

Celebration of SCHOLARSHIP



THURSDAY, APRIL 15, 2021

Poster Presentation Program

IWU'S ANNUAL UNDERGRADUATE RESEARCH CONFERENCE

SPONSORED BY THE JOHN WESLEY HONORS COLLEGE

Throughout the day (8am to 4:30pm) on Thursday, student researchers will be available to present and take questions at their posters during the times indicated in the program and listed on the posters. Natural Sciences presenters will present, in addition, between 3:00 and 4:00pm.

BARNES STUDENT CENTER COMMONS

[Stage]

Health & Human Performance



[Baldwin Windows]

Maladaptive Plasticity? Implications for AMPA receptors involvement in Cocaine Addiction

Cole Marvin

Long term potentiation (LTP) entails the increase in synaptic strength following brain activity and is the cornerstone of theories surrounding synaptic plasticity and learning. LTP involves NMDA receptor excitation and the transcription of AMPA receptor proteins including GluR1, GluR2 and NR1 by way of second messenger pathways (Bliss, 1993; Fitzgerald, Oriz, Hamedani & Nestler, 1996). Given that addiction can be construed as a maladaptive learning, implications for LTP's role within diagnosable addiction have been supported by studies into the increased activation of second messenger pathways and their products in the mesolimbic reward pathway and Nucleus Accumbens (NAc) following chronic cocaine exposure (Berhow et al., 1995). Reviews of literature have looked at the potentiality of NMDA and AMPA receptor specificity in this particular pathway due to these mechanisms, with strong evidence that increases in receptor quantity within the NAc can be positively linked to substance exposure (Hopf, 2017; Mews, Walker & Nestler, 2018). Gene deletion studies in mice have shown the importance of GluR1 in the inhibition of addictive behavior, as well as the positive correlation of NR1 and repeated exposure to cocaine in the ventral tegmental area (VTA) of the mesolimbic pathway (Schilstron et al., 2006). With this in mind, it is believed that the continued, concentrated study on these three AMPA glutamatergic receptors, in the context of both initial and maintained cocaine stimulus representative of sensitization and habituation, is of great importance to the understanding of LTP in addiction and recovery. GluR1 is of particular interest in the context of recovery and prevention, given the inhibition of these receptors leads to decreased levels of synaptic strength, especially in regard to GluR1 agonist exposure or genetic inhibition (Bellone & Lusher, 2006; Conrad et al., 1996; Kauer, 2004; Tseung et al., 2008; as cited in Hopf, 2017;). Other factors, such as the interaction between FoS gene co-expression of GluR1 and NR1, receptor differences at onset and maintenance of addictive behaviors, are also of interest due to their observed role in encoding a schematic framework supportive of addictive behavior (Whitaker & Hope, 2018). Finally, implications for cocaine seeking behavior in rats similar to human drug craving, increased sensitization associated with relapse, and fluctuations in NR1 and GluR1 glutamatergic activity within the VTA and NAcc are to be investigated in the context of behavioral addiction maintenance (Chiamulera et al., 2021; Zavala et al., 2007; Zweifel et al., 2008).

† Behavioral Tendencies Amongst College Majors

Courtney Lehe, Kara Schmidt, Kathryn Wininger, Peyton Denning, Jessie Banter

This study focuses on the prevalence of narcissistic tendencies amongst Indiana Wesleyan University students from all academic divisions. This study addresses how understanding narcissism amongst the student population can prove helpful for faculty and students, why being able to recognize narcissistic tendencies is helpful when entering the professional realm, and how historical narcissistic tendencies apply to college students. Results will be able to not only better understand the narcissistic tendencies of college students at Indiana Wesleyan specifically, but will also be able to better identify which majors on average possess students with higher Narcissism Personality Inventory scores. Indiana Wesleyan University has a goal of developing students of character and leadership (Distinctives of Indiana Wesleyan). Narcissism is the excessive interest in oneself and if a student had a large number of narcissistic tendencies, it would be hard for them to reflect-Christ in what they are doing in Although only 0.5 to 1 percent of the general population are diagnosed with Narcissistic Personality Disorder, narcissism tendencies fall on a continuum (2018). There is a level above NPD which is called narcissistic personality type and these people will lack empathy, look down on others and feel entitled (2018). This research study will be looking at which students may fall into the narcissistic personality type and this will benefit administration, faculty and staff and students.

Advocacy Research Project: The Visually Impaired and Food Service

Heather Mahoney and Alexis Gerstner

An advocacy for there to be braille menus inside of Baldwin and Wildcat for the visually impaired.

† Denotes a project also included on the oral presentation schedule

Reviewing the Enneagram through the Lens of Personality & Religion

Jessica Gormong; Emily Davis

The currently popular Enneagram is an ancient classification of human personality. Like other well-known deductive typologies, this model distinguishes groups of individuals sharing a similar lifestyle of adaptive and maladaptive tendencies. Although the Enneagram developed from narrative methodologies, there exists a paucity of empirical research supporting the enneatype descriptions. Some existent studies have examined relational connections between the Enneagrams and personality variables; researchers have investigated the validity of the nine types with the Millon, Myers-Briggs Type Indicator, the 16 Personality Factor Model, and the Five-Factor Model. Yet, most are not current and do not apply a multivariate approach. Moreover, employment of the subscales in the trait factor models has been scarce and few examine the influence of humanistic values (e.g., Maslow's self-actualization). Hence, using a sample of undergraduates ($n = 67$), we conducted a pilot study to identify variables from psychoanalytic, humanistic, and trait psychologies along with religious constructs relating to each Enneagram. Participants self-assessed their Enneagram type and completed a multivariate battery of personality and religious measures. Preliminary findings from correlational and regression analyses revealed a collection of traits and variables revealing explicit personality characteristics per Enneagram. On the average, 24 statistically significant correlations (i.e., $> .4$) along with four statistically significant predictors emerged per Enneagram. Within each set, we identified support for existent Enneagram descriptions from well-known enthusiasts and delineated suggestions for additional information per type.

The Effect of Intentional Exclusion during a Global Pandemic on Subjective Well-Being

Reka Jeckel

The purpose of this experiment is to determine how excluding affects emotions, authenticity, social power, and subjective well-being experienced by individuals during a global pandemic. Intentional exclusion is associated with higher levels of social power. Social power is associated with enhanced subjective well-being (Wood & Harms, 2017). This is because people with power can have congruence with their internal desires and beliefs (Greco, 2018). However, during a global pandemic, everyone is being forced to intentionally exclude for safety reasons. This could lead to a disagreement between the individual's internal desires and external social decisions. In this study, excluders reported higher negative emotions than those who did not exclude. The experimental group felt less positively towards themselves than the control group. In this experiment, it was hypothesized that those who excluded would feel lower subjective well-being than those who did not. The hypothesis was supported by the results because there was a significant effect on the amount of negative emotion experienced by the participants. This implies that social exclusion is experienced differently during the time of a global pandemic.

Critical Treatment Time in Parkinson's Disease Using Biomarkers and Non-motor Symptoms as Diagnostic Criteria

Reka Jeckel

Parkinson's disease (PD) is the second most common neurodegenerative disorder and is estimated to affect 1-4% of individuals aged over 60 years old. Clinical diagnosis can only occur after certain motor symptoms have been present for some time. Despite this, the non-motor symptoms of Parkinson's disease can occur up to 15-20 years prior to the distinctive motor symptoms. The most common non-motor symptoms are cognitive decline, rapid eye movement sleep behavior disorder, hyposmia, constipation, symptomatic hypotension, and depression (a complete list could be found at Tarakard & Jankovic, 2017). It has been hypothesized that there is a critical time between the start of nonmotor and motor symptoms where treatment could be most effective. Prior to the onset of motor symptoms, certain biomarkers are present. Biomarkers, which can be measured, are a distinctive substance within the body that indicates the presence of different diseases, infections, or other issues (Li and Le, 2020). The current biomarkers under review are α -synuclein, certain extracellular vesicles, microRNA's, and neurofilament light chains. A-synuclein is the most promising and reliable biomarker that can be located in cerebrospinal fluid. With further research, these biomarkers, combined with the presence of non-motor symptoms, could lead to earlier diagnosis. This review will explore the connection between nonmotor symptoms and PD biomarkers for early diagnosis through examining current research in these areas.

[†] Denotes a project also included on the oral presentation schedule

† A New Home?: a Qualitative Study on Belonging Among Hispanic and Latino Immigrants

Riley Daugherty

Health and Human Performance

† The Effect of Childhood Trauma on Pain Tolerance in Collegiate Athletes with Chronic Back Pain: A Cross-Sectional Study

Alexis VanFleet & Jared Williams

Objective: To evaluate the effect of adverse childhood experiences on pain tolerance in patients with chronic back pain.

