

GO-1

Title: John Carter's Cantata for Voice and Piano

Authors/Presenters: Sean Price

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College/School: College of Arts and Media

Mentor: Dr. Vicki Stroehrer

Sponsoring Institution: School of Music, Honors College

Research Sponsor:

Abstract

A performance of John Carter's Cantata for Voice and Piano.

Keywords: Spirituals

GO-2

Title: Schubert's Der Doppelgänger: A Narratological Analysis

Authors/Presenters: Sean Price

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College/School: College of Arts and Media

Mentor: Dr. Vicki Stroehrer

Sponsoring Institution: School of Music, Honors College

Research Sponsor:

Abstract

During the final months of his life, in 1828, Franz Schubert would compose Schwanengesang, what can be considered one of his most emotionally burdensome song cycles. Highlighting the deeply personal connection between Schubert's music and Heinrich Heine's poetry, this exploration seeks to shed light on how Schubert masterfully conveys themes of despair, existential turmoil, and eventual acceptance through narratological analysis. By examining the final movement, Der Doppelgänger, we can begin to unravel the layers of emotion and symbolism woven into Schubert's haunting musical testament, offering insights into the composer's psyche and a view of how he came to terms with his own emotionally fraught lifetime.

Keywords: Schubert, narratological, poetry, emotion, music

GO-3

Title: The Guitar Music of Villa-Lobos, Brouwer, and Barrios

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Sponsoring Institution: School of Music, College of Arts and Media

Research Sponsor:

Abstract

A performance of Prelude no. 2 by Heitor Villa-Lobos, "El Arpa del Guerrero" from El Decameron Negro by Leo Brouwer, and Una Limosna por el Amor de Dios, by Agustin Barrios.

Keywords: Guitar, Performance, Villa-Lobos, Brouwer, Barrios

GO-4

Title: Exploring Teledentistry Implementation Challenges And Overcoming Accessibility Barriers For Underserved Communities.

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Research Sponsor: N/A

Abstract

This literature review investigates the accessibility and implementation of teledentistry for underserved populations, with a focus on rural areas. Drawing upon articles sourced from the Marshall University database using Summon's advanced search feature, the study synthesizes findings across key dimensions relevant to teledentistry adoption. The review begins by tracing the historical evolution of teledentistry, highlighting its emergence as a promising avenue for improving dental care access among underserved demographics. It examines the diverse methodologies employed in teledentistry initiatives, discussing the frameworks and strategies utilized to overcome barriers in dental healthcare delivery. Technical challenges encountered in teledentistry implementations, encompassing infrastructure limitations, connectivity issues, and interoperability constraints, are comprehensively explored. Furthermore, the review delves into the complexities surrounding reimbursement policies and financial barriers impeding the widespread adoption of teledentistry services. Addressing concerns regarding data security and privacy in teledentistry platforms, the review underscores the imperative for robust safeguards against potential breaches and unauthorized access. Drawing insights from synthesized literature, the review outlines future directions and recommendations for advancing teledentistry accessibility and implementation. It emphasizes the necessity of continued research, policy advocacy, and collaborative endeavours to overcome existing barriers and optimize teledentistry's efficacy in addressing oral health disparities among underserved populations. In conclusion, this review contributes to understanding teledentistry's role in expanding dental care access for underserved communities, while reporting the multifaceted challenges and opportunities inherent in its implementation.

Keywords: Teledentistry, Accessibility, Implementation, Underserved people, Challenges.

GO-5

Title: ELL Students and Instruction

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Sponsoring Institution: Marshall University

Research Sponsor:

Abstract

In this study, I researched and discussed students that have English as their second language in classrooms across the United States. Provided within the Powerpoint presentation is information and statistics about the students, along with strategies and resources to help other professionals help these students be successful in the classroom. Students who are ELL bring a unique diversity to the classroom. They not only are learning from English speakers but can teach us about their culture and language as well. Through strategies and an open heart, all ELL can be successful in any classroom!

Keywords: English Language Learner Students and Strategies

GO-6

Title: Denmark / United States: Pre-Service Teacher Inspirations and Perspectives on Literacy Development in the Elementary Science Classroom.

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Sponsoring Institution: College of Education and Professional Development

Research Sponsor: NA

Abstract

This presentation is a work in progress. In the fall of 2023, Marshall University entered into a partnership with the Københavns Professions Højskole (KP) in Copenhagen, Denmark. Faculty and students in the College of Education and Professional Development at Marshall University and at the Københavns Professions Højskole are attempting to design and carry out educational projects to enhance learning opportunities to benefit pre-service teachers in training at both institutions.

This collaborative, pre-service teacher education project explored the educational perspectives of Danish and American university students regarding literacy practices observed in elementary science instruction. Marshall University students and their faculty mentors met with Danish pre-service teachers in training and their faculty mentors from the Københavns Professions Højskole in Copenhagen, Denmark to discuss the literacy practices they learned about in their science methods and literacy methods education classes. In addition, the students from both institutions discussed the literacy/science instructional practices they observed in their field placement residencies in elementary classrooms and shared their personal perspectives about the best literacy methods teachers use to support learning science content.

The pre-service teachers from the two institutions met via Zoom to discuss what they learned in classes at their teacher training institutions and their findings from their field placement experiences. In small groups, they shared ideas regarding the literacy practices teachers use to enhance learning science in the elementary classroom, the science content being presented in the elementary classrooms, and other factors that have an impact on science instruction for elementary students. The Danish and American students developed presentations to share with one another that addressed current issues elementary students explore in their classrooms and provided feedback to one another in small groups regarding literacy and science instruction for pre-service teachers in training at both institutions.

Undergraduate student representatives from both institutions will share live and recorded insights from their literacy/science project and perspectives and insights they gained through the small group cross-cultural discussions they had in the Zoom session.

Keywords: Pre-Service Teachers, Literacy Development, Elementary Science Instruction

GO-7

Title: Convolutional Neural Network Based In Situ Characterization of Extrusion Quality in 3D-Printed Porous Bone Scaffolds

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Sponsoring Institution: CECS-Department of Mechanical and Industrial Engineering

Research Sponsor: National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA)

Abstract

This research addresses the challenge of ensuring consistent extrusion quality in 3D printed porous bone scaffolds, a critical factor influencing their structural integrity and biomedical functionality. The overarching problem involves the lack of automated and reliable methods for real-time extrusion quality assessment during the manufacturing process. The long-term goal of this research is to establish a reliable and scalable quality control framework for 3D printed porous bone scaffolds. The primary objective of this work is to develop a Convolutional Neural Network (CNN) as an automated prediction tool, adept at learning complex visual patterns indicative of different extrusion qualities. By integrating the developed CNN model into the manufacturing workflow, real-time monitoring and classification of extrusion quality can be achieved. The significance of this research extends to the broader field of tissue engineering, where the quality of 3D printed scaffolds directly impacts their structural integrity and biological performance. The proposed model not only aids in identifying and rectifying manufacturing flaws promptly but also contributes to the overall reproducibility and reliability of 3D printed porous bone scaffolds for biomedical applications. The formation of a comprehensive dataset of 3D printed porous bone scaffolds involves instances of over extrusion, under extrusion, and normal extrusion. The dataset consists of bone scaffolds fabricated by means of Pneumatic Micro-Extrusion (PME) additive manufacturing process, and are composed of a synthesized, biocompatible composite material composed of hydroxyapatite (HA) and polysaccharide, an oxygen-generating material, and a ceramic component. The proposed CNN is designed to effectively learn distinctive visual features from high-definition images captured by an integrated camera within the bioprinter. The performance achieved through optimization of hyperparameters demonstrates the effectiveness of the CNN model in accurately predicting extrusion quality. The model proves to be robust across a range of extrusion scenarios, showcasing its potential as a practical and efficient solution for real-time quality control during scaffold fabrication. This research provides a significant advancement in addressing the extrusion quality challenge in 3D printing for tissue engineering applications. The proposed CNN model offers a reliable, non-destructive means of identifying and categorizing extrusion issues during manufacturing. In addition, the positive results obtained lay the foundation for the development of an automated quality control framework that can be seamlessly integrated into the 3D printing workflow, providing real-time feedback and aiding in the development of robust and reproducible 3D printed porous bone scaffolds for enhanced biomedical applications. This contributes to the long-term goal of establishing standardized and efficient manufacturing processes for producing high-quality, patient-specific porous bone scaffolds in the realm of regenerative medicine.

Keywords: Additive Manufacturing, Bone Tissue Engineering

GO-8

Title: Computational Modeling of Material Transport through Bone-Like Scaffolds with Complex Microstructures for Bone Regeneration

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Sponsoring Institution: Department of Mechanical and Industrial Engineering

Research Sponsor: National Science Foundation (NSF), National Aeronautics and Space Administration (NASA)

Abstract

The overarching goal of this study is to contribute to patient-specific, clinical treatment of bone pathology. The overall objective of the work is to establish computational fluid dynamics (CFD) models to identify: (i) the consequential mechanisms behind internal and external material transport through/over porous bone scaffolds and (ii) optimal triply periodic minimal surface (TPMS) scaffold designs toward cell-laden bone fracture treatment.

In this study, 10 internal-flow and 10 external-flow CFD models were established using ANSYS, correspondingly based on 10 single-unit TPMS bone scaffold designs, where the geometry of each design was parametrically created using Rhinoceros 3D software. The influence of several design parameters, such as surface representation iteration, merged toggle iso value, and wall thickness, on geometry accuracy as well as computational time, was investigated in order to obtain computationally efficient and accurate CFD models. The fluid properties (such as density and dynamic viscosity) as well as the boundary conditions (such as no-slip condition, inlet flow velocity, and pressure outlet) of the CFD models were set based on clinical/research values reported in the literature as well as according to the fundamentals of internal/external Newtonian flow modeling. Several fluid characteristics, including flow velocity, flow pressure, and wall shear stress, were analyzed to observe material transport internally through and externally over the TPMS scaffold designs.

Regarding the internal flow CFD modeling, it was observed that “P.W. Hybrid” (i.e., Design #7) had the highest-pressure output, with “Neovius” (i.e., Design #1) following second to it. These two designs have a relatively flatter surface area. In addition, “Schwarz P” (i.e., Design #2) was the lowest pressure output of all 10 TPMS designs. “Neovius” and “Schwarz P” had the highest and lowest values of wall shear stress, respectively. Besides, the velocity streamlines analysis showed an increase in velocity along the curved sections of the scaffolds’ geometry.

Regarding the external flow CFD modeling, it was observed that “Neovius” yielded the highest-pressure output within the inlet section, which contains the area of the highest-pressure location. Furthermore, “Diamond” (i.e., Design #8) displayed having the highest values of wall shear stress due to the results of fluid interaction that accrues with complex curved structures. Also, when we look at designs like “Schwarz G”, the depiction of turbulent motion can be seen along the internal curved sections of the structure. As the external velocity streamlines decrease within the inner channels of the designs, this will lead to an increased pressure buildup due to the intrinsic interactions between the fluid with the walls. Overall, the outcomes of this study pave the way for optimal design and fabrication of complex, bone-like tissues with desired material transport properties for cell-laden, scaffold-based treatment of bone fractures.

Keywords: Bone Tissue Engineering; Computational Modeling

GO-10

Title: “I Could Fail Better Than That”: Meaning, Authorship, and Instability in Tom Phillips’s A Humument

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Sponsoring Institution: College of Liberal Arts, English Department

Research Sponsor: N/A

Abstract

This paper explores how words and images come together to create meaning in Tom Phillips’s A Humument, a collage novel made of blackout poetry crafted from W. H. Mallock’s A Human Document. Not only is Phillips’s project noteworthy because he uses artwork instead of the traditional black ink to cover up words in his poetry, but he created a blackout poem for all 367 pages of A Human Document, refusing to alter anything about the form of the original work. In addition, Phillips emphasizes the instability of word meaning and order in A Humument by creating a nonlinear story completely different from the original work that he is pulling from. This choice challenges the meaning of authorship and the validity of interpretation. However, Phillips acknowledges the unique relationship he has with Mallock both in interviews and the poetry itself, looking at this relationship as more of a collaboration than a stealing of work or butchering of the original meaning. In addition, Phillips proved the fluidity of his own work by recreating all 367 pages after A Humument was first published in 1973, showing how slight changes in words or images can completely change the meaning of a piece. In comparing the two different versions of A Humument, one can see how Phillips’s process and style developed over the fifty years he worked on it. Finally, I explore these subjects by creating my own blackout poem using Phillips’s introduction to A Humument, continuing the cycle of interpretation and inspiration in the hopes that others will do the same.

Keywords: blackout poetry, multimodality, authorship, language

GO-11

Title: Attending the Deficit: Exploring How to Accommodate Students who have ADHD in Writing Centers

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Sponsoring Institution: Marshall University, Department of English

Research Sponsor:

Abstract

Though conversations surrounding mental health have been on the rise over the last two decades, they have become increasingly prevalent since the lockdown periods of COVID-19. During this time, more individuals were seeking mental health treatment due to increased levels of anxiety and depression. As a result, many previously undiagnosed individuals discovered that these symptoms stemmed from Attention-Deficit/Hyperactivity Disorder, or ADHD. While many other conversations regarding ADHD have discussed the over-diagnosing and/or premature diagnosing of children with ADHD, this paper focuses on the bevy of individuals who have just received a formal diagnosis, specifically those that are either starting college or are returning to the college environment after an extended period of distance learning and a lack of socialization. This recent surge of ADHD diagnoses necessitates a reevaluation of Writing Center practices and an exploration of effective tutoring methods to better support students with ADHD. The research investigates effective strategies, including flexible policies, goal-oriented sessions, multimodal toolkits, and organization and time management techniques. Furthermore, this paper considers the benefits of these techniques when working with students who may have other neurodivergent diagnoses, as well as those without any formal diagnoses. As many students choose not to disclose their diagnoses or express need for accommodations, Writing Centers must continue to adapt, heighten their sensitivity in gauging student needs, and embrace new methods to create more accessible and inclusive spaces for all students.

Keywords: Pedagogy; Tutoring; Writing Center; Learning Disability; ADHD

GO-12

Title: Intersecting Oppression: Black Experiences with Policing in Appalachia

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Sponsoring Institution: College of Science

Research Sponsor: N/A

Abstract

Appalachians continue to face the lasting effects of generations of state violence. Residents are often met with economic, environmental, physical, and mental hardships that are specific to the region. Particularly for Black Appalachians, a distinct history exists connecting the cultural nuances of the region with the overall history of racial inequality in the USA. The following examines these unique experiences by exploring the relationship between state violence, policing, and race in Appalachia. Using a grounded theory framework, the study utilizes qualitative interviews with Black Appalachians to gain a detailed understanding of their experiences while exploring the racial injustices tied to policing in the region.

Keywords: Appalachia, Policing, Black, African American, State Violence

GO-13

Title: Using Agnew's General Strain Theory to Understand Recovery

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Research Sponsor:

Abstract

According to the Centers for Disease Control and Prevention, drug overdose deaths in 2022 were estimated to be over 109,000. An important aspect of recovery that is often overlooked is how individuals view their own treatment. This study aims to use Agnew's General Strain Theory to better understand how individuals view their own recovery and to determine if they view it through a medical or criminal model of addiction. Focus groups are being conducted with groups of individuals in recovery at both a recovery center and through drug court. Additionally, interviews with staff of recovery centers and those working closely with drug court have been conducted to better understand how staff view the recovery process as well. This study also looks at drug addiction through the lens of strain by utilizing strain theory. Strain theorists refer to strain as societal pressure. This study attempts to examine the responses from the focus group individuals to see if societal pressures influenced their drug use.

Keywords: strain, addiction, recovery

GO-14

Title: Development, Testing, and Comparison of Decontamination Methods for Drugs and Ignitable Liquids from Mobile Devices

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Sponsoring Institution: Marshall University Forensic Science Masters Program (College of Science)

Research Sponsor:

Abstract

Mobile devices collected from clandestine labs can be contaminated with hazardous materials including illicit drugs, drug precursors, and ignitable liquids used during the synthesis process. If seized mobile devices are not adequately decontaminated, laboratory analysts can be exposed to health hazards while performing their examinations. VTO Labs (Broomfield, CO) has developed a decontamination method comprised of three solutions – Easy DECON® Parts 1-3 - that they claim cleans devices of fentanyl, carfentanil, and methamphetamine residue, thereby protecting CSI and analysts from these potential hazards. However, there are many other dangerous substances at clandestine labs that may also contaminate these devices. Previous research demonstrated the VTO Labs decontamination kit was effective at removing heroin and cocaine. Although the liquid decontamination kit from VTO Labs has been shown to work with drugs, it is also important to consider that mobile devices from clandestine labs could also be contaminated with ignitable liquids. Having a vessel that contains a decontamination solution able to remove both drugs and ignitable liquids would be beneficial. Activated carbon has been used for ignitable liquid extraction, most commonly in the form of activated carbon strips (C-strips) or loose activated carbon powder made into an adsorption package (C-bag). This project aimed to use loose activated carbon (FLUEPAC® MC) as a method for decontamination of mobile devices. This activated carbon powder could be added to any signal-blocking transportation container to serve the purpose of potentially decontaminating the device from drugs and ignitable liquids. During the study, devices were contaminated separately; one set of devices was contaminated with a street sample of heroin (obtained from the Huntington Police Department and previously analyzed by the West Virginia State Police Forensic Laboratory), and the other set of devices was contaminated with a 1:1 mixture of gasoline and diesel fuel (IL mix). The devices contaminated with drug were swabbed pre- and post-decontamination with a methanol-soaked Kimwipe®, extracted with methanol, vortexed to separate any drug from the Kimwipe®, and analyzed using a liquid chromatograph coupled to a tandem mass spectrometer (LC/MS/MS). The devices contaminated with the IL mix were wiped with a Kimwipe® spotted with approximately 1 milliliter of the mix, rinsed with distilled water, decontaminated using three different methods, (Dawn® dish soap and water, Elma Tec Clean A1 and water, and activated carbon powder and water), then processed in accordance with ASTM International standard E1412-19. The samples were analyzed using gas chromatography coupled with mass spectrometry (GC-MS) and compared to determine the effectiveness of each method. Finally, a preliminary test was performed on a decontamination method developed during this project. A final cleaning step was added to the activated carbon decontamination method. Clean glassware was contaminated with the IL mix, decontaminated using activated carbon, and then placed in either the Dawn® dish soap and water mix or Clean A1 and water mix to remove any activated carbon and IL mix that may still be present on the surface of the glassware. These samples were also tested using GC-MS.

Keywords: Ignitable Liquids, Drugs, Mobile Devices

GO-15

Title: Clostridioides difficile toxin B regulates Na-glucose co-transporter 1 (SGLT1) in intestinal epithelial cells.

Authors/Presenters: Eliane F Tsopmegha, Jennifer Haynes, Soudamani Singh, Uma Sundaram

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Sponsoring Institution: Biomedical Research

Research Sponsor: NIH

Abstract

Background: Clostridioides difficile is a gram positive, strictly anaerobe, and spore-forming bacterium that causes Clostridioides difficile (C. difficile) infection (CDI). CDI is a common and recurrent nosocomial infection primarily associated with two exotoxins: C. difficile toxin A (TcdA) and C. difficile toxin B (TcdB). CDI is known to cause colitis in the colon, while in the small intestine, it can cause enteritis. CDI colitis is known to inhibit NaCl absorption. Glucose is absorbed in the small intestine via Na-glucose co-transporter 1 (SGLT1) located at the brush border membrane of intestinal epithelial cells. However, it is unknown if small intestinal nutrient absorption is affected in CDI enteritis. Hypothesis: C. difficile toxin TcdB regulates SGLT1 in intestinal epithelial cells (IECs). Aim: Determine the effect of C. difficile toxin B on SGLT1 in IECs. Methods: Rat small intestinal epithelial cell line IEC-18 was treated with TcdB. 3H-OMG uptakes were performed for SGLT1 activity. Na/K-ATPase activity was determined by Pi released. Western blot for SGLT1. Results: SGLT1 uptake was significantly decreased by TcdB treatment. Na/K-ATPase activity was significantly decreased by TcdB treatment. Kinetic studies demonstrated the mechanism of inhibition of SGLT1 by TcdB was secondary to a decrease in Vmax without a change in the 1/Km. Western blot analysis showed a significant decrease in SGLT1 protein levels. Conclusions: C. difficile toxin B inhibits SGLT1 function and expression in IECs. CDI therefore not only affects electrolyte transport in the colon but also nutrient-absorptive processes in the small intestine.

Keywords: Clostridioides difficile, C. difficile toxin B, glucose absorption, small intestine, and intestinal epithelial cells

GO-16

Title: Bioengineering Attenuated Strains of *Pseudomonas aeruginosa* for Production of Commercial Surfactants

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Sponsoring Institution: Joan C Edwards School of Medicine/ Department of Biological Sciences

Research Sponsor: Corporate Sponsored

Abstract

Rhamnolipids are glycolipid surfactants produced by a series of bacterial species including *Pseudomonas aeruginosa* (PA), which can be used to produce biodegradable detergents and for bioremediation. PA is the most efficient producer of rhamnolipids. However, the presence of several virulence factors and antibiotic resistance mechanisms and the propensity of life-threatening infections in immunocompromised individuals limits the use of this organism in widespread industrial production. Here, we propose the use of virulence attenuated strains of PA to produce rhamnolipids. Virulence-attenuated strains PGN4 and PGN5 are derived from the wild type reference strain of PAO1 through sequential deletion of virulence factor genes using an efficient genetic system pEX100Not1. To circumvent the quorum sensing control over rhamnolipid production, the rhamnolipid synthesis genes, *rhlA*, *rhlB* and *rhlC* are further removed along with the C4 quorum sensing elements *rhlR* and *rhlI*. The required synthetic genes can be then reinserted into the host using pHERD plasmid. The production of rhamnolipids is then assayed using various analytical approaches. The project presents an example of rewiring the metabolic pathways by abolishing the endogenous regulation for rhamnolipids production. It is possible that an efficient microbial cell factory alternative to the currently-used *Escherichia coli* system be developed using attenuated strains of *P. aeruginosa* for biotechnology.

Keywords: Bioengineering, genetic engineering, bacterial genetics

GO-17

Title: Working memory deficits as a barrier to workforce readiness in a substance use disorder population.

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Mentor: Todd Davies, Ph.D.

Sponsoring Institution: Marshall University Joan C. Edwards School of Medicine Biomedical Sciences

Research Sponsor: Research grant from Robert C. Byrd Center for Rural Health

Abstract

Working memory is the ability to temporarily store and use information for cognitive tasks, and individuals with substance use disorder (SUD) often have altered neuropsychological pathways with chronic substance use. It is possible that the effects of altered neuropsychological pathways and working memory deficits are a barrier to successful employment and job retention. In this retrospective study, data from Creating Opportunities for Recovery Employment (CORE) initiative and Provider Response Organization for Addiction Care & Treatment (PROACT) were assessed to determine working memory deficits in the SUD population. Clients' data from CORE was cross-referenced with their demographics and biopsychosocial intakes to determine history of drug use and types of trauma to determine working memory deficits. The working memory deficits were based on self-reported answers or provider observations from the biopsychosocial intake. This study identified that 46.09% of CORE clients receiving care at PROACT had working memory deficits. Additionally, females with working memory deficits had higher rates of emotional and physical trauma, whereas males had higher rates of head trauma. Occupational therapy literature regarding successful recovery suggests that individuals with SUD have sustained recovery with appropriate job placement and using this study we hope to implement therapies for sustained recovery and employment.

Keywords: Working memory deficits, SUD, workforce

GO-18

Title: Molecular Mechanisms of β -Arrestin Modulated Cannabinoid Tolerance

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Sponsoring Institution: Marshall University School of Medicine Department of Biomedical Sciences

Research Sponsor:

Abstract

Cannabinoids are becoming a commonly used analgesic for the treatment of pain conditions, but prolonged utilization of cannabinoids can lead to tolerance to their antinociceptive effects, posing an obstacle to their therapeutic use. Tolerance to cannabinoids occurs when agonists are constantly present which desensitizes and/or downregulates cannabinoid receptors. Cannabinoid receptors (CB1R) are desensitized when G protein-coupled receptor kinases (GRKs) phosphorylate the receptors and β -arrestin gets recruited to putative GRK phosphorylation sites at residues 426 and 430 on the phosphorylated receptor. Receptor internalization is facilitated by β -arrestin recruitment to a second set of GRK phosphorylation sites of the distal C-terminus. Our lab has developed and worked with three different CB1R knock-in mutations of GRK phosphorylation sites to study the effects of each phosphorylation site mutation on cannabinoid tolerance. The S426A/S430A mutant mice express serine to alanine point mutations making them resistant to desensitization due to the prevention of GRK phosphorylation and β -arrestin recruitment to these residues. These mice display a reduction in cannabinoid tolerance. The six point mutant (6PM) mice express serine/threonine to alanine point mutations for six putative GRK phosphorylation sites involved in CB1R internalization which inhibits GRK phosphorylation and β -arrestin recruitment to these sites causing the prevention of receptor internalization. These mice show an increase in cannabinoid tolerance. These first two mutant models demonstrate the effects of preventing only desensitization (S426A/S430A) and preventing internalization only (6PM). The approach of our newly produced eight-point mutants (8PM) is to investigate the effects of completely blocking β -arrestin recruitment to CB1R on tolerance to cannabinoids. The 8PM mice express mutations at all eight putative phosphorylation residues involved in recruitment of β -arrestin to the CB1R which completely blocks β -arrestin recruitment, thereby preventing both desensitization and internalization of CB1Rs. This mutation is expected to reduce tolerance to cannabinoids. The S426A/S430A mice, 6PM mice, and the addition of the 8PM mice models will further assist in elucidating the mechanisms of cannabinoid tolerance providing insight for the development of cannabinoid therapeutics with lowered risk of tolerance for the treatment of pain.

Keywords: Cannabinoid Tolerance B-arrestin GRK Phosphorylation

GO-19

Title: The Effects of High Glucose on the Release of Exosomes From Adipocytes

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Sponsoring Institution:

Research Sponsor:

Abstract

Exosomes (EX) are extracellular vesicles mediating cell-cell communication by transferring molecules, and their function varies under different situations. We aim to determine the role of high glucose (HG) in the level, contents, and function of EXs from adipocytes (Adp-EXs). Adipocytes were grown in the media with normal glucose (NG) or HG (25 mM). Adp-EXs were collected using ultracentrifugation and their level and size were measured using a Nanoparticle Tracking Analysis. The microRNA (miR) - 210 level was determined by RT-PCR. Adp-EXs (5×10^8 particles/mL) were co-incubated with endothelial cells (ECs) for 24 or 48 hrs to evaluate the cellular communication function. Adp-EXs were labeled with PKH26 (2uL/mL) for tracking the incorporation of Adp-EXs with the ECs. Dihydroethidium (DHE) staining and flow cytometry were performed to measure the reactive oxygen species (ROS) production. Results showed that 1) The level of Adp-EXs in HG group was higher than NG group. There was no difference in the size between HG and NG groups. 2) The level of miR-210 was decreased in the adipocytes and the Adp-EXs in the HG group. 3) The Adp-EXs were incorporated with the ECs in a time-dependent manner. The incorporation rate of Adp-EXs with ECs is higher in the HG group than in the NG group; 4) Adp-EXs from the HG group increased the percentage of DHE-positive ECs. Data suggest that HG could stimulate the rerelease of EXs from adipocytes and change the contents of EXs by decreasing the miR-210 level. Adp-EXs from HG could induce oxidative stress in ECs.

Keywords: Exosomes, Adipocytes, Diabetes, micro-RNA

GO-20

Title: Elucidating the impact of western diet on gut microbiome and gut inflammation in MDS-susceptible mice

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College/School: School of Pharmacy

Mentor: Melinda E. Varney, varney31@marshall.edu

Sponsoring Institution: Marshall University School of Pharmacy, Department of Pharmaceutical Sciences

Research Sponsor: WV-INBRE

Abstract

Alterations in gut bacteria have been implicated in developing metabolic disorders such as obesity and the progression of diseases such as Myelodysplastic syndromes (MDS). Preliminary findings have shown a strong correlation between obesity and the incidence of MDS. Despite this knowledge, the impact of obesity on inflammatory markers in the gut of MDS patients has not been studied in detail. Therefore, this study aimed to examine how Western diet-induced changes in gut microbiota impact disease progression in a preclinical model of MDS. Four-week-old DKO and Wild-type (WT) mice were assigned to either a high-fat (HF) or low-fat (LF) diet for 15 weeks. Fecal samples were collected before and after the diet assignment for 16S microbiome analysis. Blood samples were then collected for a complete blood count, and intestines were harvested for flow cytometry. Both DKO and WT male mice assigned to HF diet exhibited an increase in body weight and total calorie consumed. Compared to the WT mice, DKO mice assigned HF diet demonstrated a sex-specific increased inflammatory myeloid cells. Spleen-to-body ratio was enhanced in DKO male and female mice compared to the WT group. Gut microbiome studies also showed increased diversity and reduced microbial population in HF diet mice when compared to the LF diet group. The preliminary findings from our experiment imply that diet-induced obesity could alter the gut microbiome and myeloid inflammatory markers which are indicative of MDS disease progression. Further research into the mechanism(s) behind this phenomenon may inform future therapeutics for MDS-susceptible individuals.

