkinson's Disease (PwPD). PubMed, EMBASE, CINAHL, and Cochrane Central Register of Controlled Trials (CENTRAL) were included in the search strategy which utilized medical subject headings (MeSH) and text words related to

Parkinson's Disease, balance, and GMI. Inclusion criteria focused on articles written in English addressing adults aged 18+ with a diagnosis of idiopathic Parkinson's Disease with an intervention that included any type of graded motor imagery with an intervention period of any length. Covidence Software was used to manage the data files. An initial list of 5439 articles was generated. After the exclusion of duplicate articles (n=335), and studies not meeting the including criteria (n=5077), and exclusions for abstract only (n=7) the data from 19 articles was fully extracted in a completed matrix. No studies addressed the implication of GMI in managing pain in PwPD. The articles included in the final matrix included interventions related to motor imagery and virtual/augmented reality. There were no studies that addressed other components of GMI including laterality or sensory discrimination. These results suggest the need for additional research to determine the potential use of complete GMI protocols in PwPD to improve balance and motor performance.

Immediate Motor Carryover of Moderate to High Intensity, High Amplitude Exercise in People with Parkinson's

Krystyn Irby, Jaelyn Knight, Kilee Lovell, Daniel Truong

Faculty Mentor: Dr. Heidi Moyer

Department: Physical Therapy

This cross-sectional crossover study aimed to determine the immediate changes in motor performance in people with Parkinson's Disease (PwPD) following an educational presentation on exercise in PwPD or a 30 minute bout of high intensity, high-amplitude training. N=10 PwPD (H&Y 1-3) were recruited for the purpose of this study. n=5 participants completed the educational session followed by the exercise intervention while n=5 participated in reverse order. A 1 week washout period was given between sessions. Baseline testing included the use of the St. Louis University Mental Screen (SLUMS) test, the Activity-Specific Balance confidence (ABC) Scale, Freezing of Gait Questionnaire (FOG-Q), and Parkinson's Disease Quality of Life (PDQ-8). Pre- and Post-interventional testing included Timed Up and Go (TUG), Timed Up and Go Cognitive (TUG-COG), Timed Up and Go Manual (TUG-MAN), 10 Meter Walk Test (10MWT), and 5 Time Sit to Stand (5TST).

Purification and Analysis of Affibody Molecules that Target Phospholipase A2

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Faculty Mentor: Dr. Edith Osborne

Department: Chemistry and Biochemistry

Phospholipase A2 (PLA2s) is prevalent in a majority of snake venoms. Research has shown a significant level of importance regarding PLA2s and envenomation. PLA2s injected into a snake bite victim contribute to the development of inflammation, hemolysis, cardiotoxicity, and neurotoxicity. Currently, the primary treatment for snake bites is the use of antivenoms, which are derived from antibodies. However, the limited availability, frequent allergic reactions, and high cost are three variables limiting the effective treatment of venomous snake bites using antivenoms. Similar to antibodies, affibodies are proteins that are designed to bind their targets with high affinity. However, affibodies are smaller and more stable than antibodies. In a previous project, several affibody molecules that target Phospholipase A2 were identified using an affibody phage display library. The goal of this project is to purify and analyze three promising affibodies, PLA2, PLA12, and PLA19.

Can restorative justice harm the victim? Examining gender differences in stakeholder attitudes.

Landri Luther

Faculty Mentor: Dr. Tyler N. Livingston

Department: Psychology

Problem

At restorative justice meetings, victims and offenders discuss options to repair wrongdoing (Sherman & Strang, 2012). One concern is that these meetings might lead to psychological revictimization and physical endangerment (Harper et al., 2017). This research compared women's and men's perceptions of the risks associated with restorative justice meetings to offer evidence-based recommendations for repairing harm.

Method

University students (N = 299; M_{age} = 20.01 years, SD = 3.54; 75% women) read a case summary involving a female victim and an alleged male offender, as well as a description of

the purpose of a restorative justice meeting. Then, they rated the risk of the restorative justice meeting revictimizing (alpha = .83) or endangering (alpha = .83) the victim.

Results

Women (*M* = 4.50/7.00, *SD* = 1.20) reported greater concern for psychological revictimization compared to men (*M* = 4.18/7.00, *SD* = 1.08; *t*(292) = -1.97, *p* = .05, *d* = -0.27). Women (*M* = 4.26/7.00, *SD* = 1.09) also reported greater concern for physical endangerment compared to men (*M* = 3.68/7.00, *SD* = 1.21; *t*(292) = -3.76, *p* < .001, *d* = -0.52).

Conclusions

Compared to men, women were more concerned about the potential for restorative justice meetings to result in psychological revictimization or physical endangerment for victims of an alleged wrongdoing. Future research should manipulate the gender of the victim and alleged offender to reveal whether the present gender differences resulted from group-serving attributions (Taylor & Doria, 1981) or genuine gender-based differences in attitudes toward restorative justice meetings.

Mammalian Parasite Identification and Testing

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Faculty Mentor: Dr. NIcholas Negovetich

Department: Biology

The Angelo State Natural History Collections (ASNHC) have received mammal specimens for decades. As part of the intake process, external parasites are removed from a specimen and saved for future identification and analysis. Four undergraduate research students received numerous vials of ectoparasites from the ASNHC, and the students were tasked with enumerating and cataloging the ectoparasites in these vials. The overall goal was to add ectoparasite data to records of the mammals from which the parasites were removed. Species were identified at the Cavness building's parasitology laboratory using stereomicroscopes. Species were identified and sorted using morphological characteristics. Host information and associated parasites were tracked using Excel, and host locations were recorded using ArcGIS (Geographic Information Systems). Over four months, 56 vials were analyzed, and 23 species were identified; the most abundant ectoparasites were human fleas, canine fleas, and mites. The tick species identified were differentiated by adult female and male adults, larval, and nymph stages. Host and

parasite data in natural history collections can assist in georeferencing parasite-borne diseases based on host species migration through time. Future research will involve using PCR (Polymerase chain reaction) testing to screen for zoonotic diseases, such as Lyme disease and Borreliosis, that are carried and possibly transmitted by these ectoparasites and track the migration of the disease over time using ArcGIS.

Tracking and Mapping the Path and Evolution of Tornadoes and Severe Weather Storm Systems in the Concho Valley Using Global Positioning and Geographic Information Systems

Katy Herber

Faculty Mentor: Dr. Jessica Garza

Department: Physics and Geosciences

From March to June every year, severe weather impacts people in the Concho Valley. One of the biggest threats to people are the tornadoes that can be produced in these storms. Tornadoes can follow in the path of the storm that produced them or can take a different path that is different from storm motion. The goal of this project is to understand the relationship between tornado paths and their respective storm's motion. In this phase, 100 tornadoes will be studied using data from the tornado damage surveys, including position, length, and direction. That tornado will be compared to radar scans of the storm that produced it to compare the direction of the tornado to the direction of the storm. This will show how much tornado paths and storm paths vary and will give good context for the second phase when this is investigated in the field. Phase two will consist of taking measurements in the field, including humidity, wind speed, and wind direction, and tracking a storm and tornado's position in real time. Phase three will consist of compiling all the data from phase two into a map using ArcGIS Pro to determine the difference between the two and hypothesize why. This research is important because having an understanding of this relationship will help forecasters better predict where tornadoes could go and could save people's lives in the process.

Air Sampling with EPA's RadNet Equipment

David Johnston, Logan Henry, Chloe Gillihan

Faculty Mentor: Dr. Kenneth Carrell

Department: Physics and Geosciences

The Environmental Protection Agency (EPA) established a radiation monitoring system called RadNet in 1956, which was equipped with alpha radiation detectors. The objective of RadNet was to monitor air quality and gather air sampling data using real-time radiation sensors. Angelo State University received an early RadNet system prototype and enhanced it by outfitting it with a gamma radiation detector.