Background: Childhood trauma has been correlated with multiple adverse health effects including chronic back pain. However, the perception of pain in people who experience childhood maltreatment has not been widely researched and has incurred mixed results in the few studies conducted concerning this topic. This study not only seeks to better understand the relationship between pain perception and ACEs (adverse childhood experiences), but to also give health care providers more insight into their patients who fall onto this spectrum.

Methods: 29 subjects with chronic back pain participated in the study. The adverse childhood trauma questionnaire (ACE-Q) was used to split subjects into the control and experimental group. The control group consisted of 12 subjects with an ACE score of ≤ 1 . The experimental group consisted of 17 subjects with an ACE score >1 . The visual analog scale (VAS) was used to assess perception of chronic back pain.

Results: Findings indicate there is no significance difference between the control and experimental groups ($p = 0.975$). A linear regression analysis was established to identify if ACE score can predict VAS score. However, the analysis did not statistically predict pain level ($F(1,27)=1.056, p=0.313$).

Conclusion: Research remains largely inconclusive as to whether ACE's influence the perception of pain.

Increasing the population size, broadening the population to include recreational athletes, and including subjects above the ages of 26 may yield better results in future studies.

† The Efficacy of Anti-Gravity Treadmill on Lower Extremity Injury Rehabilitation

Caleb Davis, Josiah Gardner, Brenden Zeisloft

PURPOSE: Distance runners routinely experience lower extremity overuse injuries resulting in weight-bearing dysfunction. Modification of protocol through weight-bearing activities can benefit a patient recovering from injury. Modified workouts can be heavily dependent on training resources available. A healthy 21-year-old female developed chronic lower extremity pain in her left knee and both feet while training for cross country season. The patient was diagnosed with chronic patellar tendon strain in her left knee with left foot plantar fasciitis and a navicular stress fracture as well as sesamoiditis in her right foot. **METHODS:** The multiple lower extremity diagnoses made running impossible without increased pain and disability. Anti-gravity treadmill training was considered due to the ability to modify the percentage of body weight impact on lower extremities through usage of this type of equipment. While literature exists on using anti-gravity treadmill for alternate training regimens, evidence of using the LightSpeed Lift (LSL) anti-gravity treadmill for lower extremity rehabilitation is almost non-existent. The patient performed an experimental protocol using the LSL for injury recovery and rehabilitation and determine the intervention effectiveness by measuring perceived pain (PP) changes over time. The patient recorded a subjective pain perception evaluation at the start and end of each protocol session followed by a 6-Minute Walk Test (6-MWT). Weight reduction through LSL was performed 2 days/week for 7 weeks, with up to 60 min of usage per session. The protocol included two major parts; concurrent warmup/mobility assessment and conditioning. **RESULTS:** After 8 weeks of LSL intervention, PP immediately following the 6-MWT was unchanged. However, the post-session PP decreased significantly over time. **CONCLUSIONS:** Lower extremity injuries are problematic for running patients due to high frequency of use to the involved joints. This case involving a competitive runner pursued anti-gravity treadmill intervention to alleviate pain and dysfunction resulting from lower

† Denotes a project also included on the oral presentation schedule

extremity injuries. This intervention approach could be utilized to reduce recovery time of injured runners and promote earlier return to activity. Additional benefits could include increased sense of well-being, as well as aerobic capacity maintenance or improvement.

ABBREVIATIONS: 6-MWT = 6-Minute Walk Test, LSL = LightSpeed Lift, PP = perceived pain.

† Metabolic Observation During Running with and without the Light Speed Lift

Damascus Mickey, Mckenzey Ridge, Melanie Stuck

PURPOSE: To investigate the differences in oxygen consumption (VO₂), predicted maximal oxygen consumption (predVO₂), respiratory exchange ratio (RER), heart rate (HR), rate of perceived exertion (RPE), and affect valence (AV) with the Light Speed Lift (LSL) to reduce 8-10% of body weight and without the LSL. **METHODS:** Thirty participants volunteered to participate in this study. During one exercise session, participants performed two submaximal tests, one using the LSL for body weight reduction, and one at full weight bearing (FWB). Conditions (LSL or FWB) were randomly counterbalanced. During both conditions, the participant worked to reach 60% of their calculated heart rate reserve. Once they reached this value, the individual remained at the obtained speed for 3 minutes. Measurements for metabolic variables were recorded at this stage using the metabolic cart while the affect valence and rating of perceived exertion was recorded manually. Paired t-tests as well as Wilcoxon Signed Rank tests were run to determine significance. The alpha levels were set at $p < 0.05$. **RESULTS:** VO₂, RER, and HR were not significant. PredVO₂ (LSL=41.1783, FWB=38.3280) as well as RPE (LSL =10.07, FWB=11.25) and AV (LSL=2.63, FWB=1.90) were statistically significant. **CONCLUSION:** Based on the findings, the utilization of the LSL brings greater enjoyment. Therefore, the LSL could be a tool that increases subject adherence. Further research is needed to develop an understanding of how the LSL affects predicted VO₂ max. A different equation to find predVO₂ can be found and used that takes time into account instead of speed.

† Mild Traumatic Brain Injury Secondary to Atypical (Asymptomatic) Hydrocephalus: Return to Play Considerations and Management

Dayton Groninger, Tonya Riffey, and Emily Heighway

This case study covers a 15 year-old diagnosed hydrocephalus patient who appears with no distinctive symptoms and requires no athletic or academic restrictions. Hydrocephalus is medically defined as having enlarged ventricles in the brain caused by an excess amount of cerebrospinal fluid (CSF) build-up. Most hydrocephalus cases present with diminished fine motor skill function as well as some kind of cognitive impairment due to the CSF pressure on the brain. The uniqueness of this case is that the brain scan of this teenage patient presents with swollen ventricles, but he experiences no cognitive or motor-functioning impairment typically seen in a patient with his diagnosis. Furthermore, this boy makes all A's in school, and is a three-sport athlete who plays soccer, basketball, and track for his high school sports teams. He currently has no sport-related restrictions or symptom management. This situation is very rare, and a case like this is not extensively covered in literature. Most diagnosed hydrocephalus cases are treated with a shunt placement surgery, but his neurologist at Riley Children's Hospital in Indianapolis did not think it pertinent to advance with surgery due to his asymptomatic condition. The purpose of our research is to fundamentally assess this patient's cognitive and motor-skill functioning to prove that this young patient can continue without sport and academic restrictions. We anticipate that the results of our testing will be within normal ranges, considering the patient currently presents with no complaints of physical or mental regression. The research and analysis of this case may benefit future doctors and athletes should another individual present with asymptomatic hydrocephalus.

† Glenohumeral Joint Dislocation in a Female Fencer Diagnosed with Ehlers-Danlos Syndrome

Jacob Glover, Gino Taylor, and Corbin Jennings

Background: Competitive Fencing is a group of three related combat sports. Competitive fencers experience a myriad of contact injuries due to the nature of the sport. Specific congenital conditions may influence susceptibility of certain orthopedic injuries. While fencing has been identified as a safe sport through extensive research studies, the officials, sport rules, and protective equipment may not be enough to foster a safe competition environment for participants with congenital conditions. **Patient:** A healthy 13-year-old female experienced an acute right shoulder

† Denotes a project also included on the oral presentation schedule

glenohumeral joint dislocation on her dominant side during a fencing match. The patient was previously diagnosed Ehlers-Danlos Syndrome (EDS), a congenital connective tissue disorder. EDS is characterized by articular (joint) hypermobility, skin extensibility, and tissue fragility. EDS can be divided into six different classifications. This patient falls into the hypermobility category of EDS. Differential Diagnosis: Joint Hypermobility Syndrome, Marfan syndrome, Osteogenesis imperfecta, Classical EDS. Treatment: Glenohumeral joint (GH) dislocations require immediate reduction by qualified medical personnel. Upon reduction, the GH joint must be immobilized and radiographs are imperative to identify bony lesions that may have resulted from the dislocation and/or reduction. Immobilization is critical to joint healing as the compromised strength of the GH joint must be re-established through the scarring process and allowed to return to normal joint function by decreasing inflammation. Immobilization (6-8 weeks) will be followed by a rotator cuff (RTC) rehabilitation program. This program is designed to strengthen the shoulder girdle musculature to ensure functional joint kinematics. Outcomes: After 12 weeks of GHJ rehabilitation, the patient was able to resume progressive reintroduction of fencing activities. The patient was asymptomatic with full fencing activities 6 months post injury. Conclusions: The shoulder joint (glenohumeral joint) is one of the most common areas for a dislocation. Shoulder and other joint dislocations are more common for individuals that have EDS. Continual dislocation of any joint can lead to arthritic changes and cause permanent damage. Congenital syndromes present unique challenges for competitors, coaches, health care professionals, and officials of contact sports. Awareness of athlete health conditions and their potential impact on participation is of paramount importance to ensure safe competition. Implementation of specific clearance rules and guidelines could promote safer competition. There is a lack of information concerning safety protocols for athletes participating with EDS. Clinical Applications: It is suggested that increased safety precautions for athletes involved in contact sports diagnosed with congenital syndromes could promote a decrease in musculoskeletal injuries. The sport of fencing has the potential to create unique circumstances that could lead to injury.