Keywords: microbiome, Myelodysplastic syndromes, gut inflammation, obesity

GO-21

Title: Droplet Digital PCR Analysis of Adipokines in Liver Tissue: Insights into Metabolic Regulation

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Sponsoring Institution: School of Pharmacy

Research Sponsor: n/a

Abstract

Understanding the intricate signaling pathways between adipose tissue and the liver is crucial for unraveling the complexities of metabolic disorders such as obesity and non-alcoholic fatty liver disease (NAFLD). Adipokines may play the role of mediators of hepatic inflammation, lipid metabolism, and insulin sensitivity, thereby shaping the pathogenesis of metabolic diseases. Droplet Digital Polymerase Chain Reaction (PCR) analysis provides a powerful tool for deciphering the expression patterns of adipokines, key signaling molecules secreted by adipocytes, and their impact on liver tissue in-vivo. The implications of our PCR analysis extend to the identification of novel therapeutic targets for mitigating obesity-related liver complications and improving metabolic health. Therefore, our study investigates the transcriptional regulation of adiponectin and resistin within the hepatic microenvironment in mice exposed to a high sugar diet.

Keywords: non-alcoholic fatty liver disease, adipokine, obesity, insulin resistance, digital PCR

GO-22

Title: Perceived Fairness of Performance Evaluations and Its Effect on Employee Retention

Authors/Presenters: Christin Kooti / kooti1@marshall.edu

College/School: College of Business

Mentor: n/a

Sponsoring Institution:

Abstract

This research aims to examine the impact of perceived fairness in performance evaluations on employee retention. Previous studies have established a significant relationship between performance evaluations and job satisfaction, and between job satisfaction and employee retention. This study draws on these findings to hypothesize a relationship using Organizational Justice and Equity theories to formulate the hypothesis. The research will involve a case analysis within a governmental entity, with employee surveys used to gauge the perceived fairness of performance evaluations and employees' intent to stay. As this study is ongoing, the expected results should offer valuable insight into employees' perceptions of fair or unfair treatment and their intent to leave or stay. As organizations continue to fight the uphill battle of high employee turnover and challenges in recruitment, the anticipated results could be pivotal for management. This information could aid in the development of new policies aimed at improving organizational structure and perceptions of fairness.

Keywords: performance evaluations, employee retention

GO-23

Title: An Exploration of Teacher Perception and Practices of Using Assessment Data to Improve Achievement of Equity Student Groups

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Sponsoring Institution: College of Education and Professional Development, Leadership Studies

Abstract

While utilizing assessment data has been a pervasive practice in educational reform for decades, and teachers are expected to use assessment data to improve instruction, little is known about how the practice of requiring teachers to review test data affects their perception of effectiveness in addressing the learning gaps of student groups. This qualitative phenomenological research study used open-ended, semi-structured interviews to help better understand how the expectations of teachers analyzing and integrating assessment data translates into teacher instructional practice and self-efficacy. This study aimed to explore the shared experience of teachers required to participate in collaborative planning centered on analyzing common test data. The study also explores common barriers to integrating assessment data into classroom lessons, deficit-thinking triggers, and effective practices for facilitating data meetings, and identifies which types of data teachers find helpful to inform their teaching practice as they work to improve outcomes for their equity student groups. The findings show the practice of having teachers collaboratively review summary test data, also used for accountability and district monitoring, is not perceived by teachers to increase their efficacy in addressing the compounded needs of equity student groups and may encourage deficit-thinking. The study also found specific practices teachers perceive as effective when looking at assessment data to improve instruction for the equity student groups.

Keywords: Assessment, Qualitative, Equity

GO-24

Title: Art Movements, Artists, & Artworks

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Sponsoring Institution: Marshall University. COEPD

Abstract

This is a WebQuest presentation for 9th-12th grade visual arts students comprised of multiple sections involving research related to art history and prevalent art movements followed by students creating original artwork expanding upon and interpreting a significant art movement stylistically.

The rationale of this WebQuest is to enhance students research and navigational skills while enhancing knowledge of art history, critical thinking and articulation ability of original ideas, and to enhance art making ability by creating work interpreting a specific context related to an art movement.

This WebQuest is divided into three tasks students will complete chronologically. Students will first research five significant art movements through video instruction, by navigating virtual galleries, and researching specific artists within major art movements. Students will identify an art movement most interesting to them and will be tasked with creating a PowerPoint or virtual presentation critique following a template where students will express personal insights on the artwork considering art making practices and the context in which the original artists created their work of three chosen pieces of art from this movement.

Upon completion of research, students will interpret their chosen art movement or the work of an artist from their chosen movement by creating an original artwork in consideration of style with this specific art movement.

Keywords: Art. History. Drawing. Painting. Thinking.

GO-25

Title: Life Cycle Explorers: Investigating How Living Things Grow and Change

Authors/Presenters: Abby Herring, herring9@marshall.edu

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Mentor: Dr. Isaac Larison

Sponsoring Institution: Marshall University, Literacy Education

Abstract

A WebQuest is an inquiry-oriented online tool for learning where the majority of information students are exploring and evaluating comes from the web. This inquiry oriented, online tool supports first-grade students as they are learning about life cycles. In this WebQuest, student knowledge will be enhanced as learners are conducting research, collaborating with peers, and creating a descriptive writing piece based on their discoveries. The focus of this project is to engage students in the concept of life cycles by encouraging learners to take on the role of biologists. This hands-on and immersive technique allows students to develop critical thinking skills and deepen their understanding of life cycles.

Keywords: Elementary, Inquiry, WebQuest, Science, Literacy

GO-26

Title: Current Literacy Issues in PreK through Grade 12: Action Research Projects in Progress

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Mentor: Dr. Isaac Willis Larison - larison@marshall.edu

Sponsoring Institution: College of Education and Professional Development

Abstract

This presentation will focus on the action research projects conducted by Literacy Education Program graduate level students in their classrooms. Each graduate student has addressed a particular issue in her classroom using a variety of action research data collection processes.

The projects/issues being addressed by students include: Writing to Improve Writing, Enhancing Writing Complexity through the Use of Writing Strategies, Improving Reading Comprehension through the Use of Repeated Reading Strategies, Vocabulary Development in the PreK Classroom through the Use of Dramatic Play, and Strategies and Computerized Applications that Support Narrative Writing in the Primary Classroom.

Each student will provide an overview of the topic she has addressed for her individual project and the research question(s) being asked. She will share an initial summary of the work that has been done on the project, the data collection processes that are being used for the project, the data that has been collected so far, and information about the interventions that are being used to explore the issue(s) being addressed. As these are works in progress, each student will share her findings at this point, her initial results for the project, and her thoughts regarding future explorations regarding literacy instruction in her classroom for her particular grade level.

The action research study literacy projects will be presented in PowerPoint and provide an overview of the topics addressed and the research question(s) posed by the students. The PowerPoint will provide a brief literature review for each project, the data collection processes used in each project, the results/findings for each of the studies, conclusions so far, and ideas for future explorations.

Keywords: Action Research, Literacy Education, PreK, Education

GO-27

Title: Sketch-to-Stretch: Literacy Strategy to Promote Critical Thinking

Authors/Presenters: Joseph Jerden - jerden2@marshall.edu

College/School: College of Education and Professional Development

Mentor: Dr. Isaac Willis Larison

Sponsoring Institution: College of Education and Professional Development - Literacy Education

Abstract

Sketch-to-stretch is a literacy strategy for students to participate in after reading a text to promote critical thinking beyond literal comprehension. After reading a text, students work on creating a sketch that reflects what the story means to them, including theme, analyzing characters, and interpretation of a writer's craft and style. In this study, I applied this strategy in a tenth-grade English Language Arts classroom after students read the novel *Lord of the Flies* by William Golding. Following the study of the novel, students discussed themes and big ideas from the novel in small groups as well as a whole class setting, including the author's use of symbolism and allegory. Following the discussion, students sketched a book cover design that reflected the discussed concepts. Students also explained their choices in written form, and the sketches and explanations were used to evaluate student understanding of themes. Student creations demonstrated the usefulness and effectiveness of the sketch-to-stretch strategy in the high-school setting.

Keywords: Literacy, Reading, Education

GO-28

Title: Literacy Strategies to Use in the Science Classroom

Authors/Presenters: Joede Weikle - weikle30@marshall.edu

College/School: College of Education and Professional Development, Honors College

Mentor: Isaac Willis Larison

Sponsoring Institution: College of Education and Professional Development

Abstract

This presentation will focus on the creative use of literacy strategies teachers can share in the science classroom. At least two strategies (Question and Answer Relationships and Survey, Question, Read, Recite, Relate, Review (SQ4R)), will be shared in this virtual presentation. The presenter will connect each strategy to a current work of literature to demonstrate how teachers are able to incorporate trade books in the classroom and show students how to apply each strategy to science content.

The presenter will provide an overview of the science topics and grade levels she teaches and the kinds of literacy challenges she has to address in her classroom. She will share insights into the use of literacy strategies to support science instruction for her students and share how the application of the strategies benefits her students.

One of the greatest challenges for teachers is helping students (especially students who struggle with literacy skills) make sense of text materials being used in content areas. The use of literacy strategies allows discipline area teachers to address the literacy needs of a diverse group of students and still deliver the content.

The strategies will be presented in a PowerPoint and provide an overview of the science topics addressed and the literacy strategies used by the students.

Keywords: Literacy, Science, Learning Strategies,

GO-29

Title: Exploring Adult Education: AI as a Solution

Authors/Presenters: Summer Grose / grose52@marshall.edu

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Mentor: Dr. Isaac Larison / larison@marshall.edu

Sponsoring Institution: Marshall University

Abstract

This presentation highlights the pressing challenge of adult literacy in Randolph County, WV and explores the innovative use of Artificial Intelligence (AI) as a potential solution. With a staggering one in five adults nationwide struggling with basic literacy, the urgency for effective interventions is clear. In West Virginia, this issue is even more acute, with three in five adults facing literacy challenges. These statistics underline a critical need for educational programs that are accessible, flexible, and tailored to adult learners' diverse needs.

Adult learners face unique barriers to literacy, including limited access to suitable programs, insufficient resources, and the logistical difficulties of balancing education with other life responsibilities. Traditional literacy programs often fall short in addressing these challenges, necessitating a search for alternative solutions that can provide personalized, engaging, and effective literacy education.

Artificial Intelligence presents a promising avenue for revolutionizing adult literacy education. AI's capability to offer adaptive learning experiences tailored to the individual's pace and level can significantly enhance engagement and outcomes. By integrating AI-driven platforms, learners can access personalized educational content anywhere, anytime, making learning more accessible for those with tight schedules or transportation issues. Furthermore, AI can support educators by automating administrative tasks, offering insights into student progress, and identifying specific areas where learners need additional support.

Keywords: Adult Literacy, Artificial Intelligence, Educational Barriers, Personalized Learning, Technology in Education

UGO-1

Title: War! What Is It Good For? Anti-War Music as Advocacy Journalism in the 1960s

Authors/Presenters: Rebecca Law - law41@marshall.edu

College/School: College of Arts and Media

Mentor: Rob Rabe - rabe@marshall.edu

Sponsoring Institution:

Research Sponsor:

Abstract

Music has been used as a mode of entertainment, storytelling, advocacy, and teaching about history for centuries. One use of music has been overlooked: as a form of journalism. One of the purposes of advocacy journalism is to mobilize the people to vote, to speak out, and to care about something. Understanding some forms of music as a kind of advocacy journalism allows an audience to connect to a topic deeply and mobilize them to action. A great example of music and journalism mobilizing people is the anti-war music written and performed during the 60s and 70s, especially about the Vietnam War. In my research, I have found music and musicians that used music as a way to write about the news of the war, much like how advocacy journalists use prose to write about the news. I have also found instances when musicians were inspired by news to write music, in hopes of inspiring a broader audience to care about what they care about and mobilize them into action. I specifically researched “Fortunate Son” by Creedence Clearwater Revival, “I-Feel-Like-I’m-Fixin’-To-Die Rag” by Country Joe and The Fish, “Masters of War” and “The Times They Are a-Changin’” by Bob Dylan, and “Street Fighting Man” by The Rolling Stones as examples of anti-war protest songs that resemble journalism. All of these songs took inspiration from the circumstances of the times and the news available and did what standard journalism could not: express a definite opinion.

A core tenet of journalism is to be objective and unbiased while reporting. Advocacy journalism throws this tenet out the window; it expresses clear opinions alongside the accurate and factual reporting. When living through divisive political times, often people search for more argumentative writings to help formulate their own opinions and ethical understandings, thus advocacy journalism was born. In the 60s where journalism fell short in providing an opinion, music often picked up the slack. For a society engaging in a war that felt drastic to some, finding musicians and writers who expressed their own opinions through song helped people feel unified, and likely swayed some people’s opinions on both America’s engagement in Vietnam and the policies surrounding the draft. Anti-war music in the 60s makes a case for “biased journalism,” journalism that expresses the truth of the matter and more emotional aspects of a social justice movement regardless of seeming left or right leaning in content. Through these examples, I will showcase why certain music can, and should, be considered advocacy journalism both in the 60s and today.

Keywords: music, journalism, Vietnam, history, advocacy

UGO-2

Title: Hieronymus Bosch's Haywain Triptych

Authors/Presenters: Thomas Hartley hartley63@marshall.edu

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Mentor: Doctor Heather Stark, stark5@marshall.edu

Sponsoring Institution: College of Arts and Media

Research Sponsor:

Abstract

Hieronymus Bosch, an enigmatic and visionary Netherlandish painter of the fifteenth and early sixteenth centuries, stands as a captivating figure in the history of art. His works are often detailed with layers of outlandish imagery and symbolism, generally containing religious themes and commentary, and have intrigued art historians for centuries. One of his most celebrated masterpieces, the Haywain Triptych (circa 1500-1516. Oil on panel. 135 x 190 cm. Museo del Prado, Madrid), is a testament to Bosch's unique ability to create surreal and otherworldly scenes, challenging conventional subjects and images of his time alongside his changing social climate. Because Bosch's pieces often feature references to specific historical figures, excerpts from religious texts, and cultural or social phenomena of the late Middle Ages and the Renaissance, interpreting the imagery and symbolism within the Haywain Triptych requires a historical and theological lens in order to understand the religious, social, and political climates that the artist lived in and was naturally influenced by. This research paper explores the inspirations and themes behind the imagery throughout the Haywain Triptych, emphasizing the theological and historical background of the symbols that the artist incorporated within the piece. Furthermore, using historical information about the political figures and social trends during Bosch's lifetime, this essay identifies figures and events such as the king of France and the Holy Roman Emperor, among others, to interpret what political and social commentary Bosch may have been offering through the Haywain Triptych. Finally, the paper discusses the methods in which Bosch relates each symbol and figure within his work to expound on various Biblical narratives that he is depicting and their broader relation to his contemporary religious setting.

Keywords: Art History

UGO-3

Title: An Exploratory Study of Awareness for Cultural Events on a University Campus

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Sponsoring Institution: College of Arts and Media, School of Journalism and Mass Communications

Research Sponsor: Marshall Artist Series

Abstract

This exploratory research investigated declining student attendance at cultural events on a university campus. The study focused on a university's cultural events organization. The organization provides community outreach events for the performing arts, theatre, and lectures. The primary objective of this research is to understand the factors influencing awareness, knowledge, and engagement with the cultural organization among students and faculty. The research employed a mixed-methods approach, incorporating a focus group and interviews. Key research findings for students include a preference for social media as an information source and identified barriers to attendance due to conflicting schedules and lack of awareness. Faculty interviews revealed varying levels of awareness and limited attendance due to scheduling conflicts, but potential interest in aligning cultural organization events with curriculum. Recommendations include improving ad placements, increasing social media presence, addressing scheduling conflicts, and encouraging faculty involvement.

Keywords: cultural, awareness, curriculum, mixed methods

UGO-4

Title: The Intersection of Acting and Mental Health: Navigating the Challenges and Prioritizing Mental Well-being

Authors/Presenters: Jimi lee Lawson lawson166@marshall.edu

College/School: College of Arts and Media

Mentor: Jack colcough

Sponsoring Institution:

Research Sponsor:

Abstract

The failing mental health of stage actors is a pressing issue that needs to be addressed, as evidenced by the historical prevalence of suicides among actors, and it is crucial for actors to prioritize their mental well-being in order to prevent burnout and the rise of depression.

Keywords: Mental health, depression, suicide, stage, acting

UGO-5

Title: Clarinet Music by Claude Debussy and Michele Mangani

Authors/Presenters: lynch132@marshall.edu

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Mentor: Ann Marie Bingham, binghama@marshall.edu

Sponsoring Institution: School of Music, College of Arts & Media

Research Sponsor:

Abstract

A performance of Claude Debussy's Premiere Rhapsody and Michele Mangani's An American in Paris Blues

Keywords: clarinet, performance, Debussy, Mangani, Gershwin

UGO-6

Title: Nephrotoxicity Potential of 2,5-Dibromophenol in Isolated Kidney Cells from Fischer 344 Rats

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Mentor: Gary O. Rankin rankin@marshall.edu and Dianne K. Anestis anestis@marshall.edu

Sponsoring Institution: Marshall University Biomedical Sciences

Abstract

Bromobenzenes are important chemical intermediates for many agricultural and industrial products. Human exposure to a monobromobenzene can cause toxicity in several organs, including the liver, kidney, and lung. There is a lack of information regarding the toxic effects of dibromobenzenes on the kidney. Studies in Dr. Rankin's laboratory determined the effects of the six dibromobenzene (DBB) isomers on isolated kidney cells from male Fischer 344 rats. The nephrotoxicity of the metabolite of 1,4-DBB, 2,5-dibromophenol (2,5-DBP) was explored to see if it contributes to the toxicity of 1,2-DBB. This investigation was conducted through surgeries used to extract the kidneys from the subjects, male Fischer 344 rats, and then treat them with the compound in order to observe its effects and determine its toxicity. The toxicity is measured through the amount of LDH, lactate dehydrogenase, present within the media which will be made visible through the use of trypan blue.

Keywords: Nephrotoxicity, Dibromobenzenes, Metabolites, Protectants, Pathway

UGO-7

Title: The American Dream is Dead: Drugs, Homelessness, and Poverty in Huntington, West Virginia

Authors/Presenters: belmore@marshall.edu

College/School: College of Education and Professional Development

Mentor: Puspa Damai (damai@marshall.edu)

Sponsoring Institution: Marshall University

Research Sponsor:

Abstract

This paper aims to raise awareness of the homeless population in Huntington, West Virginia. I am conducting research to uncover different causes of the rising homeless population and different coping mechanisms of this community. Huntington is known for many things, but -unfortunately- is known for having one of the highest overdose rates in America. The homeless shelters are becoming full. People have no choice but to turn to the streets. This is a complex cause-and-effect relationship. The blue-collar working class becomes injured and turns to opioids. What happens when they become addicted to these drugs? What happens when they turn to other drugs because they cannot get their opioids? This leads these people down a dangerous path. From poverty to drugs to homelessness, these people are in need of help. The goal of this paper is to help inspire people to help Huntington. Or maybe inspire Huntington to help itself.

Keywords: Homelessness, Drugs, Overdose

UGO-8

Title: Polypropylene and Glass Fiber Composite Extrusion for Additive Biofabrication of Bone Tissue Scaffolds with Complex Microstructures

Authors/Presenters: Hamzeh Al-Qawasmi, alqawasmi4@marshall.edu; Sebastian Risch, risch@marshall.edu; Roozbeh (Ross) Salary*, salary@marshall.edu

College/School: College of Engineering and Computer Sciences, Honors College

Mentor: Dr. Roozbeh (Ross) Salary, salary@marshall.edu

Sponsoring Institution: College of Engineering and Computer Science, Biomedical Engineering

Research Sponsor: NASA, Grant #80NSSC22M0249

Abstract

Osseous fractures account for 16% of all musculoskeletal injuries in the U.S. annually. Various tissue engineering methods have emerged for bone repair, including additive biomanufacturing techniques like extrusion-based bioprinting. Despite technological and scientific advances in bone tissue engineering, it has remained unknown how the complex rheological dynamics of composite material deposition affect the functional properties of fabricated bone scaffolds. The goal of this work is to fabricate mechanically robust, dimensionally accurate, and biocompatible tissue scaffolds for treatment of bone fractures. The objectives of the work are to investigate the influence of (i) single-screw filament extrusion temperature and (ii) internal scaffold microstructures, on the physical and mechanical properties of bone scaffolds, fabricated using fused deposition modeling (FDM). Uniform monofilaments of polypropylene (PP) and glass fibers (GF) were extruded at temperatures of 185 °C, 210 °C, and 235 °C, then used to fabricate porous bone scaffolds via FDM. Also, four scaffolds with bone-like microstructures were designed, based on novel mathematical formulations of triply periodic minimal surfaces (TPMS). The physical and mechanical properties of these scaffolds were characterized to identify optimal fabrication and design parameters. Among the four TPMS designs constructed, Design #2 exhibited the highest compression modulus, attributed to its compact microstructure. Besides, extrusion temperatures of 210 °C and 235 °C had similar effects on scaffold properties compared to 185 °C. These findings contribute to the development of clinically viable bone scaffolds and future advancements in regenerative medicine.

Keywords: Bone Tissue Engineering; Biomanufacturing; Material Extrusion; Regenerative Medicine; Polypropylene; Glass Fiber.

UGO-9

Title: Scanning Electron Microscopy (SEM) to evaluate carbon nanomaterials in cement mortars

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Mentor: Sungmin Youn (youns@marshall.edu)

Sponsoring Institution:

Research Sponsor: Kenai Defense, The Air Force Civil Engineering Center

Abstract

This project consists of the introduction of carbon nanomaterials within concrete to enhance characteristics of the concrete such as compressive strength and thermal properties. Commercially available graphene was added to cement mixtures. The samples include various amounts of graphenes (0.1%, 0.5%, 1.0%, 1.5%, and 2.0%). Composite mortars were cured for 28 days and their compressive strengths were measured. Mortars containing more than 0.1% graphene or CNT actually decreased the compressive strength of the concrete. Samples containing less than 0.1% of graphene increased the compressive strength. The use of graphene increased the thermal properties of concrete as well. Broken mortar samples were collected and observed under a Scanning Electron Microscope (SEM). The collected specimens are looked at using various magnifications and working distances within the SEM. The control mortar, which did not contain graphene, did not exhibit any sharp edges resembling graphene sheets. However, sharp, sheet-like shapes were observed in the samples containing graphene. It was observed that graphene within cement mortars did not appear aggregated, although they were harder to identify quantitatively based on SEM images. An artificial intelligence model was used to compare the images of the composite mortar samples and the carbon nanomaterials dispersed within the water to confirm the appearance of carbon nanomaterials on the surface of the mortars. The artificial learning model was successful in identifying the location of graphene within the composite mortars. It is concluded that an artificial intelligence model could provide a more efficient and accurate method for identifying and analyzing nanocomposite materials.

Keywords: nanomaterials, concrete, graphene, compressive strength

UGO-10

Title: Calculating Above Ground Forest Biomass using Machine Learning with Image Segmentation

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Sponsoring Institution: Marshall University College of Engineering and Computer Science

Research Sponsor: NSF S-Stem Project Works Student, Marshall Creative Discovery

Abstract

In response to the escalating threat of climate change, this study explores the use of cutting-edge technology for carbon stocks data, specifically the estimation of above ground biomass (AGB). Traditional methods of AGB estimation are time-consuming and labor intensive, prompting the need for more efficient techniques. Our research focuses on the use of satellite imagery and machine learning models with image segmentation for AGB assessment in mature Appalachian hardwood forests. The preliminary data was gathered during the summer of 2022 that created a model for estimating AGB by measuring the canopies and finding their relationship to the diameter at breast height. However, the technique of measuring the canopy area could be more accurate, as well as species identification for the density variable. To better determine the areas of the tree canopies, we are utilizing a machine learning model with image segmentation. This model is being trained with multispectral images taken from the initial test sites. By separating the images across different spectra, the differences between canopies and tree species become much easier to detect for the machine learning model. This allows us to approximate the real area of the canopy using camera geometry. This should increase time and workload efficiency more than the original method derived in 2022, while also providing more accurate and detailed inventories of West Virginian forests.

Keywords: Machine Learning, Image Processing, Remote Sensing, GIS, Natural Resource Management

UGO-11

Title: Characterization of Various Nanomaterials using the Cytoviva Hyperspectral Imaging System

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Sponsoring Institution: Marshall University, Department of Civil Engineering

Research Sponsor: National Science Foundation

Abstract

The objective of this project is to utilize the Cytoviva Hyperspectral Imaging (CHI) system to analyze the structure of nanomaterials. The CHI system offers a unique advantage by allowing optical observation of nanoparticle size and shape, and precise measurement of hyperspectral data for nanoparticle sizes. Three types of nanomaterials were used in this study: silica nanoparticles, multi-walled carbon nanotubes, and graphene. These were dispersed in deionized water with a surfactant. The silica sample exhibited an orange color, while the graphene and carbon nanotubes were black. Images of the samples were captured at two different stages: when the sample was still in liquid form and after it had dried overnight under the coverslip. Hyperspectral images and graphs were generated using Ocular and ENVI software. The structure and definition of the sample were inferred from the hyperspectral images and the amount of noise within the image. A more defined image was associated with less noise. Among the samples, the silica sample's hyperspectral images were the most defined, followed by the carbon nanotubes, while the graphene sample had the most noise. In conclusion, the CHI system has proven to be an effective tool for characterizing the structure of nanomaterials. The study demonstrated that the quality of the hyperspectral images, indicated by the level of noise, can provide valuable insights into the structure and definition of the nanomaterials. This could potentially lead to more accurate predictions of particle size distributions, thereby advancing the field of nanotechnology.

Keywords: Cytoviva Hyperspectral Imaging of Nanomaterials

UGO-12

Title: Forearm Muscle Pennation Angle Increases During Maximal Grip Contractions

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College/School: College of Health Professions

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Sponsoring Institution: Marshall University, School of Exercise Science

Research Sponsor: N/A

Abstract

This study evaluated the relationship between grip strength and muscular pennation angle. Grip strength is known to be a gauge for many different health related attributes, yet research on muscular pennation angle in the upper limb is sparse. The techniques used in this study aim to develop a better understanding of how the architecture of a muscle adapts to improve force output.

Sixteen individuals participated in this pilot investigation (12 males, 4 females, mean age=20.6±2.5 years, mean height=177.8±8.3cm, mean weight=79.2±17.6Kg). Participants tested grip strength by performing Maximal Voluntary Isometric Contractions (MVIC) using a hand dynamometer in narrow and wide settings. Ultrasound images of participants' right extensor radialis longus muscle were collected at rest and during MVIC to measure muscle cross sectional area (MA), muscle thickness (MT), and muscle pennation angle (PA).

Grip strength was greater in the wide position (mean=43.1±9.8Kg) than the narrow position (42.1±10.0Kg). This difference did not reach statistical significance (p=0.509).

MA increased with muscle contraction in both wide (mean=32.9±23.6cm², p<0.001) and narrow positions (26.9±27.3cm², p=0.001). There was no difference in MA change between the narrow and wide grip during MVIC (6.0±23.2 cm², p=0.317).

MT increased in the wide (mean=0.81±0.8cm, p<0.001) and narrow (0.24±0.6cm, p=0.111) positions, but the increase in the narrow position did not reach statistical significance. There was a difference in MT change between the narrow and wide grip during MVIC (0.56±0.59cm, p<0.001).

PA increased during muscle contraction in the narrow (mean=3.1±2.6°, p<0.001) and the wide position (2.6±2.5°, p<0.001). There was no difference in PA change between the narrow and wide grip during MVIC (0.53±3.4°, p=0.540).

These results indicate a relationship between pennation angle and grip position due to a change in length-tension relationship.

Keywords: Grip, Dynamometer, Pennation Angle, Ultrasound

UGO-13

Title: Forces of Change: The Evolution of Marshall College Under Political and Economic Pressures

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Sponsoring Institution: College of Liberal Arts - History Department

Research Sponsor: N/A

Abstract

This paper is a historical study of Marshall College in Huntington, West Virginia, and the political and economic forces that shaped the evolution of the institution's curriculum. Three periods of Marshall College's history are investigated: the antebellum period from 1837-1861 when the college was an academy, the postbellum normal school period from 1867-1924 when Marshall College served as the state's foremost normal school, and the industrial period from 1924 onwards when the college began offering degrees in the sciences. Each of these periods is differentiated by changes in Marshall College that were brought about by external political and economic forces. During the academy period, the institution strove to fulfill the needs of the poor and provide a high school education. During the normal school period, it worked to provide teachers for the state. During the industrial period, Marshall College began offering programs that would equip West Virginians with new industrial skills. The study reveals that the academy period was marked by political and economic forces proceeding from Virginia that resulted in the closure of the school, the normal school period was guided by top-down political forces, and the industrial period was brought about by the economic needs of local Cabell County residents.