This system includes an air vacuum mechanism and a small metal frame with various-sized filters. Three undergraduate research students installed 2-micron cotton filters into the filtration system and recorded the initial and final masses over specific periods. The filters were then examined under petrographic microscopes to determine the grain size and composition of the collected particulates.

The initial goal of the experiment was to test for the presence of barred olivine ($(Mg, Fe)2SiO_4$), Fe-60, or Ca-41. While we found a minimal amount of identifiable minerals through petrographic microscopy, a significantly high quantity of organic material was present. Interestingly, the lungs' ability to clear foreign debris is typically limited to particles larger than 10 μm. However, this clearing mechanism only pertains to expulsion, as particulates smaller than 2.5 μm are generally considered more harmful due to their ability to penetrate deep into the lungs' alveoli. Particulates below 0.1 μm can even enter the bloodstream and be processed by the body.

Our research team conducted a point count analysis of the filters to calculate the time it would take to inhale 1 gram of the most abundant mineral on Earth, potassium feldspar ($KAlSi_3O_8$), compared to 1 gram of random organic material. These calculations were based on potassium feldspar's atomic mass, the average mass of the material collected over a specific period, the volume of air drawn into the RadNet system, and the ratio of identified minerals to organic matter.

We plan to utilize the scanning electron microscope (SEM) energy-dispersive X-ray spectroscopy (EDS) attachment to identify specific isotopes and micrometeorites. We will

present this research at a fall symposium for biophysics and, hopefully, at a physics symposium in spring 2026.

Orchid Propagation Testing

David Johnston, Glenda Mejicano

Faculty Mentor: Dr. Carlos Maya-Lastra

Department: Biology

Orchid germination presents significant challenges due to intricate fungal symbiotic relationships. This study investigates innovative propagation techniques to enhance mass production while overcoming the limitations of traditional methods, which tend to be labor-intensive and time-consuming. We examined four substrate conditions on orchid growth: standard gardening soil (control), a soil-sand mix, a tree bark-soil blend, and a leaf litter-tree bark substrate. Some treatment groups received growth hormone additives, specifically cytokinin, and auxins, while others were watered with standard irrigation through an automated system.

Conducted in a climate-controlled environment, we meticulously recorded growth parameters, including size, growth rate, color, and rigidity. Our findings indicate that substrate type significantly influences orchid health and growth, highlighting the importance of substrate composition and hormonal treatment. These results will be presented at the 2025 Angelo State University Undergraduate Symposium, contributing valuable insights to orchid propagation techniques.

Investigating Anticipated Weight Stigma and Binge Eating by Race and Gender

Hemma Rangel

Faculty Mentor: Dr. Ashley Araiza

Department: Psychology

Research shows that people report more unhealthy eating patterns in response to weight-based stigma (Ashmore et al., 2008; Wellman et al., 2019). However, less attention has been given to how *anticipating* weight stigma relates to maladaptive eating patterns. Here, we tested whether anticipated weight stigma predicted binge eating. We also examined whether any observed association between anticipated weight stigma and binge eating was moderated by race or gender. Undergraduate students (N = 122; Age: M = 20.17, SD = 3.93; Gender: 78.3% Women, 21.7% Men; Race: 46.7% European American/White, 53.3% all other races) completed self-report measures of anticipated weight stigma (Hunger & Major, 2015), binge-eating behaviors (Gormally et al., 1982), and demographic characteristics. Results showed that anticipated weight stigma significantly predicted binge eating among participants who self-identified as White (n = 57) and as any other race (n = 65). The overall model including gender as a moderator of the effect of anticipated weight stigma on binge eating was statistically significant; however, none of the individual effects predicted binge eating in the context of each other. Findings from this study provide evidence that one's anticipation that they will be stigmatized because of their weight may have consequences for eating behavior regardless of race. This is important because our results add to our understanding of how anticipated weight stigma relates to disordered eating among a population underrepresented across the weight stigma literature. Future research should manipulate anticipated weight stigma to determine whether it does cause binge eating.

Examining Anticipated Weight Stigma and Health Outcomes

Hemma Rangel

Faculty Mentor: Dr. Ashley Araiza

Department: Psychology

Weight stigma is a relevant topic today, as the prevalence of obesity is high in the U.S., with a rate of 39.8% among adults in 2015-2016 (Hales, et. al., 2017). Individuals with higher body weight regularly experience weight stigma, which can impact their well-being and

health outcomes, including eating and exercise behaviors (Lessard, 2021). However, much of the research on weight stigma has focused on perceiving or experiencing weight-based stigma and discrimination, with less on *anticipating* being stigmatized against because of one's weight or the potential health consequences of that anticipation. In a previous study conducted among undergraduate students, we found that anticipating weight stigma predicted binge eating behavior and that this relationship existed regardless of race. In this follow-up study, we investigated the relationship between anticipating weight stigma and binge eating in a broader sample of U.S. adults recruited through Amazon's Mechanical Turk (MTurk) data-collection platform. We also examined how anticipating weight stigma relates to exercise outcomes. A target sample of N = 235 participants was recruited for this online study through MTurk. Participants completed self-report measures of anticipated weight stigma (Hunger & Major, 2015), binge eating behaviors (Gormally et al., 1982), social exercise anxiety (Levinson et al., 2013), and exercise frequency (Mackey & La Greca, 2007). We hypothesized that anticipating weight stigma would relate to binge eating behaviors, indicators of social exercise anxiety, and lower exercise frequency. We also were interested in whether these associations differ by demographic characteristics. Results and implications will be discussed.

Crater Age dating and Geomorphologic Study of the moon

Hannah Goeke

Faculty Mentor: Dr. Sarah Heinlein

Department: Physics and Geosciences

Advancements in age dating and geomorphology are crucial not only for understanding Earth's dynamic landscape but also for advancing extraterrestrial research. Geomorphology provides insights into the formation and evolution of landforms giving us knowledge into the past, present, and future while age dating reveals the geological timeline of surfaces and layers, including resurfacing events such as lava flows. The integration of both methods facilitates a thorough analysis of celestial bodies, providing crucial insights into their history, evolution, and potential habitability. Using the United States Geologic Survey (USGS) databases, data on the Moon's craters, specifically Philolaus, Copernicus, and Amundsen, have been compiled and analyzed, resulting in detailed charts and maps. This research also uses numerical modeling, software (ArcGIS) for image analysis, and Geographic Information Systems (GIS) to enhance our understanding of the Moon's geomorphologic and chronological characteristics. The chart (Fig. 1), created using GIS data from the USGS, illustrates the number and age of craters located at the Moon's North Pole, South Pole, Mercator regions, as well as the total number in each age.

Solid State Quantum Tunneling

Caeden Moody

Faculty Mentor: Dr. Eddie Holik III

Department: Physics and Geosciences

Quantum Tunneling Composites (QTC), often referred to as QTC pills, are small, semiconductive sensors which, when one applies pressure onto them, can facilitate quantum tunneling. These pills suspend a conductive metal otherwise too dispersed to conduct electricity; however, when pressure is applied, the conductive component of the pill becomes compressed enough to allow an incident electron to tunnel through. These composites see frequent use in technologies employing pressure-dependent systems like impact sensors or blood-pressure cuffs. I propose to mathematically model and then experimentally measure the efficiency of various QTC pills.

To take such measurements, the time-independent Schrödinger Equation can be solved for a wave function $\psi(x)$ in terms of the incident and transmission amplitudes of the electrons, T. Using the uniaxial strain tensor, ε, and the height of the QTC, it will be possible to parameterize the resultant transmission amplitude as a function of force applied to the cross-sectional area of the QTC pill. The experiment will be constructed from a set of these composites connected in series with a direct current (DC) power source. With this experiment, one could uncover not only a proper model describing the ability of these composites to tunnel electricity, but also characteristics like their durability under prolonged exposure to a live current.