Efficacy of Blood Flow Restriction Therapy on Quadricep Muscle Post-Anterior Cruciate Ligament Reconstruction: A Critically Appraised Topic

Jeremy Baldes, Macean Cook, Grace Frederickson

Blood Flow Restriction Therapy (BFRT) is a relatively new technique for minimizing muscle disuse atrophy and inducing muscle hypertrophy during the rehabilitation process. BFRT allows patients who undergo anterior cruciate ligament reconstruction (ACLR) to gain similar musculoskeletal effects of high intensity resistance, while using low intensity resistance and placing less stress on the graft. The theory states there may be benefits during the early stages of the rehabilitation process when there are weight limitations on the injured limb. BFRT focuses on using metabolic stress to activate and induce hypertrophy in type II muscles fibers. Metabolic stress occurs when there is a high concentration of metabolites and a low oxygen concentration in a muscle. BFRT is not shown to increase quadricep muscle strength independently. It may provide an opportunity for pain reduction in order to administer rehabilitation in other capacities.

Low-Level Laser Therapy Treatment of Type I Complex Regional Pain Syndrome

Lena Hunt, Emma Schmidt, Jacob Stump

Complex Regional Pain Syndrome (CRPS) is a form of chronic neurological pain that typically affects the extremities following trauma. The pain experienced by patients is commonly disproportionate to the severity of the initial injury. The incidence of this syndrome in patients isn't completely understood and its etiology makes it challenging to select effective therapeutic interventions. CRPS is thought to occur from an injury to or an abnormality of the peripheral and/ or central nervous systems.

† Comparing muscular activation through EMG during full-weight bearing versus reduced-weight bearing treadmill running.

Madison Seymour, Ian Hudson, Christopher Maxon

PURPOSE: The LightSpeed Lift is a positive pressure treadmill system that allows for the reduction of body weight while running on a treadmill. In this study, we are looking at the difference in muscle activation in relation to maintaining full body weight and reduced body weight in order to determine the effects of force on the body. These results can be applied to individuals involved in rehabilitation regarding the lower body or as a means of active

† Denotes a project also included on the oral presentation schedule

recovery and injury prevention for athletes. **METHOD:** The true experimental study will include a controlled condition and a treatment condition with the subject strapped into the harness for both settings in order to maintain consistency. The controlled condition will include their full body weight and the treatment condition will be a reduction of 20% to 30% of their body weight, running for approximately 3 minutes for each condition setting. The results will be analyzed utilizing SPSS and t-tests to determine the average muscle activation for both condition settings. **RESULTS:** Results showed that the gluteus maximus and the rectus femoris were statistically significant in reducing the average of muscle contractions (in volts) over 6 steps, while the gastrocnemius and the biceps femoris were not statistically significant. The results also showed that in comparing the means of all four muscle groups, all but the biceps femoris decreased in the average of muscle contraction (in volts).

† The Cultural Competency of IWU Undergraduate Students Pursuing Graduate Study in Health Professions

Sarah McLimore

Cultural competence is of paramount importance for health care providers. Patients come from a wide variety of backgrounds and experiences. While cultural competence is never fully achieved, it is a necessary and ongoing process across the span of a clinician's career. Formal training is helpful and foundational to establish a standard of care. However, it is important to consider the content of that initial training. Depending on the administrator's background, experiences, and education, perspectives on cultural competence training could be laden with bias, stereotypes and misinformation. It is of critical importance to ensure a broad and inclusive perspective when educating future practitioners.

Music

A TRIP DOWN MEMORY LANE: MUSIC THERAPY AND ALZHEIMER'S DISEASE

Alexandra Smith

"1 IN 3 SENIORS DIES WITH ALZHEIMER'S OR ANOTHER DEMENTIA. IT KILLS MORE THAN BREAST CANCER AND PROSTATE CANCER COMBINED" (alz.org). Alzheimer's disease is a growing research subject, whether it's about music therapy or not. Those with Alzheimer's suffer not only cognitively- but physically, emotionally, and developmentally. Alzheimer's disease makes individuals lose their independence- driving, going places on their own terms, and being able to see friends. This brings up the need for more resources to help us understand those who suffer. Music therapy has been known to help those from birth to the end of our lives. These therapists help clients with non-musical objectives (increasing academics, increasing attention span), but use musical activities to obtain those goals. Not everyone is a music therapist- these therapists are Board-Certified and also have psychology backgrounds to help clients in addition to using music. Music therapists are becoming more desired for the older populations, because of the population growing older faster than believed to. In this poster presentation, we will explore the many different levels of Alzheimer's disease, as well as how music therapy can help those with Alzheimer's.

The Effects of Music on PTSD

Aria Granger

Posttraumatic Stress Disorder (PTSD) is an anxiety disorder characterized by symptoms that develop following the unveiling of traumatic life events which cause an immediate reaction of intense fear, vulnerability, or panic. The purpose of this research was to see the effects of music on the different triggers of PTSD, both positive and negative, to elicit a conclusion of what methods of music usage are beneficial to a patient with PTSD and what methods or forms of music negatively impact their cognitive and physical wellbeing. A literature review was conducted on various articles regarding emotional responses to music, brain networks during a musical intervention, and auditory sensitivity of triggers. Throughout the literature review, multiple methods were used dependent on the population studied, including client specified music interventions, measuring behavioral tendencies and memories through music, and surveying generational inclinations to PTSD. The results of this literature review concluded the brain focuses on external or internal stimuli based on a certain type of music and physiological reactions are dependent on the type of instrument played and timbre in the voice. They also revealed that avoidance of generational conflict stems from negative communication patterns that can be overcome by music interventions. In conclusion, music

† Denotes a project also included on the oral presentation schedule

can have both positive and negative effects on PTSD and one can be cognizant of the effects of music on anxious triggers through preferred or memory evoking music and the type or dynamic of instrument being used.

The Affects of Music Therapy on Pregnancy

Emily Hunsberger

The time of pregnancy is typically a very happy time for expecting mothers. However, during this time it can be an extremely stressful time for these mothers. This is a time where their bodies are rapidly changing as well as they are trying to prepare themselves for their new baby. Not only all that but the process of delivering their baby can be extremely painful. Stress has been shown to have adverse effects on the expecting mothers but also the babies too. Something that has been shown to help with not only stress but also the in the delivery room helping distract from pain is music therapy. In this presentation it will be discussing what music therapy is, what stress can do for a pregnancy, how music therapy can be help with the stress and pain of pregnancy, as well as how music therapy can be used with the babies once they are born.

The Use of Music Therapy to Aid Students with Dyslexia Develop Reading Skills

Hannah Collier

Students with Dyslexia face many challenges in the learning environment. It is important that every student is given the tools they need to face such challenges. Music Therapy can be that tool for many students with dyslexia. Rhythmic capabilities are often seen to be lacking in students with dyslexia; music therapy can help develop this and other such skills.

The Effects of Group Vs. Individual Music Therapy On Social Skills Of Kids With Autism

Kristin Fowler

The purpose of this research was to see if there was any difference between group versus individual music therapy on the social skills of kids with autism. There have been many studies with either group or individual music therapy and comparing it to a controlled group that gets no music therapy, but never to see which one is more effective for social skills. All of my articles that I have found support my research that music therapy is effective on social skills with those on the autism spectrum. The hypothesis in this research was that group music therapy would be more effective on the social skills of kids with autism rather than individual with the background knowledge that each client could benefit from something different than another client.

The Effects of Music on Substance Abuse Issues

Loren Abell

For this poster presentation, I will be researching the effects that music has on substance abuse issues. To put it simply, I will be researching how music affects the brain and body. Along with that, I will be researching the effects that substance abuse has on the brain and the body. My goal is to prove that music can be used to offset some of the dangerous addictive characteristics that substance abuse has, and it can also be used as a coping mechanism. I will be doing this by finding scholarly articles about music and substance abuse so I can compare data in previous studies. I also will be using some personal research that I will be conducting with ex-substance abusers and how they have used music to help themselves to overcome addiction.

The Impact on Trauma-Informed Care in the Music Therapy Field

Michaela Thomas

Therapeutic approaches are continually challenged on their ability to advocate for a client's individuality and providing an understanding of how that individualism is shaped by a client's experiences. Creative arts therapies, such as Music Therapy, facilitate a space to explore individual-focused approaches in the therapeutic setting, specifically when targeting trauma. In questioning these approaches, research and experimental data were collected through a literature review on the effects of traumatic experiences involving physiological responses, relational needs, and social resources in both a music and non-music setting. Current research shows that the

[†] Denotes a project also included on the oral presentation schedule

trauma-informed approach provides a safe psychological environment for clients to explore their feelings, thoughts, and experiences. Incorporating this approach into the Music Therapy field fosters resilience in clients with PTSD leading to healing and growth. This review is beneficial for the advocacy of the client's experience and how it will affect their therapeutic success. Additionally, it will guide Music Therapists' understanding of the value of being trauma-informed and the lasting impact it will leave on their clients.