Keywords: History, Higher Education, Marshall University

UGO-14

Title: Motivations for social media use and associations with depression, envy and mindsets

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Sponsoring Institution:

Research Sponsor:

Abstract

Social media is a vastly utilized tool for entertainment and communication and can garner a negative reputation regarding its impacts on mental health; however, research around the topic has mixed and inconsistent findings. One of the current speculated explanations for these discrepancies is motive (i.e., motivation for social media use, or why one uses social media). Specifically, we examined what motive(s) predicted depression and the nuanced relationships among envy, agency mindsets (i.e., sense of control over social media use), and such motive(s). Using an online crowdsourcing platform (Prolific), we collected data from 230 participants aged 41.0 on average (SD = 13.9) (51% male, 46% female, and 3% non-binary or other; 77% White), who responded to our online questionnaire. Among different motives, only social enhancement (i.e., to impress) and escapism (i.e., to escape reality) predicted higher likelihoods of depression (controlling for each other motive and the time of social media use), which means that those with high levels of other motives did not have higher likelihoods of depression. In addition, higher malicious envy (i.e., jealousy of another person's qualities/possessions without the intent to self-improve, and seeing the success as undeserved) predicted lower agency mindsets, which in turn predicted both higher social enhancement and escapism. Considering these findings, simply discouraging social media use may not be the solution, as using social media is not inherently harmful. Instead, addressing specific motives, as identified in this study, as risk factors for depression may be an approach towards reducing the negative mental health impacts.

Keywords: Social media, motivations, depression, mindsets

UGO-15

Title: “Omission and Negligence in Classical Engagement: Implications of Selective Appropriation in Classical Texts”

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Sponsoring Institution: Marshall University Humanities Department

Research Sponsor:

Abstract

Contemporary mistrust of the government has resulted in extreme polarization of political parties, with support for the main tenets of democracy declining leading to extreme violence, misinformation, and abrasive rhetoric. Significantly, only 20% of Americans trust the government and both Republicans, 52%, and Democrats, 56%, express that the government neglects common issues (Pew Research 2022). It is worth noting if this polarization and mistrust is a structural or conceptual issue in the nation’s very framework. This paper explores whether the lessening of respect for the Humanities contributes to our current state of polarization. The question is worth asking since the Founding Fathers assumed a continuing reverence of the liberal arts, especially the Humanities, as a civic imperative for the successful function of the Republic.

When the Founding Fathers, namely James Madison, confronted the idea of factions, they anticipated that the passions and aversions of the people would be reconciled by the country’s “tendency to break and control the violence of faction” (Madison 1787, Federalist No. 10). These tendencies namely being electing representatives of the common good and an emphasis on public education. Thomas Jefferson’s emphasis on public education, civic virtue, and the “liberal arts” manifested in his creation of the University of Virginia, which guaranteed access to an essential liberal arts education. Thomas Jefferson, and prominent framers, were college-educated, which required fluency in Latin and Ancient Greek for entrance, and firmly believed “the most important bill” was “the diffusion of knowledge among the people” (Jefferson 1786). Without public education, the imperative to connect, namely identifying unchecked factionalism and sharing common values of civic engagement and civic virtue, which they believed the liberal arts fostered.

And yet, the number of graduates in the Humanities has declined by 29.6% from 2012 to 2020.

Additionally, only 4% of college graduates in 2020 majored in the Humanities (Integrated Postsecondary Education Data System 2020). The Humanities piece together how humans, throughout time, have understood and processed events—the various disciplines clarify a common human story. Thus, the denigration of the Humanities may lead to an inability to process significant contemporary societal changes. Devaluing the Humanities is not new as opposing arguments to the Humanities arose from the Revolutionary period, where thinkers like Benjamin Rush argued that the Humanities did not produce innovative thinkers.

This paper seeks to examine the fundamental connection between the devaluation of the Humanities and the increased social trends of civic disengagement, polarization, and mistrust of the government. By engaging with Classical thinkers, including the works of Benjamin Rush, James Madison, and Thomas Jefferson, as well as Ancient thinkers, predominantly Cicero and Aristotle, and intermediaries, such as John Locke, we can understand our public institutions’ foundations and the purpose of the Humanities.

Keywords: Humanities, Polarization, Mistrust, Classics, Government

UGO-16

Title: Fleeting Focus, Lasting Impressions: Effects of Attention Span Decline on First Impressions of People Who Stutter

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Mentor: Jill Underhill / underhillj@marshall.edu

Sponsoring Institution: College of Liberal Arts

Research Sponsor:

Abstract

Attention spans have been on the decline for years, a decline often attributed to new media's penchant for instant gratification and micro-reading. As people get accustomed to this fast-track flow of information, it could be detrimental to their interpersonal connections with people who cannot communicate fluently. Stuttering is a speech disfluency condition characterized by the inability to speak in a continuous flow. This project seeks to understand how attention span levels could influence first impressions, perceptions, and behavioral intentions toward those who stutter. Extensive research has been done into perceptions of people who stutter, as well as the decline in attention span; however, a study has not been performed to consider the relationship between these variables. This project utilized an experiment in which participants filled out a self-report measure to determine attention span levels, then listened to a person speaking with a stutter or a person speaking without a stutter, and rated initial impression traits, social communications perceptions, and their desire for further interaction. Participants then filled out sections of the POSHA-S regarding beliefs about stuttering, people who stutter and self-reactions to people who stutter. This presentation will include the project's findings and implications.

Keywords: Stutter, Attention Span, perceptions, attitudes

UGO-17

Title: The Effects of Art Therapy on the Male Brain

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Sponsoring Institution: Marshall University- College of Liberal Arts- Communication Department

Research Sponsor:

Abstract

Abstract

The Purpose of the Research and Scientific Rationale:

As a group, men in the United States are experiencing severe mental health challenges and not seeking treatment or engaging in therapeutic activities. These mental health challenges are increased by toxic masculinity, which teaches men to suppress their feelings and adhere to traditional male norms. Toxic masculinity creates a barrier to traditional treatment. Previous research has suggested that alternative therapeutic activities might be more effective for some men. Art therapy emerges as a potent intervention, but may be rejected by men who believe it violates traditional male norms. This study investigates the relationships between conformity to masculine norms, mental health stigma, and attitudes toward art as a therapeutic activity.

The Procedures to be Performed (Step by Step):

Study approval will be obtained from the Marshall University Institutional Review Board. Data collection will take place in the spring semester and will be completely anonymous. Before beginning the online study, participants will first respond to a question asking them to identify their sex. Those that indicate they identify as male will be directed to a consent form administered through Qualtrics. Those who indicate that they identify as female or other will be directed to the end of the survey and thanked for their interest, but told they are not eligible to participate. Male participants will first fill out the demographic information questions. These questions will include race, educational level, and age of participants. Next, participants will be asked to respond to a questionnaire that includes measures of masculinity, attitudes toward art therapy, exposure to art therapy, mental health stigma, previous mental health treatment. Participants will be thanked for their time and offered the opportunity to enter the raffle or provide information for course credit via a link that will take them outside of the survey.

The Risks and Potential Benefits of the Research:

There are no risks or benefits to participating in this research.

Complete Inclusion/Exclusion Criteria (may be submitted separately if extensive):

This study focuses on men aged 18 years older. Therefore, people who identify as under 18 or not as male will be excluded from the study. Again, all data will be collected anonymously.

Keywords: Keywords: Art Therapy, neurobiological, destigmatization

UGO-18

Title: Studying behavior and cardiometabolic changes in adolescent age vaping Mice

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Nick Williams, Samuel Tetteh-Quarshie, Scotty Davis, Madysen Terry, Brandon Henderson and Nalini Santanam.

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Sponsoring Institution: Department of Biomedical Sciences, Marshall University

Research Sponsor: Supported by AHA UGR: 850405, AHA Undergraduate Student Research Program at Marshall University and JCESOM matching funds and NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence. CC acknowledges funding from Marshall

Abstract

E-cigarette usage has increased significantly in recent years, especially among adolescents. The long-term health consequences of e-cigarette use are a major concern. Though several studies focused on the effects of vaping on adults, there is a dearth of research on adolescents. The goal was to assess the negative effects of vaping on cardiometabolic and behavioral parameters in adolescents, and if exercise would prevent these effects. Adolescent age (4-5 weeks) wild-type C57bl6 mice and mice that over-express catalase (Cat-tg) were divided into four groups: sedentary, exercise, vape, and exercise + vape. The exercise group ran five times/week at 15m/min on a mouse treadmill. The vaping group was exposed to 6 mg/ml of nicotine for two hours/day, five times/week. Weekly body weights, lean/fat mass using ECHO-MRI, and behavioral tests (open-field, rotarod, and grip-strength) were performed on all groups. At the end of 8-weeks, the mice were euthanized. Lipid/glucose profile was measured in the blood. Results indicated a significant lowering of body weights through the 8-week period for most groups compared to C57-sed, which correlated with a loss of lean mass (MRI). There were no observable differences in the behavior tests or cardiometabolic panel among the groups. While there was a decrease in the mRNA expression of catalase in the liver of C57-exercise, vape, C57 and Cat-tg vape + exercise, there was a corresponding increase in FGF21 in C57-vape, C57 and Cat-tg vape + exercise compared to C57-sed. This shows possible induction of reductive stress due to vaping, which needs further verification.

Keywords: Cardiovascular, metabolism, vaping, oxidative stress

GP-1

Title: Brand Equity in Sport Business: A Systematic Review and Future Directions for Research

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Research Sponsor: N/A

Abstract

Brand equity within the world of sports has been a pivotal and extensively explored topic since its conceptualization in the late 1980s. Over the past two decades, scholarly studies have investigated the impacts of brand equity on sports organizations, athletes, and their sponsors. This study aimed to provide a comprehensive systematic review of the current research on brand equity in sports. The Systematic Quantitative Literature Review (SQLR) approach analyzes and categorizes the findings from selected articles, ensuring a rigorous and unbiased synthesis, and provides valuable insights into the quantitative methodologies and metrics utilized in brand equity research. To conduct this thorough analysis, the research team examined literature from 1995 to 2023 using the EBSCOhost database. This initial search found 575 scholarly articles related to brand equity and sports. To refine the search, only peer-reviewed articles written in English were included. Afterward, the research team conducted title and abstract screening of the remaining articles using additional inclusion criteria and removed 485 articles that did not meet the inclusion criteria. Specifically, inclusion criteria emphasized aspects of brand equity, utilization of quantitative research methods, and exclusive focus on the sports industry. Subsequently, 90 scholarly articles that met the search criteria remained for further analysis. This study provides bibliographic findings, extends the conventional SQLR approach, and employs inductive thematic analysis of article findings to synthesize the knowledge base in extant research. Building upon SQLR findings, several themes were identified in the following areas: (1) "Sponsorship in Sports" referring to the financial or material support companies provide to sports teams, events, or athletes in exchange for advertising rights. (2) "Fan Engagement" encompassing social media interactions, fan events, exclusive content, and interactive experiences. (3) "Rebranding" involving changes to a team's name, logo, colors, or overall brand identity, is often undertaken to revitalize a team's image, appeal to new audiences, or reflect a shift in values or goals. (4) "Athlete Endorsement" entailing professional athletes partnering with brands to promote products or services. (5) "Financial Impact" addressing economic outcomes such as revenue generation, cost management, profitability, and overall financial well-being of sports organizations. This study concluded that understanding these concepts is vital to comprehending the impact of brand equity in the dynamic sports industry. Insights gained from this analysis shed light on the current state of knowledge regarding brand equity in sports while illustrating ways future studies can explore the emerging trends within the field and gaps in the current understanding of the interplay between brand equity and the sports industry.

Keywords: Brand Equity, Sports, Athlete Branding, Sponsorship, Fan Engagement

GP-2

Title: "From Data to Delivery: Driving Cost Efficiency and Operational Improvement in Healthcare"

Authors/Presenters: NONE

College/School: College of Business

Mentor: NANCY LANKTON

Sponsoring Institution:

Research Sponsor:

Abstract

This poster titled "From Data to Delivery: Driving Cost Efficiency and Operational Improvement in Healthcare" showcases the transformative journey of healthcare from traditional methodologies to cutting-edge, data-driven strategies. It illustrates the critical role of data analysis in revolutionizing healthcare delivery, emphasizing the transition towards utilizing big data, artificial intelligence (AI), and machine learning to significantly enhance operational efficiency, reduce costs, and improve patient care quality.

Traditionally, healthcare systems depended on empirical experiences and historical data analysis, which, while foundational, limited predictive analytics and real-time decision-making capabilities. The emergence of big data analytics represents a significant paradigm shift, enabling the analysis of vast datasets to reveal previously hidden patterns, trends, and insights. This poster highlights how predictive analytics can forecast patient admissions to optimize staffing and resource allocation effectively. Moreover, the poster visualizes how integrating electronic health records (EHR) through data analytics has led to improvements in diagnostic accuracy, treatment outcomes, and patient management processes, notably reducing medical errors. It further explores the advent of personalized patient care facilitated by data analytics, allowing healthcare providers to tailor treatments to individual patient needs, thus enhancing medical intervention effectiveness and promoting cost efficiency by minimizing unnecessary treatments and hospital re-admissions.

The poster aims to provide a comprehensive understanding of the impact of data analysis in healthcare, demonstrating through visual elements how leveraging big data, AI, and machine learning not only streamlines operational processes and reduces healthcare costs but also significantly elevates the quality of patient care through personalized treatment plans.

Through visual representations, this poster delves into the proactive aspects of healthcare management, enabled by predictive analytics, which anticipates potential health issues for better outcomes. It incorporates real-world case studies to underscore the tangible benefits of data analysis in healthcare, offering viewers a detailed view of its pivotal role in advancing healthcare delivery.

In essence, this poster captures the essence of healthcare evolution towards a more efficient, cost-effective, and patient-centric delivery model, highlighting the indispensable role of data analytics in driving this evolution, marking a significant advancement in how healthcare services are managed, delivered, and optimized for the betterment of patient outcomes and system sustainability.

Keywords: Data Analysis, Healthcare Delivery, Operational Efficiency, Cost Reduction, Personalized Patient Care.

GP-3

Title: Teenage mental health and technology use

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Sponsoring Institution:

Research Sponsor:

Abstract

This paper conducts an in-depth literature review to address the research questions of (a) what is the current state of teenagers' mental health and (b) what impact does technology have on teenagers' mental health? Inclusion and exclusion criteria were developed to conclude with a total of 23 sources. Relevant themes identified were mental state, links between technology and mental health, technology use, and impact on relationships. Implications included vulnerability factors and blended space. Findings included that teenagers are experiencing a significant mental health crisis; technology is following an upward trend of positive outcomes for mental health; teenage technology use is fairly compact across ten primary platforms and three forms of hardware; and that teenage use of technology and digital media is producing positive outcomes for the development of teenage relationships. A brief discussion of recommendations follows.

Keywords: mental health; technology; teenagers; parent-teenager relationship

GP-4

Title: A Computational Fluid Dynamic (CFD) Investigation of Bone Scaffolds Within a Perfusion Bioreactor

Authors/Presenters: Hannah Rollins, rollins72@marshall.edu

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Sponsoring Institution:

Research Sponsor:

Abstract

Methods: This analytical cross-sectional study consisted of one experimental group and two healthy control groups. Thirty-seven adults (13 females, 24 males; 18.65 ± 1.25 YO, 14.8 ± 1.93 months PO, 1.76 ± 0.09 m, 82.45 ± 15.54 kg) that recently underwent f-ACL-R were randomly selected. Thirty-seven volunteers (13 females, 24 males; 22.08 ± 1.98 YO, 1.77 ± 0.12 m, 77.56 ± 14.52 kg) participated as healthy controls, all currently enrolled as students at Marshall University. Lastly, thirty-seven NCAA athletes (13 females, 24 males; 21.57 ± 1.88 YO, 1.82 ± 0.11 m, 81.27 ± 11.31 kg) were recruited from the Marshall student body. Participants who underwent f-ACL-R were selected at different time points post-operation (9-12 months PO, $n = 3$; 12-15 months PO, $n = 16$; 15+ months PO, $n = 16$). The participants performed 4 bilateral countermovement jumps with no restrictions applied to the CMJ. A 2-way ANOVA test was used to determine the significance with the alpha set at 0.05. Measures of central tendency were calculated for the variables of interest. The two variables investigated were the differences between groups and the differences between sexes.

Keywords: bioreactor, fluid analysis, CFD, scaffold

GP-5

Title: Assessing the mental health of minority students at a Primarily White Institution (PWI)

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Sponsoring Institution: Marshall University College of Health Professions & College of Education and
Professional Development

Research Sponsor:

Abstract

The purpose of the research study “Assessing the mental health of minority students at a Primary White Institution” (PWI) that is designed to examine the mental health functioning of ethnic/racial minority students on the campus of Marshall University, which is a primary white institution. By examining the responses of current racial/ethnic minorities relating to mental health and wellness, researchers will have information as to how we can further assist and influence the mental health and wellness needs of minority students. Research will be compared to national data concerning ethnic/racial minority mental health.

Keywords: minorities, mental health, wellness, students, ethnicities

GP-6

Title: MEDIAL COLLATERAL LIGAMENT THICKNESS AND MEDIAL JOINT WIDTH GAPPING DURING A VALGUS STRESS TEST

Authors/Presenters: Blake Lacy (lacy39@marshall.edu), Bobby Christopher Canterbury (canterbury99@marshall.edu), Dr. Mark Timmons (timmonsm@marshall.edu)

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Sponsoring Institution: Marshall University, College of Health Professions, School of Kinesiology, Athletic Training

Abstract

Context: Ligamentous injuries to the medial knee are common. The width of the medial joint gap (MJG) measured on radiographs has been used to measure medial knee stability. The current study explored the relationship between MJG width and the medial collateral ligament (MCL) on ultrasound during a knee valgus stress (VS) test. The hypothesis was that a negative correlation would be found between MCL width and an increase in the MJG during the VS test.

Methods: Thirty-seven participants without history of medial knee injury were recruited for this laboratory based repeated measures study. The MJG and the MCL widths were measured on ultrasound images collected during a VS test. Two images were collected of each knee, and the mean MJG and MCL width measurements were entered into statistical analysis. Pair T-tests and Pearson correlations were used to determine relationships between MJG and MCL width and change in the MJG during the VS test.

Results: The mean MJG was 7.4 ± 0.14 mm on the right knee and 7.7 ± 1.4 mm on the left in the unstressed condition. With applied VS the right side MJG increased to 11.3 ± 1.6 mm and to 11.9 ± 1.5 mm on the left. There was not a statistical difference between the sides for the MJG in either stressed condition, the MJG during the VS test was statistically greater in the stressed condition on the right (mean difference = 3.9 ± 0.9 mm, $P < 0.001$) and left (mean difference = 4.2 ± 1.1 mm, $P < 0.001$) sides.

The MCL width was 1.9 ± 0.3 mm on the right side and 1.8 ± 0.3 mm on the left. No statistical difference between right and left sides for MCL width ($P = 0.292$). The MCL to MJG width ratios were 0.27 ± 0.05 on the right and 0.25 ± 0.05 on the left side in the unstressed condition and 0.9 ± 0.04 on the right and 0.18 ± 0.03 on the left side in the stressed condition. The MCL to MJG ratio was not statistically different between right and left sides ($P > 0.05$). The decrease in the MCL MJG ratio was statistically significant on right (mean difference = 0.09 ± 0.05 , $P < 0.001$) and left sides (mean difference = 0.09 ± 0.04 , $P < 0.001$). No statistically significant correlations found between the participants' BMI and MCL or MJG

Conclusion: The hypothesis was not supported by the findings. It was expected that the MCL width would lessen while MJG would increase during VS test. However, MCL width slightly increased during VS test. Limitations were that only participants without knee injury were used. This research provides baseline testing information to be used to judge presence and severity of MCL injuries.

Learning Objectives: Describe the change in the medial knee joint gap and the medial collateral ligament during the VS test.

Explain the relationship between the width of the medial joint gap, medial collateral ligament, and the participants BMI.

Discuss the relation between the width of the medial collateral ligament and the change in the medial knee joint gap during the VS test.

Main Take home point: The width of the medial knee joint gap increases during the VS test, but the magnitude of the increase is not related to the participants BMI.

Keywords: MCL Valgus Medial

GP-7

Title: "Ability of DPT students to identify a peripheral artery using palpation vs. ultrasound imaging."

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Sponsoring Institution: Marshall University School of Physical Therapy

Research Sponsor:

Abstract

Purpose/Hypothesis: Inability to detect a dorsalis pedis pulse may indicate peripheral vascular disease, but manual detection can be difficult even in non-pathologic patients. Ultrasound imaging is highly sensitive at detecting arterial pulses. The purpose of this study is to determine if Doctor of Physical Therapy (DPT) students having undergone a modest amount of training with ultrasound imaging will demonstrate enhanced ability to detect the dorsalis pedis pulse compared to standard manual assessment.

Number of Subjects: Twenty-five patients (50 ankles). To date, 40% of subjects have been collected with anticipation of completion prior to July 31, 2023.

Materials and Methods: A sample of convenience from the local university community was utilized. Following consent, manual palpation of dorsalis pedis pulse was performed, using the method taught within the DPT curriculum. If the pulse was located by the student researcher, a second student researcher confirmed accuracy via simultaneous palpation of radial pulse and comparison with the first student researcher's verbal report of pulses, and the location was marked with a surgical marker. The US probe was placed axially at the anterior ankle. The artery was then located in B-mode and confirmed with power Doppler. The centerline screen mark was centered over the artery, and a video recording was captured. The center location of the probe was marked with a surgical marker. A comparison was made between the manual palpation and ultrasound marks. If those two marks were less than the width of the researcher's finger the palpation method was deemed to have been accurate. This procedure was repeated on the opposite ankle. The video recordings were reviewed by an ultrasound-certified faculty member with over five years' experience to assess if the artery was correctly identified.

Results: Preliminary data show that students identified 14/20 or (70.0%) of arteries using manual palpation, and 20/20 (100%) of arteries using ultrasound. Review by a certified and experienced faculty sonologist confirmed 19/20 (95%) of student imaging findings.

Conclusions: Students demonstrated a 30.0% increased ability to detect the dorsalis pedis pulse when assisted by ultrasound imaging. Training in the use of this technology was accomplished with a modest four-hour group training session, suggesting that the skill could be reasonably acquired within an entry-level curriculum or continuing education course.

Clinical Relevance: The difficulty in dorsalis pedis artery palpation can confound clinical decision-making regarding potential need for medical referral. Point-of-care ultrasound imaging is becoming increasingly available, and clinicians can be easily trained to use ultrasound imaging to confirm the presence or absence of arterial flow in cases where manual palpation leaves doubt, thereby reducing unnecessary referrals and resulting in improved care and lowered medical cost.

Keywords: ultrasound, musculoskeletal, peripheral artery, dorsalis pedis, manual palpation

GP-8

Title: Breaking the Chains: Unveiling the impact and resilience of children with a history of substance exposure

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Sponsoring Institution: Marshall University

Research Sponsor: not applicable

Abstract

The opioid epidemic is a national public health crisis that has persisted in our country impacting those who are pregnant and leading to an increase in infants born with Neonatal Abstinence Syndrome (NAS). Research shows that infants exposed to substances in utero have significant developmental differences such as speech, language, emotional, behavioral, and cognitive delays. Unfortunately, there is limited research that indicates neurodevelopmental differences beyond infancy.

The purpose of this research was to evaluate neurodevelopmental outcomes in early school-age period as well as compare outcomes between children whose mothers received medication-assisted treatment (MAT) during pregnancy versus those who did not. In addition, we explored caregiver perspectives of their child's development and their experiences providing care for a child with a history of NAS.

In this study, we used the NIH toolbox cognitive battery and emotional battery to assess cognitive and behavioral functions and psychological wellbeing in 12 children who were exposed to substances in utero. We tested speech using the articulation screening (PLS-5) and grip strength with the hydraulic hand dynamometer. We also used semi-structured interviews with caregivers using qualitative analysis to assess the child's development.

Results from the study indicate that children born to mothers in a MAT program had higher cognitive scores than children with mothers who were not in a MAT program, though these differences were not statistically significant. On the other hand, children with mothers in a program had lower emotional scores than children whose mothers were not in a program. Results between the two groups were also not statistically significant. Psychological wellbeing fell below the mean for both groups compared to typically developing peers. In the interviews, caregivers described adverse childhood experiences and social-emotional challenges in their child with previous substance exposure.

This study emphasizes the emotional and cognitive implications for school-age children with opioid exposure which can help us to understand areas of need for this population. The study is ongoing, so all results are preliminary in nature. As the sample size grows results may continue to shift.

Keywords: neonatal abstinence syndrome, medically-assisted treatment, neurodevelopmental, school-age, children

GP-9

Title: Marxism Expressed Through Science Fiction

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Mentor: Dr. Stephen Underhill

Sponsoring Institution: College of Liberal Arts, Communication Department

Research Sponsor:

Abstract

My research explores the ways in which Marxism and its fundamentals are not only showcased in many examples of science-fiction works, but find themselves at home in the futuristic, dystopian trappings of their settings and narratives. Writers and directors are given the opportunity to couch complex economic, industrial, and sociopolitical conversations found in Marxist rhetoric within the flashy spectacle of the silver screen, drawing audiences in with easy to digest visuals and world building, while leaving them with intriguing reflections on the social and economic climate of current day life. While the conversation surrounding Marxism via news outlets and political punditry is overwhelmingly negative, the way films and novels can present the themes found within Marx's commentary on social and economic issues are more palatable to audiences who are initially won over by the "wrapping" those themes are found within. Action packed set pieces, innovative visuals, and stellar writing can convincingly mask concepts those uninterested in further analysis might overlook entirely.

Keywords: Marxism, Sci-Fi, science fiction, rhetoric, dystopian.

GP-10

Title: TIME 4 K: A collaborative effort to improve children's mental health

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Sponsoring Institution:

Research Sponsor:

Abstract

TIME 4 K is a multidisciplinary program aimed at addressing the rise in children's mental health concerns. The program began in 2019, with funding from the Office of Juvenile Justice, and is continuing with support from the Pallotine Foundation. Stakeholders include Marshall University Departments of Social Work and School Psychology, local elementary schools, community behavioral healthcare providers, and families. The program places graduate students in schools, serving as caring mentors who teach young children coping strategies and problem-solving skills. Levels of support are dependent on the children's needs and may include individual sessions, classroom activities, and/or family outreach. Children are referred for support by school officials and parents.

The initial research phase explored the commonalities among referred children and investigated the intervention outcomes from the children's perspectives. Results from the initial phase were limited by the disruption in services due to COVID-19 school closures. This second phase follows a different group of children during the 2023/2024 academic year. This time, teachers are rating the behavior and emotional concerns of the referred children upon their enrollment in the program, using the BASC-3 BESS measure, and then rating the children's responses to interventions. Preliminary findings show the referred children are displaying more externalizing and internalizing problems compared to their same-aged peers. Data collection and analyses will continue through the end of the school year to yield post-intervention results. These findings will help identify evidence-based interventions for improving children's mental health.

Keywords: children, mental health, interventions

GP-11

Title: Agriculture and Natural Resources Microcredentials to Support Workforce Development in Southwestern West Virginia

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Sponsoring Institution:

Research Sponsor:

Abstract

The areas surrounding Marshall University in Huntington, West Virginia are severely underemployed and economically distressed. As the economy shifts from resource extraction to more sustainable practices, Marshall University has an invaluable opportunity to create a viable workforce in the region, aligning with leading regions in agriculture and natural resources (ANR) by offering microcredentials designed to meet the relevant needs of the current workforce. To evaluate the relevant needs of the current workforce in agriculture and natural resources related careers, a needs assessment was emailed to employees in agriculture and natural resource related industries. The goal of the needs assessment was to identify the changes needed to Marshall University's current curriculum to strengthen skills and competencies required upon entering the region's workforce. The aim of this project is to answer the following questions: 1) what are skills and competencies required for each ANR industry? 2) what are skills and competencies that should be covered for entry-, mid-, and senior-level positions? 3) what microcredentials are needed in close proximity to Marshall University (MU)? The long-term goal of this research project is to increase the quality of life in the region by sustaining workforce development in agriculture and natural resource related careers in southwest West Virginia.

Keywords: Microcredential, Needs Assessment, Workforce Development, Agriculture, Natural Resources

GP-12

Title: Internal Validation of Janovsky Color Test and Testing the Platinum Chloride Microcrystalline Method for Benzodiazepines

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Research Sponsor: North Carolina Department of Justice State Crime Laboratory

Abstract

Benzodiazepines are commonly seen in forensic samples; thus, presumptive tests are useful for the efficient analysis of seized drugs in a crime laboratory. The minimum standard for a targeted approach of analysis set forth by American Standards of Testing Materials (ASTM) and Organization of Science Area Committees (OSAC) adopted by the North Carolina State Crime Laboratory (NCSCCL) requires a series of tests that support one another to identify controlled substances. Currently, the NCSCCL lacks a preliminary test for benzodiazepines. Validation of an efficient, selective, robust, and rugged color test and/or microcrystalline test would improve efficiency in the crime lab, help reduce cost, and reduce the wait time for the consumer. This study will explore the effectiveness of the Janovsky color test and the platinum chloride microcrystalline test as potential preliminary methods to identify benzodiazepines.

Appropriate guidelines for validation were utilized in this study. The Janovsky color test consists of m-dinitrobenzene and potassium hydroxide solutions. An approximate 2% dinitrobenzene solution and 5N potassium hydroxide solution were prepared.