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The Prevalence of Alzheimer's Myths in the General Public and Occupational Therapy

Abigail Ketchum

Faculty Mentor: Dr. Drew Curtis

Department: Psychology

Given the heightened prevalent rates of Alzheimer's in the US, the general public holds a startling number of misconceptions about the disease (Bailey, 2000; Cahill, 2015; Lowe, 2015; Werner, 2003). Misconceptions can even be unintentionally endorsed by medical professionals. As a result, this creates a never-ending cycle that unfortunately reinforces the myths rather than dispelling them. The present study seeks to determine the common myths surrounding Alzheimer's disease (AD) that are held by the general public as well as to ascertain if Texas occupational therapists (OT) will endorse the same myths. In the survey, participants were presented with a series of statements regarding AD and were asked to answer true or false. Preliminary data indicated that on average, college students answered 75% of the questions correctly with OTs answering 88% correctly. The myth most endorsed by students was the forgetfulness of names as a key sign of AD. Currently, only 7 OTs have completed the questionnaire. Preliminary analyses do show a significant difference between the OT percentage and the students' percentage of correct answers. If the findings persist with continued data collection, then the hypothesis will be supported, in that OTs are more knowledgeable of AD myths than college students.

Automated Sustainable Hydrocarbon Extraction and Quantification in Oilfield- Contaminated Soil

Courtney Turner

Faculty Mentor: Dr. Shanmugapriya Dharmarajan

Department: Chemistry and Biochemistry

Hydrocarbon contamination of soils at oilfields poses significant environmental and health risks to local communities and ecosystems. Our project introduces an efficient, automated approach to analyze contaminated soils from oil fields in the San Angelo region. We will

implement the Accelerated Solvent Extraction (ASE) technique to streamline the extraction process, enabling consistent hydrocarbon isolation while reducing solvent use and environmental impact. The workflow integrates Multivapor®, an automated parallel solvent evaporation technique for uniform sample preparation, followed by high-throughput Gas Chromatography-Mass Spectrometry (GC-MS) analysis with auto-sampling capabilities for identification and quantification. This combination allows for rapid, precise quantification of hydrocarbon profiles across multiple samples. The automated methodology we propose offers three key advantages: enhanced analytical throughput, improved data reproducibility, and reduced environmental impact through minimal solvent use. These detailed contamination profiles will directly inform the site-specific distribution of hydrocarbon types.

Synthesis, Characterization, and Application of Magnetic Gold Nanoparticles for Metal-Enhanced Fluorescence

Alejandro Rodarte, Dawson Myers

Faculty Mentor: Dr. Saravanan Ramasamy

Department: Chemistry and Biochemistry

Magnetic core-shell Fe_3O_4/Au nanoparticles hold significant potential for applications in biosensing and bioimaging due to their combined magnetic and plasmonic properties. This research focused on the successful synthesis of monodisperse Fe_3O_4/Au nanoparticles with controlled size, shape, and shell thickness using wet chemical methods, including thermal decomposition and seed-mediated growth. A robust and reproducible synthesis approach was established to ensure uniformity and stability of the nanoparticles. The core-shell structure was confirmed through UV-Vis Spectroscopic and Electron Microscopic characterization techniques, validating the integrity of the Fe_3O_4 core and the uniform deposition of the Au shell. Surface modification strategies were implemented to enhance construct stability and dispersibility. The magnetic properties of the synthesized nanoparticles were evaluated to assess their potential for efficient magnetic separation, which is crucial for their use in liquid-phase applications. The nanoparticles were functionalized with Quantum Dot fluorophores through controlled assembly via direct conjugation or linker molecules. These findings contribute to the advancement of magnetically separable hybrid nanomaterials, providing a strong foundation for future functionalization and applications in metal-enhanced fluorescence, biosensing, and bioimaging.

Use of ddRad sequencing to diagnose cryptic species with low interspecific mitochondrial divergence

Halle Summers

Faculty Mentor: Dr. Loren K. Ammerman

Department: Biology

Sister species that have diverged from each other recently can appear similar morphologically but typically have genetic features that can distinguish them. In the case of two sympatric species of bat (Myotis californicus and M. ciliolabrum) that are cryptic, they can be distinguished by features of their echolocation call, but no genetic marker has been discovered that can easily distinguish them. A simple diagnostic genetic marker, like a DNA sequence barcode, would assist researchers to characterize the presence or absence of these species from wing punches or fecal pellets from a roost without the need to collect the bat. Despite research on their mitochondrial genome from specimens across their range, a barcoding approach does not work for this complex. We tested the hypothesis that these two species are genetically distinct using a genomic approach. We used reduced representation genome sequencing (ddRAD-seq) to identify and analyze single nucleotide polymorphisms (SNPs) from individuals of M. californicus (n=20) and M. ciliolabrum (n=22). We will determine if the SNP panel will be able to diagnose the two currently recognized cryptic species through cluster and network analyses. Our data will be explored as a possible molecular tool that could be used to screen DNA samples and identify these two species.

What Did You Expect? A Study on Expectancy Violation Theory by Using Photovoice Methodology

Emma Bryant

Faculty Mentor: Dr. Benjamin Brojakowski

Department: Communication and Mass Media

Attending college for the first time can be a stressful but exciting time. Many new college students don't know what to expect or they may think they know exactly what to expect when attending college for the first time. However, everyone's experiences are different and there is the possibility for your expectations to be violated. When these expectations are violated, they can either be negative, positive, or neutral, this is what we call Expectancy Violation Theory (EVT). This study aims to focus on new college students and their expectations on relationships with roommates, faculty, and student organizations. In

addition to exploring EVT within new college students, this study will use photovoice methodology. Photovoice has long been a tool used to perform research by demonstrating individual interpretation. Therefore, first time college students will get the opportunity to use photovoice to express their expectations of college and how they differed from reality. This study will explore three research questions: 1. How did your interpersonal interactions with your roommate(s) differ from your expectations about roommate relationships? 2. How did your interpersonal interactions with your professors differ from your expectations about student-professor relationships? 3. How did your interpersonal relationships with members of your student organizations differ from your expectations about relationships with peers within student organizations?

An expedition to the Purus River in central Brazilian Amazonia: unraveling the diversity of nonvolant small mammals

Aramide Gift Oladiran

Faculty Mentor: Dr. Edson F. Abreu

Department: Biology

The Amazon Rainforest is one of the most biologically rich areas on the planet. However, many regions throughout the Amazon remain poorly studied. To help fill gaps in the diversity and distribution of nonvolant small mammals (orders Didelphimorphia and Rodentia) in the Amazon, we conducted a month-long (July 2024) field survey in flooded and upland forests along the Purus River. Conventional trapping methods (including Sherman and Victor traps) and pitfall traps were used, in addition to nocturnal hunting. Sampling was conducted in four locations: Caua-Cuiuanã, Uixi, Lago Jari, and Arumã. Our total sampling effort was 5337 conventional trap-nights and 986 pitfall trap-nights. We captured 85 individuals in total, representing 17 species (seven didelphid marsupials and 10 rodents). The sampling success was 0.94% for conventional traps and 1.32% for pitfall traps. Out of the four sampling sites, in Uixi we recorded the highest diversity (13 species). Sherman traps and nocturnal hunting retrieved the highest number of species across methods (eight), followed by pitfalls (six). Based on our morphological identifications, we documented eight previously unreported species for the Purus basin. Further molecular analysis will help us to clarify the taxonomic identification of some specimens that are still pending.