The Effects of Music Therapy on Parents of Preterm Infants in the NICU

Mya Thomas

The purpose of this research was to examine the effects of music therapy with parents of premature infants in the neonatal intensive care unit (NICU). Many studies and meta-analyses have been conducted on how music therapy affects premature infants, but it was hypothesized that music therapy could have a significant impact on parents of NICU infants as well. Upon reviewing existing literature on this topic, it was found that music therapy helps parents cope with the emotional trauma of having a child in the NICU, decreases stress and anxiety, increases parent-child bonding, and increases the quality and quantity of parent-neonate interactions (which tangibly benefits the infant's health as well). These findings support the use of music therapy in the NICU to help meet the needs of parents of NICU infants in addition to, and separate from, the needs of the infants themselves.

The Effects of Music Therapy on the Deaf Community

Nikki Schreiner

My presentation will be about individuals who are Deaf are just as able to play music than individuals who are hearing. Music is just as beneficial to them as to us. I will have information on what music therapy is, the Deaf community, and how music therapy can be used with this population.

The Effects of Music Therapy on Depression in the Elderly

Serenity Bloom

Music therapy is a field that is able to benefit a wide variety of people. One of the populations that music therapists treat is the elderly population. It should be no surprise that depression among the elderly is exceptionally high. Elderly people commonly reside in nursing homes where they do not interact with many people. They also may exhibit some sort of hearing and/or visual impairments that make communication difficult. Music therapy can be used in these settings not only to decrease feelings of isolation, but to also increase positive reminiscence and motor skills, among others!

Natural Sciences

† Optimization of a Viability Rescue Assay in Human Oral Keratinocytes

Abigail Conrad

Zoledronate (ZOL) is used to treat bone resorptive diseases such as osteoporosis and cancer metastases to bone. ZOL is associated with medication-related osteonecrosis of the jaw (MRONJ), a condition known to cause bone destruction and maxillofacial region lesions. Geranylgeraniol (GGOH) is a potential rescue agent that provides an alternate route in the mevalonate pathway when the pathway is inhibited by ZOL. This study measured the viability of normal human oral keratinocytes (NHOKs) when exposed to ZOL and when GGOH was added under varying conditions to rescue the ZOL-induced viability loss. Viability was measured by an MTT assay in which viable cells convert water-soluble (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) into an insoluble, formazan product. Quantitation was performed by measuring absorbance of the product at 570 nm (630 nm reference) after 72 hours of treatment incubation. NHOKs grown on uncoated 96-well plates showed significantly higher corrected absorbance values ($p < 0.035$) than NHOKs grown on poly-L-lysine-coated plates; consequently, successive experiments were performed on uncoated plates. We tested rescue of NHOKs when 10 microM GGOH was added

† Denotes a project also included on the oral presentation schedule

15 minutes prior to ZOL, 24 hours prior to ZOL, or simultaneously with ZOL. In the 15 minute-prior variation, 25 and 50 microM ZOL significantly decreased viability but GGOH did not rescue. The 24 hour-prior and the simultaneous addition variations displayed significant ZOL-induced viability loss at 10, 25, and 50 microM. Only when ZOL and GGOH were added simultaneously did significant rescue occur. These results inform successive NHOK experimentation on the relative efficacy of rescue agents to rescue from ZOL-induced viability loss. This work was partially funded by an Indiana Academy of Science senior research grant.

RETINAL MÜLLER GLIA ACTIVATED BY ATP CAUSE AN EXTRACELLULAR ACIDIFICATION MEDIATED BY INTRACELLULAR ACIDIFICATION, CALMODULIN AND PROTEIN KINASE C

Adam Schantz

Numerous studies have shown pH regulation in the outer retina is a potent regulator of synaptic transmission. These pH dynamics have been postulated to underpin important physiological events like feedback inhibition. Previously, we have extended this regulation to include retinal glia acidifying the extracellular space when activated by ATP. We have shown extracellular ATP applied to Müller cells activates P2Y receptors leading directly to an IP₃ mediated Ca²⁺ rise that results in a Na⁺/H⁺ exchange-dependent extracellular acidification. Here we measure intracellular pH detecting fluorescence emitted from BCECF, a pH sensitive dye, loaded in Müller cells isolated from salamander retina. These measurements demonstrated that exogenous application of ATP increases intracellular H⁺. Additionally, we show the extracellular acidification around Müller glia is mediated through calmodulin and protein kinase c pathways. H⁺ flux was measured from isolated salamander Müller cells using H⁺ sensitive self-referencing microelectrodes. Self-referencing recordings report that bath application of ATP resulted in a large extracellular acidification that was attenuated by the calmodulin antagonists, W-7, chlorpromazine, trifluoperazine. The protein kinase c antagonist, chelerythrine, also dramatically decreased the ATP-induced extracellular acidification. When used in combination the calmodulin and PKC antagonists completely abolished the ATP-induced acidification. Collectively, this work sheds additional light on non-neuronal signaling pathway through which ATP shapes extracellular pH. We hypothesize this regulation by retinal Müller cells is important in shaping visual signaling, and characterization of this glial regulatory pathway lays a foundation for understanding how glia may impact neuronal signaling throughout the nervous system.

Endocytosis Inhibition as a Rescue Strategy for Zoledronate-Induced Cell Death

Alex Cartwright

Medication-related osteonecrosis of the jaw (MRONJ) arises most often in cancer or osteoporosis patients. The disease causes the jawbone and surrounding tissue to necrose, leaving painful intraoral fistulae and complications. Nitrogen-containing bisphosphonates (NBPs) are the most prominent risk factor for MRONJ. Zoledronate (ZOL) is one of the most potent NBP's available and was therefore chosen for this study. Blocking ZOL's entry specifically into cells of the oral cavity would make treatment easier for these same patients by removing the possibility of developing MRONJ from systemic NBP administration. This study investigates endocytosis as a possible cell uptake mechanism for ZOL by inhibiting different types of endocytosis and further determining if any of the inhibition rescues from ZOL-induced viability loss. This study used an endocytosis inhibitor panel that included Chlorpromazine, Methyl β -Cyclodextrin, Wortmannin, and Dynasore, each of which inhibits a different sub-category of endocytosis. Normal human oral keratinocyte (NHOK), human gingival fibroblast (HGF), and Michigan Cancer Foundation - 7 (MCF-7, human breast cancer) cell lines were tested for responses. The 50 mM ZOL treatments significantly decreased viability compared to the vehicle control in each of the three cell types. In the NHOKs, Wortmannin and Dynasore both significantly rescued from ZOL-induced viability loss with P values less than 0.05 and 0.01, respectively. In contrast HGFs were not rescued by any of the inhibitors, regardless of the time of inhibitor pre-incubation (15, 30, or 60 minutes) prior to ZOL treatment. The MCF-7 did not show any signs of rescue at a 15-minute pre-treatment with the specified doses.

Müller (Glial) Cell Mechanisms Changing Extracellular pH

Alexis Hoover

Our research team examines how extracellular conditions shape glial cell regulation of neuron communication. In order to do this, the retina of a tiger salamander was isolated, and then cells were enzymatically isolated. One of these retinal cells are glial cells, more specifically Müller cells. Once Müller cells were isolated, H⁺ selective microelectrodes were used in a self-referencing system. Changes in the extracellular pH (concentration of H⁺ ions)

[†] Denotes a project also included on the oral presentation schedule

were observed when different concentrations of ATP were applied. After ATP-induced changes were observed, the cell was returned to its original solution to see if any recovery would take place. The aim of these studies are to better understand how the regulation of extracellular pH by Müller glial cells shapes visual processing. Previously we have shown Müller glia to be potent regulators of extracellular pH. The present studies shown that exogenous ATP induces a large, concentration-dependent extracellular acidification around isolated glia. We can conclude that glia shape pH and propose these pH dynamics shapes processing of visual signals. In the future, we plan to research if there is an inhibitor that can lessen, or fully block, the effects a high ATP (H⁺) concentration on a Müller glial cell.

Impact of Intermittent Fasting on the Human Body

Ally Wimmer

The trend of intermittent fasting is gaining rapid popularity as a strategy for weight loss and other health benefits. In summarizing research, it can be determined that intermittent fasting is a feasible and ideal method for losing weight. Intermittent fasting consists of periods of refraining from food and drink. The amount of time of fasting and feasting is determined by ratio. The most popular ratio is 16 hours fasting with 8 hours eating. The 5:2 method is a type of intermittent fasting in which 5 days of the week are spent eating normally, while 2 days are spent restricting calories. Alternate day fasting consists of eating normally every day and fasting on the opposite days. The research consists of 27 trials of various intermittent fasting methods (n=944 participants). It was concluded by all research that in every trial, intermittent fasting resulted in weight loss ranging from 0.8% to 13.0% of baseline body weight.