Pharmaceutical and designer benzodiazepines had consistent chemical reactions resulting in an obvious purple color except for lorazepam and oxazepam. Ten forensic science practitioners tested unknown samples using the Janovsky color test and correctly observed the expected color changes. The limit of detection (LOD) was between one part benzodiazepine with 500 to 750 parts diluent. Three drops of Solution A to one drop of Solution B were needed to yield an obvious purple color. Color observation was less obvious when Solution A and solution B were added and approximately two minutes elapsed to perform the test and when Solution A and Solution B were added approximately two minutes apart from one another. When Solution B was added first the reaction was weaker. The more material in the well the more prominent the reaction. When comparing acetone and methanol for cleaning there was no difference in the results of the test.

Five controlled substances most encountered by the NCSCCL were tested to determine if they produced similar effects. A purple color change was observed in the presence of fentanyl but took longer to develop and was not as prominent as with benzodiazepines. The color change reaction for diazepam did not appear to be affected by cocaine base, cocaine HCl, fentanyl, heroin, or methamphetamine.

The platinum chloride reagent microcrystalline test produced distinctive crystals in the presence of some benzodiazepines that can be observed with a polarized light microscope. An approximate 5% w/v chloroplatinic acid hexahydrate solution was prepared. Delorazepam, diazepam, flunitrazepam, and phenazepam resulted in distinct crystal formations. The LOD was between 250 to 500 parts diluent to one part benzodiazepine. The diluents/commonly encountered controlled substances analyzed inhibited crystal formation.

Keywords: Validation, Janovsky, Morphology, Benzodiazepines

GP-13

Title: Validation of the DANI DiscovIR-GC™ Detection System & Identifying Complex Isomers of Controlled Substances

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Research Sponsor: West Virginia State Police Forensic Laboratory

Abstract

In the world of forensic chemistry, gas chromatography – mass spectrometry (GC-MS) is often used within the laboratory to confirm the identity of a controlled substance. This instrumentation commonly utilizes electron impact ionization – a technique that fragments the substance in various ways to make identification easier. However, there are some downsides to this technique, one of the more significant being that with some controlled substance isomers, fragmentation patterns tend to look similar to one another. This makes determining the specific isomer of the substance more difficult. In recent years, synthetic cathinone and nitazene isomers have increased in occurrence within forensic laboratories. These compounds pose serious health threats, and the need for their identification and differentiation is significant. Synthetic cathinone compounds tend to fragment extensively with the electron impact ionization technique; the fragmentation pattern yields convoluted mass spectra that are difficult for the scientist to analyze and distinguish one from another. Nitazene compounds, which have toxicity levels comparable to synthetic opioids, also present problems with the fragmentation technique. The results of the mass spectra for the nitazene isomers appear very similar, making the compounds non-distinguishable from each other. With the use of a technique known as gas chromatography – infrared spectroscopy (GC-IR), different isomers and analogs of a controlled substance can be identified. Because of the emergence of various dangerous controlled substance isomers, the need for confirming the presence of specific positional isomers of the substances has increased. The GC-IR instrumentation allows for these isomers to be distinguished from one another by yielding unique banding and absorption patterns specific to each compound, which is the major difference and benefit of this type of instrumentation as opposed to GC-MS analysis. While the two methods of analysis are both acceptable confirmatory methods when it comes to drug analysis, in the instance of structurally and chemically similar isomers of a controlled substance, the GC-IR technique can be more useful to the laboratory. This project aimed to validate the DANI DiscovIR-GC™ Deposition and Detection System for seized drug analysis in a forensic laboratory. Furthermore, an in-house library of nitazene and synthetic cathinone compounds was also created to benefit the laboratory and aid in identification and confirmation of these specific compounds within forensic casework.

Keywords: Isomers; Nitazene; Cathinone; GC-IR; Forensic

GP-14

Title: Qualitative Analysis of Xylazine, Nitazenes and Common Opioids/Analogues by LC/MS/MS Following Collection with the M-Vac™ Wet-Vacuum System

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Research Sponsor: Marshall University Forensic Science Graduate Program

Abstract

Clandestinely produced drugs and adulterants are constantly being introduced to the drug market by suppliers seeking to avoid detection and penalties. The introduction of synthetic opioids like fentanyl and nitazene compounds along with the non-opioid sedative, xylazine, to the illicit drug supply has made it increasingly difficult to determine the true contents of already dangerous drugs. Fentanyl boasts a potency that is 100 fold greater than that of heroin, while nitazene compounds are 10 fold more potent than fentanyl^{1,2}. Even more unsettling, xylazine, also known as “Tranq” and “Zombie Drug”, is known to worsen the life-threatening effects caused by opioids while also causing severe necrotic skin ulcerations³. Although naloxone is effective in reversing the effects of opioids, like fentanyl, it proves inadequate in regard to the potency of nitazene compounds and the pharmacological effects of xylazine^{2,3}. The combination of xylazine with fentanyl has been seen in 48 states and appears to be following the same East-to-West progression as fentanyl^{3,4}. In April 2023, the use of fentanyl adulterated or associated with xylazine (FAAX) was declared an “emerging drug threat” by the United States government³. These drugs/adulterants are likely entering the United States drug supply at a rapid rate due to a lack of detection at the postal inspection level, as there is currently no method for detecting these drugs in the increasingly small amount required to exhibit their effects. The Marshall University Forensic Science Center sought to devise a new method for qualitative analysis of these compounds along with commonly encountered opioids found on packaging materials. The inside of packaging material was investigated for trace amounts of drugs using an M-Vac™ Wet-Vacuum System. This instrument has been successful in recovering trace amounts of touch DNA and holds potential when applied to trace drug recovery⁵. The phosphate buffered solution used during M-Vac™ recovery is typically discarded following filtration to isolate DNA. The discarded solution can then be analyzed for the presence of drugs.

Thirty four drugs/adulterants/standards were included in this study: lidocaine, quinine, dextromethorphan, diphenhydramine, protonitazene, N-desethyl isotonitazene, N-pyrrolidino protonitazene, nitazene, xylazine, and the scheduled drugs/adulterants included codeine, morphine, fentanyl, cocaine, heroin, oxycodone, hydrocodone, methamphetamine, methadone, buprenorphine, ketamine, isotonitazene, metonitazene, carfentanil, valeryl fentanyl, U-47700, AH-7921, 6-monoacetylmorphine (6-MAM), acetylcodeine, isotonitazene-d⁷, metonitazene-d³, fentanyl-d⁵, heroin-d⁹, acetylmorphine-d³ and acetylcodeine-d³. The M-Vac™ was used to recover a 5 mg homogenized sample containing these 34 compounds from the inside of a Tyvek envelope. A 5 mL aliquot of the phosphate buffered solution from the M-Vac™ collection underwent solid phase extraction followed by qualitative analysis. All 34 compounds were successfully identified using liquid-chromatography tandem mass spectrometry (LC/MS/MS) to analyze the sample extract. The results from this initial study demonstrate the potential for the identification of drug residues from porous substrates (such as packaging materials) and from a sample previously discarded following DNA collection.

Keywords: LC/MS/MS, M-Vac™, Extraction, Xylazine, Nitazenes

GP-15

Title: Optimization and Expansion of Cannabinoid Assays for Quantitation of Delta-8-THC

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Research Sponsor: Alabama Department of Forensic Sciences

Abstract

Delta-8-THC has become increasingly popular in recent years. While delta-8-THC is technically legal under the Agriculture Improvement Act of 2018, many states are introducing legislature to regulate, restrict, or ban delta-8-THC. Twenty-one states currently have some regulation of delta-8-THC and there could be federal regulation of delta-8-THC with the upcoming 2023 Farm Bill. Currently the Alabama Department of Forensic Sciences (ADFS) only performs qualitative analysis for delta-8-THC in toxicology specimens and they are looking to implement a method for quantitation of delta-8-THC.

A deuterated internal standard for delta-8-THC recently became available for the purposes of quantifying delta-8-THC. The new internal standard and a few novel cannabinoids were tested to determine if they were interferences with analytes currently tested using the ADFS cannabinoid assays. This new internal standard was then evaluated for use as the internal standard to quantitate delta-8-THC. In addition, the method of standard addition (MSA) was evaluated as an alternative method to quantitate delta-8-THC since ADFS does not have a validated method for quantitation of delta-8-THC using a traditional external calibration method.

The results of this study indicate that the new internal standard could be added to the ADFS assays for qualitative analysis and with further testing it could be implemented for quantitative analysis. MSA was also determined to be a viable alternative method for quantitation of delta-8-THC.

Keywords: Forensic Science, Toxicology, Delta-8-THC, LC-MS/MS, Method of Standard Addition

GP-16

Title: Probabilistic Genotyping Analysis of Trace DNA and Transfer Evidence

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Research Sponsor: Marshall University Forensic Science Graduate Program

Abstract

The amount of trace DNA deposited on a surface is typically dependent on how readily an individual sheds cells and the amount of pressure applied to the object. Phase I of this project addressed deposition procedures, best depositors, and the feasibility of generating a profile. Phase II focused on the transfer of trace DNA using two depositors.

Probabilistic genotyping (PG) software, STRmix v2.6.2, was utilized to examine the statistical confidence of potential contributor genotypes to better assess the usefulness of the data. For Phase II sample analysis, the numerator for all ratios included both contributors, while the denominators were designed to assess each contributor as a person of interest (POI). Each POI deconvolution was run in triplicate.

The PG analysis was evaluated for accuracy in the POI genotypes. Rather than reporting only allele counts, likelihoods that met the 99% 1-sided highest posterior density (HPD) were reported to communicate the statistical strength of the results.

The samples in this study were below potential stop at quantitation values and instrument and dye specific stochastic thresholds, meaning these samples would likely have not been usable for an accredited laboratory with sufficient validation. Additionally, when only focusing on allele counts, the same count does not always mean the presence of the same alleles which adds to the complexity of evaluating the usefulness of trace DNA evidence.

Trace DNA, while seemingly prominent, is not a good source of DNA to confidently decide on the presence of an individual or the providence of the evidence. As seen through this experimentation and probabilistic genotyping analysis, it is unlikely a useful DNA profile is obtained only through transfer. This study also supports the need for validation and understanding of the performance of low-level data and transfers.

Keywords: Trace DNA, Probabilistic Genotyping, STRmix, DNA Analysis

GP-17

Title: Internal Validation of the M-Vac for Forensic Use

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Research Sponsor: Marshall University Forensic Science Graduate Program

Abstract

As DNA analysis continues to stand as a pillar in the discipline of forensic science, new technology within the field is routinely emerging. One technology that has been around for several years, but has recently started to find a niche within some forensic laboratories, is the M-Vac[®]. Short for microbial vacuum, the M-Vac[®] harnesses wet vacuum technology to release cellular material confined within a substrate through a combination of mechanical forces.¹ As the substrate is sprayed with sterile buffer, the vacuum generates a turbulent force enabling the recovery of DNA in the collection device.¹ Once DNA is retrieved from the substrate, it is conveniently concentrated onto a filter, which can then be used for extraction. In the forensic community, decades old cold cases have exhausted traditional retrieval methods, resorting in the need to explore non-traditional methods. The M-Vac[®] has been used successfully in recent years to finally generate DNA profiles, and subsequent answers, in several of these cold cases. The ability to cover large surface areas, even on evidentiary substrates that are difficult to sample, and capture DNA where traditional methods have failed has made the M-Vac[®] a revolutionary recovery method. In order for the instrument to be utilized on forensic casework as a collection method, the laboratory must perform an internal validation.² The internal validation studies performed throughout this effort included concordance, contamination, sensitivity, repeatability, reproducibility, and mock evidence testing.^{2,3} The contamination study was conducted by taping the border of the workbench and mapping out a 7.5cm perimeter from each stain to assess potential DNA contamination from the spraying mechanism. The results showed low level contamination on the taped perimeter, and no contamination between the two stains at a distance greater than 7.5cm was observed. To assess sensitivity, a serial dilution of whole blood was prepared and spotted onto a substrate and collected using the M-Vac[®]. The average percent recovery was 25.7%, in which twelve of the fifteen samples were above Marshall University Forensic Science Center's stop-at-quantitation threshold. The quantitation results also showed that the M-Vac[®] is capable of capturing DNA as low as 0.0146 ng/ μ L without falling below the stop-at-quantitation threshold. Using the same preparation method for serially diluted whole blood, it was spotted onto a substrate and wet/dry swabbed. The average percent recovery was 3.5%. The mock casework study was performed on substrates typically encountered in sexual assault kits, such as underwear. Other commonly encountered items, such as hats, ropes, and gloves were also tested. The M-Vac[®] obtained a notably higher quantity of DNA comparative to wet/dry swabbing when sampling underwear, baseball hats, and some cord samples.

Keywords: Microbial Vacuum, DNA analysis, Forensics

GP-18

Title: The Validation of a Manual Selective Degradation Method of Differential Extraction

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Research Sponsor: Kentucky State Police Central Laboratory

Abstract

Differential extraction is a tried-and-true method for the separation of sexual assault samples into female and male fractions which allows for a more efficient analysis of sexual assault evidence. This method of separation, however, can issue many challenges due to the multiple pipetting steps involved. Selective degradation is a promising technique used for differential extraction that makes separation a quicker process by eliminating pipetting and centrifugation steps through the addition of a nuclease and makes interpretation easier and more efficient by producing a more pure male fraction. The present research aimed to validate the manual application of the selective degradation method of a differential extraction using the Erase Sperm Isolation Kit and similarly made in-house DNase reagents. For this research, a comparison of the Erase reagents and DNase reagents was made using serial dilution swabs as well as mock casework swabs already processed with KSPCL's current method of differential extraction, using the QIAcube. A sensitivity study was performed to assess how well both reagents recovered sperm cell DNA at different seminal dilutions. The sensitivity study was reproduced to ensure consistent results were obtained with both reagents when performed by the same analyst. A mock casework study was performed to assess repeatability with both reagents when compared to the QIAcube. This study highlights the promising nature of using Erase and DNase reagents for the selective degradation method of a manual differential extraction when compared to using the QIAcube, but also suggests the need for further research and improvements of the methods. A lot of variability was seen in the data of this research and because validations take a lot of time and resources, KSPCL was unable to continue this validation at this time. Once more research can be conducted, the implementation of selective degradation would provide KSPCL with a method of differential extraction that is not only cost and time efficient but has been proven by this research to give typable STR profiles that are as readily interpretable as the profiles produced using the QIAcube.

Keywords: Differential; Extraction; DNA

GP-19

Title: Ecological Services of Urban Trees on Marshall University's Campus

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Sponsoring Institution: Marshall University, Department of Biological Sciences

Research Sponsor: WV NASA Grant, WVSU, Geological Society of America, The Garden Club of America, Appalachian Vegetation Management Association.

Abstract

Many urban areas lack significant tree cover and are primarily dominated by impervious structures such as roadways, parking lots, and buildings. Urban trees provide many ecosystem services, including rainwater retention and flood mitigation as they increase water infiltration. Thus, they are important during periods of high rainfall as they can reduce and postpone peak flow. My first objective is to examine how urban trees mitigate the severity of precipitation events. I hypothesize that canopy interception by trees will result in a time lag in surface runoff and reduce the intensity of the precipitation event. The second objective of this study is to complete a full tree inventory for the Marshall University campus. I will use i-Tree Eco to quantify the ecological services provided by campus trees. To date, I have inventoried 512 trees representing 69 different species on campus. My research will enhance the understanding of how urban trees can help divert and temporarily intercept precipitation runoff away from the Municipal Storm Drainage Systems through interception and stemflow. An updated campus tree map will provide fundamental information on the diversity of trees already on campus to guide future plantings and enhance biodiversity.

Keywords: Urban, trees, precipitation, services, campus

GP-20

Title: The Impact Of Unweighting Time & Eccentric Impulse On Return To Play For Athletes With A Fertilized Anterior Cruciate Ligament

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Sponsoring Institution: Marshall Unviersity

Research Sponsor: N/A

Abstract

Context: This study investigated change of direction metrics between fertilized anterior cruciate ligament reconstruction (f-ACL-R) patients compared to healthy controls. We expect that utilizing an f-ACL for the ACL-R procedure should lead to values in eccentric impulse and unweighting time with minimal differences when compared to healthy non-athletic controls, but larger differences when compared to healthy athletes.

Keywords: Eccentric Impulse, Unweighting Time, f-ACL-R

GP-21

Title: Finding A Needle in a Haystack: one laboratory's quest to streamline DNA profile interpretation

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Research Sponsor: Palm Beach County Sheriff's Office

Abstract

The subjectivity inherent to the interpretation of complex DNA profiles has been an ongoing challenge for forensic laboratories since the late 1990's. The desire for consistency among analysts has been a persistent topic within the forensic biology and legal communities, resulting in multiple studies, papers, and critiques of the discipline. Probabilistic genotyping tools have aided the forensic community in moving toward standardization. While probabilistic genotyping has reduced the subjectivity in DNA mixture deconvolution and statistical analysis, the reality is that there are still aspects of DNA interpretation that remain subjective among analysts within and between laboratories. One such aspect is whether or not a DNA profile is actually suitable for comparison. To address this, the Forensic Biology Unit at the Palm Beach County Sheriff's Office took a second look at their STRmix™ validation data. Two, three, and four person mixtures of varying contributor ratios and template amounts were compared against 500 known non-contributors. Non-contributor matches were evaluated for the number of alleles expected versus obtained, template amount as defined by STRmix™, and the percent of drop-out per contributor. The data were then correlated against generated 99% 1-sided highest posterior density (HPD) likelihood ratios in an effort to establish allele drop-out percentage and minimum template amount thresholds. Additionally, 249 anonymized casework samples of varying contributor ratios and template amounts were compared against 500 known non-contributors. The resulting matches were evaluated for the template amount as defined by STRmix™ and the percent of drop-out per contributor. The validation mixtures were then correlated to the casework mixtures to determine if the same trends were seen in both data sets. The result of this re-evaluation will be to implement thresholds to work in tandem with STRmix™ results reducing variability among analysts, limiting potential legal questions regarding subjective interpretations, and ultimately creating a more streamlined approach to the analysis of complex DNA mixture interpretation.

Keywords: DNA, mixture, interpretation, genotyping

GP-22

Title: Performance Comparison of three viral RNA pathogens in MK Buffered Solution for Diagnostic Based Detection using quantitative PCR vs droplet digital PCR.

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Sponsoring Institution:

Research Sponsor: Puritan Medical Products

Abstract

Performance Comparison of three viral RNA pathogens in MK Buffered Solution for Diagnostic Based Detection using quantitative PCR vs droplet digital PCR.

Background: Droplet digital PCR (ddPCR) by partitioning a single reaction into many thousands of nano-droplets allows for the absolute quantitation of a given DNA/RNA target and represents the gold standard for the identification and quantification of pathogens in clinical and environmental samples. While nucleic acid based molecular diagnostics have become fundamental for the accurate and rapid quantification of specific pathogens, these instruments are still based upon quantitative PCR (QPCR) assays. The goal of this study was to assess the compatibility of a MK Buffered solution with three different RNA viruses combined into two standard clinical negative matrices and compare performance of ddPCR and QPCR for all three pathogens.

Methods: Serial dilutions of heat-inactivated Sars-CoV-2 (NR-52286), Influenza A (ATCC VR-1469) and RSV-A (ATCC strain VR-26) were combined into a single tube and added to two confirmed clinically negative matrices, Nasal and Sputum (Lee Biosolutions, Maryland Heights, MO). Serial dilutions of the combined pathogens were added to sample tubes containing 500 μ L of MK buffered solution yielding final concentrations of each pathogen over 4 orders of magnitude in each clinical matrix. For each sample 300 μ l was processed for RNA isolation using standard RNA isolation kits (Zymo Viral RNA Kit). For ddPCR samples were quantified for all three pathogens using a BioRad® Droplet Digital PCR System (QXD200). For QPCR, samples were quantified using Quantitative real-time PCR using Promega GoTaq® Probe 1- Step RT-qPCR System. The same TAQMan® probes specific for each pathogen were used for both systems.

Results: Yields of all three viral RNAs were significantly lower from sputum samples as compared to nasal samples. For all three pathogens the ddPCR assay was an order of magnitude more sensitive than observed with QPCR. QPCR and ddPCR values showed a significant linear relationship for all three pathogens (Sars-CoV-2, $r^2 = 0.984$; RSV A, $r^2 = 0.814$; Influenza A, $r^2 = 0.985$).

Conclusions: QPCR and Droplet digital PCR accurately quantified concentrations of all three RNA pathogens in both clinically negative nasal and sputum matrices across four orders of magnitude, though detected yields were significantly lower in samples spiked into the sputum matrix. For all three pathogens there was a significant linear relationship with decreasing concentration. ddPCR was an order of magnitude more sensitive than QPCR for all three pathogens.

Keywords: PCR, RNA pathogens, Diagnostic, Performance

GP-23

Title: Cytotoxicity of Reactive Oxygen Species is Reduced by Pterostilbene in Renal Proximal Tubular Epithelial Cells

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Research Sponsor: Supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence.

Abstract

Natural products have shown promise in reducing nephrotoxicity by the cancer chemotherapy agents cisplatin and doxorubicin that generate reactive oxygen species (ROS) such as hydrogen peroxide (H₂O₂). Pterostilbene is a constituent in blueberries that possesses antioxidant and anticancer activity. The hypothesis for this project is that pterostilbene will reduce the oxidative stress in cells associated with cancer chemotherapeutic agents. A human proximal tubular epithelial cell line, HK2, were exposed to 0-2000 uM hydrogen peroxide (H₂O₂) for 24h in the presence of 0-10 uM PTER. Cells were also incubated for 24h with 0-30 uM Cisplatin in the presence of 0-10 uM PTER. All HK2 cells were preincubated 1 hour with 0-10 uM of pterostilbene and followed by 24h coincubation with 0-2000 uM hydrogen peroxide or 0-30 uM cisplatin. Upon completion of the incubation cell viability was assessed using the MTT assay and cell Countess. A minimum of 4 independent experiments were conducted for each western blot analysis. PTER at 5 and 10 uM reduced cisplatin cytotoxicity. PTER reduced H₂O₂ cytotoxicity. Pterostilbene alone did not appear to change cleaved caspase 3. H₂O₂ did not increase trypan blue exclusion. These results indicate that PTER reduced damage by H₂O₂ and cisplatin.

Keywords: Renal, Antioxidant, Pterostilbene, Apoptosis, Cisplatin

GP-24

Title: Optic atrophy in a diabetic patient on hemodialysis

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Research Sponsor:

Abstract

Optic atrophy is a rare disease that affects approximate 1 in 35,000 individuals and can lead to permanent vision loss. Conditions that cause optic atrophy include changes in intraocular pressure, inflammation, infections, trauma, toxins, congenital problems, nutritional deficits, or medications. We present the case of a 71-year-old female with type 2 diabetes and end-stage renal disease due to poorly controlled hypertension who complained of the gradual onset of bilateral blurred vision over a couple of months. Her primary care physician felt she most likely had diabetic retinopathy. However, a retinal scan showed optic atrophy. Work up included magnetic resonance imaging (MRI) of the brain and optic chiasm and multiple blood tests to establish the etiology of the optic nerve atrophy. Surprisingly she had a mildly elevated lead level of 5 mg/dl and a positive QuantiFERON gold test. On further questioning she had a history of TB exposure in the past and did not recall if she was treated. Her sputum for TB and chest x ray were negative for acute infection. We did not identify a definite source of lead however the patient replaced her dishes and tested the paint in her apartment. She had dialysis urgently a couple of times before the onset of symptoms and was on regular hemodialysis at the time of presentation.

This case is unusual because her decreased vision was not diabetic retinopathy, but optic atrophy.

Research into the possible causes of her eye problem showed an association of many eye diseases with hemodialysis including optic atrophy. We also found that elevated lead and other trace elements can occur after dialysis. When faced with a diabetic patient with blurry vision ophthalmologic referral should be obtained quickly as some causes of optic atrophy such as lead toxicity are treatable.

Keywords: optic atrophy, lead poisoning, latent tuberculosis, hemodialysis

GP-25

Title: The Impact of Antabuse (Disulfiram) on the Intestinal Microbiome and Evaluation of Impact on Gram-Positive Bacteria

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Research Sponsor: NIH/NIAID 1R15AI151970

Abstract

Disulfiram (DSF) is a drug used to treat alcohol addiction by creating unwanted side effects upon the consumption of alcohol. It has not been confirmed as to what effects this drug has on the gastrointestinal microbiome. DSF was evaluated using C57/B6 mice in a short-term administration model. This drug has shown antimicrobial activity against Gram-positive organisms, which should correlate to a relative abundance increase in Gram-negative microbes. Two different sections of the intestinal tract were harvested as well as a fecal sample and evaluated using 16s DNA analysis. Male and female mice were included in the study to verify the effects across genders. The major changes surfaced in the male fecal samples. The ileum did not have any major changes, likely due to the few number of species endemic in this area by proximity to stomach acid. The cecum being closer to the colon had several significant changes, and the feces had major shifts in species composition. All data was evaluated between DSF and Control, and per sex grouping. Overall DSF changes the gut microbiome when administered, and a longer-term study would be beneficial to see if these changes are maintained.

Keywords: Disulfiram, Pharmaceutical, Microbiome, Drug Repurposing, Clostridium

GP-26

Title: The Role Of Astrocytes In The Regulation Of Neuronal Fear-Related Circuitry Following Adolescent Ethanol Exposure

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Research Sponsor: Neurobiology Research Laboratory, Hershel 'Woody' Williams Veterans Affairs Medical Center, Huntington, WV 25704, USA

Abstract

Adolescence is a crucial period for neurological development. Binge-drinking during this period has been associated with long-term disruption of neuronal and cognitive function. How non-neuronal cells contribute to these deficits remains understudied, yet recent work shows that astrocytes can influence cognitive performance through the modulation of local and projecting neuronal circuitry. Via their peripheral astrocyte processes (PAPs), they ensheath synapses and maintain overall synaptic health. Our previous data demonstrated that adolescent intermittent ethanol (AIE) disrupts hippocampal PAP-synaptic proximity, hippocampal astrocyte function, and cognitive performance that is dependent on hippocampal (Hipp)-medial prefrontal cortex (mPFC)-amygdala (AMG) connectivity. Here we investigate how AIE and GqDREADDs activation within Hipp astrocytes influences the Hipp-mPFC-AMG fear circuitry and contributes to the recovery of freezing behavior in the contextual fear conditioning task.

Methods: Female and male Sprague Dawley rats received bilateral dHipp injection of GqDREADDs targeted to astrocytes. Rats received intermittent EtOH or H₂O from PND 30-45. After a 26-day washout (26DWO) period, rats received saline or clozapine-N-oxide (CNO, i.p.). 30 min. post-injection, rats performed the contextual fear conditioning task or were euthanized to assess cFOS activation.

Results: dHipp astrocyte activation via GqDREADDs+CNO (Gq+CNO) attenuated AIE-induced freezing deficits in the contextual fear conditioning paradigm in male rats. In behaviorally naïve male rats, dHipp astrocyte activation (Gq+CNO) resulted in a significant increase in neuronal (cFOS) activation in H₂O and AIE groups within the infralimbic and prelimbic mPFC, yet astrocyte activation was only increased in the H₂O group. Additionally, dHipp astrocyte activation (Gq+CNO) increased neuronal and astrocyte (cFOS) activation in both H₂O and AIE groups within the AMG. Female data collection is ongoing and will be presented.

These data show that dHipp astrocytes can influence local dHipp neuronal activity and neuronal activity within the dHipp-mPFC-AMG fear-associated neuronal network. Whether attenuation of the AIE-induced loss of freezing behavior through the recovery of astrocyte function is dependent on astrocyte-regulated-neuronal activity across mPFC-dHipp-AMG projecting neuronal circuit is yet to be determined. Future studies will investigate the role of astrocytes in these regulating projecting neuronal circuits in the context of AIE and as a potential non-neuronal therapeutic target for alcohol-induced cognitive deficits.

Keywords: adolescence, alcohol, astrocyte, neuronal circuitry, fear conditioning

GP-27

Title: Telomerase Activity Levels Vary Among Natural Populations of *Arabidopsis thaliana*

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Research Sponsor: National Institute of Health

Abstract

Telomeres are repetitive DNA sequences that cap the ends of Eukaryotic chromosomes and are critical in maintaining genome stability. As cells divide, telomeres shorten until they reach a critical threshold, and the cell population enters senescence. The telomerase enzyme is expressed in germline and stem cells to counteract this reduction in telomere length by adding telomere repeats at the termini of chromosomes. While genetic factors regulating telomere length itself are actively studied, genetic factors regulating telomerase activity are less well understood. To probe these factors, we have utilized various genetic backgrounds in the plant model system *Arabidopsis thaliana*, as well as a qPCR-based approach to quantify telomerase activity. Our preliminary results from this work indicate that the enzymatic activity of telomerase varies substantially based on genetic background, with approximately a 500-fold difference in activity among natural populations. Furthermore, when comparing the telomere length and telomerase activity within the same genetic background there is no correlation between the two values. This suggests that *in vivo* telomerase activity and telomere length are likely regulated by factors beyond the *in vitro* telomerase activity measured in our assay. Further studies will aim to quantify telomerase activity in additional genetic backgrounds to identify specific genetic loci responsible for the observed variation in telomerase activity.