The Impact of Self-Affirmation on Stress, Motivation, and Effort Following Negative Feedback

Catherine Boldrick

Faculty Mentor: Dr. Ashley Araiza

Department: Psychology

Negative feedback can negatively affect stress, motivation, and effort. For example, negative work performance reviews can lower self-efficacy and intrinsic motivation, often to a degree comparable to or greater than the motivating effects of positive feedback (Fong et al., 2019). Research suggests reflecting on and affirming one's core personal values (i.e., self-affirmation) can help individuals maintain a positive attitude and buffer the adverse effects of criticism. As such, this study examines whether self-affirmation reduces stress and enhances motivation and effort following a simulated negative performance review. Participants (N = 100) will be undergraduate students from Angelo State University recruited through Sona Systems. All participants will first imagine themselves as an employee reading a negative performance review from their manager. Then, they will be randomly assigned to one of two affirmation conditions: a self-affirmation condition in which they write about one core value that is most important to them or a no-affirmation (control) condition in which they write about one core value that is not important to them. Next, participants will complete several questionnaires assessing negative feedback stress (Cohen et al., 1983), work motivation (Deci & Ryan, 1985), and effort investment (Vallerand, 1997). We hypothesize that participants within the self-affirmation condition will report less feedback stress, higher levels of motivation, and greater effort investment than those in the control group. Findings may provide insight into how self-affirmation can serve as a coping mechanism by helping individuals better compartmentalize feedback and take it less negatively. Results and implications will be discussed.

Food Neophobia's Relation to College Student's Nutritional Knowledge, and Food Consumption

Amia Coleman

Faculty Mentor: Dr. Paige Trubenstein

Department: Psychology

This study examined the relationship between food neophobia (fear of trying new foods), food preferences, and nutritional knowledge among college undergraduate students. The mean age of participants was 20.26 (SD=5.65). Participants indicated their meal plan status, with 48% of the participants reporting that they had a campus meal plan. The Food Neophobia Scale (Pliner & Hobden, 1992) was used to measure levels of food neophobia with this population demonstrating moderate levels of food neophobia M=34.35 (*Range*=10-66). Participants completed the Food Attitude Scale (Raudenbush et al., 1995) where they were shown 74 food items and prompted to describe their preference (or lack thereof) for each food item. Of the 74 food items, some foods all participants had previously tried (ice cream), while other foods few had tried (muktuk). Nutritional knowledge was measured using the Consumer Nutritional Knowledge Scale (Spillmann-Dickson et al., 2011) with participants showing relatively high nutritional knowledge (*M*=14.59, *Range*=6-20). Participants also reported on their frequency of visiting on-campus food options with Chick-fil-A being the most popular on-campus dining option. Positive correlations were observed between age and the total of foods tried (*r*=0.28, *p=0.008*), and the total of foods tried and diet history (*r*=0.55, *p*=<0.000). Negative correlations were observed between sex and nutritional knowledge (*r*=-0.28, *p=0.009*), food neophobia and diet history (*r*=-0.36, *p*=0.001), and food neophobia and number of foods tried (*r*=-0.57, *p*<0.000).

Model Rocket Flight Analysis

Mason Cave, Moira Mendoza

Faculty Mentor: Dr. Wanda Green

Department: Physics and Geosciences

Model rockets have served as an incredible resource to help teach students the fundamental principles of rocketry, such as the four forces that act on an object in flight (lift, drag, thrust, and weight) or how a rocket's center of pressure affects its stability during flight. In this project, we created a model rocket intending to achieve a height of over six

hundred feet while carrying a fragile payload (an egg) and returning to the ground without damaging the payload. We designed our rocket using OpenRocket simulation software which allowed us to test our design accurately before launch and design custom fins that could be cut out of eighth-inch plywood with a CNC router. With our data, we are able to compare how simulation data compared to physical launches and analyze the effects our design had on our launch.

A comparison between static and dynamic stretches on vertical jump height in sedentary adults

Ezekielle Faith Matias

Faculty Mentor: Dr. James Zero Eldridge

Department: Kinesiology

Athletes typically engage in a warm-up exercise before competition to enhance performance and reduce the risk of sports-related injuries. Traditionally, this warm-up involves light aerobic exercise followed by either static stretching (SS) or dynamic stretching (DS). However, recent studies indicate that static stretching may impair explosive muscle performance due to factors like tendon slack and autogenic inhibition from being in a stretched state for extended periods. As a result, trainers and athletes are increasingly shifting towards dynamic stretching. Dynamic stretching involves controlled, rhythmic movements through the active range of motion of each joint. This method is linked to several physiological processes that positively impact muscle performance, particularly the ability to quickly generate the maximum force of a muscle contraction commonly known as power. Other key benefits of dynamic stretching include increased intramuscular temperature, reduced muscle viscosity, improved reflex sensitivity, enhanced summation and synchronization of motor units, improved muscle blood flow, and post-activation potentiation, collectively offering a greater potential of force production in Type II muscle fibers and benefiting individuals who participate in activities requiring brief bursts of maximal strength and speed. Since most research focuses on experienced and trained athletes, this study aims to examine how static and dynamic stretching affects sedentary individuals.

Onsite Water Sampling and Quality Measurement Device

Jose G. Arteaga

Faculty Mentor: Dr. Kum, Dr. Haque

Department: Engineering

This study proposes the development of an on-site water sampling and quality measurement device designed for integration with an unmanned aerial vehicle (UAV). The primary objectives of this device are to measure critical water quality parameters, including pH levels, dissolved oxygen concentration, and total dissolved solids, as well as to collect water samples for subsequent laboratory analysis. The innovative design aims to enhance operational efficiency and accessibility while minimizing potential hazards associated with in-person sampling. By utilizing a partnered research drone, this device seeks to streamline water quality assessment processes in diverse environments, thereby contributing to improved environmental monitoring and management practices.

Measuring the Effect of Demographic Differences in Library Anxiety Among Undergraduate Students

Nicora Coleman

Faculty Mentor: Dr. Aubrey Madler, Dr. Mellisa Huffman

Department: English and Modern Languages

This study explores undergraduate students' feelings and experiences toward using library resources and services at a small regional university in West Texas. The study used a modified version of the Bostick Library Anxiety Scale (LAS) to define factors that might contribute to library anxiety and to determine the extent to which library anxiety exists among undergraduate students within this population. To investigate library anxiety there, researchers used quantitative methods in the form of a modified survey based on Bostick's (1992) LAS. 118 enrolled undergraduate students were recruited throughout the fall 2024 semester via on-campus signage and announcements made by faculty members. 12 responses were eliminated due to incomplete surveys. The instrument was tested for internal reliability using Cronbach's alpha test. The modified survey consisted of three sections: demographic factors, the modified LAS, and an optional short response. The research protocol identified four factors: staff approachability, feelings of inadequacy, comfort levels, and library constraints. The overall mean scores did not indicate high levels of anxiety. An Independent-Samples t-Test and One-way Between-Groups ANOVA test was conducted to analyze significant differences between mean scores based on demographic

factors. The findings of the study suggest that there is a not a statistically significant relationship between library anxiety and the demographic factors defined by the LAS among survey respondents nor was there an overall high level of anxiety according to the four factors.

The Effect of High Concentrations of Aluminum on the Tubulin Isoform TUBA4A in Zebrafish and Corresponding Neurodegeneration

Ella Favor

Faculty Mentor: Dr. Fohn, MD, PhD

Department: Biology

Multiple factors can cause neurodegeneration, ranging from environmental exposure to toxins to genetic predispositions. Environmental toxins can include heavy metals such as arsenic (As), mercury (Hg), aluminum (Al), lead (Pb), and cadmium (Cd). Each of these metals are neurotoxic because of their effects on motor neurons, and the excessive accumulation of each metallic element can result in neurodegenerative diseases (Baoman et al., 2021); exposure to these elements can happen through contaminated air, water, and food and occupational contamination or smoking. Recent studies suggest that intracellular aluminum accumulation in mammalian cells can lead to mitotic errors, including microtubule instability, facilitating consequential disorders and diseases (Tenan et al., 2021). One way microtubule stability can be affected is by a mutation in the tubulin alpha 4a gene (TUBA4A), as it exhibits a deleterious effect on primary motor neurons and the microtubule network (Pensato et al., 2015). In this experiment, we want to examine the changes in expression of the tubulin isoform TUBA4A in zebrafish in response to aluminum exposure. Our study consists of exposing zebrafish to excessive aluminum and observing the fish for signs of neurological impairment or changes in gene expression, using RT-PCR (reverse transcription-polymerase chain reaction) and analyzing our results with agarose gel electrophoresis. We hypothesize that excessive accumulation of aluminum in fish cells will cause abnormal expression of the tubulin isoform TUBA4A gene and behavioral abnormalities suggestive of neurological damage/ degeneration. Experimental studies are ongoing.