Role of Calmodulin and PKC in ATP-Induced Acidification of Muller Cells

Alyssa Powell

In recent years, an increasing number of studies have analyzed the relationship between glial cells and synaptic transmission in different parts of the central nervous system. Within visual signaling of the retina, an extension of the central nervous system, extracellular H⁺ dynamics are known to be potent inhibitors of the release of neurotransmitters. This study further characterizes the pathway through which glial cells, when stimulated by ATP, release protons into their extracellular environment. This study specifically implicates two second messengers in this ATP initiated cascade, calmodulin (CaM) and protein kinase C (PKC). CaM and PKC antagonists were added to tiger salamander retinal Müller cells and the extracellular acidifications were recorded using self-referencing. Results showed that CaM and PKC both decreased the effect of ATP, and when used together they even more potently blocked the ATP effect. Collectively, the findings reported lend further support to a cell signaling pathway through which ATP initiates a potent acidification of the extracellular space and suggests glial cells may play an important role in gain control of neuronal signaling in the retina.

Gut-Brain Axis and Microbiome: Effects on Mental Health

Audrey McCollum

Tremendous efforts are being made trying to distinguish the bidirectional activity of the gut-brain axis, along with gut microbiota impact on emotional behavior and stress related systems of the body. This review was put together via library research, in order to summarize some of the current studies being performed regarding the connection between the gut microbiome and the nervous system, and how this microbial ecosystem may affect mental health issues such as depression and anxiety. Though this a relatively new area of research, it may help pave the way for future research of brain and body interactions and the approach of mental health concerns.

Effects of Anti-VEGF Drug on Age-Related Macular Degeneration

Austin Trump

This study focuses on macular degeneration. Macular degeneration is one of the leading causes of vision loss of people 50 years and older. The macula is located in the back of the eye on the retina which functions to focus light and send signals to the brain to translate the images that we see. When the macula is damaged, vision is blurred, colors are faded, and central vision is nearly lost. In recent studies, it is found that certain anti-VEGF drugs are able to treat the degeneration. Different drugs like Avastin and Lucentis are commonly studied and the effects on age-

[†] Denotes a project also included on the oral presentation schedule

related macular degeneration are becoming clear. There are also two carotenoids in the diet that the human retina can accumulate: zeaxanthin and lutein. These carotenoids were studied along with Anti-VEGF drugs in order to figure out the best care option for age-related macular degeneration.

Sulfur-Cycling Bacteria Lake Fryxell Dry Valley's Antarctica

Bailey Watkins

Lake Fryxell, Antarctica is an excellent and promising habitat for finding potentially novel, cold-adapted, sulfur-cycling prokaryotes and learning how they contribute to the global sulfur cycle. Sulfur-oxidizing and sulfate-reducing bacterial strains have been isolated and described from samples collected from Lake Fryxell. Investigations into morphology and other characteristics were carried out on the multiple strains isolated from the lake. Phylogenetic (16S ribosomal ribonucleic acid) studies were also conducted to determine the closest relatives of these strains, revealing that the sulfur-oxidizing bacteria were of the genus *Thiobacillus*, and the sulfate-reducing bacteria were a novel species of *Desulfovibrio*. Although the study of these isolates has significantly broadened our knowledge of sulfur-cycling bacteria from polar ecosystems, there is still much to be learned regarding the biodiversity of these microbes and their contribution to global sulfur cycling. Molecular analyses have shown that a diversity of sulfate-reducing bacteria exists in Lake Fryxell, and we are currently working with water column samples to isolate new strains and expand upon the cultured diversity of cold-adapted sulfur-cycling bacteria.

A Year in the Life of an Eastern Bluebird

Caleb Scott

A Year in the Life of an Eastern Bluebird. This study was focused on detecting the behavioral patterns of Eastern Bluebirds through the observation of thirty-five different Bluebird boxes. The study took place in central Indiana, and observations of the Bluebird boxes were noted at different times throughout the year. The ultimate goal was not only to take note of behavioral patterns in Bluebirds, but to also place an emphasis on the activity of other organisms within the same ecosystem that may compete with the Eastern Bluebird. Much research has already been conducted on the behavioral and migration patterns of Bluebirds. The types of nests built by these birds, the types of competitors they face for habitat and food, and how long Bluebirds tend to occupy one nest are all topics of past research. Based on information collected throughout this study, it was found that Bluebird eggs were present in the nests in May, June, and July. It was observed that when Bluebirds were not present, organisms such as Chickadees, spiders, and wasps occupied the boxes. Eastern Bluebirds are extraordinary creatures that deserve our efforts of preservation, and we can play an important role in their future success or demise. Further understanding the behavioral patterns of Eastern Bluebirds, along with gathering more information about the environment they live in could play an essential role in ensuring that Eastern Bluebirds can thrive here in Indiana.

How Sleep Affects Students Holistically

Dacota Shockley

My presentation covers select topics as to why a lack of sleep can affect students holistically. A lack of sleep is a negative contributor to mental health, academic performance and motivation, focus, social interactions, cortisol levels, etc. A lack of sleep is also typically causes a higher consumption rate of caffeinated supplements, alcohol, and drugs. My research includes tables for the negative side effects of sleep deprivation, causes for sleep deprivation, and my own research, which includes graphs of what some college students believe is/are contributor(s) to their own sleep performance and how those contributors affect their health holistically and academics. Students are struggling in school and need to understand the risks that come with a lack of sleep.

Causes of Type I Diabetes Mellitus

Daniel Butler

Type 1 Diabetes (T1D) is an autoimmune disease that has become more prevalent globally and in the US. It is mediated by the destruction of beta-pancreatic cells by T cells of the patient's immune system. Unfortunately, it has been increasingly difficult to find a sole cause. This is partly due to monozygotic twins not having a 100% sharing rate in developing T1D. This points to multiple contributing factors in the pathogenesis. Knowledge of HLA, PTPN2, ILR2A and multiple other gene loci have correlations with T1D points to how the genes are regulated. This study investigates the contributing factors of the epigenetics correlating with T1D. In combination with these gene loci,

[†] Denotes a project also included on the oral presentation schedule

exposure to drugs during certain periods of time also affect the susceptibility to T1D. Neomycin-treated offspring of non-obese diabetic (NOD) mice decreased susceptibility with similar HLA regions, while vancomycin increases the rate of diabetogenesis. This study investigates the various ways these dispositions interact.

Inhibitory Effects of Moringa Seed and Leaf Extracts on Gram-positive bacteria
Emma Brown

Native to India, Moringa is hailed as the "Miracle Tree" for its impressive resume of nutritional, hygienic, and medicinal uses. Nutritionally, Moringa leaf powder contains significant levels of proteins, iron, calcium, potassium, β -carotene, vitamin C, vitamin E, and dietary fiber and other complex carbohydrates. It has been used in many feeding programs where malnutrition is a problem. Moringa seed powder has also been used as a coagulant in water purification. With an impressive growth rate of 3-5 meters in one season, this plant has proven beneficial in developing areas around the world. Recently, promises as an antibacterial agent have been discovered using an extract of the seeds and leaves produced by *Moringa oleifera* and *Moringa stenopetala*. Our studies would like to provide proof of an effect against common Gram-positive bacterial strains using the Kirby-Bauer disk diffusion assay technique. This discovery would further advance the knowledge of the beneficial uses of Moringa in daily, practical use. Its prospect as an aid to developing countries increases the significance in the field of science and herbal medicine.

Rescue of Human Oral Keratinocytes and Gingival Fibroblasts from Zoledronate-Induced Viability Loss: Inroads to Lessening a Bone-Cancer Drug Side Effect

Evan Brown

Medication-related osteonecrosis of the jaw (MRONJ) is a serious intraoral side effect of bisphosphonate, antiangiogenic, and denosumab treatments. Individuals affected with MRONJ are unable to heal from dental procedures, leading to painful oral lesions that involve exposed bone and unhealed soft tissue. This adverse reaction is often examined in osteoporotic patients treated with bisphosphonates such as zoledronate (ZOL). ZOL is used to treat bone-resorptive disorders like postmenopausal osteoporosis, Paget's disease, multiple myeloma, and cancers that have metastasized to bone. GGOH (geranylgeraniol) provides a bypass for the inhibited metabolic pathway blocked by ZOL, thereby serving as an intermediate or alternative route for biomolecules to continue through the mevalonate pathway. Recent studies indicate that GGOH acts as a rescue agent in its ability to protect in vitro oral mucosa tissue from the death effects of ZOL and restore cell viability. However, several studies indicate that GGOH possesses tumorigenic properties. Phosphonoformic acid (PFA), a therapeutic agent currently used to lessen the effects of various viral infections in humans, is thought to inhibit transporters that allow entry of ZOL into cells and hence is a theoretical candidate to serve as a rescue agent like GGOH. The purpose of this study was to determine whether PFA rescues oral soft tissue cells from ZOL-induced viability loss and to compare that ability to the rescue effects of GGOH. In this study, normal human oral keratinocytes (NHOKs) and human gingival fibroblasts (HGFs) were treated with either 50 μ M ZOL, 50 μ M ZOL plus GGOH, or 50 μ M ZOL plus PFA. The preliminary results indicate that at the dosages tested, GGOH significantly rescues but PFA does not at 48 hours of treatment. However, at 72 hours of treatment both GGOH and PFA significantly rescue from ZOL-induced cell viability loss. Collectively the data suggests that PFA, not known to have tumorigenic properties, may be an advantageous alternative to GGOH with the hope that an eventual local, oral topical application could protect from systemic ZOL administration. This work was partially funded by an Indiana Academy of Science Senior Research grant and a University Scholar Award from Indiana Wesleyan University.