Keywords: Telomerase, natural variation, *Arabidopsis thaliana*

GP-28

Title: Subungual Onycholemmal Cyst: A Benign Cause of Longitudinal Melanonychia

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Research Sponsor: N/A

Abstract

Subungual onycholemmal cysts (SOC) are an abnormality of the nail resulting in a benign growth beneath the nail plate that typically presents with varying features of onychodystrophy, including nail plate discoloration, ridging, thickening, and separation from the nail bed. Diagnosis and treatment of SOCs are essential to mitigate further dystrophy and permanent damage to the nail. The following case is an example of a 50-year-old African American female who presented with a darkened area of her 5th digit toenail, consistent with longitudinal melanonychia 4mm in width. Due to the enlargement of the discoloration and the involvement of the proximal nail fold, suggestive of a positive Hutchinson sign, a nail biopsy was performed to exclude subungual melanoma. The results of the biopsy were consistent with SOC. This case demonstrates the importance of considering SOC as a differential diagnosis for longitudinal melanonychia or pseudo-Hutchinson sign. Additionally, when evaluating nail abnormalities, providers should utilize a high degree of clinical suspicion and proper biopsy methods to ensure appropriate treatment, minimize further damage, and exclude malignancy.

Keywords: Subungual onycholemmal cyst, longitudinal melanonychia

GP-29

Title: Assessing Immediate and Lasting Effects of Student Physical Therapists' Participation in a Leadership Development Program

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Abstract

Context: Leadership opportunities among Doctor of Physical Therapy (DPT) and Physical Therapist Assistant (PTA) students are required for accreditation but implementation varies widely. Leadership capacity is increasingly important in today's complex healthcare environment; equipping graduates with skills necessary to face those challenges is warranted. Our research measured leadership practices of current DPT and PTA students before and 1 year after attending a 2-day extracurricular leadership development event.

Methods: A convenience sample was recruited from the 2022 and 2023 Student Leadership Academy (SLA) sponsored by the American Physical Therapy Association - West Virginia (APTA-WV). All attendees were enrolled in an accredited DPT or PTA program within WV. Consent was obtained and study participants were assigned a random identification number to maintain confidentiality of responses. Participants completed the Leadership Practices Inventory (LPI) and demographic profile on day 1 of the SLA and 12 months following. The LPI is a widely used, reliable, and valid tool consisting of a 30-item self-report questionnaire measuring presence and frequency of exemplary leadership behaviors. Five subscales/leadership practices are defined by the LPI: Model the Way, Inspire a Shared Vision, Challenge the Process, Enable Others to Act, Encourage the Heart. On day 2 of the SLA, participants received instruction regarding their results and participated in a facilitated session where they created an individualized leadership development plan. One year follow-up was conducted via email. Two-thirds of the initial 18 participants (5 males, 7 females; ages 23-27; all DPT) responded to follow-up. Data was transferred to Microsoft Excel™ and analysis included descriptive and inferential statistics.

Results: The most frequently observed leadership practices among initial participants (n=18) included Enable Others to Act (mean: 24.6; SD: 2.2; range: 20-28) and Encourage the Heart (mean: 23.5; SD: 3.8; range: 16-29). Mean total LPI scores improved among the 12 participants who completed initial and follow-up administrations (initial: 111.3; follow-up: 118.8; p=0.04). During the 1-year follow-up period, the greatest improvement in mean score was demonstrated in Challenge the Process (initial: 19.6; follow-up: 24.3; p=0.0009) and Inspire a Shared Vision (initial: 20.4; follow-up: 23.3; p=0.001). A one-tailed, paired t-test revealed changes in total and each practices' scores were not due to chance (p-value <0.05).

Conclusions: These research findings suggest that a 2-day student leadership development event may serve to enhance leadership practices/behaviors and propel emerging physical therapy leaders. Identifying baseline perceived leadership practices among DPT students may facilitate continued leadership development and assist with evaluating change over time. Entry-level leadership curriculum and extracurricular leadership development initiatives are necessary to achieve APTA's mission and prepare physical therapy practitioners to address healthcare challenges. These results signify the importance of programs such as the SLA to foster the growth of future physical therapy leaders.

Keywords: leadership, physical therapy, students, healthcare, development

GP-30

Title: Revitalizing Laboratory Services: Lessons from a Quality Improvement Project in Rural Malawi

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Sponsoring Institution: Ekwendeni Mission Hospital

Research Sponsor:

Abstract

Intro:

Malawi is a small landlocked country in south-east Africa that faces many healthcare challenges due to limited resources and underdeveloped infrastructure. Essential medications and laboratory equipment are frequently inadequate, especially in rural areas such as the town of Ekwendeni. Ekwendeni Mission Hospital (EMH) is a 100-bed hospital where Marshall medical students can complete rotations, that services over 370 rural villages. While completing a summer research project there, it was learned that all laboratory tests besides malaria and hemoglobin were out of service and patient care was compromised.

Methods:

A quality improvement project (QIP) was initiated at the request of the head physician and laboratory director to try to get some of these machines back up and running over the span of 4 weeks. To best serve EMH's laboratory and its resources, a walk-through of the lab was conducted with discussion of where quality and safety could be improved. Based on the data collected in this review, a list of supplies needed was created, and goals for machine maintenance and quality control were set. A modest donation was secured for the supplies needed, and as a team, lab practice standardization was begun. Training on manual CBC counts was conducted so that the lab could perform these even when the analyzers were not running. Local and national government officials were contacted and the companies who had donated the supplies were able to secure new service contracts for the machines that were out of service. New temperature checks were also implemented in the blood banking area to ensure the quality of blood products.

Results:

At the end of the project, a presentation was given during morning rounds to the hospital staff to integrate the lab back into the clinical side of the hospital. The staff was taught how to use lab results to decrease antibiotic resistance. A month after the QIP was completed, the hospital had a functioning hematology analyzer, chemistry analyzer, HIV testing, and TB testing. In sub-Saharan Africa, there is always difficulty with having reagents and electricity to run the lab, and despite initial success, the chemistry analyzer is out of service again. However, after the education sessions provided, the staff at EMH are now highly knowledgeable and equipped to handle these struggles.

Conclusions:

In a few weeks, standardization of lab practices and updates in equipment allowed a previously non-functioning laboratory to again service patients. This project also highlighted the need for not only supply donations in rural Malawi, but continuing support for material donations in the form of service contracts and personnel training.

Keywords: Rural Healthcare, QIP, Laboratory Services

GP-31

Title: Molecular Mechanisms of β -Arrestin Modulated Cannabinoid Tolerance

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Research Sponsor:

Abstract

Cannabinoids are becoming a commonly used analgesic for the treatment of pain conditions, but prolonged utilization of cannabinoids can lead to tolerance to their antinociceptive effects, posing an obstacle to their therapeutic use. Tolerance to cannabinoids occurs when agonists are constantly present which desensitizes and/or downregulates cannabinoid receptors. Cannabinoid receptors (CB1R) are desensitized when G protein-coupled receptor kinases (GRKs) phosphorylate the receptors and β -arrestin gets recruited to putative GRK phosphorylation sites at residues 426 and 430 on the phosphorylated receptor. Receptor internalization is facilitated by β -arrestin recruitment to a second set of GRK phosphorylation sites of the distal C-terminus. Our lab has developed and worked with three different CB1R knock-in mutations of GRK phosphorylation sites to study the effects of each phosphorylation site mutation on cannabinoid tolerance. The S426A/S430A mutant mice express serine to alanine point mutations making them resistant to desensitization due to the prevention of GRK phosphorylation and β -arrestin recruitment to these residues. These mice display a reduction in cannabinoid tolerance. The six point mutant (6PM) mice express serine/threonine to alanine point mutations for six putative GRK phosphorylation sites involved in CB1R internalization which inhibits GRK phosphorylation and β -arrestin recruitment to these sites causing the prevention of receptor internalization. These mice show an increase in cannabinoid tolerance. These first two mutant models demonstrate the effects of preventing only desensitization (S426A/S430A) and preventing internalization only (6PM). The approach of our newly produced eight-point mutants (8PM) is to investigate the effects of completely blocking β -arrestin recruitment to CB1R on tolerance to cannabinoids. The 8PM mice express mutations at all eight putative phosphorylation residues involved in recruitment of β -arrestin to the CB1R which completely blocks β -arrestin recruitment, thereby preventing both desensitization and internalization of CB1Rs. This mutation is expected to reduce tolerance to cannabinoids. The S426A/S430A mice, 6PM mice, and the addition of the 8PM mice models will further assist in elucidating the mechanisms of cannabinoid tolerance providing insight for the development of cannabinoid therapeutics with lowered risk of tolerance for the treatment of pain.

Keywords: Cannabinoid Tolerance B-arrestin GRK Phosphorylation

GP-32

Title: The Effects of High Glucose on the Release of Exosomes From Adipocytes

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Research Sponsor:

Abstract

Exosomes (EX) are extracellular vesicles mediating cell-cell communication by transferring molecules, and their function varies under different situations. We aim to determine the role of high glucose (HG) in the level, contents, and function of EXs from adipocytes (Adp-EXs). Adipocytes were grown in the media with normal glucose (NG) or HG (25 mM). Adp-EXs were collected using ultracentrifugation and their level and size were measured using a Nanoparticle Tracking Analysis. The microRNA (miR) - 210 level was determined by RT-PCR. Adp-EXs (5×10^8 particles/mL) were co-incubated with endothelial cells (ECs) for 24 or 48 hrs to evaluate the cellular communication function. Adp-EXs were labeled with PKH26 (2uL/mL) for tracking the incorporation of Adp-EXs with the ECs. Dihydroethidium (DHE) staining and flow cytometry were performed to measure the reactive oxygen species (ROS) production. Results showed that 1) The level of Adp-EXs in HG group was higher than NG group. There was no difference in the size between HG and NG groups. 2) The level of miR-210 was decreased in the adipocytes and the Adp-EXs in the HG group. 3) The Adp-EXs were incorporated with the ECs in a time-dependent manner. The incorporation rate of Adp-EXs with ECs is higher in the HG group than in the NG group; 4) Adp-EXs from the HG group increased the percentage of DHE-positive ECs. Data suggest that HG could stimulate the rerelease of EXs from adipocytes and change the contents of EXs by decreasing the miR-210 level. Adp-EXs from HG could induce oxidative stress in ECs.

Keywords: Exosomes, Adipocytes, Diabetes, micro-RNA

GP-33

Title: Concurrent assessment of three viral RNA pathogens in MK Buffered Solution using droplet digital PCR. Performance Comparison for Diagnostic Based Detection.

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Research Sponsor: Puritan Medical Products

Abstract

Background: Nucleic acid based molecular diagnostics have become fundamental for the accurate and rapid quantification of specific pathogens. Droplet digital PCR (ddPCR) by partitioning a single reaction into many thousands of nano-droplets allows for the absolute quantitation of a given DNA/RNA target and represents the gold standard for the identification and quantification of pathogens in clinical and environmental samples. The goal of this study was to assess the compatibility of a MK Buffered solution for detection and quantification using ddPCR of three different RNA viruses combined into two standard clinical matrices.

Methods: Serial dilutions of heat-inactivated Sars-CoV-2 (NR-52286), Influenza A (ATCC VR-1469) and RSV-A (ATCC strain VR-26) were combined into a single tube and added to two confirmed clinically negative matrices, Nasal and Sputum (Lee Biosolutions, Maryland Heights, MO). Serial dilutions of the combined pathogens were added to sample tubes containing 500 μ L of MK buffered solution yielding final concentrations of each pathogen over 4 orders of magnitude in each clinical matrix. For each sample 300 μ l was processed for RNA isolation using standard RNA isolation kits (Zymo Viral RNA Kit). For ddPCR samples were quantified for all three pathogens using a BioRad® Droplet Digital PCR System (QXD200) with TAQMan® probes specific for each pathogen.

Results: Yields of all three viral RNAs were significantly lower from sputum samples as compared to nasal samples. Droplet digital PCR values showed similar linear decreases for each pathogen with increasing dilutions in both clinical matrices. At the lowest concentration, ddPCR values for Influenza A in sputum were 8.48 genome copies/ μ l (estimated spiked concentration 24.3 genome copies/ μ l); for RSV ddPCR values were 0.96 versus estimated spiked concentration of 1.62 genome copies/ μ l, for Sars-CoV-2 ddPCR values were 0.21 versus estimated spiked concentration of 0.41 genome copies/ μ l.

Conclusions: Droplet digital PCR accurately quantified concentrations of all three RNA pathogens in both clinically negative nasal and sputum matrices across four orders of magnitude. Detected yields were significantly lower in samples spiked into the sputum matrix.

Keywords: PCR, ddPCR, RNA

GP-34

Title: Diet-induced obesity alters bone marrow cytokines following influenza immunization

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Research Sponsor: a John Marshall Scholar award and MUSOP startup funds to Melinda Varney, Ph.D.

Abstract

Obesity contributes to waning immunity in influenza-immunized individuals. While most researchers aim to determine underlying mechanisms for this association by investigating sites of infection or fully differentiated immune cells, little is understood regarding how obesity impacts hematopoietic stem and progenitor cell (HSPC) dynamics upon immunization. We hypothesized that obesity alters cytokine signatures in the bone marrow following influenza immunization. We postulate that these alterations may impact HSPC dynamics and immune cell fate, leading to waning immunity in vaccinated obese individuals when compared to vaccinated individuals of a healthy weight.

To test our hypothesis, C57/BL6 mice were first fed a low-fat or high-fat diet for 15 weeks. Mice were then subjected to caudal muscle injection with a vehicle control or flu vaccine. Complete blood counts and flow cytometry were performed to evaluate HSPC dynamics. Bone marrow media was isolated and analyzed for expression of various cytokines.

Findings suggest that diet-induced obesity altered HSPC frequency, potentially inducing myeloid skewing in flu-immunized mice when compared to all other groups. Furthermore, bone marrow cytokine analyses suggest that diet-induced obesity alters cytokine signatures present in the bone marrow microenvironment.

This study may provide insight into mechanisms by which obesity impacts HSPC dynamics following immunization. Our long-term goal is to inform the design of future vaccine formulations or co-administered therapeutics to increase immune protection in obese individuals.

Keywords: Obesity, Cytokines, Immunization, Hematopoietic Stem and Progenitor Cells (HSPC), Low fat / High fat diets.

GP-35

Title: Western diet alters components of the bone marrow microenvironment, leading to increased cell number of MDS and AML cells.

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Research Sponsor: WV-INBRE grant (P20GM103434) and Marshall University Undergraduate Creative Discovery and Research Scholar Award (AR)

Abstract

Western diet is associated with myelodysplastic syndromes (MDS) and acute myeloid leukemia (AML) incidence. Data suggests that Western diet contributes to more rapid induction of MDS-like phenotypes in MDS-susceptible mice. We aimed to determine if alterations in the bone marrow microenvironment contribute to this phenomenon. We hypothesized that Western diet alters bone marrow microenvironment components, resulting in hematopoietic cell expansion. Four-week-old MDS-susceptible mice were assigned a control or Western diet for fifteen weeks. Bone marrow extraction was then performed by flushing femurs and tibias with cell culture media. Conditioned media was isolated from cells via centrifugation. Ex vivo cell culture experiments were conducted to determine if conditioned media from Western diet mice induced hematopoietic cell expansion. Mouse bone marrow cells cultured in media extracted from Western diet-fed MDS-susceptible mice increased in number when compared to cells cultured in media extracted from control diet-fed MDS-susceptible mice. Similar results were obtained when human leukemia cells were subjected to these culture conditions. Preliminary observations suggest that Western diet alters components of the microenvironment, contributing to hematopoietic or leukemic cell expansion. Future studies include determining if increased cell number is due to alterations in proliferation or cell death.

Keywords: MDS, AML, obesity, malignancy

GP-36

Title: Regulator of G-Protein Signaling 6 (RGS6) Knockout Mice Exhibit Hypothermic Effects of Morphine and THC

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Sponsoring Institution:

Research Sponsor:

Abstract

Regulator of G-Protein Signaling 6 Protein (RGS6) KO Mice Morphine and THC Dose Response and Morphine Conditioned Place Preference Testing

Regulator of G Protein Signaling proteins (RGSs) function to negatively regulate G Protein-Coupled Receptor (GPCR) signaling. RGS6 is a protein in this family that stops G Protein signaling from occurring by increasing the activity of GTPases of the α subunits of the G Proteins. This increase in activity places the G Protein α subunits in their inactive GDP-bound form, thus inhibiting GPCR signaling. Drugs associated with addiction, such as morphine and $\Delta 9$ -THC, exert their effects through G Protein signaling cascades after binding to their receptors, indicating the possibility of RGS6 playing a role in signaling pathways involved in drug addiction. Adult Male and Female wildtype and RGS6 knockout (KO) mice were used in morphine and $\Delta 9$ -THC dose response acute sensitivity tests consisting of hotplate, tailflick, and temperature as well as morphine conditioned place preference (CPP) testing. RGS6 knockout mice showed greater hypothermic effects to both morphine and $\Delta 9$ -THC. Male RGS6 knockout mice exhibited conditioned effect to morphine in the CPP test. These results suggest that in the absence of RGS6, mice are more susceptible to the hypothermic effects of morphine and $\Delta 9$ -THC and that male RGS6 KO mice have a conditioned preference toward the effects of morphine.

Keywords: Regulatory G protein 6 signaling, morphine ,THC, Dose response ,Conditioned place preference

GP-37

Title: Dexmedetomidine Co-formulated with Naloxone to Inhibit Methamphetamine and Fentanyl effects.

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Research Sponsor: Marshall University

Abstract

While agitation is uncommon after naloxone (NLX) reversal of intoxication with opioids alone, it is very common with methamphetamine (METH) intoxication, and opioid-induced sedation can obscure this distressed state. This study investigated the use of dexmedetomidine (DEXMED) as an NLX adjunct to attenuate METH-induced agitation upon reversal of opioid induced sedation. Male Sprague Dawley rats were subcutaneously (SC) administered 0.1 mg/kg fentanyl \pm 1 mg/kg METH. After 15 minutes, 0.1 mg/kg NLX \pm 0, 0.032, 0.056, and 0.1 mg/kg DEXMED. On days 0-3, locomotor activity, used as a rat model of agitation, was measured (see increasing DEXMED dose on subsequent days). On day 9, using the highest DEXMED dose, blood oxygenation and heart rate were recorded after NLX \pm DEXMED administration. All DEXMED doses significantly reduced METH-induced locomotor activity after the NLX reversal of fentanyl-induced sedation ($p < 0.05$, with no significant differences from non-METH treated groups). Adjunct DEXMED did not impair blood oxygenation in METH treated rats, but significantly reduced these values in the non-METH treated DEXMED group. DEXMED significantly reduced heart rate, but the reduction was greater in the absence of METH. Based on these preclinical data, DEXMED may be an effective NLX adjunct in concurrent fentanyl-METH intoxication, but controlled clinical research is needed prior to clinical use.

Keywords: Overdose Fentanyl Methamphetamine Dexmedetomidine Naloxone

GP-38

Title: Exploring Adipokine Expression in the Brain Tissue of Mice on a High-Sugar Diet: Insights into Metabolic Neurobiology

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Sponsoring Institution: School of pharmacy

Research Sponsor: n/a

Abstract

The consumption of high-sugar diets is strongly associated with metabolic dysregulation and obesity, with emerging evidence suggesting profound effects on central nervous system function. Adipokines, bioactive molecules predominantly secreted by adipose tissue, play crucial roles in regulating metabolism and energy homeostasis, yet their expression and impact within brain tissue under high sugar dietary conditions remain poorly understood. Diets high in fructose intake has been shown to contribute to metabolic disturbances in mouse models resulting in weight gain and an increase in adipokine expression, which ultimately could lead to insulin resistance. By elucidating the role of adipokines in high sugar diets on brain health, our findings could offer novel insights on the role of adipokines in the brain under conditions of dietary stress, highlighting potential targets for therapeutic intervention aimed at preserving metabolic and cognitive health in the face of modern dietary challenges. Therefore, this study investigates adipokine expression patterns in the brain tissue of mice subjected to a high sugar diet regimen through droplet digital PCR.

Keywords: Adipokines, Obesity, Metabolism, Insulin Resistance, Digital PCR

UGP-1

Title: Coreen Simpson - African Americans in the Arts

Authors/Presenters: Makayla Welch (welch92@marshall.edu)

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Sponsoring Institution: School of Art and Design

Research Sponsor: The Dr. Carter G. Woodson Lyceum and the School of Art & Design

Abstract

This poster is meant to reference photographer Coreen Simpson who was known for not only her pictures but her collages as well. Simpson was known for having extremely contrasting photos and eye-catching motifs in her collages. This poster has an image of Simpson with collage elements that were featured in her work. As I was researching, I wanted to consider representing the work whilst making it my own. Since Simpson is well known for her photography and collage work, I want to incorporate it in my own poster. There were not many pictures of the artist I used the one of the few I could find to highlight her own work and the person behind it. It is meant to not only pay tribute to the artwork she created but also Simpson as an individual. Artists are constantly putting a metaphorical piece of themselves in their craft. They put forth so much time and effort into them and unfortunately for black artists, they often end up being forgotten. Since this is a frequent occurrence, I did not want to show the whole collage to resemble how much we truly know about African Americans in the arts; we only know what is provided for us. This poster is meant to encourage more people to look beyond what they see in front of them and expand their knowledge on Black artists.

Keywords: Art & Design Showcase

UGP-2

Title: Seize the Time

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Mentor: Sandra Reed

Sponsoring Institution:

Research Sponsor: The Dr. Carter G. Woodson Lyceum and the School of Art & Design.

Abstract

Emory Douglas was the Minister of Culture and member of the Black Panther Party working as their revolutionary artist and designer for their publications. Douglas designed the newspaper, "Black Panther," that used a combination of imagery from graphic design, collage, illustration, cartoons, and text, through methods of printmaking.

Douglas stated, "That at the time the black community was not a reading community, but they learn through observation and participation. We want to have a lot of images so that those who were not going to read long articles would get the gist of what was going on by looking at the photographs and captions." He inspired political awakening in everyday people.

The art Douglas created was in service of the community. "Seize the Time," comes from text that Douglas would often use in his work, and a LP that contains political songs recorded by Elaine Brown and the cover art by Douglas. "Seize the Time" stood as a call to action, sometimes followed with the text, "By Any Means Necessary, Unless You Got Something Better."

Douglas used his skills and creation of art for a purpose bigger than himself and to serve his people and community. His legacy still carries on today. My poster references Douglas' artistic style with headlining text, bold outlines, and prominent political figures.

Keywords: Art & Design Showcase, Black History Month

UGP-3

Title: untitled ###

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Sponsoring Institution: Marshall University College of Arts & Media

Research Sponsor: The School of Art & Design

Abstract

My piece "untitled ####" is a multimedia video installation self-portrait that explores concepts of internal and external self-perception. The projected video is an animation of a journal entry, containing intimate thoughts I have about myself that one wouldn't usually share with others. It is paired with an audio piece from a separate device that plays recordings of several of the people closest to me describing the type of person they perceive me as. There is also a silk scarf that I covered in all scents related to me: my body wash, hair product, laundry detergent, etc. that viewers can smell. The viewer listens to the audio, watches the piece, and smells the scarf simultaneously.

The piece explores the duality between the image we have of ourselves compared to the image others have of us. This project was supposed to be a three-part self-portrait without showing our face, but as someone who finds it hard to describe themselves, it incorporates other participants to create that imagery. The journal entry was not something planned—the video was originally something different, but the entry was impulsively written a few days before the project was due and I felt that it was a more honest portrayal of myself than what I had planned. I am incredibly sensitive to smell and olfactory memory is most powerful to me. People are known to have a specific smell, one that loved ones recognize and easily connect with. One thing I am completely sure about regarding myself is my scent and what scents I choose to surround myself with, so the scarf acts as a piece of me that leaves a vague impression on the viewer of my physical image. All three pieces together work as an immersive, visceral experience for the viewer.

Keywords: Art & Design Showcase, video installation, duality

UGP-4

Title: Designing the personality and visual identity of an innovative brand for the untapped tween market.

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Sponsoring Institution: SOJMC

Research Sponsor:

Abstract

Children are growing up too fast. Inundated with media influences, kids want to grow up as quickly as possible. The “tween” phase has seemed to disappear. Children go from kids to young adults with no stage in between. This phenomenon is evident in the growing social media trend of “Sephora kids,” tweens who desire the adult makeup they see their favorite influencers using. Some even desire skincare products that contain ingredients such as retinol, which is harmful to young skin. Tweens need products that offer a stepping stone between childhood and young adulthood. This project introduces the brand Feybelle, an innovative beauty brand that seeks to do just that. Feybelle was created to decrease the influence of social media and give tweens products that are safe for their skin. Feybelle promises to offer clean products that go deeper than the surface so tweens can stop playing pretend and start being themselves. With a brand personality that is creative, honest, confident, and approachable, Feybelle seeks to help tweens unlock their innocent confidence. To address this untapped market we designed a branding guide containing a logo, typography, colors, and other elements for a complete brand identity.

Keywords: design, brand identity, beauty brand

UGP-5

Title: Laser Carved Sgraffito

Authors/Presenters: Joshua Perry Perry151@marshall.edu

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Sponsoring Institution: School of Art & Design

Research Sponsor:

Abstract

This research addresses the challenge faced by disabled artists who encounter difficulty in carving clay due to precision limitations in holding traditional tools. By reimagining the concept of sgraffito, meaning "to scratch," I explored the potential of laser carving as a solution to empower artists facing these daily obstacles.

The research methodology centered around the utilization of laser engraving technology, specifically integrating Creality 3D printers with Creality Laser Engraving Attachments. Rigorous testing was conducted, comparing the efficacy of both 1.6-watt and Falcon 20-watt lasers. The higher power of the 20-watt laser proved pivotal, offering a broader spectrum of options for slips and underglazes while mitigating refraction issues inherent in the laser beam.

Central to the process was the software Lightburn, serving as the primary tool for configuring power settings and defining tool paths, streamlining the laser carving process for optimal results.

Initial experimentation relied on plaster molds to create clay forms, facilitating their transfer onto a wood-cutting surface for laser carving. Optimal outcomes were achieved at approximately 70% power, utilizing multiple passes to ensure clarity and depth. A recommendation to employ a brush between passes to remove carved dust emerged as a crucial step in maintaining precision throughout the carving process. Distinguishing between different clay types, stoneware demonstrated resilience, remaining malleable in a soft slab state post-carving, while porcelain necessitated rehydration before being suitable for construction. The establishment of a wet box provided a simple solution for rehydration, emphasizing the importance of working with clay at its wettest state to achieve finely carved results. Notably, when dealing with leather-hard clay, the resulting texture leaned towards etching rather than the traditional sgraffito finish.

A key observation from the study was the heightened efficacy of utilizing molds, enabling swift transfer of soft clay forms onto the cutting surface. This approach expedited the carving process and enhanced precision, contributing to overall success.

In conclusion, this research introduces a groundbreaking method for disabled artists to use clay carving, revolutionizing accessibility within the art community. By harnessing laser engraving technology and innovative techniques, individuals facing physical limitations can explore their creativity with newfound freedom, unlocking a world of possibilities in sculptural expression.

Keywords: Ceramics, Graphic Design, Digital Fabrication

UGP-6

Title: The Stitch of a Quilt on a Barn in Appalachia

Authors/Presenters: Callie Thacker - thacker136@marshall.edu

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Mentor: Hanna Kozlowski

Sponsoring Institution: Marshall University/College of Arts and Media

Research Sponsor:

Abstract

My proposed work, a stained-glass sculpture and documentary style video, is largely influenced by barn quilts specifically throughout Appalachia. I aimed to discover the historical function and cultural symbolism behind this regional, folk-style, art form. Not only did I achieve this goal, but I achieved a growth in connection with my artistic community, development of new skills with new mediums, and an abundant appreciation for Appalachia and its people.

Keywords: art, stained glass, Appalachia, barn quilts, folk art

UGP-7

Title: Black History Month Poster - Louis Armstrong

Authors/Presenters: Bryce Lushsr

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Mentor: Sandra Reed

Sponsoring Institution: College of Arts and Media

Research Sponsor: The Dr. Carter G. Woodson Lyceum and the School of Art & Design.

Abstract

With this year's theme being based on African

American and the Arts I wanted to represent

someone who went through many struggles through their life and career and still were able to fight against the negativity with their art. After going through many different artists that made a name for themselves, I was stuck on one person in particular

who can be seen smiling in almost every photo of him on the internet and was able to see through this dark world with their music and bring that light to others around him.

My poster design is based on the famous jazz

trumpeter and vocalists Louis Armstrong. Louis is most known for his song "What a wonderful world",

this song was the main theme I wanted to bring in when creating a poster to commemorate him and

show the light he shined on the world with his unique

sound. I took most of my subjects for the poster from the music video cover image of this song and added

Louis in playing his trumpet to act as if he is the reason the sun is shining, nice blue skies and butterflies filling the air.