Three-Dimensional Granular Dynamics: An Investigation of Methodology

Andrew Long

Faculty Mentor: Dr. Michael Holcomb

Department: Physics and Geosciences

Discussion on aging with individuals of any age will result in an exasperated, fear-filled conversation on change and getting older. Today's society emphasizes youth as beauty currency, leading to high levels of body dissatisfaction in most of the population. Between genders, this dissatisfaction is especially found in women of all ages (Carrard, et al., 2021). This discontent in women comes hand in hand with intense aging anxiety, stemming from a societally prescribed view of femininity and beauty, which is highly ageist at heart, and claims that as women age, their attractiveness declines substantially (Winterich, 2007). Men are not typically prescribed this view of lost attractiveness and desirability with age. This research questioned whether one major source of aging anxiety in women is this negative body image pushed by society. If so, women should report more physical appearance concern and therefore more aging anxiety than men. We used four scales in a survey of men and women (N=150) of ages 18-60 to test this hypothesis: the Multidimensional Body-Self Relations Questionnaire- Appearance Scales (MBSRQ-AS), the Aging Anxiety Scale (AAS), the Conformity to Feminine Norms Inventory (CFNI-45), and the Conformity to Masculine Norms Inventory (CMNI-46). Data has been collected and is in the process of analysis.

Does Aging Differ Between Genders? Exploring Aging Anxiety and Gender

Elinore Banschbach, Katie Molho

Faculty Mentor: Dr Nicole Lozano

Department: Psychology

Discussion on aging with individuals of any age will result in an exasperated, fear-filled conversation on change and getting older. Today's society emphasizes youth as beauty currency, leading to high levels of body dissatisfaction in most of the population. Between genders, this dissatisfaction is especially found in women of all ages (Carrard, et al., 2021). This discontent in women comes hand in hand with intense aging anxiety, stemming from a societally prescribed view of femininity and beauty, which is highly ageist at heart, and claims that as women age, their attractiveness declines substantially (Winterich, 2007). Men are not typically prescribed this view of lost attractiveness and desirability with age.

This research questioned whether one major source of aging anxiety in women is this negative body image pushed by society. If so, women should report more physical appearance concern and therefore more aging anxiety than men. We used four scales in a survey of men and women (N=150) of ages 18-60 to test this hypothesis: the Multidimensional Body-Self Relations Questionnaire- Appearance Scales (MBSRQ-AS), the Aging Anxiety Scale (AAS), the Conformity to Feminine Norms Inventory (CFNI-45), and the Conformity to Masculine Norms Inventory (CMNI-46). Data has been collected and is in the process of analysis.

Custom GPT Pentesting: Evaluating Custom GPT Models for Realistic Lateral Movement Simulations

Riley Alexander Arndt

Faculty Mentor: Dr. Sundar Krishnan

Department: Computer Science

Effective penetration testing remains a critical component in maintaining robust cybersecurity defenses, requiring realistic adversarial simulations to identify, mitigate, and patch vulnerabilities. Recent advancements in artificial intelligence, specifically the emergence of highly refinable pretrained large language models (LLMs) such as OpenAI's ChatGPT, offer promising prospects for automating and enhancing the realism of AI-operated adversarial simulations, yet their full potential remains largely unexplored. This research aims to uncover more of such potential by utilizing custom-pretrained GPT models powered by ChatGPT to simulate attacks often used to attain lateral movement within a compromised system and determine whether AI-driven lateral movement attacks can effectively mimic sophisticated human attackers.

This research will utilize customized instances of OpenAI's GPT models, each specifically pre-trained and fine-tuned for distinct lateral movement techniques within simulated compromised environments. Controlled prompt injection methods ("jailbreaking") are to be applied to extend the operational capabilities of these LLMs, allowing for in-depth and automated execution of lateral movement techniques such as pass the hash (PTH), pass the ticket (PTT), and credential dumping attacks. The performance of these models will be compared against traditional penetration testing techniques and previously published LLM-driven cybersecurity methods to qualitatively determine the accuracy and humanlike behavior of these models.

This research anticipates that the AI-driven methodology will effectively replicate complex, human-like adversarial behaviors, showcasing improved efficiency and adaptability

compared to traditional penetration testing techniques and showing that GPT-powered simulations can effectively be used for penetration testing purposes.

The Impacts of One-Month Ballet Training on Landing Skills among Division II Collegiate Drill Team: From a Biomechanical Perspective

Seugwon Lee, Erin Lane, Mackenzie Holt, Susanna Mosquieda

Faculty Mentor: Dr. Yo-Rong Chen

Department: Health Science Professions

Background:
Vertical Ground Reaction Force (vGRF) affects movement efficiency, injury risk, and performance (Harwood, 2018). Ballet training enhances flexibility, balance, and joint mobility, potentially benefiting collegiate drill team dancers. However, limited biomechanical research exists on landing and vertical jumping (VJ) skills post-ballet training. This study examines how ballet training influences jumping and landing biomechanics in collegiate drill team members.

Method:
Eleven female ASU drill team performers (age: 19.4±1.71, height:163.5±9.07 cm; weight: 70.5±21.26 kg) volunteered to participate in ballet classes for five weeks (≥10 sessions). Pre-post training assessments measured peak vGRF during 3 landings and flight time and jump height during 3 VJs at the ASU Biomechanical Lab. Participants wore identical attire and bare feet for consistency. Participants landed from a 45 cm-high box on 2 forceplates simultaneously in landing tests and then performed 3 VJs for the flight time and jump height assessments. Dependent t-tests used to determine pre-post differences.

Results:
Ballet training significantly reduced bilateral average vGRF during landing (Pre:1346.88±412.63 N; Post:1200.81±391.09 N, p=0.006). However, individual leg vGRF (Left:p=0.057; Right:p=0.14), flight time (p=0.083), and VJ height (p=0.092) showed no significant differences.

Conclusion:
Ballet training improves landing mechanics by reducing bilateral vGRF impact but does not affect flight time or VJ height in the VJ test. This finding shows ballet training potentially prevents overload of vGRF to drill team performers.

Entity Component Systems: An Alternative to SQL for General Purpose Databases?

Robert Wess Burnett

Faculty Mentor: Dr. Sundar Krishnan

Department: Computer Science

An Entity Component System (ECS) is a commonly used data structure in game development that assigns independent data units, called components, to unique identifiers known as entities. This arrangement allows specialized functions called systems to efficiently query these entities based on the components they possess. This research explores repurposing an ECS as an alternative to Structured Query Language (SQL) for general-purpose databases, with a focus on business management systems. By drawing parallels between ECS entity lookups and SQL database queries, this study investigates whether the inherent advantages of an ECS-based approach—such as superior performance, optimized hardware utilization, and reduced dependency on complex domain-specific languages—can address the limitations of traditional SQL databases for certain use cases. A prototype implementation serves as the basis for benchmarking and trade-off analysis, offering insights into the potential benefits and drawbacks of adopting ECS architectures outside the game development sphere

Exploring the Effects of Aspirin on Muscular Regeneration in Girardia dorotocephala

Logan Leto

Faculty Mentor: Dr. Laurel Fohn

Department: Biology

Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used to reduce inflammation and relieve pain. Many of the long-term effects of overuse of these drugs on muscular regeneration and gene expression are not understood. In this project I explored the effects of aspirin, a common NSAID, on muscular stem cells using planarians, Girardia dorotocephala, as a model organism. Girardia dorotocephala were exposed to an aspirin solution before being bisected along the transverse plane. Growth was measured through morphometric analysis for the next week, and the rate of growth between the treatment groups were compared to evaluate the effects of aspirin on overall cell proliferation and regeneration. My results showed a statistically significant correlation between exposure to aspirin and reduced regeneration. Further testing is being conducted to verify the correlation with a larger sample size. A behavioral assessment of the gait patterns of Girardia dorotocephala while exposed to aspirin demonstrated scrunching behavior over the standard movement pattern of gliding. Another behavioral assessment of assessing the planaria's response time and movement speeds will be conducted based on planarians' photophobic behavior to collect more quantitative data on aspirin's effects on muscular function. The expression of DjMHC-A and DjRlc genes to indicate the activity of muscular regeneration will be quantified from the tissues of Girardia dorotocephala through amplification of RNA through RT-PCR. This study could provide valuable insights into possible effects of NSAIDs on muscular stem cell proliferation in Homo sapiens development.