The Causes of Periodontal Disease and the Connection to Systemic Diseases

Isaac Maguire

Periodontal disease is highly prevalent in our world today. Researchers in every field of medicine have discovered a connection between oral health and the health of the rest of the body. The importance of oral health has thus been elevated due to the risk of developing other systemic diseases such as cardiovascular disease, osteoporosis, Type III diabetes, and failed pregnancies. This connection has lead researchers towards improving the study on periodontal diseases, their risk factors, and treatments so these other systemic diseases do not develop. If the prevalence of periodontal diseases can be achieved through educating patients on the risk factors, which will lead to lowering the number of systemic diseases and their adverse effects on the health-care system.

[†] Denotes a project also included on the oral presentation schedule

Covid 19 - What is Known and how the Future Will be Impacted Because of the Pandemic

James Parker Johnson

Corona Virus 19 has been impactful beyond the health of the afflicted; it has had a significant social and psychological impact as well.

Cultivation and Characterization of Snowbound Microorganisms from the South Pole

Janessa George

Antarctica is commonly known for its freezing temperatures and few organismal species. Previous research inquired about the microbial life on the coastal regions, only to isolate one bacteria of the *Pseudomonas* genera. In contrast, various analyses conducted via metagenomics suggests that the polar snows of the central regions contain great bacterial diversity, however; as of now there are few attempts to isolate from these samples. In this investigation, three microorganisms were isolated and identified as a strain of yeast and two distinct bacteria strains. The bacteria genera were identified as *Methylobacterium* and *Sphingomonas*, and the yeast was identified with the *Naganishia* species. Among the determination of phylogeny, various investigations were conducted for each organism's characteristics as follows: morphology, growth during various temperatures, salinities, and energy sources. Overall, the yeast strain maintained a significant halotolerance, and all were considered cryotolerant.

Teaching Evolution to Students with a Christian Background

Jason Walther

This study explored how teachers' religious views effected their view on evolution and how they teach it in their classroom. It also looks at how their students' religious views affected their receptiveness to the material on evolution. Several different sources discussed how older individuals tend to lean toward anti-evolution, whether it be in the form of introduced legislation or complete avoidance of the subject matter. On the other hand, the younger generation seemed to react in a way that defied their religious backgrounds.

Otoconia and Similar Structures – The Secret to Balance

Jeremiah Teesdale

Otoconia, Otoliths, Statoliths and Statocytes are the structures in creatures that detect motion. Crystalline in nature and usually formed of calcium carbonate, they are embedded in the utricle and saccule of the human ear and serve to detect changes in balance. In experiments, evidence was found suggesting that this function is not instinctive, but rather learned, as jellyfish born in space were unable to orient themselves once returned to earth. Additionally, the prevalence of these structures in almost all multicellular life suggests critical importance of motion detection to higher life.

† Geranylgeraniol, Not Phosphonoformic Acid, Partially Rescues Human Gingival Fibroblasts From Zoledronate-Induced Death

Jessica Binkley

The drug zoledronate (ZOL) is used for treatment of bone resorptive diseases including cancer metastasis to bone. ZOL is linked to medication-related osteonecrosis of the jaw (MRONJ), which is known to cause hard and soft tissue lesions in the maxillofacial region. Potential rescue agents for managing ZOL-associated side effects include geranylgeraniol (GGOH), sodium citrate, and phosphonoformic acid (PFA). GGOH is a known mevalonate pathway intermediate that circumvents ZOL-induced inhibition of this pathway. In osteoclasts and macrophages, bisphosphonate uptake is enhanced by calcium ions. Use of citrate, the major calcium chelator in saliva, could potentially limit ZOL uptake. PFA, a topical anti-viral, is thought to inhibit the SLC20/34 families of sodium-dependent phosphate transporters, thereby preventing bisphosphonate entry. This study measured human gingival fibroblast (HGF) viability in the presence of ZOL and varying amounts of either GGOH, citrate, or PFA in order to evaluate relative rescue from ZOL-induced viability loss. Viability was measured by an MTT assay. Viability dose-response curves for each compound were determined at 48 and 72 hours of treatment in order to optimize the doses tested for rescue. 50 mM ZOL-induced viability loss was partially but significantly rescued by both 10 and 30 mM GGOH but not by the optimized doses of PFA (0.5 mM) nor citrate (2 or 3 mM). To investigate the failure of PFA to rescue, we analyzed gene expression of the SLC20 transporter family genes in HGFs via quantitative real

† Denotes a project also included on the oral presentation schedule

time RT-PCR. The SLC20A1 gene was moderately expressed, albeit significantly less than the positive control. The SLC20A2 gene was minimally expressed. The data suggests that alternative mechanisms of ZOL entry into HGFs must exist. This work was partially funded by a Senior Research grant from the Indiana Academy of Science and a University Scholar Award from Indiana Wesleyan University.

Complete Genome Sequence of the Thermophilic Purple Sulfur Bacterium *Thermochromatium tepidum* Contrasted with that of the Mesophilic *Allochromatium vinosum*

Mackenzie Hayward

The complete genome sequence of the thermophilic purple sulfur bacterium *Thermochromatium* (Tch.) *tepidum* strain MCT (DSM 3771T) is described and contrasted with that of its mesophilic relative *Allochromatium* (Alc.) *vinosum* strain D (DSM 180T). The Tch. *tepidum* genome is a single circular chromosome of 2,958,290 base pairs with no plasmids and is substantially smaller than the genome of Alc. *vinosum*. The genome of Tch. *tepidum* encodes two forms of RuBisCO and contains *nifHDK* and several other genes encoding a molybdenum nitrogenase but lacks a gene encoding a protein that assembles the Fe-S cluster required to form a functional nitrogenase molybdenum-iron cofactor, leaving the organism phenotypically Nif⁻. The Tch. *tepidum* genome contains the necessary genes necessary for oxidizing sulfide to sulfate as photosynthetic electron donor but is genetically unequipped to either oxidize thiosulfate as an electron donor or carry out assimilative sulfate reduction, both of which are physiological hallmarks of Alc. *vinosum*. Also, unlike Alc. *vinosum*, Tch. *tepidum* is obligately phototrophic and unable to grow chemotrophically in darkness by respiration. Several genes present in the Alc. *vinosum* genome but absent from the genome of Tch. *tepidum* likely contribute to the major physiological differences observed between these two related rod-shaped purple sulfur bacteria that inhabit distinct ecological niches.

† Dynasore, A Dynamin Inhibitor, Prevents Zoledronate-Induced Human Gingival Fibroblast Death

Makayla Standfest

Medication-related osteonecrosis of the jaw (MRONJ) is a condition known to cause bone destruction and lesions of the maxillofacial region. Associated with the onset of MRONJ, zoledronate (ZOL) is a drug used for treatment of bone resorptive diseases such as osteoporosis and cancer metastasis to bone. ZOL inhibits the mevalonate pathway, and geranylgeraniol (GGOH) is a known pathway intermediate shown to partially rescue human gingival fibroblasts (HGFs) in vitro. However, there is evidence that GGOH may be tumorigenic and hence alternatives are needed. Phosphonoformic acid (PFA) is a potential alternative that theoretically could inhibit ZOL uptake via inhibition of soluble carrier (SLC) sodium-dependent phosphate transporters. Another compound of interest theoretically is a dynamin inhibitor, Dynasore, that could limit endocytosis and ZOL uptake. This study used quantitative real time RT-PCR to first measure the expression of SLC transporter genes in HGFs and found that the SLC34 family is not significantly expressed, explaining earlier work in the laboratory that revealed failure of PFA to rescue HGFs from ZOL-induced viability loss. Next, we investigated the ability of Dynasore to prevent ZOL-induced death as well as the effect of GGOH and Dynasore in combination over 72 hours of treatment. Initially, dose-response curves were determined for each of ZOL, GGOH, and Dynasore to define the optimal doses for testing. Pre-treatment with either 10 or 30 mM Dynasore 15 minutes prior to ZOL addition completely prevented 50 mM ZOL-induced viability loss in HGFs. Combination doses of GGOH and Dynasore provided no additional benefit. The data suggests that Dynasore merits further study for use as an oral topical agent in the prevention of MRONJ. This work was partially funded by a Senior Research grant from the Indiana Academy of Science and a University Scholar Award from Indiana Wesleyan University.