Keywords: Art & Design Showcase

UGP-8

Title: Maya Angelou: The Power of Words in Art

Authors/Presenters: Ashley Morris- nichols100@marshall.edu

College/School: College of Arts and Media

Mentor: Sandra Reed - sandra.reed@marshall.edu

Sponsoring Institution: School of Arts & Design

Research Sponsor: The Carter G. Woodson Lyceum

Abstract

When considering a subject for my poster, I scrolled through a list of prominent and amazing people from whom I draw inspiration from, but ultimately my feminist heart called out to make an homage to Maya Angelou and the wonderful things she has done for the art community as a poet and writer. I considered many things for the design of the poster, and ultimately wanted to try and create a dynamic image that illustrated the impact her words and presence had.

I chose to illustrate an image of her reading her poetry aloud, as her skills at speaking were one of the reasons I had always been so drawn to her. The emotion that she carried with her words was amplified by the way with which she delivered her messages.

For the background, I used a typewriter to type out some clips of her poetry; the irregularity of the type created by a typewriter has always been a fascination of mine, and I think that it creates a feeling of humanity and life to the words. From there I used watercolor paints to add droplets of colors, and cut them out and scanned them onto my computer, where I pieced them together in a digital collage

Keywords: Art & Design Showcase, Poster design, Maya Angelou, Black History Month, Mixed media

UGP-9

Title: Kehinde Wiley: African Americans and the Arts

Authors/Presenters: Alexander Vance- Vance378@marshall.edu

College/School: College of Arts and Media

Mentor: Sandra Reed

Sponsoring Institution: Marshall University School of Art and Design

Research Sponsor: The Dr. Carter G. Woodson Lyceum and the School of Art & Design

Abstract

In crafting my poster submission, I selected the artist Kehinde Wiley as the focal point of my design. Notably, Wiley made history as the first African American artist commissioned to paint a presidential portrait, a portrayal of Barack Obama in 2018. My decision to prominently feature this iconic presidential painting on the poster comes from its widespread recognition and profound significance. Additionally, I sought to enhance the viewer's engagement by incorporating an image of Wiley himself, fostering a connection between the artist's identity, appearance, and body of work.

Within the portrayal of Wiley, I interwove floral motifs featured as the background for some of his portraits. While constituting the backdrop in his works, these motifs intentionally draw attention to elements frequently neglected, resonating with the broader narrative of both his artistic repertoire and the often-overlooked contributions of people of color in America.

To capture the vibrancy inherent in Wiley's palette, I incorporated colorful squares throughout the composition, each hue derived from images of his artworks. The chosen font, Gotham, proved instrumental in aligning my typographic choices with Wiley's own aesthetic. The same font was chosen for Wiley's portfolio website. My approach seeks to transcend mere aesthetic appeal, striving to communicate the rich narrative of African Americans in the arts and contribute meaningfully to the overarching theme of the 2024 competition.

Keywords: Art & Design Showcase, Black History Month, Graphic Design, Visual Arts, Art

UGP-10

Title: A Noiseless, Patient Spider - A Work of Lyrical Motion

Authors/Presenters: Trinity Rollins / rollins75@marshall.edu

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Mentor: Courtney Chapman / courtney.chapman@marshall.edu, Tacie Jones / jonestac@marshall.edu

Sponsoring Institution:

Research Sponsor: The School of Art & Design

Abstract

The video "A Noiseless, Patient Spider" functions as an experimental, artistic study of the self and human connection. Through digital film and elements of animation, this short film visualizes the poem by the same name, written by Walt Whitman. The spider's actions (building a web) serve as a metaphorical representation of the human soul, desperate for emotional connections. The yarn artwork used in this film acts as a physical manifestation of the human "signals" and desires to reach out to those around them. Overall, it was my goal to explore the themes of isolation and connection within my own life to their utmost extent. I recruited several of the people that I am emotionally closest with, yet physically farthest from to collaborate with me on this project via the Internet. By asking my abroad best friends to narrate this film, my long-distance partner to compose the film's music, and my long-distance sister to craft the crochet artwork, this work became a juxtaposition of being alone, yet accompanied in vastly different ways simultaneously.

Keywords: Art & Design Showcase, video, poetry

UGP-11

Title: Harlem Renaissance

Authors/Presenters: Lana Thacker (thacker142@marshall.edu)

College/School: College of Arts and Media

Mentor: Kyle Dyer

Sponsoring Institution: College of Art and Design

Research Sponsor:

Abstract

My poster was inspired by the Harlem Renaissance. The early 20th century social and creative boom that followed the Harlem neighborhood's emergence as a Black cultural hotspot in New York City is known as the Harlem Renaissance.

Roughly spanning from the 1910s to the mid-1930s, this era is revered as the height of African American cultural expression in the forms of literature, music, theater, and art. The actual illustration style I was inspired by the artist Aaron Douglas and tried to mimic his style. 100 years ago, African American painter Aaron Douglas had a significant role in the Harlem Renaissance. Douglas, who is sometimes referred to as "the father of black American art,". In the poster there are some notable artist names featured on the poster, Dizzy Gillespie, Billie Holiday, and Duke Ellington.

I chose to feature The Savoy Ballroom because it is a famous Harlem jazz club, opened its doors in 1925. It quickly became a cultural epicenter and a symbol of the vibrant nightlife during the Harlem Renaissance. The Savoy Ballroom gained notoriety for its inventive dances, such the Lindy Hop, and its energetic jazz shows. It drew in both white and African American customers, transforming into a place where social interaction, dancing, and music could be enjoyed without temporarily erasing racial boundaries. I also chose to feature the Apollo Theater in Harlem began as a burlesque establishment. It soon became a well-known theater and entertainment venue, showcasing African American artists from the Harlem Renaissance onward. African American musicians, comedians, dancers, and performers had a stage at the Apollo Theater where they could display their talents and make a name for themselves. Many artists who went on to become famous used it as a springboard, and its renowned Amateur Night gave budding actors a chance to compete for the approval of the crowd and possibly land jobs.

The Harlem Renaissance was a golden age for African American artists, writers, and musicians. It gave these artists pride in and control over how the Black experience was represented in American culture and set the stage for the civil rights movement.

Keywords: Design, Black History, Harlem Renaissance, Illustration, Art History

UGP-12

Title: Basquiat

Authors/Presenters: Morgan Napier / napier245@marshall.edu

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Mentor: Kyle Dyer / Kyle.dyer@marshall.edu

Sponsoring Institution: College of Arts and Media, School of Art and Design

Research Sponsor:

Abstract

When thinking of African Americans & the Arts, an influential figure that stood out the most to me was Jean-Michel Basquiat who was a New York born artist who created paintings surrounding social issues and more. He used a unique graphic style that helped the rise of graffiti art in his early career and switched to painting. His impact on the art community was formative during the 1980's since his art was visual commentary on race relations and drew from the culture of the African Diaspora.

His work was a catalyst for his art style to be used in fashion, music, and film. His street art to gallery journey is an inspiration to many young artists and helped change the way people view contemporary art. His art brought a new diverse perspective to the art scene in New York and around the world which is still lasting today.

When creating the poster, I wanted to pay tribute to Basquiat's unique and sketchy style by using a hand drawn like illustration around the figure. I chose to portray Jean-Michel Basquiat in the middle because I wanted him to be the focal point of the poster since he was such a young, influential, and brilliant artist.

The colors of the poster were drawn from his popular paintings Warrior and In Italian which use a blend of cool tone and warm tone

photos. In all, I wanted this poster to highlight his style and his

Keywords: Art, Black History Month, Poster

UGP-13

Title: Making History in a Graceful Way

Authors/Presenters: Graci Davis/davis1316@marshall.edu
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Mentor: Kyle Dyer/kyle.dyer@marshall.edu

Sponsoring Institution: Marshall University, Department of Art and Design

Research Sponsor:

Abstract

Misty Copeland is an accomplished ballet dancer and a trailblazer in the world of classical ballet, particularly as an African American woman. Born on September 10, 1982, in Kansas City, Missouri, Copeland faced numerous challenges on her journey to becoming a principal dancer with the American Ballet Theatre (ABT). Her achievements are significant not only in the realm of ballet but also in the broader context of African-American history. In 2015, Misty Copeland made history by becoming the first African American woman to be promoted to principal dancer in the American Ballet Theatre's 75-year history. This was a groundbreaking achievement and a significant moment in the world of classical ballet. Copeland faced numerous challenges growing up, including financial struggles and being a late starter in ballet compared to many of her peers. Despite these obstacles, her talent and determination propelled her forward. Copeland's achievements have had a significant impact on the representation of African Americans in the arts. Her success has contributed to a broader conversation about diversity, breaking down stereotypes, and challenging preconceptions about who can excel in classical ballet. Misty Copeland's impact on ballet and African-American history is significant. Through her talent, determination, and advocacy, she has opened doors for future generations of dancers. She has played a crucial role in promoting diversity and inclusion in classical ballet. Misty Copeland's influence extends beyond the stage. She has become a role model for young dancers and a symbol of resilience and determination. Her story is often cited in discussions about breaking down racial barriers in various fields, not just in the arts. In my poster design, I wanted to use a ballet color pallet with colors that represented ballet. I gave my design a graceful and elegant look to fit my theme.

Keywords: Misty Copeland, Black History Month poster, ballet, arts, ballerina turned to the back

UGP-14

Title: Black History Month 2024

Authors/Presenters: Kaylie Williams

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Mentor: Kyle Dyer/ kyle.dyer@marshall.edu

Sponsoring Institution: College of Arts and Media/School of Art and Design

Research Sponsor:

Abstract

Since the theme for the 2024 Black History Month poster is African Americans and the Arts, I decided that I wanted my poster to represent not only artists but every aspect of the arts. The way that I represented this is by depicting four individuals who each have had great impact on the arts overall. Each person specializes in a different art, which include music, dance, art, and literature. The first individual is Louis Armstrong, who is pictured on the top right. Louis Armstrong was a famous vocalist but was better known as a jazz trumpeter. His music and gravelly singing had a huge impact on how later artists produced music. I chose to include him playing the trumpet and list one of his most famous songs “What A Wonderful World”. The second individual that I chose was Bill “Bojangles” Robinson, who is pictured in the bottom right. He was known as the father of tap dance. He headlined many Broadway shows and was one of the earliest black performers to perform solo overcoming vaudeville’s two-color rule. The third individual I chose was Maya Angelou, who is pictured in the bottom left. She is most well-known for her unique writing style in memoirs and poetry, but she is also a civil rights activist. She has published multiple autobiographies and books of essays and poetry and has received dozens of awards and honorary degrees. Beside of her portrait is one of her most famous poems “And Still I Rise”. The fourth individual is Kara Walker, pictured on the top left. She is an artist who specializes in painting, printmaking, installation, and filmmaking. Her work explores race, gender, sexuality, violence, and identity. She is best known for using black silhouettes in many of her works. These individuals have had a great impact on society and can be seen as inspirations to everyone.

Keywords: Poster, Black History Month, arts, music.

UGP-15

Title: Theaster Gates

Authors/Presenters: Seth Hardwick, hardwick12@marshall.edu

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Mentor: Kyle Dyer, Kyle.dyer@marshall.edu

Sponsoring Institution: School of Art and Design

Research Sponsor: Dr. Carter G. Woodson Lyceum

Abstract

Theaster Gates is not only an extremely intriguing artist he is also a humanitarian. Much of Theaster's work helps communities like his nonprofit Rebuilding Foundations has contributed in many ways to his hometown of Chicago. Some of these contributions being Stony Island Art Bank which is an old bank that has been restored to practice and innovate on contemporary art practices. One of his other projects the Dorchester Art and Housing Collaborative or (DAHC), is an attempt to give back to his community through the availability of low income housing. Almost all of the spaces used were abandon at some point in time and then renovated for use of the neighborhood they are placed. One of his main goals is to share culture with the people in these spaces and to overall improve the lives of those around him.

My design elements in this poster are busy and splattered if what seems to be black splotches. Theaster is known to use tar in some of his works and I wanted to have that implemented into the poster one way or another. For the white lines throughout the piece, this was to pay tribute to his interest in collections of things, I figured making his poster seem to have a collection of a singular element felt appropriate. The Arches in the upper left is a tribute to his Afro Mengei exhibition.

Keywords: School of Art and Design, Theaster Gates, Poster, Black History Month, Graphic Design

UGP-16

Title: Honoring West Virginia Native: Bill Withers

Authors/Presenters: Olivia Miller

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College/School: College of Arts and Media

Mentor: Kyle Dyer, kyle.dyer@marshall.edu

Sponsoring Institution:

Research Sponsor: The Dr. Carter G. Woodson Lyceum and the School of Art & Design

Abstract

Honoring West Virginia Native: Bill Withers

Bill Withers was born in Slab Fork, West Virginia. This came as a surprise to me because I have always heard his name and music circulate, but not his roots. I was less surprised as I continued to read interviews of his upbringing and experience in rural West Virginia. Not only him being a West Virginian, but how that specifically shaped his experience as a black man born in 1938--constantly experiencing inequality, multiple facets of wealth, and the professions that helped him survive. Honing in on his roots, Slab Fork, West Virginia is recorded to have a population of around two hundred people. His song "Lean On Me" was inspired by missing the strong community of Slab Fork when he moved to Los Angeles. Withers' retirement from performing music later in his career aligned with my thoughts of retirement for the people of Appalachia, and the effect of not needing to make ends meet. It is an Appalachian hope to seek peace and comfort where inequality exists. We are constantly seeing this struggle as native West Virginians, especially when tuned into the wealth disparity and racism in our state. It reminds me of how, despite the work and effort that is ingrained in our DNA, there are many natives stuck within this generational wealth disparity, and that trickles down into a large portion of the black community. Music is a way for people to cope through hard times, especially when put into the perspective of Withers' experience of a wealth gap, racial segregation, and how intensely he connected with community members in Slab Fork.

In an interview with Jake Stump at West Virginia University, Withers was asked how prevalent the issue of race was throughout his career. He responds, "It's always been a complex thing with me. I've been poor and black, middle class and black, and wealthy and black. I'm always aware I'm black. But it's like stuttering. I was never determined to let that define me." His songwriting continues to be an inspiration for people to seek out comfort and strength in community, and to pursue music as a way of feeling deeply and connecting; Withers' contribution is attributed to the African American population in Appalachia that we want to continue to uplift and celebrate, especially as we look forward to Black History Month in February.

Keywords: Art & Design Showcase, Bill Withers, West Virginia Artist, Black History Month

UGP-17

Title: Frozen Time

Authors/Presenters: Sophia Gillispie/gillispies@marshall.edu

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Mentor: Courtney Chapman courtney.chapman@marshall.edu

Sponsoring Institution: Marshall University School of Art and Design, Honors College

Research Sponsor: N/A

Abstract

"Frozen Time" is a nostalgic journey into the memories of my childhood. Set against the backdrop of a picture-perfect day at Felixstowe beach in England, this piece for me encapsulates the essence of family. At the heart of the painting are my brother and young cousins, their figures captured in a moment of carefree familiarity. Through gestural strokes, I tried to convey not just their physical image but also the essence of their personalities and the bond shared between them.

The tranquility of the sea, stretching into the horizon, mirrors the timeless quality of childhood memories and that sense of endless summers.

I respond to color, and I used a soft and faded palette to create a sense of visual harmony but also evoke a feeling of serenity and happiness, reminiscent of the carefree innocence of childhood.

"Frozen Time" is my attempt to demonstrate the ability of art to preserve fleeting moments. It serves as a visual memoir, allowing me to revisit and relive the memories of my youth, while inviting viewers to embark on their own journey of nostalgia and reflection.

Keywords: Time, memory, color, gesture, emotion

UGP-18

Title: Frozen Time

Authors/Presenters: Sophia Gillispie/gillispies@marshall.edu

College/School: College of Arts and Media, Honors College

Mentor: Courtney Chapman/courtney.chapman@marshall.edu

Sponsoring Institution: Marshall University

Research Sponsor: The School of Art & Design

Abstract

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The tranquility of the sea, stretching into the horizon, mirrors the timeless quality of childhood memories and that sense of endless summers.

I respond to color, and I used a soft and faded palette to create a sense of visual harmony but also evoke a feeling of serenity and happiness, reminiscent of the carefree innocence of childhood.

"Frozen Time" is my attempt to demonstrate the ability of art to preserve fleeting moments. It serves as a visual memoir, allowing me to revisit and relive the memories of my youth, while inviting viewers to embark on their own journey of nostalgia and reflection.

Keywords: Art & Design Showcase Time, memory, color, gesture, emotion

UGP-19

Title: An Examination of Business Approaches to the UN SDGs and Implications on West Virginia

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Sponsoring Institution: Lewis College of Business

Research Sponsor:

Abstract

This research study addresses the United Nations' Sustainable Development Goals (SDGs) and how they can be successfully integrated into business operations, to gain insights as to how these integrations could be applicable to increasing sustainability in the state of West Virginia. Through the use of case studies, this study examines the challenges and opportunities that arise with the implementation of sustainable initiatives. The selected case studies encompass a range of industries in order to provide a comprehensive view of how businesses address the social, environmental, and economic elements that are outlined in the SDGs. By reviewing the actions taken by the companies, the research will analyze best practices and lessons that can be transferred to West Virginia.

Additionally, the study will review the socio-economic landscape of West Virginia and how its distinctive characteristics may present unique hurdles in adopting these practices. Based off the successful examples in the case studies, the research will propose recommendations and strategies for businesses in WV to integrate the SDGs in an effective manner. The ultimate goal of this study is to provide valuable insights not only for businesses but also policymakers and stakeholders to transition towards a more sustainable future for the state.

Keywords: sustainability, development, initiatives, business, stakeholders

UGP-20

Title: Scanning Electron Microscopy (SEM) to evaluate carbon nanomaterials in cement mortars

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Sponsoring Institution:

Research Sponsor: Kenai Defense, The Air Force Civil Engineering Center

Abstract

This project consists of the introduction of carbon nanomaterials within concrete to enhance characteristics of the concrete such as compressive strength and thermal properties. Commercially available graphene was added to cement mixtures. The samples include various amounts of graphenes (0.1%, 0.5%, 1.0%, 1.5%, and 2.0%). Composite mortars were cured for 28 days and their compressive strengths were measured. Mortars containing more than 0.1% graphene or CNT actually decreased the compressive strength of the concrete. Samples containing less than 0.1% of graphene increased the compressive strength. The use of graphene increased the thermal properties of concrete as well. Broken mortar samples were collected and observed under a Scanning Electron Microscope (SEM). The collected specimens are looked at using various magnifications and working distances within the SEM. The control mortar, which did not contain graphene, did not exhibit any sharp edges resembling graphene sheets. However, sharp, sheet-like shapes were observed in the samples containing graphene. It was observed that graphene within cement mortars did not appear aggregated, although they were harder to identify quantitatively based on SEM images. An artificial intelligence model was used to compare the images of the composite mortar samples and the carbon nanomaterials dispersed within the water to confirm the appearance of carbon nanomaterials on the surface of the mortars. The artificial learning model was successful in identifying the location of graphene within the composite mortars. It is concluded that an artificial intelligence model could provide a more efficient and accurate method for identifying and analyzing nanocomposite materials.

Keywords: nanomaterials, concrete, graphene, compressive strength

UGP-21

Title: Characterization of Various Nanomaterials using the Cytoviva Hyperspectral Imaging System

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Sponsoring Institution: Marshall University, Department of Civil Engineering

Research Sponsor: National Science Foundation

Abstract

The objective of this project is to utilize the Cytoviva Hyperspectral Imaging (CHI) system to analyze the structure of nanomaterials. The CHI system offers a unique advantage by allowing optical observation of nanoparticle size and shape, and precise measurement of hyperspectral data for nanoparticle sizes. Three types of nanomaterials were used in this study: silica nanoparticles, multi-walled carbon nanotubes, and graphene. These were dispersed in deionized water with a surfactant. The silica sample exhibited an orange color, while the graphene and carbon nanotubes were black. Images of the samples were captured at two different stages: when the sample was still in liquid form and after it had dried overnight under the coverslip. Hyperspectral images and graphs were generated using Ocular and ENVI software. The structure and definition of the sample were inferred from the hyperspectral images and the amount of noise within the image. A more defined image was associated with less noise. Among the samples, the silica sample's hyperspectral images were the most defined, followed by the carbon nanotubes, while the graphene sample had the most noise. In conclusion, the CHI system has proven to be an effective tool for characterizing the structure of nanomaterials. The study demonstrated that the quality of the hyperspectral images, indicated by the level of noise, can provide valuable insights into the structure and definition of the nanomaterials. This could potentially lead to more accurate predictions of particle size distributions, thereby advancing the field of nanotechnology.

Keywords: Cytoviva Hyperspectral Imaging of Nanomaterials

UGP-22

Title: Design, Simulation, and Fabrication of a Military Truck Automated Mirror Device

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Research Sponsor: Department of Defense (DoD), National Security Innovation Network (NSIN), Maker Program

Abstract

Variants of the M1075 and M1200 military trucks have been utilized by the United States Army since as early as 1993. A persisting issue common between these two vehicles is the outdated side view mirrors. When in use, if the mirrors are moved out of the position the operator set them in, the operator must choose between stopping the vehicle to get out and adjust the mirror, or to continue driving without the use of the side view mirrors. This is unacceptable because in military operations it can be dangerous to stop and get out of the vehicle for any amount of time. The goal of this project is to create a new, robust mirror design that will allow drivers of the vehicle to adjust the side mirrors to their liking from the inside of the vehicle. Constraints for this new mirror design included not being able to connect to the existing electronics inside of the truck, the new mirror could not increase the silhouette of the trucks, no screws or bolts could be inserted into the body of the truck, and the material of the mirror would have to be able to withstand harsh weather conditions. With these constraints in mind, a central controller was designed to sit in the cab of the trucks and connect with the mirrors through a wire fed into the front of trucks. Inputs from the controller send signals to a motor that will adjust the mirrors accordingly. With this new design, operation of the M1075 and M1200 military vehicles will be significantly safer and potentially save lives.

Keywords: US Army, Control Systems, Mechanical Systems, Capstone, Mirror

UGP-23

Title: Design of a Fuel Pumping System for High-Throughput Refueling in Military Operations

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Sponsoring Institution: Weisberg Department of Mechanical and Industrial Engineering

Research Sponsor: Department of Defense (DoD) / National Security Innovation Network (NSIN)

Abstract

The current refueling system used by the KC-135 involves long deactivation periods using off-aircraft equipment. A new refueling system will be designed, requiring less time, using onboard equipment. Because the current fueling situation is not well suited for dynamic situations, the design will increase flowrate to decrease time grounded.

The system will be comprised of off-the-shelf components that have already been tested for performance and safety. This will ensure that flow rates will be optimal and verified by calculation. The pump system will be modular, and each component will weigh at most 1500lbs. The frame(s) mounting system will be custom designed. The frame(s) will be linked together during operation and must contain lifting lugs capable of holding the apparatus' weight during loading and unloading.

Pump candidates have begun to be selected to satisfy the various requirements for this project. Many pumps advertise specifications that are required for this project. Analysis will be conducted on these pumps to determine flow rates and pump heads when integrated into our system. Multiple pumps will satisfy the gross requirements, so the choice will be based on pro-con analysis to determine the appropriate specifications and cost.

Creating a more compact and mobile refueling system for the KC-135 aircrafts will provide many benefits for the AirForce, and potentially other branches of the military. This project will be of great benefit for the Airforce when needing to siphon fuel from decommissioned or abandoned machinery. Creating this fuel system will minimize downtime and optimize the KC-135's operational use.

Keywords: Fuel Pump, Design, Fabrication, Modeling, Military

UGP-24

Title: Perovskite Solar Cell and Thermoelectric Generator Combination for Improved Power Efficiency

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Sponsoring Institution: College of Science, Department of Math and Physics

Research Sponsor: NASA Space Grant Advisory Committee

Abstract

This project aims to fabricate a hybrid device that consists of a perovskite solar cell (PSC) on top and a thermoelectric generator (TEG) at the bottom, potentially enabling a boost in power conversion efficiency beyond the Shockley-Queisser limit. The device absorbs much of the incident sunlight in the visible light region and allows infrared light to pass through and reach the upside of the TEG, based on which a temperature gradient can be created, and electricity is produced. The work principle of TEG is based on the Seebeck effect which can be maintained for hours in the sun radiation due to the intentionally chosen poor thermal conductivity materials. Furthermore, this TEG can then act as a waste heat sink to prevent the solar cell from degrading at an elevated temperature. In the meantime, the TEG converts waste thermal energy to electricity. Material syntheses are focused on inorganic compounds such as photosensitive perovskite material of Cs_2SnI_6 and thermoelectric material oxyselenide of BiSeCuO , since they are stable, durable, moisture-compatible, and simple to process, making them promising candidates for energy device fabrication. Various characterization tools are employed on the devices to optimize energy conversion outputs. The combination of PSC and TEG in a single hybrid energy device is expected to substantially improve solar energy conversion efficiency.

Keywords: perovskite, thermoelectric, solar cell, renewable

UGP-25

Title: Ontology-Aided Aircraft Thermal Design

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Sponsoring Institution: Department of Mechanical and Industrial Engineering

Research Sponsor: Department of Defense (DOD)- National Security Innovation Network (NSIN)

Abstract

The goal of this project is to create an ontology framework that can be used to investigate a thermal design problem and to explore the design space for the United States Air Force. In this project, we will be designing, modeling, and prototyping an engine heating/cooling system using a heat exchanger and/or a heatsink system, where ontology is utilized for thermal design optimization.

To accomplish the design project, we will first begin by examining the current system we are attempting to improve. Once we have identified problems and room for improvement, we will begin computer-aided design (CAD) modeling to identify potential solutions. The CAD modeling will be used in the prototyping stage to design multiple variants, followed by thermal analysis in the ANSYS environment. Once the final design is chosen, we will then have our design produced to test and ensure that it is a satisfactory solution.

Throughout this design process, also we will develop an ontology framework through the platform Protégé. The ontology will be a guideline, displaying individual components of our design and describing their relationships or dependencies with each other, which will lead to identification of the consequential design parameters that impact the cooling performance.

Upon completion of the project, we expected to have produced a mechanical design that results in greater cooling performance and reliability. Experimentation with design parameters like fin length and cooling configurations will have different results and advantages. So far, our group has tested various demonstration heatsinks to test for production. We will eventually be able to test our design in the system to ensure its quality and performance.

By producing a more reliable and user-friendly design, we will make maintenance and servicing easier for USAF personnel. This will ensure that costs are kept lower, and the machinery can operate for longer periods of time.

Keywords: Thermal Design, Ontology, Aircraft

UGP-26

Title: Effect of antioxidants on elastin deposition by human dermal fibroblasts

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Department of Biomedical Engineering

Research Sponsor: NSF S STEM grant (2030806)

Abstract

Elastin is a fibrous protein key to the structure and support of skin as well as other organ tissues. Elastic fibers are located in the skin's dermal layer and make up approximately 2% to 4% of the fat-free dry weight of the dermis in the skin of adults. Aging causes the progressive degradation of elastin fibers. Loss of these fibers can cause skin sagging and wrinkling, loss of healthy blood vessels and lung capacity, aneurysms, and Chronic Obstructive Pulmonary Disease (COPD). We hypothesized that a combination of antioxidants like CoQ10, N-acetylcysteine (NAC), Retinol, Epigallocatechin gallate (EGCG), and Coenzyme Q10 (CoQ10) will increase elastin and collagen in human dermal fibroblasts (HDF). We treated HDFs with them for 28 days to see the elastin deposition in HDF cell cultures. When all the antioxidants were introduced together, insoluble elastin and collagen deposition were significantly higher in HDFs compared to other groups. Thus, a mixture of antioxidants can improve skin extracellular matrix production of elastin and collagen and may improve skin fine wrinkles.

Keywords: Skin aging, elastin, tissue engineering

UGP-27

Title: Polypropylene and Glass Fiber Composite Extrusion for Additive Biofabrication of Bone Tissue Scaffolds with Complex Microstructures

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Research Sponsor: NASA, Grant #80NSSC22M0249

Abstract

Osseous fractures account for 16% of all musculoskeletal injuries in the U.S. annually. Various tissue engineering methods have emerged for bone repair, including additive biomanufacturing techniques like extrusion-based bioprinting. Despite technological and scientific advances in bone tissue engineering, it has remained unknown how the complex rheological dynamics of composite material deposition affect the functional properties of fabricated bone scaffolds. The goal of this work is to fabricate mechanically robust, dimensionally accurate, and biocompatible tissue scaffolds for treatment of bone fractures. The objectives of the work are to investigate the influence of (i) single-screw filament extrusion temperature and (ii) internal scaffold microstructures, on the physical and mechanical properties of bone scaffolds, fabricated using fused deposition modeling (FDM). Uniform monofilaments of polypropylene (PP) and glass fibers (GF) were extruded at temperatures of 185 °C, 210 °C, and 235 °C, then used to fabricate porous bone scaffolds via FDM. Also, four scaffolds with bone-like microstructures were designed, based on novel mathematical formulations of triply periodic minimal surfaces (TPMS). The physical and mechanical properties of these scaffolds were characterized to identify optimal fabrication and design parameters. Among the four TPMS designs constructed, Design #2 exhibited the highest compression modulus, attributed to its compact microstructure. Besides, extrusion temperatures of 210 °C and 235 °C had similar effects on scaffold properties compared to 185 °C. These findings contribute to the development of clinically viable bone scaffolds and future advancements in regenerative medicine.