3D Printed Molecules

Taylor Hinds, Matthew Bullock, Talyn Franco

Faculty Mentor: Dr. Edith Osborne

Department: Chemistry and Biochemistry

The main focus of this research is science-based learning. Science is a challenging and complex subject that is hard for students to understand (*Exploring our Fluid Earth*). Technology has led to many advancements in science, such as the advancement of microscopes and nanotechnology. The main technology advancement for this experiment

is 3D printing. According to (Durbin *What is 3D printing? how do types of 3D printers work?*), 3D printing was invented in the 1980s and was initially known as "rapid prototyping." Although 3D printing has changed and improved, it still has the same function: to make 3D prints of prototypes quickly. 3D printers make 3D models of all different types of things by adding material layer by layer, eventually creating a 3D model.

The protein Hemoglobin was one specific molecule we found interesting and challenging to understand. According to (Billett *Hemoglobin and Hematocrit*), Hemoglobin is a protein found in red blood cells, and its function is to carry oxygen to the tissue. Like everything, something does not function properly or do its job thoroughly and correctly. There is a disease known as sickle cell anemia, and it affects the function of the protein Hemoglobin. Although by 3D printing the hemoglobin protein, you can not see how it functions, you can see the molecule's structure. Being able to see the structure helps better understand how everything works together to be able to perform its proper function.

The Impact of Tumble Time and Vacuum Pressure on Boneless Ham Yields and Objective Color Scores

Abigail Mayer

Faculty Mentor: Dr. John Kellermeier

Department: Agriculture

The objective of this study was to compare vacuum pressures and tumble times on the yield and objective color scores of boneless hams. Boneless ham pieces were randomly assigned to one of four treatments: -0.5 bar × l hour, -0.5 bar × 2 hours, -0.9 bar × 1 hour, and -0.9 bar × 2 hours. Weight differences at the fresh, cooked, and chilled steps were taken on formed hams (n = 48). Instrumental color readings on packaged ham slices were conducted on d 7, 14, and 21 (n = 24 / treatment). Results indicated that there were not any significant weight differences within the treatments. However, significant differences were found on d7 for L* and a* scores between the -0.9 bar × 2 hours and all other treatments (P < 0.05). Additionally, significant differences were detected within on d14 a* color scores between the -0.9 bar × 1 hour, -0.5 bar × 1 hour, and -0.9 bar × 2 hours treatments (P < 0.05). Significant differences were indicated on d14 a* color scores between the -0.5 bar × 2 hours and -0.9 bar × 2 hours treatments. Lastly, significant differences were indicated on d14 b* scores within the two treatments of -0.5 bar × 1 hour and -0.9 bar × 2 hours as compared to the treatments of -0.5 bar × 2 hours and -0.9 bar × 1 hour. The results of this

study indicate that vacuum pressure combined with tumble time could have an impact on cured color.

Examining the Effects of PFAS Toxicity in the Kidneys and Gonads of Zebrafish (Danio rerio) Using Ki-67 Protein as a Marker of Cell Proliferation.

Ethan Aguilar

Faculty Mentor: Dr. Laurel Fohn

Department: Biology

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that have garnered increasing attention due to their pervasive presence in various industrial and consumer products, as well as their detrimental impact on human health. Epidemiological studies have revealed a concerning correlation between PFAS exposure and kidney and gonad cancer development in humans (Seyyedesalehi and Boffetta, 2023). In this experiment, we aim to investigate renal and gonadal toxicity induced by a prominent PFAS compound, perfluorooctane sulfonic acid (PFOS) within zebrafish kidneys and gonads.

Following exposure to PFOS, we will perform gross analysis of gonad and kidney morphology followed by histologic analysis of these tissues using both hematoxylin and eosin staining and immunohistochemistry techniques.   Histological analysis will be employed to quantify cellular changes within kidney and gonad tissue sections, providing insight into the effects of PFOA exposure at the cellular level. We intend to utilize ki-67 protein immunohistochemistry on alternating tissue sections to form an expression index, reflecting the degrees of cell proliferation due to exposure to PFOA compounds. Currently, the zebrafish are undergoing exposure to PFOS. In preparation for morphologic and histological analysis of the kidneys and gonads of zebrafish .

What explains the relationship between screentime and attention deficits in college students?

Ivory Ballenger

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Department: Psychology

Problem

Screen time, specifically excessive smartphone use, has been linked to negative cognitive outcomes, including attention deficits, among young adults (Harkin & Kuss, 2020). Disrupted sleep may play a key role in mediating these cognitive effects (Shahid et al., 2011). The study investigated whether sleep difficulties mediate the relationship between screen time and attention deficits in college students.

Method

University students (N = 113; Mage = 19.9 years, SD = 3.10; 75.2% women) reported the number of hours per week they spend on their smartphones and responded to subjective measures of screen use (Harkin et al., 2020), sleep importance (Peach & Gaultney, 2017), and attention deficits (Adler et al., 2018; Cronbach's αs < 0.68).

Results

Participants' mean screen time was 19.3 hours/week (SD = 27.10). Subjective measures of screen use were positively associated with sleep importance (r(111) = 0.28, p = .003) and attention deficits (r(111) = 0.25, p = .008). Mediation analysis tested whether sleep importance explained the relationship between screen use and attention deficits. The total effect of screen use on attention deficits was significant (c-path; b = 0.23, p = .006). The pathway linking screen use to the mediator, sleep importance, was also significant (a-path; b = 0.17, p < .002). The pathway linking screen use to attention deficits trended toward significance (b-path; b = 0.24, p = .09). The direct effect was diminished when accounting for the mediator (c'-path; b = 0.19, p = .03), suggesting that sleep importance helped to explain the relationship.

Conclusions

Smartphone use may be positively associated with attention deficits in college students, and sleep functioning might offer a partial explanation for this relationship. Sleep quality can be an important factor for mitigating screen-related attention issues among this population. Future research should test interventions targeting sleep improvement to alleviate attention deficits associated with screen use.

Using Fecal Sampling & DNA Metabarcoding for Dietary Analysis of Passerines in Tom Green County, Texas

Adina L. Hernandez

Faculty Mentor: Dr.Ben Skipper

Department: Biology

Passerines, better known as songbirds or perching birds, are a charismatic group of roughly 6500 species across more than 140 families. A variety of migratory passerine species reside in Tom Green County Texas over the fall and winter months in addition to the many year-round resident species that live in this area. Our understanding of diet in many of these species is limited to general descriptions such as insectivore, granivore, and omnivore with the exact identification of food items being unknown. Fecal sampling and DNA metabarcoding techniques can provide a much clearer idea of what passerines in Tom Green County, Texas are actively consuming during the fall and winter months by identifying food items to the genus or species-level

How Indoor Vs. Outdoor Exercise Affects the Cognition of Female Collegiate Athletes

Alexa Schwertner

Faculty Mentor: Dr. Kristi White

Department: Health Science Professions

Background:

College athletes face unique cognitive demands as they balance the rigor of their sport and the challenges that come with higher education. The environment in which these athletes train and compete, outdoor or indoor, may influence their cognitive function.

Methods:

30 female Angelo State University student-athletes (15 indoors and 15 outdoors) had the MoCA test administered after a regularly scheduled practice. At the completion of data collection an independent t-test will be ran to compare the average scores of the indoor and outdoor athletes and draw conclusions from that data.