† Measuring the Effect of Normal Modes on Vibrational Polariton Formation

Mark Rettstatt and Leah Stallkamp

A Fabry-Pérot cavity is an apparatus capable of forming a micrometer-sized cavity between two reflective mirrors. IR light, when passed through the space, reflects as it hits the mirrors, temporarily trapping it within the confines of the cavity. Only integer values of the wavelength of light passed through the cavity are allowed to pass through to the other side. These integer values are known as the cavity modes. Molecular modes, likewise, are the vibrations observed during a typical IR experiment. The optical mode of the cavity can be overlaid with the vibrational mode of the molecule resulting in the formation of hybrid light-matter states, known as a polaritons. These states, called the upper and lower polaritons, are spaced above and below the original molecular modes at

† Denotes a project also included on the oral presentation schedule

equal distances that are proportional to the square root of the concentration.

The formation of polaritons and the fundamental physics is well known. By changing the length of the cavity by adjusting the angle of incidence or moving the mirrors, the cavity mode can be tuned to fit theoretically any desired molecular mode, including polaritonic states. Our research attempted to determine the effect of normal vibrational modes on polariton formation, determining that there is a qualitative difference between weakly and strongly coupled oscillators.

The Impact of the Nef-Hck interaction on the Pathology of HIV

Mark Ziegler

Nef is an accessory protein that is produced by both human (HIV-1 and HIV-2) and simian immunodeficiency viruses. It is essential to viral pathogenicity because it facilitates virus replication, infectivity, and immune evasion. On its own, Nef does not have any known intrinsic enzyme functions. Instead, Nef is able to interact with many different host cell signaling pathways. One of the most important molecules that Nef interacts with is Hck, an Src-family member. Hck is responsible for regulating various immune receptor signals, phagocytosis, and the release of cytokines during the immune response. Hck has two important protein domains, called the SH3 and SH2 domains. They also have an SH2-kinase linker that the SH3 domain will bind to when Hck is downregulated/inactivated. The removal of this binding reactivates Hck. Nef has PxxPxR motif that has an extremely high affinity for the Hck SH3 domain, which is able to displace the SH2-kinase linker and activate Hck. This interaction between Nef and Hck is believed to cause many of the affects that lead to the increased pathogenicity previously discussed. However, it is unclear how exactly this occurs. This presentation will focus on highlighting what is currently known about the Nef-Hck interaction and some of the known affects that this interaction has on HIV.

Investigation of VPAC2R-Deficiency as it May Affect Glucose-Stimulated Insulin Secretion And Size or Cell Number of Isolated Murine Islets

Mary Anderson

The peptides Vasoactive Intestinal Polypeptide (VIP) and Pituitary Adenylate Cyclase Activating Peptide (PACAP) are expressed in pancreatic islet cells. These neuropeptides bind to Vasoactive Intestinal Peptide Receptor types 1 and 2 (VAPC1R and VPAC2R), which are G-protein-coupled receptors. The neuropeptides additionally have the ability to bind to a third receptor, PAC1. All three of these receptors are expressed in pancreatic Islets of Langerhans (islets). The role of VIP and PACAP in the pancreas is the stimulation of glucagon secretion and augmented insulin secretion in response to the presence of glucose. To study the role of VPAC2R specifically, a colony of VPAC2R-deficient mice (MUT) was generated. Our investigation into the functional differences between the islets isolated from wild-type (WT) mice and those isolated from VPAC2R-deficient mice focuses on three components: glucose-stimulated insulin secretion; islet size (diameter), and islet cell count. The effect of the absence of a functional VPAC2R on glucose-stimulated insulin secretion was investigated by isolating the islets from both WT and MUT mice, then analyzing insulin release through glucose-stimulated insulin secretion (GSIS) assays. The resulting insulin secreted from GSIS assays was then quantified by enzyme-linked immunosorbent assays (ELISA). Differences in the size of islets was also investigated. WT islets appeared physically larger than MUT islets. This difference was investigated through application of Image J software to analyze phase-contrast photomicrographs of islets. This size difference also compelled investigation into the number of cells per islet. A method based on flow cytometry was employed to enumerate islet nuclei in groups of 160 lysed islets of MUT and WT mice. Islet diameter and mean cell number per islet were determined through these methods. Differences in insulin secretion can be seen in the 18 hour fall study group mice when stimulated with 17mMol glucose solution with MUT mice producing a much greater amount of insulin than their WT counterparts. The 24 hour study group only yielded enough islets to test the WT mice, further comparison with MUT mice of similar ages but not of littermate pairs may provide further insight. While the 18 hour study group shows similar mean islet diameter between the WT and MUT mice, the 24 hour study group indicates MUT mice to have a greater diameter on average than WT by about 100 pixels. Results for cells per islet were only available for MUT mice of the 18 hour study group and the WT mice of the 24 hour study group. Comparatively, the MUT mice had more cells per islet on average than the WT mice.

Dose Response Curves and Comparative Rescue for the MTT Viability Assays

Michael Zitney

† Denotes a project also included on the oral presentation schedule

Lab testing for the current "Sweet Spot" of Dose Response based on MTT Viability Assays that will lead to the treatment of patients with BRONJ.

Investigating the Role of VPAC2R in Hepatic Liver Metabolism

Mitchell Grecu

Vasoactive Intestinal Peptide Receptor Types 1&2 (VPAC1R and VPAC2R) are two G protein-coupled receptors that share the same two ligands, vasoactive intestinal polypeptide (VIP) and pituitary adenylate cyclase activating peptide (PACAP). To study the function of the VPAC2R, VPAC2R-deficient mice were created. Previous studies of these VPAC2R-deficient mice (mutant mice, or MUT) have revealed that these mice have a different circadian rhythm compared to the wild type (WT) mouse which includes an advance in the time in which they feed. Respiratory quotient analysis of these MUT mice show that they preferentially burn fat. Additionally, histological analysis of WT and MUT liver specimens shows a decrease in hepatic fat deposition in MUT mice, especially with increased age. In an attempt to understand the disturbance that VPAC2R deficiency imposes on lipid metabolic pathways systemically and specifically in the liver, fasting plasma samples were collected to determine circulating free fatty acid (FFA) levels, and select liver enzyme expression was investigated. Since peroxisome proliferator-activated receptor alpha (PPAR α) is an essential transcriptional regulator of fatty acid catabolism, and its dysfunction has been associated with disorders like nonalcoholic fatty liver disease (NAFLD), we initially analyzed expression of this protein. Plasma FFA concentrations were measured after 18- and 24-hour fasts. Significantly lower concentrations of FFAs were found in the MUT mice compared to the WT mice following the 18 hour fasts as well as when measurements from both 18- and 24-hour fasts were combined. Through protein expression analysis of liver specimens via western blotting, PPAR α concentrations were determined for littermate-pair WT and MUT mice. The data shows no difference in the expression levels of PPAR α , suggesting that VPAC2R affects hepatic lipid metabolism through a different pathway.

[†] Restoration of the Chesapeake Bay

Preston Collyer

The Chesapeake Bay is the largest estuary in the United States flowing into six different states along the east coast and the second-largest in the world. This dynamic body of water has faced many challenges since colonization. Pollution from both urban and rural areas along with overharvesting of the Eastern Oyster, a keystone species in the bay, has caused the water quality of the bay to drastically decline. Many efforts have been made to restore the Chesapeake Bay, but they have led to little success. My research focused on the implications of poor water quality and its effects on public health. Additionally, I offer what I believe the most efficient options on how to begin restoring the Chesapeake Bay to its original beauty. These methods include resorting to the oyster population through oyster farms and halting oyster harvesting from the bay, only allowing harvesting from manmade oyster reefs intended for consumption. It is just as important to more properly measure and limit the amount of nitrogen and phosphorous used in fertilizer. Although it is essential for agriculture, it causes over 80% of all of the pollution in the bay, and limiting the amount used would directly aid in restoration.

Effective High School Science Textbooks and Best Practice for Use

Rachel Glover

Textbooks have long been a staple of the educational system of America, especially in the natural sciences. Nearly every student is carrying a textbook to class, although in this day and age textbooks come in a variety of formats—print, digital, print and digital with interactive capabilities, and even more. With so many options available to educators and school administrators, one question lingers: What Makes an Effective Biology Textbook? This study was designed to answer this question, or at least provide direction for further studies. The methods used to complete this study were secondary data analysis and archival study. Through detailed analysis of prior studies and research it was determined that biology textbooks featuring high quality graphics that are written at a level appropriate for the audience with real-world connections are the most impactful and effective for students. These findings can allow educators and school administrators to make more informed choices when selecting new biology textbooks to adopt for their students so that students are benefiting from utilizing a textbook.