Keywords: Bone Tissue Engineering; Biomanufacturing; Material Extrusion; Regenerative Medicine; Polypropylene; Glass Fiber.

UGP-28

Title: Pavement Deformation Characteristics Under Traffic Loads

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Research Sponsor: N/A

Abstract

The longevity of asphalt pavement is a critical component in maintaining safe and usable roadways or airfields for extended periods of time. With increased variation in vehicle types, new advancements and adjustments have been made to the tire utilized by their particular machine. One important adjustment to these vehicle tires is the increase in tire inflation pressure due to increased vehicle loads. For instance, when heavy-duty trucks carry loads above their normal specification, higher inflation pressure is required to ensure that the tires can sustain larger loads throughout their operational life cycle. A particular pavement section's performance is heavily dependent on the frequency of loading from traffic, the vehicle speed, and vehicle type to name a few. As a result, it can be expected that alternations in tire inflation pressure will simultaneously affect the performance of asphalt pavement. The objective of this study is to utilize finite element modeling (FEM) to analyze the impact of altering a vehicle's tire pressure on pavement performance, cracking, and rutting. By using numerical modeling to simulate a tire rolling over a section of pavement, the stress wave propagation can be analyzed to examine the tire's influence on pavement longevity. In this work, ABAQUS, a FEM software, will be employed to generate both static and dynamic simulations to examine tire inflation pressure alteration impact. Specifically, these dynamic cases will model a tire rolling over a pavement section to identify and evaluate the resultant stress wave. Several dynamic cases will be produced wherein parameters such as inflation pressure, weight distribution, and velocity will be systematically altered in simulations to study their effects and correlations. Through the obtained numerical solutions, the significance of altering tire pressure can be determined, wherein advisory remarks can be provided against increased inflation pressure if this increase greatly decreases the life span of an asphalt pavement.

Keywords: Finite Element Modeling, Tire Inflation Pressure, Pavement Deformation

UGP-29

Title: Calculating Above Ground Forest Biomass using Machine Learning with Image Segmentation

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Research Sponsor: NSF S-Stem Project Works Student, Marshall Creative Discovery

Abstract

In response to the escalating threat of climate change, this study explores the use of cutting-edge technology for carbon stocks data, specifically the estimation of above ground biomass (AGB). Traditional methods of AGB estimation are time-consuming and labor intensive, prompting the need for more efficient techniques. Our research focuses on the use of satellite imagery and machine learning models with image segmentation for AGB assessment in mature Appalachian hardwood forests. The preliminary data was gathered during the summer of 2022 that created a model for estimating AGB by measuring the canopies and finding their relationship to the diameter at breast height. However, the technique of measuring the canopy area could be more accurate, as well as species identification for the density variable. To better determine the areas of the tree canopies, we are utilizing a machine learning model with image segmentation. This model is being trained with multispectral images taken from the initial test sites. By separating the images across different spectra, the differences between canopies and tree species become much easier to detect for the machine learning model. This allows us to approximate the real area of the canopy using camera geometry. This should increase time and workload efficiency more than the original method derived in 2022, while also providing more accurate and detailed inventories of West Virginian forests.

Keywords: Machine Learning, Image Processing, Remote Sensing, GIS, Natural Resource Management

UGP-30

Title: Autonomous Drones: Multiple Drone Control and Obstacle Avoidance in Obstacle-Deployed Environments

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Abstract

This research seeks to use artificial intelligence (AI) to advance the autonomy of the drone swarm (>10 drones) by using obstacle avoidance techniques and refining the control of drones within a predefined region. By utilizing machine learning (ML) algorithms and sensor technologies, the research aims to enhance the coordination of individual drones, emphasizing the importance of seamless operations in dynamic and complex environments.

The project's core objectives involve developing and implementing obstacle avoidance mechanisms, emphasizing the need for drones to navigate with accuracy while avoiding collisions. Thorough testing and algorithm improvement are integral to this research to enhance the efficiency and reliability of managing multiple drones within an obstacle-deployed region.

Beyond technological advancements, the significance of this research lies in its potential applications across diverse sectors, such as disaster response, environmental monitoring, and infrastructure inspection. The drone control strategies used in this research hold promise for enhancing data collection processes, contributing to more informed decision-making across various industries. These advancements signify progress towards establishing a safer and more reliable autonomous drone landscape, emphasizing this research's implications and practical applications.

Keywords: Drones, Object Detection, Python

UGP-31

Title: An Acute Bout of Throwing Increases Elbow Laxity in Inexperienced Throwers

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Sponsoring Institution: School of Kinesiology

Abstract

Context:

Athletes participating in overhead-throwing sports commonly report shoulder pain and injury. These injuries are frequently attributed to muscle fatigue from repeated throwing. Differences in medial joint space width and medial collateral ligament thickness are reported to develop over time in experienced throwers but the effects of throwing on inexperienced throwers are unknown. The study tested the hypothesis that following a bout of throwing, participants would show increased laxity, increase medial joint space width, and increase medial collateral ligament thickness.

Methods:

Fifteen right-handed (age 21 ± 1.5 years, 176 ± 9.7 cm, 72 ± 15.8 Kg, 8 male, 7 female) inexperienced throwers without a history of elbow injury participated in the investigation. The project was approved by the University IRB and participants provided consent before testing. Ultrasound images of the participants' medial joint space were collected during a valgus stress test. Measures of the medial joint space width were made on the ultrasound images. Then participants performed 60 overhead throws using a regulation weight and size softball. All ultrasound imaging was repeated following the throwing bout. The change in the width of the medial joint space was measured on the Ultrasound images. Paired T-tests were used to test the differences in the change in the medial joint space during the valgus stress test and before and after the throwing bout.

Results:

Before the throwing bout the width of the medial joint space increased during the valgus stress test on both the right (0.84 ± 0.22 mm) and left (0.73 ± 0.23 mm) sides. The difference between the sides was not statistically significant (difference 0.11 ± 0.32 mm, $t=1.343$, $P=0.202$). Following the throwing bout, the change in the medial joint space width was 1.00 ± 0.29 mm on the right side and 0.63 ± 0.25 mm on the left side. Following the throwing bout, the right to left side difference in the change of the medial joint space width did reach statistical significance (0.37 ± 0.28 mm, $t=4.988$, $P<0.001$).

Conclusion:

The study finds that there is an increase in medial joint space width after one bout of throwing. The result of the current study suggests that anatomical changes are seen in the elbow after one bout of throwing, understanding these changes to the elbow following the throwing bout aids to bridge the gap of how experiences throwers may develop these anatomic abnormalities.

Keywords: Elbow laxity, ultrasound imaging, ulnar collateral ligament, elbow injury, overhead throwing

UGP-32

Title: Load Carriage Reduces Scapular Motion during Arm Elevation and Gait

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Sponsoring Institution: Marshall University, College of Exercise Science

Abstract

Background:

Previous research demonstrates a link between scapular motion during arm elevation and the development of shoulder pain. It is also suggested that scapular motion patterns during gait might lead to shoulder pain. The prevalence of shoulder pain in military population is high and the mechanism leading to these injuries is not fully understood. Military personnel carry heavy loads on their shoulders using rucksacks regularly. The purpose of this study is to investigate the effect of the rucksack on scapular motion during arm elevation and gait.

Methods:

The scapular motion of ROTC cadets will be measured with an electromagnetic tracking system. Scapular upward rotation, internal rotation, and posterior tilt will be measured during gait and repeat overhead arm elevation. Kinematics will be measured while the Cadet wear their rucksack (35lbs) and without the rucksack. Pilot data has been collected on two participants.

Results:

Pilot data has been collected on 2 participants. Results of the 2 participants suggest that the scapula experiences less scapular external rotation (5°) and posterior tilt (7°) at 90° of arm elevation while wearing the rucksack. Scapular upward rotation was not affected by the load carriage. During gait the scapula was in a more downwardly rotated (9.5°) and internally rotated (3.5°) position in the load carriage condition. Load carriage did not affect scapular posterior tilt during gait.

Discussion:

The pilot data collected suggests that the load carried by military personnel could be a mechanism leading to the shoulder and back pain reported in these populations.

Keywords: Military, Scapular Motion, Shoulder Pain

UGP-33

Title: A Needs Assessment of Marshall University Food Pantry Participants: A Quantitative Review

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Abstract

Since its establishment in 2013, the Marshall University Food Pantry has been a source of nutritional assistance for Marshall University students and citizens of the Tri-State area. In the past eleven years the food pantry has grown from serving roughly thirty households in one month to serving up to fifty households per day of operation. To gain additional insight on pantry participant needs, pantry staff administered a voluntary, one-time survey to pantry participants in the fall 2023. Demographic findings show that most clients are not affiliated with Marshall University, and half of all clients receive pantry food once per week while also shopping at grocery chains and convenience stores. Further data reveals that 74% of clients have skipped meals in the past month, despite the majority agreeing that they receive enough food for their household. Although most clients have access to basic cooking tools, only half of participants used nutrition information and recipes they received from the pantry. Furthermore, 73.08% and 76.92% of participants agreed that the pantry has taught them how to prepare foods and about nutrition, respectively. These results indicate that the Marshall University Food Pantry could provide more nutrition and culinary education in addition to the food assistance offered. Providing a more tailored approach to pantry services can potentially improve the overall health and wellness of pantry participants.

Keywords: Marshall University; Food Pantry Participants; Quantitative Analysis; Food Pantry; Dietetics

UGP-34

Title: A Mixed-Method Analysis of Marshall's Nutrition for Health, Healing, and Recovery Program

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Sponsoring Institution: Marshall University, Department of Dietetics

Abstract

Substance abuse is a prominent issue in West Virginia and Huntington has become a hub for rehabilitation efforts and resources. Research shows that substance abuse can cause nutrient deficiencies and a variety of other health issues. Marshall's Nutrition for Health, Healing, and Recovery Program aims to help patients of inpatient substance use disorder recovery programs by providing nutrition education, cooking classes, and common cooking utensils. Nutrition education is offered through a six-lesson series. Program objectives include: increasing the participants' abilities to identify nutrient-dense foods, recognize the importance of consuming these foods to improve overall health and decrease the risk of relapse, and to improve participants' confidence in shopping for and preparing healthy snacks and meals. The program is evaluated through a mixed-methods analysis of pre and post-surveys, as well as comment cards that capture participant experience at the end of every class. Data analysis is ongoing, but initial analysis of the pre and post-surveys show that, despite fluctuating attendance in weekly classes, participants show an increase in nutrition and health knowledge; the ability to implement knowledge gain; and overall increase in ability to prepare meals.

Keywords: nutrition in recovery, nutrition education, substance abuse disorder, mixed-method, dietetics

UGP-35

Title: Load Carriage Increases Trunk Flexion during Arm Elevation and Gait in Soldiers

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Sponsoring Institution: Marshall University/ College of Health Professions/ School of Kinesiology

Abstract

Introduction:

Previous research has shown that soldiers' gait and upper extremities have been affected by their rucksack weight. Military members need to carry these heavy loads to accomplish missions in the field. The purpose of this study is to measure the effect the load carriages have on trunk kinematics during overhead arm motion and gait in a sample of ROTC cadets.

Methods:

The trunk kinematics of ROTC cadets were measured with an electromagnetic tracking system. The participants' trunk flexion, lateral flexion and rotation were measured during gait and repeat overhead arm elevation. Kinematics were measured while the Cadets wore their rucksack (35lbs) and without the rucksack. Pilot data has been collected on two participants.

Results:

During arm elevation in unloaded condition the trunk started at 18° trunk flexion and moved to 16° as the arm moved from the rest position to 90° arm elevation. In the loaded condition the trunk was 30-24°. During gait trunk flexion position ranged 25°-24° in the unloaded condition and 39°-37° in the loaded condition. No differences were found in trunk lateral flexion or rotation. Sample size calculations based on pilot data suggest a sample of 24 will provide adequate statistical power.

Discussion:

The increased trunk flexion angle during gait could be a contributing factor in the development of low back pain. The restricted trunk motion during arm elevation could also lead to the development of shoulder injury and back pain. Completing this study will provide healthcare providers with information of musculoskeletal pain in military population.

Keywords: Load Carriage Increases Trunk Flexion

UGP-36

Title: Determining Athlete Fatigue and Injury Risk Using Field Testing Outcomes

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Sponsoring Institution: Marshall University, School of Kinesiology: Biomechanics

Abstract

Unweighting Time: A two-way ANOVA revealed no significant difference between gender or testing groups in regard to unweighting time during a CMJ. There was no significance in the interaction between gender and testing group.

Keywords: Hop Test ACL Injury

UGP-37

Title: First Responder Nutrition: Evaluating Nutrition Habits During-Shift versus Off-Shift

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Abstract

Conclusion: This study determined that vertical deceleration factors may be behind athletic norms if they are not an area of focus during the rehab process. Relearning jumping and landing mechanics may be needed. This focus is so the athlete can both maximize the ability to absorb large amounts of force and absorb this force quickly to change direction at a greater rate.

Keywords: Nutrition, First Responders, Shiftwork, Habits

UGP-38

Title: Forearm Pronation Reduces Glenohumeral External Rotation

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Sponsoring Institution: School of Kinesiology

Abstract

Forearm Pronation Reduces Glenohumeral External Rotation

Auvil F, Jeffers B, Elk R, Timmons MK: Marshall University, Huntington, WV

Department/Institution: School of Kinesiology, Marshall University

Introduction:

People with limited glenohumeral (GH) external rotation (ER) have a greater risk of developing shoulder and elbow pain. It has been reported that throwing athletes with reduced GH ER while in forearm pronation have a higher risk of developing shoulder injury. The relationship between forearm pronation and GH ER in a general population has not been reported. The purpose of this current study was to explore the effects of forearm pronation on GH ER in a general population. Specifically, the study tested the hypothesis that nonthrowing athletes would have less GH ER in forearm pronation compared to forearm supination.

Methods:

Eleven right-handed participants (7/4 (male/female), mean height = 175.8±4.9cm, mean weight 74.3±12.1Kg) were included in this repeated measure laboratory-based investigation. The project was approved by the University IRB and participants proved consent before testing. Participants include individuals without a history of shoulder pain or participation in organized throwing sport activities. The GH ER of the right and left shoulder was measured using standard two arm goniometer. The GH ER was measured with the participants shoulder at 0 and 90 shoulder abduction and forearm supination, neutral, and pronation positions. GH ER was measured twice in each shoulder and forearm position. The means of the 2 measures were used for analysis. A three-way Repeated measures ANOVA was used to test the effect of shoulder and forearm position, and side on GH ER.

Results:

The shoulder position main effect was significant ($F(10,1)=15.231$, $P=0.003$), greater GH ER was found in the 90° than the 0° abducted position (mean difference = 13.9±3.6°). The forearm main effect was statistically significant ($F(20,2)=23.882$, $P<0.001$), greater GH ER was found in the supinated position compared to the neutral (3.3±0.7°, $P=0.002$) and pronated (6.1±0.9°, $P<0.001$) positions. Less GH ER (2.8±1.0°, $P=0.050$) was found in the pronated than the neutral position. All two and the three-way interaction were not significantly significant.

Conclusion:

Forearm pronation reduced the GH ER at both the 0° and 90° shoulder abducted positions. The decrease in GH ER as the forearm moves from supination to the pronated position suggests that the increase in bicep length might be a contributing factor in the decreased ER. Forearm pronation has a similar effect on GH ER on both right and left sides, this finding needs to be further explored in throwing athletes that typically have greater GH ER on their throwing side. Further research needs to be conducted to explore the relation between shoulder injury, forearm pronation, and GH ER.

Keywords: Goniometry, shoulder motion, anterior shoulder pain, throwing injury

UGP-39

Title: The Influence of Muscle Cross-sectional Area on Grip Strength

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Abstract

The observation of the binary neutron star merger GW170817, marked by both gravitational waves and electromagnetic signals, including the gamma-ray burst GRB 170817A, presents a unique opportunity to study these astrophysical events. The gamma-ray spectrum of GRB 170817A features two distinct components: a hard short pulse followed by a softer thermal emission, with the origin of the hard pulse still widely debated. Our research explores the hypothesis that gamma-ray de-excitations from isomeric transitions contribute to this spectral feature. By establishing a selection criterion for isomers based on solar element abundances, we aim to match it with the observed GRB spectral characteristics. An interactive Python-based webpage has been developed to display gamma-ray spectra from key isomers, enhancing our understanding of nuclear processes in cosmic events. This study not only sheds light on the intricate mechanisms behind gamma-ray bursts but also contributes valuable insights to the field of astrophysics.

Keywords: grip strength, muscle adaptations

UGP-40

Title: Helping the Helpers: Outcomes of Stress, Satisfaction, and Dedication Among Residential Treatment Staff

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Sponsoring Institution: Psychology (COLA)

Research Sponsor:

Abstract

In substance abuse treatment, staff turnover has become a significant issue. In addition to the obvious costs of turnover (recruitment and training, lost productivity, and low morale), having a revolving door of staff damages counselor-client relationships and performance (Bride & Kintzle, 2011). People tend to want to leave jobs they do not feel valued doing, specifically in helping professions (Bakker & Oerlemans 2016). Turnover intentions often result from a sense of being excluded from setting goals and making plans within the work system (Sand et al., 2011). Working in substance abuse treatment requires helping clients with issues like “broken families, dissocial behavior, and a high mortality” (Volker et al., 2009). Such secondary post-traumatic stress has been linked to less commitment among substance abuse counselors (Bride & Kintzle, 2011).

This study examined predictors of turnover intentions, performance, and life satisfaction among $n = 33$ (14 clinical, 19 non-clinical) staff at a residential sober living facility. Results suggest Clinical Staff who believe the center is helping clients with recovery tend to be less interested in quitting their jobs and show more organizational citizenship behaviors. Clinical Staff who are exhausted or feel that policies and procedures are unfair tend to be more interested in quitting and have more counterproductive work behaviors. Pay satisfaction was the only predictor of intentions to quit for Non-Clinical staff. All staff who are more dedicated tend to report higher levels of task performance. This study can help recovery-focused centers develop strategies to help all staff thrive.

Keywords: employee stress, performance, turnover, life satisfaction

UGP-41

Title: The E-Cigarette Flavoring Agent Menthol's Effects on the Kidney

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Sponsoring Institution: School of Medicine

Research Sponsor: NIH Grant P20GM103434

Abstract

The health effects for E-cigarette and vaping device usage is not well studied. Menthol is a flavoring agent contained in vaping products and menthol is detectable in plasma following vaping. The purpose of this project was to evaluate the effect of menthol on renal proximal tubular epithelial cells. The overall hypothesis was that menthol is cytotoxic to renal human (HK-2) cells by impairing mitochondrial function. Human HK-2 cells were plated and equilibrated for 48h. Cells were then exposed to 0-1500 uM menthol for 24h. Studies were conducted as 4 independent experiments with different cell passages. Differences between groups were evaluated using ANOVA followed by a post hoc test. Cytotoxicity was assessed using the MTT assay in which viable cells convert MTT to formazan. Menthol changed MTT in HK-2 cells exposed to 200-1500uM compared to vehicle control ($p < 0.05$). Studies examined autophagy markers LC3BII and I and SIRT1 by western blot which showed no difference between groups exposed to 0-200 uM menthol. Additional studies examined mitochondrial function following a 24h exposure to menthol. The findings of this project were that menthol impaired cell function in HK-2 cells within 24h. (Supported by NIH Grant P20GM103434).

Keywords: Menthol, renal, cytotoxicity, mitochondria, autophagy

UGP-42

Title: Priming and Paranormal Beliefs

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Sponsoring Institution:

Abstract

The purpose of the present study was to examine the effects of “priming” an intuitive or analytical style of thinking on beliefs related to ghosts and hauntings. Prior research has shown that belief in the paranormal is associated with an intuitive (instinct, emotion, gut feeling) style of thinking and that the activation of an analytical style of thinking (evidence, reason, logic) reduces belief in the paranormal. After completing a 10-item Pre-Assessment measure to assess belief in ghosts and hauntings, participants (n = 137 adults) were randomly assigned to one of four priming conditions. To prime an intuitive style of thinking, participants read 18 words/short phrases (e.g. spooky, death) describing the emotions and visual images associated with seeing a ghost or experiencing a haunting (Paranormal-Emotional) or 18 words/short phrases (e.g. orbs, ectoplasm) describing the phenomena people experience when in the presence of a ghost or when experiencing a haunting (Paranormal-Educational). To prime an analytical style of thinking, participants read 18 words/short phrases (e.g. truth, discovery) describing what makes science exciting and why the scientific method is the best method for discovering the truth (Scientific-Emotional) or with 18 words/short phrases (e.g. sleep paralysis, hallucinations) describing scientific explanations for why people believe they have seen a ghost or experienced a haunting (Scientific-Educational). Participants were then asked to recall as many of the 18 words/short phrases as possible. Finally, participants completed a 10-item Post-Assessment measure to assess belief in ghosts and hauntings following the priming intervention. Change in belief in ghosts and hauntings (Pre-Priming vs. Post-Priming) was the primary outcome of interest. The results revealed that: (a) emotional words/short phrases were remembered more frequently than educational words/short phrases and (b) consistent with prior research, the priming of an intuitive thinking style with Paranormal-Educational words/short phrases increased belief in ghosts and hauntings while the priming of an analytical style of thinking with Scientific-Educational words/short phrases decreased belief in ghosts and hauntings.

Keywords: Priming, Thinking Style, Paranormal, Beliefs

UGP-43

Title: Redrum Road: A Look at the Psychology in Stanley Kubrick's The Shining

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Sponsoring Institution:

Abstract

In Stanley Kubrick's The Shining, the main draw of the film is that the Overlook Hotel is filled with ghosts that haunt the Torrance family. But that's not quite the whole story. The ghosts are the main appeal but there's more to their appearance. Within the film, the ghosts are an extension of the trauma that the family has experienced. The isolation and withdrawal from important homosocial relationships, and the presence of mental illness and trauma prior to that isolation, is the perfect mixture for trouble to arise. The ghosts are manifestations of mental illness and trauma: Lloyd the bartender, Grady the waiter, the room 237 ghost—they are all manifestations of trauma.

Keywords: Kubrick, psychology, trauma

UGP-44

Title: Demographic Information of LGBTQ+ Appalachians

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Mentor: Jonathon Day-Brown

Sponsoring Institution: College of Liberal Arts/Psychology Department

Abstract

Despite the ever-growing population of LGBTQ+ individuals in rural areas, many people consider Appalachia to be an area filled with cisgender and heterosexual individuals. The result of this assumption is that very little research is available on queer Appalachians. The goal of this project is to help close that gap in research and provide demographic information on a sample of sexual minorities in Appalachia. Participants were given surveys at a variety of events, primarily Pride events, in Appalachia. The surveys contained questions related to gender identity, sexuality, education level, and hormone replacement therapy (HRT). The information from these surveys was then analyzed to produce these results. Of the 104 viable participants, 29 identified as both cisgender and heterosexual, 75 identified as queer in some way, 38 identified with multiple LGBTQ+ identities (referred to as “intersectional”), and 21 were on HRT (all of whom were not cisgender). 76% of LGBTQ+ participants and 73.7% of intersectional participants had some education post-high school. Of those on HRT specifically, 81% had some level of post-high school education, compared to 65.5% of cisgender and heterosexual participants. Further research is necessary to determine more potential causes of these differences. The results of these surveys may be skewed due to the locations chosen, all of which were relatively close to Marshall University and therefore had a high concentration of college-aged individuals. This sample, therefore, cannot be broadly applied to rural areas, and should instead be used as a reference point for further research.

Keywords: LGBTQ+, Appalachia, Demographics

UGP-45

Title: The effects of circulating extracellular vesicles on endothelial injury in hypertensive conditions.

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Research Sponsor: This work was made possible by NASA West Virginia Space Grant Consortium, NASA Agreement #80NSSC20M0055, American Heart Association Career Development Award (935826), the National Institute of General Medical Sciences (U54GM104942), and Marshall University

Abstract

Ischemic stroke (IS) is a leading cause of death in the United States. Previous studies show that IS is exaggerated in hypertensive conditions. Fortunately, exercise has beneficial effects on vascular diseases, although the underlying mechanisms have not been well understood. Extracellular vesicles (EVs) are a novel mechanism of intercellular communication. Recently, emerging evidence has indicated that exercise promotes the release of EVs. In this study, we examine whether the circulation of EVs is a potential route used by exercise to influence the endothelium in hypertensive and hypoxia conditions. Circulating EVs (cEVs) were collected from plasma of hypertensive (Alb1-ren) mice that either conducted treadmill exercise (ET, 10 m/min, 5 days/wk for 8 wks) or no exercise (nET). Mouse brain microvascular endothelial cells (mBMECs) were exposed to angiotensin II (Ang II) and hypoxia before co-culturing with cEVs to study potential uptake and restorative effects. We observed a trend of high uptake efficiency of ET-cEVs by mBMECs. Both ET-cEVs and nET-cEVs improved the migration ability of mBMECs challenged by hypoxia and Ang II. What's more, ET-cEVs further decreased ROS production in hypoxia/Ang II-injured mBMECs. These results suggest that exercise-intervened cEVs play a role in protecting endothelial oxidative stress against hypertensive and hypoxia injury.

Keywords: Stroke, endothelium, extracellular vesicles, hypertension

UGP-46

Title: Antimicrobial profiling of *Serratia marcescens* SM6 using BIOLOG chemical sensitivity assays

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Sponsoring Institution: Marshall university - college of science

Research Sponsor: NASA West Virginia Space Grant Consortium

Abstract

The emergence of bacterial drug resistance is a global public health concern. *Serratia marcescens*, the Gram-negative bacterium from the order Enterobacteriales, is an emerging pathogen with increasing clinical importance due to its intrinsic resistance to several classes of antibiotics. *S. marcescens* causes diseases of the central nervous system such as meningitis, urinary tract infections, pneumonia, bloodstream infections, various respiratory diseases, and many different types of wound infections in people with weakened immune systems. To identify additional compounds that could be used for treatment or prevention of *S. marcescens* infections, we utilized the Biolog Phenotype MicroArray technology. Phenotype MicroArrays (PM) consists of a panel of ten 96-well plates containing different classes of chemical compounds. Each PM plate contains twenty-four chemicals of varying structures and function in four different concentrations. The entire panel allows testing for sensitivity of 240 antimicrobials. In this ongoing project, we currently screened 96 compounds and found that 25 of them can inhibit bacterial growth. Of those, many compounds were not previously reported to have antimicrobial activity against *S. marcescens*. After initial screening, the identified anti-*S. marcescens* candidate compounds will be tested individually to determine minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC). Our project will fill a critical knowledge gap in understanding *S. marcescens* sensitivity to antimicrobials. Obtained information would provide the additional results required to develop a strategy to control *S. marcescens* infection.

Keywords: Profiling of *S.marcescens* using BIOLOG

UGP-47

Title: Nephrotoxicity Potential of 2,5-Dibromophenol in Isolated Kidney Cells from Fischer 344 Rats

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Abstract

Bromobenzenes are important chemical intermediates for many agricultural and industrial products. Human exposure to a monobromobenzene can cause toxicity in several organs, including the liver, kidney, and lung. There is a lack of information regarding the toxic effects of dibromobenzenes on the kidney. Studies in Dr. Rankin's laboratory determined the effects of the six dibromobenzene (DBB) isomers on isolated kidney cells from male Fischer 344 rats. The nephrotoxicity of the metabolite of 1,4-DBB, 2,5-dibromophenol (2,5-DBP) was explored to see if it contributes to the toxicity of 1,2-DBB. This investigation was conducted through surgeries used to extract the kidneys from the subjects, male Fischer 344 rats, and then treat them with the compound in order to observe its effects and determine its toxicity. The toxicity is measured through the amount of LDH, lactate dehydrogenase, present within the media which will be made visible through the use of trypan blue.