Results:

Results and a conclusion will be available after the completion of data collection at the end of March or early April.

Conclusion:

The current hypothesis is that a female collegiate athlete's exercise location, indoor vs. outdoor, affects their cognition; more specifically their short-term memory, visuospatial abilities, executive functioning, attention, concentration, working memory, language, and their orientation to time and place.

Keywords: Cognitive Assessment, MoCA test, Indoor vs. Outdoor

Using an octaamine resorcinarene derivative as an extraction framework to isolate metal ions in the lanthanide series from a variety of phases: A DFT investigation

Samuel Zipp

Faculty Mentor: Dr. Kyle A. Beran

Department: Chemistry and Biochemistry

The structural binding mode and corresponding energetic interaction between metal ions in the lanthanide series and an octaamine resorcinarene derivative are elucidated utilizing theoretical models. Full geometry optimization and energetic analysis of the resorcinarene derivative, along with the metal ions (M3+), is carried out utilizing density-functional theory (DFT) with the ωB97X-D functional in combination with the 6-31G* basis set. This methodology was conducted in the gas-phase and in the presence of a polar solvent as well as a water solvent. Structural properties of the molecular ion complex (M3+ - derivative) are analyzed and compared to literature data, primarily focusing on the coordinate covalent bond length between the M3+ ion and nitrogen atoms in the resorcinarene derivative. The reaction (binding) energy between the metal ion and the derivative in all three phases are also investigated. Theoretical data indicates that the length of the coordinate covalent bonds is inconsistent with literature values due to the rotational characteristics of the benzyl rings at the methyl group linkages in the derivative. The binding energy, or the extraction energy, for all molecular ion complexes are energetically favorable. Consequently, the octaamine resorcinarene derivative could possibly serve as an extraction tool for the removal of M3+ ions from any one of the three phases.

Development of Additional Experiential Learning Modules for Students in Engineering Mechanics

Dominic Burk

Faculty Mentor: Dr. Anthony Battistini

Department: Engineering

In terms of Engineering Mechanics, statics and dynamics are the courses with the highest DFW rate, which is a measurement that shows how many students either fail, barely pass, or withdraw from the class before the end of the semester. To address this issue, the David L. Hirschfeld (DLH) Department of Engineering introduced an additional one-hour lab time in Fall 2019 for students to practice problem-solving in both these courses. The lab time includes guided practice of concepts already learned during the class and provides students access to the professor as well as an undergraduate student instructor for problem-solving help.

As part of an ASU FREP Grant Proposal in AY 2021-2022, Dr. Haque and Dr. Battistini worked with undergraduate students to create dimensionally accurate three-dimensional models to supplement these labs. The models are accompanied by experiential learning modules, which allow students to physically visualize, measure, and experience the abstract theory and calculations taught in the classroom. This project aims to supplement the previous work by incorporating additional experiential learning modules into these courses, with a specific focus on the Statics course, with the goal of increasing student motivation and information retention.

Mechanically Active Monolayer of Cells Inspired by the Game of Life

YooJin Choi

Faculty Mentor: Dr. Michael C. Holcomb

Department: Physics and Geosciences

Given the complexity and heterogeneity of cancer cells, existing models often require intricate understanding and detailed parameterization, which may limit their predictive power. Cellular Automata (CA) provides an effective alternative by enabling simpler, rule-based simulations to model cell behaviors under diverse conditions. Here, we present a CA model focused on cellular responses to volumetric stress inspired by principles from Conway's Game of Life. This approach aims to explore aspects of proliferation dynamics and potential apoptosis triggers. We demonstrate that some dynamics of mechanically active monolayers of cells can be captured from this kind of approach.

A density-functional investigation of the interaction energetics between a tetrol cavitand and metal ions in the lanthanide series

Zandria Stanfield

Faculty Mentor: Dr. Kyle A. Beran

Department: Chemistry and Biochemistry

Density-functional theory (DFT) is employed to probe the structural and energetic interactions between a tetrol cavitand and the metal ions (M3+) in the lanthanide series. Initial analysis of the cavitand using the semi-empirical PM3 model was followed by a thorough structural and energetic analysis of the molecule using the DFT-ωB97X-D functional in combination with the 6- 31G* basis set. DFT analysis of the reaction between tetrol cavitand and the M3+ ions was conducted in the gas-phase, in the presence of a general polar solvent, and in an aqueous solution. Structural properties of the molecular ion complex (M3+ -cavitand) are analyzed and compared to literature data, primarily focusing on the coordinate covalent bond length between the M3+ ion and oxygen atoms in the tetrol complex. The reaction (binding) energy between the metal ion and the cavitand in all three phases are also investigated. Theoretical data indicates that the length of the coordinate covalent bonds is consistent with literature values and the binding energy for all molecular ion complexes are favorable; therefore, indicating that the cavitand is a candidate to be used as a molecular tool for the extraction of the M3+ ions from any one of the three phases.

C.burnetii effector CinF upregulation of autophagy using qRT-PCR

Estefany Reyes Villicana

Faculty Mentor: Dr. Emerson Crabill

Department: Biology

Intracellular bacterial pathogens have evolved the capacity to invade host cells to establish a replicative niche, allowing them to be protected from the systemic components of the host innate immune system. They have learned to use host tools to their advantage, among these tools is the autophagic pathway. *C. burnetii* has learned to manipulate autophagy at the molecular level as a major component of their virulence strategy. One effector protein, CinF, appears to play a role in upregulating autophagy. We will monitor autophagic flux by qRT-PCR. We will test the levels of SQSTM1, which is an autophagosome cargo protein that targets other proteins to which it is bound for autophagy, with and without the expression of CinF, as well as the CinF catalytic mutant, and in the presence and absence of bafilomycin

A. This will be done by immunoblot with SQSTM1- specific antibodies. To ensure the changes in SQSTM1 expression are due to changes in autophagic flux and not transcription, we will measure its mRNA levels by qRT-PCR for all the conditions tested.

Determining Precise Orbital Periods of HATNet Exoplanets

Raymond Brown

Faculty Mentor: Dr. Kenneth Carrell

Department: Physics and Geosciences

Exoplanets are planets that are not inside our solar system. Most exoplanets orbit other host stars while some do not. We will be looking exclusively at exoplanets with host stars. When these exoplanets pass in-front of their host stars, from our perspective, we call the event a transit. During transits, we can measure a small dimming of the brightness of the host star. Observing multiple transits of an exoplanet, we can look for any discernible changes in the orbital period of the planet. Here the orbital period is defined as the time it takes for the exoplanet to complete one orbit around its host star. I looked at the following exoplanet/host star pairs to determine if there were any statistically significant transit timing variations: HAT-P-13 b / HAT-P-13, XO-2N b / XO-2N, WASP-8 b / WASP-8, and HAT-P-36 b / HATP-36. We will present the methods and data/analysis for these exoplanets.

Formation and Characterization of Silicon-Carbon Hybrid Anode Material

Ramon Rodriguez Chacon

Faculty Mentor: Dr. Gregory Smith

Department: Chemistry and Biochemistry

Silicon-carbon hybrid materials have shown promise as the anode in lithium-ion batteries. Silicon has a higher specific capacity (3600 mAh/g) compared to conventional graphite anodes (372 mAh/g). However, upon lithiation silicon expands to 320% of its original size, fracturing the anode material after only a few charge cycles. To build a silicon-carbon hybrid anode material, we react silicon with acetylene to interconnect the particles in a conductive carbon network. To promote the reaction, acetylene was introduced to the silicon nanoparticles, then the pressure was increased. The reaction caused the particles to aggregate into large clumps, the size of which was a function of the time spent in exposure to the acetylene gas. These particles were examined with a scanning electron microscope. Future research includes investigating methods to control the reaction,

including changing the temperature and applying sonication, and measuring its properties for suitability as an anode material for lithium-ion batteries.