[†] Denotes a project also included on the oral presentation schedule

Measuring ATP-Induced Extracellular Acidification around Müller Cells

Rachel Leininger and Hannah Miller

Recent studies in neurophysiology have led to an increased interest in the effect of glial cells on neuronal signaling, and cell signaling in the retina presents one opportunity to understand the influence of glial cells in signaling within the nervous system. Glial cells are a cell type abundantly found in the retina with Müller cells being the predominant form of glia. The scope of this study specifically was to determine the effects of ATP on glial cells and to understand the mechanism by which ATP evokes responses and shapes the extracellular space around Müller cells. Tiger salamander Müller cells were extracted and isolated so they could be examined through self-referencing, which is where the extracellular pH in response to ATP is measured using an electrode with a proton permeable ionophore. Observations revealed that there is an increase in extracellular acidification in response to ATP and that there is an ATP-dependent pathway within the Müller cell influencing synaptic transmission within the retina. Because previous conclusions have led to understanding portions of this ATP-dependent pathway, the following steps in this pursuit include filling in the remaining unknown parts of the pathway. Self-referencing techniques presented in this study will continue to be used in the uncovering of the rest of the pathway.

Rootstock Compatibilities and Grafting Success Rates for Cucumis Sativus

Sarah Harding

Grafting is a technique in which two different plants are fused together and grow as one functional unit. Grafting began in the 1920s and is now prominent commercially in Asia, Europe and the Middle East. This method is under study in the United States as a way to more efficiently produce higher quality produce. Grafting of cucurbits has been shown to increase hardiness in the forms of temperature, drought, disease and pH resistance. This allows for vegetables to be grown in a wider range of circumstances and for a longer growing season. Studies have also been conducted to investigate the impacts of grafting on fruit quality in 'Diva' cucumbers (*Cucumis sativus*) and it has been shown that traits such as firmness, ascorbic acid content, sweetness, and pH are impacted in grafted plants. Results vary on whether changes in fruit quality are advantageous or deleterious. Rootstock species has a great impact on graft success, yield, and quality. 'Diva' scion grafted onto 'Baby Bear' pumpkin (*Cucurbita pepo*) rootstock showed compatibility. The engineered rootstocks Carolina Strongback and Flexifort have been cultivated to facilitate cucurbit grafting and were used to increase grafting success rate as well.

Nursing

† Providing a Good Death: A Quantitative Study of How Hospice Care Education Can Relieve Death Anxiety and Improve Death Competence in BSN Students at IWU

Kendra Webster

This research was completed to evaluate the nursing curriculum's efficacy in preparing nurses to provide care for individuals with autism spectrum disorder (ASD). Research conducted by Massachusetts General Hospital has shown that medical professionals are not adequately trained to give adaptive care to individuals with ASD. The study assessed the nursing program in its preparation, with the participants being nursing students in their senior year. After taking a pretest, the participants completed education modules on autism spectrum disorder and the nursing considerations related to their care. After completing the educational modules, they took a posttest consisting of the same questions as the pretest. This evaluates whether an ASD-specific curriculum will prepare nursing students to care for patients with ASD. Nursing students performed better on the test, provided more knowledgeable answers, and demonstrated an improved understanding of autism spectrum disorder after completing the ASD-specific training modules. This research illustrates the lack of education in the nursing curriculum for caring for patients with ASD.

† Denotes a project also included on the oral presentation schedule

† Nursing Proficiency for Patients with Autism Spectrum Disorder: A Qualitative Study in Education

Presley Ratliff

This research was completed to evaluate the nursing curriculum's efficacy in preparing nurses to provide care for individuals with autism spectrum disorder (ASD). Research conducted by Massachusetts General Hospital has shown that medical professionals are not adequately trained to give adaptive care to individuals with ASD. The study assessed the nursing program in its preparation, with the participants being nursing students in their senior year. After taking a pretest, the participants completed education modules on autism spectrum disorder and the nursing considerations related to their care. After completing the educational modules, they took a posttest consisting of the same questions as the pretest. This evaluates whether an ASD-specific curriculum will prepare nursing students to care for patients with ASD. Nursing students performed better on the test, provided more knowledgeable answers, and demonstrated an improved understanding of autism spectrum disorder after completing the ASD-specific training modules. This research illustrates the lack of education in the nursing curriculum for caring for patients with ASD.

Teacher Education

WHO WE ARE AND HOW WE DO (NOT) FEEL: A PRESENTATION ON ADHD & EMOTIONAL DYSREGULATION

Alexandra Smith

What is ADHD? What is Emotional Dysregulation? How do they work together? This presentation will inform students and staff on the impact of ADHD and how those who have ADHD can also struggle with Emotional Dysregulation. This presentation will also give students resources to help them understand how to cope with emotional dysregulation, and how to help students who have ADHD or Emotional Dysregulation. Finally, the presentation will have a real life example from the presenter on their life with ADHD and Emotional Dysregulation, and how they can help people and students like her be successful in school or outside of school.

Sign Language and Travel

Nikki Schreiner

In my presentation, I will be talking about/have information about different words and phrases in sign language that those who are traveling to places like Zambia should know. There's will also be information about the Deaf culture here in America and in Zambia to allow for more knowledge of the cultures to be known. My overall goal for this project is to bring awareness to the Deaf community not just here in America, but in other English speaking countries and to provide tools for basic words and phrases to be known.

Deaf Inclusion at IWU

Addison Evans and Marayla Kirkman

This presentation is about ways IWU can be more inclusive to the Deaf community. This presentation analyzes: the disability focus, reason for inclusion of the Deaf community, area of influence, action steps, and our end goal.

Neurodiversity in Theatre

Bailey Hunt, Noah DeGeorge

My partner and I will be compiling a list of plays that include a neurodiverse cast of characters and support neurodiverse performers and presenting them (via video) to the IWU Theatre Guild. We will also be researching sensory-friendly staging conventions to present to the Guild as well.

† Denotes a project also included on the oral presentation schedule

ADHD in the Classroom

Betsy Marshall

My presentation is over ADHD in the classroom. I will be incorporating the psychology/brain functioning behind ADHD, classroom strategies for teachers (alternative seating; the use of fidgets; and what teachers can do to best accommodate for their students), and alternatives to medication in my presentation.

Fidget Items for Westview

Ellie Snider

The purpose behind this project is to bring fidget items to the children at Westview, to enhance the learning of those with ADHD present at this school. This poster presentation will summarize that, the need for it, and why I decided to take on this specific task.

Wheelchair accessibility in gym arenas

Havyn Gates

Kindness and inclusion

Katelyn Norman

This poster is for others to learn how to socialize with those with disabilities or special needs. It is an infographic and included information and tips for each disability.

Helping Everyone Learn

Katy Huber

When I was in grade school there was a lot of things that were unhelpful to those who had a learning disability. The pace in the classes is either fast or slow. Even the "smart" kids have a hard time keeping up and learning and keeping the knowledge that they would need for a test. If you don't get a topic you will not succeed. I created a template/ classroom setting that will help the students to get more practice and help them to succeed better.

ADHD Friendly Youth Group

Lexa Richardson Weston Kundo

We looked at Exit youth group and how the environment could potentially cause handicaps for students with ADHD. We researched how to reconstruct the youth group setting to make an ADHD friendly space. The original structure of the youth group could be enhanced through changing how they format the lesson, small groups, and game.

Appropriate accommodations for a collegiate-level ensemble

Luke Sellers

This poster will present information on research that was completed to make Wind Ensemble a better experience for ONE particular student on the Autism Spectrum

ADHD in Children's Literature

Morgan Strahm, Rachel Allen

Our presentation covers the need for children's literature over ADHD. In a classroom of 25-30 students, there will be at least 1 child with ADHD. There is stigma towards these children and involving it in literature can help break the stigma and bring more enlightenment. We wrote our own children's book as an example of this kind of literature as part of our presentation.

[†] Denotes a project also included on the oral presentation schedule

Advocating for ASL Interpreters

Quincy Bashore and Domanic Heater

For our advocacy project for Psychology for the Exceptional Learner (PSY-276) we choose to research and learn more about the community of individuals with hearing impairments. Our goal for this project was to raise awareness for the deaf community through social media and advocating for a sign language interpreter at the IWU chapel.

Hearing Impairment in the Classroom

Wilson Wirebaugh

This project is about strategies for teachers and professors to make their classroom accessible to those with hearing impairments. In a time of COVID-19, masks make it hard for students with hearing impairments to understand their instructor because they rely on lip reading, as well as struggling to understand under the muffling of a mask.

[†] Denotes a project also included on the oral presentation schedule