A parasite survey of Dorosoma cepedianum (Gizzard Shad) in a small pond from Rockwall, Texas

Jaycee Dockrey

Faculty Mentor: Dr. Nicholas Negovetich

Department: Biology

A plasma is a body of mobile charges, governed by statistical mechanics and typically dominated by electric and magnetic forces. Usually, plasmas exist at high temperatures and low pressures as this allows self-sustained ionization and minimal neutralizing collisions. However, through dielectric barrier discharge (DBD), electrons in the system can be preferentially heated, leaving the far more massive ions at a cooler temperature. DBD occurs when the voltage across 2 electrodes is sufficiently high to eject electrons from the surface, while not generating an arc discharge. These electrons then collide with atoms from an input gas, ionizing it without producing a high current through the plasma. This results in a weakly coupled plasma where the bulk temperature is as low as room temperature. In addition, this can be achieved at atmospheric pressure, although the plasma is not in thermodynamic equilibrium and quickly neutralizes. In this research, a nonthermal atmospheric pressure plasma jet was produced, and characteristics of the plasma were investigated via BOLSIG, a numerical solver for the boltzmann equation for low-temperature plasmas. Additionally, the effects of varying power input, gas flow rate, and anode placement on the jet characteristics were investigated.

Characterization of a Nonthermal Atmospheric Pressure Plasma Jet Generated via Dielectric Barrier Discharge

Matthew Barton

Faculty Mentor: Dr. Trey Holik

Department: Physics and Geosciences

This paper examines how the water supplies of notable late 19th century frontier outposts in Texas created challenges for their respective posts and underscores the importance of

water in an arid landscape to these posts. It uses the medical histories of Fort Richardson, Davis, Concho, McKavett, Griffin, and Stockton where information regarding water supply quality, quantity, disease, and flooding occurs. In an arid climate like Texas's water was a crucial necessity for a frontier post but having a clean and fruitful source was not always possible. This paper looks how the quality of the water supply contributed to diseases such as malaria and typhoid. It also not only covers problems of quantity when drought or unpredictability of rain led to once reliable water sources drying up, but also how too much water could lead to problems of flooding and lower sanitation. While the problems of these frontier post's water sources have been acknowledged in current literature and research, the intertwining nature of quantity and quality has been little discussed or focused on. This new interpretation makes the specific point that problems in quantity could directly lead to problems in quality of a fort's water source. Additionally, to help support this paper's analysis, modern sources have been used to supplement knowledge of disease that the 19th post surgeons did not have but 21st medical science can now provide.

Both Boon and Curse: Water and Sanitation on the Texas Frontier

Daisy Jane Herr

Faculty Mentor: Dr. Jason Pierce

Department: History

Bonnie Parker and Clyde Barrow were an infamous duo that came out of the Great Depression era. They would captivate the American imagination with their exploits and tragic end. This biography delves into the lives of Bonnie and Clyde. To explore their paths from a humble beginning to becoming one of the most notorious criminal couples in history. By researching their lives, we are able to see the complex relationship they had to themselves, their families, and the American public. That they were not just cold blooded criminals, but people who were shaped by the harsh reality of life at the time. We will see how their story will unfold against the background of economic turmoil, social change, and the pull of rebellion.

The Tale of Bonnie and Clyde

Zelda Montez

Faculty Mentor: Dr. Jason Pierce, Dr. Rebekah McMillan

Department: History

This research paper explores Empress Elisabeth's sympathy for the Hungarians, her role in the Austro-Hungarian Compromise of 1867, and her relationship with Hungarian Count Gyula Andrassy. Empress Elisabeth's affinity for the Hungarians stemmed from her distaste for the rigid Austrian court life and her admiration for Hungarian culture, which she embraced through close relationships with Hungarian figures and frequent stays in Hungary. Her role as a mediator between her husband, Emperor Franz Joseph, and Hungarian leaders was crucial in facilitating the compromise agreement, highlighting her significant influence. Additionally, her close relationship with Count Gyula Andrassy was instrumental in his appointment as the first prime minister of Hungary, as she supported his political aspirations and advocated for his leadership within the newly established dual monarchy.

The Crown and the Compromise

Kristopher Elizabeth Frentz

Faculty Mentor: Dr. Rebekah McMillan

Department: History

This research paper explores Empress Elisabeth's sympathy for the Hungarians, her role in the Austro-Hungarian Compromise of 1867, and her relationship with Hungarian Count Gyula Andrassy. Empress Elisabeth's affinity for the Hungarians stemmed from her distaste for the rigid Austrian court life and her admiration for Hungarian culture, which she embraced through close relationships with Hungarian figures and frequent stays in Hungary. Her role as a mediator between her husband, Emperor Franz Joseph, and Hungarian leaders was crucial in facilitating the compromise agreement, highlighting her significant influence. Additionally, her close relationship with Count Gyula Andrassy was instrumental in his appointment as the first prime minister of Hungary, as she supported his political aspirations and advocated for his leadership within the newly established dual monarchy.

Transportation Methods and How that Affects Prices in the Grocery Store

Vian Ozuna

Faculty Mentor: Dr. Rebekah McMillan

Department: History

In paper I'm investigating the change in price of groceries as transportation methods changed in San Angelo. I will be investigating the price change when the railway, highways, interstates, and when food along with transportation was limited due to World War II. In addition, I will include factors that could affect prices and the history of grocery stores in San Angelo. In paper I'm investigating the change in price of groceries as transportation methods changed in San Angelo. I will be investigating the price change when the railway, highways, interstates, and when food along with transportation was limited due to World War II. In addition, I will include factors that could affect prices and the history of grocery stores in San Angelo.

Structural properties of a series of lanthanide potassium sulfates, KLn(SO4)2

Thomas Hodge, Jackson Turner

Faculty Mentor: Dr. Ralph Zehnder

Department: Chemistry and Biochemistry

Safe and efficient storage of nuclear waste is a significant obstacle in creating a sustainable nuclear infrastructure. The study of the radioisotopes produced as a byproduct of nuclear fission is challenging and widely inaccessible due to safety measures and cost. Trivalent lanthanides are commonly used as surrogates for their actinide counterparts when studying f-element chemistry. Their similar chemical properties and ionic radii make the lanthanides a more accessible and low-risk alternative when optimizing experimental procedures intended for actinides. We have created a small number of lanthanide potassium coordination polymers with the generic formula KLn(SO4)2 employing hydrothermal synthetic methods. We combined 0.35 mmol of Ln2(SO4)3 , 2.1 mmol KCl, and 10 mL of deionized water in a Parr autoclave. We then sealed the autoclave and placed it in a laboratory oven. We maintained 170° C for 3 days before collecting the resulting coordination compound. We anticipate that further investigation of the structural properties of this series of isomorphous coordination polymers will contribute to a better insight regarding the physicochemical behaviors of the actinides. We also hope that this method can be applied to some of the actinide elements, such as plutonium and

americium. The structural properties as a function of the decreasing ionic radii along the series are explored in this work. We have also investigated the possible substitution of smaller alkali metals such as sodium and lithium in place of potassium.

Green Building

Katelyn Bohensky

Faculty Mentor: Dr. Anthony Battistini, Dr. Soyoon Kum

Department: Engineering

As the construction industry faces growing pressure to reduce carbon footprints and improve sustainability, it is essential to understand the comparative environmental implications of different building materials. This study compares the life cycle assessments (LCAs) of timber, concrete, and steel buildings to evaluate their environmental impacts through production. The analysis encompasses key factors such as embodied energy, carbon emissions, resource consumption, and end-of-life disposal/recycling. Timber buildings are often praised for their renewable nature and carbon sequestration capacity, while concrete and steel are associated with high embodied carbon due to their energy-intensive manufacturing processes. However, concrete offers durability and fire resistance, and steel is known for its strength and recyclability. This study examines each material's performance across the production stage of the life cycle offering insights into which material or combination thereof may be more sustainable. The findings aim to inform architects, engineers, and policymakers about the most efficient and sustainable material choices for building design, with a focus on reducing overall environmental impact while meeting functional and structural requirements