Keywords: Nephrotoxicity, Dibromobenzenes, Metabolites, Protectants, Pathway

UGP-48

Title: Anti-cancer Activity of Non-Pungent Region C Capsaicin Analogs

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Research Sponsor: Funding for our study was supported by the NIH R15-AREA Grant (2R15CA161491-02 and 2R15CA161491-03) to PD and MAV. Furthermore, this study was supported in part by the West Virginia IDeA Network of Biomedical Research Excellence (WV-INBRE) grant (NIH gra

Abstract

Abstract:

Introduction: Capsaicin is the spicy pungent ingredient of chili peppers. Although traditionally associated with analgesic activity, recent studies have shown that capsaicin has profound anti-neoplastic effects in several types of human cancers. However, the applications of capsaicin as a clinically viable drug are limited by its unpleasant side effects, such as gastric irritation, stomach cramps, and a burning sensation. This has led to extensive research focused on the identification and rational design of second-generation capsaicin analogs, which possess greater bioactivity than capsaicin. The pharmacophore of capsaicin can be divided into three regions Region A, B and C. Published reports show that the addition of long-chain unsaturated fatty acyl groups in Region C of capsaicin generated non-pungent compounds (called unsaturated N-acylvamillamides, uN-AVAMs) which retained the pain-relieving activity of capsaicin. However, the anti-cancer activity of these compounds is yet to be studied. We synthesized a panel of uN-AVAMs with 0-4 double bonds in the side chain of capsaicin. We selected our “hit compound” Arvanil for further studies. We investigated the growth-inhibitory activity of these compounds with an MTT-based screening assay. The apoptotic activity of arvanil was compared to capsaicin (in a panel of human small-cell lung cancer cells) using the caspase-3 activity assay and the Cell death ELISA assay. The anti-tumor activity of Arvanil in vivo was determined using SCID mice tumor xenograft model. In addition, the growth-suppressive activity of Arvanil was also determined in patient-derived organoids of SCLC. The pro-apoptotic activity of arvanil was mediated by TRPV1 receptor and required the activation of the calpain pathway. We observed that the non-pungent capsaicin-analog arvanil displayed greater pro-apoptotic activity than capsaicin. Most interestingly, arvanil did not impact the growth of normal lung epithelial cells. The dietary administration of Arvanil robustly decreased the growth rate of human SCLC tumors xenografted on SCID mice. Moreover, Arvanil displayed greater growth-suppressive activity (than capsaicin) in patient-derived organoids of SCLC.

Conclusions: The non-pungent uN-AVAM compound Arvanil may be a promising agent for the treatment of SCLC.

Keywords: Capsaicin Analogs, Lung Cancer

UGP-49

Title: Magnesium Modulates the Period of the Circadian Clock

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Sponsoring Institution: College of Science, Department of Chemistry

Research Sponsor: WV NASA Space Grant

Abstract

Magnesium is an essential element for life, playing a crucial role in regulating circadian rhythms, which govern the activity of organisms on Earth. In cyanobacteria, the circadian clock orchestrates a 24-hour rhythm that synchronizes with the natural light/dark cycle. However, the precise mechanisms through which the bacterial timekeeper responds to environmental cues and finely tunes its temporal state remain elusive. One potential mechanism may involve fluctuations in the ATP/ADP ratio over the course of the day. The availability of ATP can modulate the rate of phosphorylation, thus influencing the progression of the biological clock. Moreover, the presence of this metabolite in the clock mixture can affect the circadian rhythm's period. Notably, a study by Goda et al. reported that elevated ATP concentrations in a reconstituted circadian clock led to a shorter period. However, our findings contradict this report. In our investigation, we observed that a high ATP concentration in the mixture resulted in a lengthened period, while a high concentration of magnesium ions (Mg^{2+}) had a significant opposite effect, shortening the circadian period. These observations raise intriguing questions about the outcomes reported by Goda et al. and prompt a reevaluation of the role of Mg^{2+} in the circadian rhythms.

Keywords: Circadian Clock, Phosphorylation, KaiC, Kinase

UGP-50

Title: Pore Fouling in Azo-Dye-Functionalization Membranes

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Research Sponsor: 1.) NASA WVSGC, NASA Agreement #80NSSC20M0055 2.) SURE Program

Abstract

The textile dye industry is one of the largest polluters of freshwater on Earth, contributing to the nearly 280,000 tons of synthetic textile dyes discharged into the environment annually. While this specific type of pollution occurs in specific areas around the World, the effects are of global concern. Recent research shows that polycarbonate filters functionalized with anionic azo dyes have the potential to enhance dye rejection, leaving nearly completely decolorized water after filtration in specific instances. This process, referred to as azo-dye-functionalization, provides an elegant solution to water pollution by textile dyes, demonstrating that the textile dyes, are part of the solution. Based on the literature data and models, this work aims to understand the pore fouling effect that occurs at the polycarbonate surface during the functionalization process. While the charge on dyes is kept constant, the dependency of charge is eliminated, which allows for the structural examination of functional end groups on pore fouling. To test for functionalization, direct red 28 and direct red 81 were cycled from low concentration to high concentration and back. Both showed hysteresis (changes) in the data as the concentration was increased and then decreased, with direct red 28 having larger hysteresis than direct red 81. In the end, this research paves the way for the overall goal of water purification of textile dyes and other charged contaminants.

Keywords: azo dye; fouling; hysteresis; pollution

UGP-51

Title: Nephrotoxicity of Bromobenzene and Dibromobenzene Isomers in Isolated Rat Kidney Cells

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Sponsoring Institution: Marshall University

Research Sponsor: Supported in part by NIH grant P20GM103434.

Abstract

Bromobenzenes are common starting materials used in the synthesis of numerous commercial products. In vivo exposure to bromobenzenes can induce organ-related toxicities, including hepatotoxicity and nephrotoxicity. Nephrotoxicity appears to be the result of hepatic biotransformation of the parent brominated benzene to oxidative metabolites that are carried to the kidney to induce toxicity. However, there is little information on the direct effects of the parent bromobenzenes on the kidney. The purpose of this study was to determine the nephrotoxic potential of bromobenzene (BB) and the three dibromobenzene (DBB) isomers in isolated kidney cells (IKCs) from male Fischer 344 rats. IKC (~4 million cells/ml; 3 ml) were incubated with shaking at 37°C under a 95% oxygen/5% carbon dioxide atmosphere with BB or a DBB isomer (0.25, 0.50 or 1.0 mM) or vehicle (dimethyl sulfoxide) for 30 or 60 min. General cytotoxicity was measured by determining trypan blue exclusion by IKC and measuring changes in lactate dehydrogenase (LDH) release. BB induced cytotoxicity at 0.5 and 1.0 mM at both 30 and 60 min. Both 1,3- and 1,4-DBB induced cytotoxicity at 0.5 mM or 1.0 mM at 30 and 60 min, while 1,2-DBB was not toxic at 30 min but induced cytotoxicity at all concentrations at 60 min. Pretreatment of IKC with piperonyl butoxide (0.1 mM, 15 min), a non-selective cytochrome P450 inhibitor, reduced 1,2-DBB (1.0 mM) toxicity at 60 min. These results suggest that BB and the three DBB isomers are directly toxic to kidney cells and that renally-produced metabolites may contribute to nephrotoxicity induced by bromobenzenes. Supported in part by NIH grant P20GM103434.

Keywords: Toxicology, Nephrotoxicity, Bromobenzene, Dibromobenzene

UGP-52

Title: Tribromobenzene Nephrotoxicity in Isolated Kidney Cells from Male Fischer 344 Rats

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Research Sponsor: NIH grant P20GM103434

Abstract

Brominated benzenes are widely used in the manufacture of many commercial products. Previous studies have demonstrated that mono- and dibromobenzenes are toxic to liver and kidney, primarily through toxic metabolites. There is evidence that tribromobenzenes (TBBs) are also hepatotoxicants, however, there is very little information on the nephrotoxic potential of TBBs. The purpose of this study was to determine the nephrotoxic potential of the three TBB isomers and explore the role of bioactivation and free radicals in TBB nephrotoxicity in vitro. Isolated kidney cells (IKC) (~4 million cells/ml; 3 ml) from male Fischer 344 rats were incubated with shaking at 37°C under a 95% oxygen/5% carbon dioxide atmosphere with a TBB isomer (0.25, 0.50 or 1.0 mM) or vehicle (dimethyl sulfoxide) for 30 or 60 min. General cytotoxicity was measured by determining trypan blue exclusion by IKC and measuring changes in lactate dehydrogenase (LDH) release. In some experiments, IKC were pretreated with an antioxidant (glutathione, 1.0 mM, 30 min; N-acetyl-L-cysteine 2.0 mM, 30 min, ascorbate, 2.0 mM, 5 min; or α -tocopherol, 2.0 mM, 5 min) or a cytochrome P450 (CYP) inhibitor (piperonyl butoxide, 0.1 mM, 15 min) before 1,2,3-TBB and 1,3,5-TBB (1.0 mM; 60 min incubation). Among the TBBs, only 1,2,4-TBB induced cytotoxicity at 0.5 mM or greater at 30 min and 0.25 mM or greater at 60 min. 1,3,5-TBB induced cytotoxicity at 0.5 mM or greater at 30 and 60 min and 1,2,3-TBB only induced cytotoxicity at 1.0 mM at 30 and 60 min. The cytotoxicity induced by 1,2,3- and 1,3,5-TBB (1.0 mM, 60 min) was attenuated by all antioxidants and the CYP inhibitor. These results indicate that the order of decreasing nephrotoxic potential was 1,2,4- > 1,3,5- > 1,2,3-TBB, and that free radicals play a role in the mechanism of nephrotoxicity induced by 1,2,3- and 1,3,5-TBB metabolites. Supported in part by NIH grant P20GM103434.

Keywords: Nephrotoxicity, tribromobenzene, bromobenzene, toxicology

UGP-53

Title: The Characterization of Pyrolysis Products of (2-Chloroethyl)-benzene using Matrix-Isolation Fourier Transform IR Spectroscopy

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Mentor: Laura R. McCunn, mccunn@marshall.edu

Sponsoring Institution: Marshall University, Department of Chemistry

Abstract

The chemical recycling of plastics via pyrolysis is a growing field of study. One commonly observed product of PVC pyrolysis is 2-(chloroethyl)-benzene. Identifying and understanding the thermal decomposition pathways of chlorinated hydrocarbons can improve the management of the chemical recycling of PVC by reducing landfill waste, recovering energy, and producing valuable chemicals that can be used to synthesize new plastics. The compound 2-(chloroethyl)-benzene is an excellent representative product of PVC pyrolysis. In order to understand the decomposition pathways of (2-chloroethyl)-benzene, gas-phase pyrolysis experiments with matrix-isolation FTIR detection were conducted. A dilute mixture of the sample in argon was passed through the pulsed valve into a heated SiC tube and deposited onto a cold CsI window. The deposited products were then characterized using FTIR. Results following 1400 K pyrolysis showed the formation of HCl, styrene, benzene, acetylene, ethylene, propyne, phenylacetylene, vinylacetylene, and an HCl-H₂O complex. Computational analyses using Gaussian 09 at the HF/6-316 G(d) and B3LYP/6-311++G(d,p) theory levels were performed to observe the formation of HCl from the pyrolysis of (2-chloroethyl)-benzene. Further computational work was done to identify peaks present in the 2650-3000 cm⁻¹ region. Wavelengths at 2811 cm⁻¹ and 2846 cm⁻¹ were attributed to possible HCl-styrene complexes.

Keywords: Pyrolysis, PVC, Chemical Recycling, Spectroscopy

UGP-54

Title: Identifying pollinators of wild ramps using the COI barcode

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Sponsoring Institution: Marshall University, College of Science, Department of Biological Sciences

Research Sponsor: 1. NASA Established Program to Stimulate Competitive Research, Grant #80NSSC22M0027 2. First2 Network

Abstract

Ramps (*Allium tricoccum*) are a perennial North American species of wild onion. Ramps are highly regarded in both traditional cuisine and Native American medicine and are highly sought after during their short growing season in early spring, to the point of being threatened by overharvesting in many locations. Ramps commonly grow in colonies within deciduous forests in shaded, moist areas. They bloom early in the summer, and in order to produce fruits and seeds, they need to be pollinated by insects. However, little is currently known about the identity of these pollinators. For this study, we did visual surveys in two ramp populations in Grafton, WV, and Bolivar, PA, during the summer of 2023. A total of 45 insects were observed visiting the ramps. These insects were collected in ethanol, their DNA was extracted, and the universal barcode for animals, the mitochondrial cytochrome oxidase subunit I (COI) gene was amplified. Resulting DNA sequences were then compared to the NCBI and BOLD databases to identify the insects. Our results show that honeybees, bumblebees, syrphid flies and other insects visited ramp flowers. Due to the varied morphology of the collected insects, our study shows how DNA barcoding may be a more straightforward and time-effective method for identifying potential pollinators that does not require taxonomical expertise. Our research contributes valuable knowledge on the pollinators of a meaningful plant in West Virginia culture and history.

Keywords: DNA barcoding, pollination, wild onion

UGP-55

Title: Methods for Sampling and Detection of Viral Pathogens Using Material Extracted from Wastewater

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Research Sponsor: US CDC via WV Bureau of Public Health

Abstract

COVID-19 and other viruses cause major disruptions and losses of life. Due to shortages in testing capacity in 2019-2020, determining the affected areas proved to be a challenge. Knowing the location and severity of viral outbreaks is valuable information for making public health and safety choices. The Marshall University Infectious Disease Surveillance Lab was established in Fall 2020 to determine the presence of virus using localized wastewater (WW – a.k.a. sewage). The initial samples were taken from dorms on MU's campus; the first positive result for SARS-CoV-2 was Oct 13, 2020. Our initial method (Randazzo, 2019) concentrated the virus using centrifugal force and coprecipitation reagents. From there, the virus's RNA is extracted and run through a PCR machine to amplify the signal. The PCR results are refined by comparing them to a control sample with a known amount of virus added. This allows for comparisons in signal strength between the field sample (raw WW) and the "spiked" sample to determine amount of virus in the source. Following this, other concentration methods were tried and developed; the method following Medema (2020) involves filters and centrifugation while the Ceres Nanotrap® method uses nanoparticles to bind to the virus which can then be pulled from the sample using powerful magnets. In May 2021, the project expanded to incorporate samples from eight WV water treatment plants; Huntington through Charleston and beyond. This allows for a larger pool of detection and more data with potential to inform public health decisions regarding viral outbreaks in West Virginia.

Keywords: Wastewater, Covid-19, Infectious Diseases

UGP-56

Title: The Adverse Impact of Adolescent Binge Drinking on the Structural Stability of the Tripartite Synapse

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Research Sponsor: NNX15AI01H (NASA West Virginia Space Grant Consortium to CDW), R21AA030086 (NIAAA-R21 to MLR), BX005403 (VA Merit Award to MLR)

Abstract

Adolescent binge drinking disrupts cognitive function in humans and animal models, and increases the emergence of alcohol use disorder. Recent studies demonstrate that adolescent intermittent ethanol/alcohol (AIE) disrupts the tripartite synapse in rats. The tripartite synapse is composed of a pre- and post-synaptic terminal that is ensheathed by a peripheral astrocyte process (PAP) allowing for the regulation of synaptic function/cognition. The stability of the tripartite synapse via bridging proteins (e.g., neuroligin and neurexin) are critical for synaptic health. Here we discuss the methods required to rigorously assess tripartite synapse integrity and reveal how AIE impacts tripartite structure.

Sprague Dawley rats received an intracranial injection of a virus to fluorescently label astrocytes. On PND 30, rats were subjected to intermittent water or ethanol for a total of 10 days. Following a 26-day washout period (26DWO) animals were prepared for immunohistochemistry or Western blot.

The emphasis of this study is primarily on methodological approaches. However, we will show that AIE drives PAP-synaptic decoupling that correlates with changes in neurexin-neuroligin.

Whether AIE disrupts neurexin-neuroligin protein structure preventing functional interaction or if gross astrocyte morphological changes prevent neurexin-neuroligin from physically interacting is yet to be determined and will be the focus of future work.

Keywords: adolescent, ethanol, hippocampus, astrocytes, synapse

UGP-57

Title: Investigating Neural Development Defects in AgNP Exposure Using *Caenorhabditis elegans*

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Abstract

Due to their strong antimicrobial properties, silver nanoparticles (AgNPs) are becoming increasingly common in household items and medical devices. AgNPs can shed from these products, resulting in bioaccumulation in the brain. We previously found that AgNP exposure disrupts F-actin organization in cultured neural cells. We also found an increase in tau tangles, a hallmark of neurodegenerative diseases, in the brains of rats exposed to AgNP. The nematode *Caenorhabditis elegans* (*C. elegans*) has a small and well-characterized nervous system, making it well suited to study animal behavior and neuron structure. They are also genetically accessible and transparent, allowing the expression of fluorescent transgenes that allow visualization of individual proteins and cells in intact animals. Because AgNPs disrupt cytoskeletal organization in neural cells, we investigated if AgNP exposure interferes with development of neuronal morphology and synapse formation, which are dependent on cytoskeleton. We also examined AgNP exposure effects on the accumulation of tau protein in neurons. Worms expressing normal and disease forms of human tau, which aggregates with aging, were used to determine if AgNP exposure induced tau aggregation or reduced worm lifespan. This work will help understand the effects of AgNP exposure on brain function and inform regulation of the manufacture and disposal of products containing this material.

Keywords: AgNPs, *C. elegans*, cytoskeleton, synapse, tau

UGP-58

Title: Preventing Stem Cell Aging via Epigenetic Drift Using HSP90 Inhibition

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Abstract

Aging results from the progressive decline of physiological processes required for continued survival. A hallmark of aging is increasing dysfunction in epigenetic patterning, known as epigenetic drift. Stem cells, which require a conserved epigenome, are especially impacted by epigenetic drift. An altered epigenome can result in improper differentiation as these cells replenish mature cells during the lifetime of a person. Progressive decline in this ability is part of age-related dysfunction. Here, we present that heat shock protein 90 (HSP) modulates epigenetic gene regulation. Thus, we hypothesize that HSP90 inhibition may prevent epigenetic drift. Our lab generated an epigenetic drift model in EML hematopoietic stem cells through exposure to high serum concentrations. We treated EML cells cultured in hypoxia with AUY922, an HSP90 inhibitor, before inducing epigenetic drift. Flow cytometry analysis was performed to determine the concentrations of markers CD117 (myeloid cell marker) and Sca-1 (a central positive marker for isolating stem cells). Our results showed that EML cells treated with HSP90 inhibitor had increased levels of Sca-1 after high serum exposure. This indicates that inhibition of HSP90 can prevent epigenetic drift from occurring, as more of the cells could stay in a stem cell state. These results can be used to further understand the molecular mechanisms of aging in stem cells and inform future prevention and treatment strategies for age-related diseases.

Keywords: Epigenetics, HSP90, Stem cells, flow cytometry

UGP-59

Title: Elucidation of Rhamnolipid Structure through High-Performance Liquid Chromatography and Nuclear Magnetic Resonance

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Abstract

Rhamnolipids offer a biodegradable alternative to current chemically based surfactants which have a variety of applications in fields such as oil cleaning. The leading synthesizer for rhamnolipids is *Pseudomonas aeruginosa*. Currently, industry is looking to amplify production and maximize purity through different synthesizing and extraction techniques. Extracted products need to be accurately identified. Most literature accomplishes this through assessments physiochemical characteristics, such as measuring the ability to lower surface tension and create micelles. Though these are useful, they could be supplemented by techniques that elucidate the structure of a given sample. Chosen techniques for this study are High-Performance liquid chromatography (HPLC) and Nuclear Magnetic Resonance (NMR). Through repeated testing with known synthetic rhamnolipids of high purity, their structure can be correlated with different types of NMR spectra. Common impurities can be identified with a higher degree of accuracy, with confirmation of a consistent product. As produced rhamnolipids appear in many isomeric forms, their eventual methods of production and extraction can be identified with a goal of obtaining a single isoform as the majority in the final products. Repeated testing of synthetic high purity rhamnolipids reveal a consistent structure showing pronounced signals at expected locations. HPLC offers many similar benefits as data collected further verifies an assumed structure. Coupled bioengineering with the high-resolution detection by HPLC and NMR, it is possible to produce a high amount of pure rhamnolipids with a defined structure from the non-pathogenic form of *P. aeruginosa*.

Keywords: rhamnolipids, NMR, HPLC, *Pseudomonas aeruginosa*

UGP-60

Title: The Role of the HTR10 Gene in Telomere Length Regulation and Telomerase Activity

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Sponsoring Institution: Marshall University, College of Science, Biology Department

Research Sponsor: Creative Discovery Award

Abstract

Results: Eccentric Impulse: A two-way ANOVA revealed a significant difference between gender and eccentric impulse during a CMJ $F(1,105) = 20.403$, $p < 0.001$. The two-way ANOVA also revealed a significant difference between the testing groups and eccentric impulse during a CMJ $F(1,105) = 7.738$, $p < 0.001$. There was no significance in the interaction between gender and testing group. Tukey HSD post hoc testing indicated that the f-ACL-R group differed from the healthy control ($p < 0.032$) and healthy athlete controls ($p < 0.001$).

Keywords: Genome Telomere Telomerase

UGP-61

Title: Characterization Of 4-Pyrone Pyrolysis Products Via Computational Modeling And Matrix-Isolation Ft-Ir

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Sponsoring Institution: College of Science

Abstract

The modeling of the decomposition pathways of biomass pyrolysis plays a critical role in the development of synthesizing viable and renewable clean energy sources. One commonly observed product of the pyrolysis of biomass such as wood chips, cotton husks, and straw is 4-pyrone (IUPAC: 4H-pyran-4-one), yet despite its abundance, little research exists on its own thermal decomposition pathways. Applying matrix-isolation techniques, the thermal decomposition products of 4-pyrone were identified by depositing a diluted 1:1000 mixture of sample and inert argon through a heated SiC tube onto a cold CsI window, which is then characterized by FT-IR. Computational studies at the Hartree-Fock and B3LYP theory levels were also performed to model the unimolecular decomposition pathways of 4-pyrone, and results were compared to spectroscopic data to determine the agreement. Current pyrolysis data collected with temperatures ranging between 900 K and 1400 K indicate the formation of acetylene, vinylacetylene, propyne, acrolein, ketene, methylketene, and carbon monoxide. The formation of formylketene is also likely, as computational predictions involving the cleavage of the Csp²—Osp³ and Ccarbonyl—C α bonds suggest its formation alongside of acetylene and predict a vibrational mode for formylketene that matches experimental data.

Keywords: Thermal Decomposition, biofuels, FT-IR, Physical Chemistry

UGP-62

Title: REEY Concentrations in Shales and Fireclays from WV Investigated Using ICP-AES and SEM

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Research Sponsor: WV NASA Space Grant Consortium

Abstract

Rare Earth Elements and Yttrium (REEYs) are integral to industry and the demand for REEY has increased dramatically given their use in automotive manufacturing and electronic devices. This has led scientists to explore for sources of REEY other than the traditional igneous carbonatites. These unconventional sources include fireclays and shales associated with coal seams in Appalachia, particularly West Virginia.

We collected and analyzed 82 samples of shales, fireclays, and tonsteins from Pennsylvanian aged units throughout WV. This was completed using inductively coupled plasma atomic emission spectroscopy (ICP-AES) after careful selection of rock standards for calibration curves. The results show that samples from the Lower and Upper Freeport and Lower Kittanning members of the Alleghany formation collected from the northern panhandle and the Pittsburgh member at the base of the Monongahela Formation of the Milton area contain Σ REEY values > 350 ppm, indicating some economic potential. However, it is necessary to identify the minerals that contain these elements, which will determine how they will be extracted from the source rock. To investigate the source of REEY and their host minerals, we analyzed two shales with the highest Σ REEY values from the Pittsburgh member in Milton using backscattered electron imaging and energy dispersive spectrometry (EDS) attached to the scanning electron microscope (SEM).

Results show that the shales consist of kaolinite, illite, potassium feldspar, plagioclase feldspar, and chlorite. zircon, ilmenite, xenotime, monazite, and apatite are common accessory minerals constituting < 5 volume %. REEY are concentrated in angular to subrounded monazite and xenotime, which are clearly detrital with average grain sizes of 360 and 340 square microns, respectively. EDS spectra indicate that the clay minerals do not contain any REEY. This suggests that REEY were not carried by fluids; as precipitation of these elements would cause them to be adsorbed onto the surface of the clay minerals.

Keywords: mineralogy, geochemistry, SEM, ICP-AES, REEY

UGP-63

Title: Nephrotoxicity of 2,6-Dibromophenol on Isolated Kidney Cells from Male Fischer 344 Rats

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Research Sponsor: NIH grant P20GM103434. WV-INBRE.

Abstract

Halogenated benzenes are frequently used as chemical intermediates to produce many industrial and agricultural chemicals. It has been found that dichlorobenzene compounds can have harmful effects on the liver, kidneys, lungs, skin, and central nervous system after acute or long-term exposure. However, research on the nephrotoxicity of dibromobenzenes (DBBs) and DBB metabolites is understudied. The current study was designed to determine the nephrotoxic potential of 2,6-dibromophenol (DBP) using the isolated kidney cell (IKC) model obtained from male Fischer 344 rats in vitro. Preliminary studies indicate that phenolic metabolites may be involved in the direct toxicity of dibromobenzenes to the kidney, but it is unclear which metabolites contribute to dibromobenzene nephrotoxicity. Isolated kidney cells (~4 million cells/mL) from male rats were exposed to vehicle (DMSO) or 2,6-dibromophenol (DBP) (0.25mM, 0.5mM, and 1.0mM) for up to 60 minutes. Cytotoxicity was measured by trypan blue exclusion and changes in lactate dehydrogenase (LDH) release. In IKC, 2,6-DBP was cytotoxic at 0.25mM or greater at 30 minutes and 0.5mM or greater at 60 minutes, as evidenced by the release of lactate dehydrogenase (LDH). In subsequent studies, isolated kidney cells were exposed to a pretreatment (antioxidant or enzyme inhibitor) prior to exposure to 2,6-DBP (1.0 mM) for 60 minutes. These pretreatments included exposure to metyrapone (1.0 mM), piperonyl butoxide (0.1 mM) (non-specific cytochrome P450 inhibitors), or glutathione (1.0 mM), and ascorbate (2.0 mM) (antioxidants). Results of this study indicate that 2,6-DBP induces nephrotoxicity at various concentrations, and that the metabolism and free radical formation in 2,6-DBP exposure affect the nephrotoxic potential of this compound. Supported in part by NIH grant P20GM103434.

Keywords: 2,6-dibromophenol, nephrotoxicity, rat isolated kidney cells

UGP-64

Title: The Creation and Usage of a Python Webapp to Identify Nuclear Isomers In GRBs

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Mentor: Dr. Maria Hamilton

Sponsoring Institution: College of Science / Department of Mathematics and Physics

Research Sponsor: NASA

Abstract

The observation of the binary neutron star merger GW170817, marked by both gravitational waves and electromagnetic signals, including the gamma-ray burst GRB 170817A, presents a unique opportunity to study these astrophysical events. The gamma-ray spectrum of GRB 170817A features two distinct components: a hard short pulse followed by a softer thermal emission, with the origin of the hard pulse still widely debated. Our research explores the hypothesis that gamma-ray de-excitations from isomeric transitions contribute to this spectral feature. By establishing a selection criterion for isomers based on solar element abundances, we aim to match the observed GRB spectral characteristics. An interactive, python based webpage has been developed to display gamma-ray spectra from key isomers, enhancing our understanding of nuclear processes in cosmic events. This study not only sheds light on the intricate mechanisms behind gamma-ray bursts but also contributes valuable insights to the field of astrophysics.

Keywords: Neutron star, gamma-ray burst, isomeric transitions, abundances, python

UGP-65

Title: Do Pollinator Gardens Require Maintenance in Order to Increase the Pollinator Population?

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Mentor: Tara Veazey

Sponsoring Institution: Marshall University or WV State Science Fair

Abstract

Scientists are concerned that pollinator populations are decreasing due to habitat fragmentation, pesticide use, climate change, and the spread of emergent pathogens, parasites, and predators. Research was conducted, and an experiment was established to determine if a pollinator garden required maintenance to increase the pollinator population. It was hypothesized that an unmaintained pollinator garden would attract more pollinators than a maintained pollinator garden because the environment would be more natural. To test this hypothesis, three locations were selected to plant two half-acre pollinator gardens in each area. One pollinator garden would be maintained with periodic watering and weeding. The other pollinator garden would not be maintained after being planted. This experiment began with the preparation of the experimental field in May 2023. Weekly observations began in mid-June 2023 and consisted of volunteers counting pollinators in their quadrant. According to the data from this experiment, unmaintained pollinator gardens had significantly more pollinators than maintained gardens with a T Test value of $P < 0.05$. Site one, located on reclaimed mine-land, had slightly higher numbers (16% more in the unmaintained garden) of pollinators in the unmaintained garden than the maintained garden. However, the unmaintained gardens in sites two and three residential areas had about 54% and 46% more pollinators, respectively, than the maintained gardens. The result of this experiment supports the hypothesis that unmaintained pollinator gardens attract more pollinators than maintained ones. This experiment demonstrates that establishing a pollinator garden will increase the pollinator population in an area.

Keywords: Pollinator Gardens

UGP-66

Title: Studying behavior and cardiometabolic changes in adolescent age vaping Mice

Authors/Presenters: Claire Combs (combs110@marshall.edu)

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Sponsoring Institution: Department of Biomedical Sciences, Marshall University

Research Sponsor: Supported by AHA UGR: 850405, AHA Undergraduate Student Research Program at Marshall University and JCESOM matching funds and NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence. CC acknowledges funding from Marshall

Abstract

E-cigarette usage has increased significantly in recent years, especially among adolescents. The long-term health consequences of e-cigarette use are a major concern. Though several studies focused on the effects of vaping on adults, there is a dearth of research on adolescents. The goal was to assess the negative effects of vaping on cardiometabolic and behavioral parameters in adolescents, and if exercise would prevent these effects. Adolescent age (4-5 weeks) wild-type C57bl6 mice and mice that over-express catalase (Cat-tg) were divided into four groups: sedentary, exercise, vape, and exercise + vape. The exercise group ran five times/week at 15m/min on a mouse treadmill. The vaping group was exposed to 6 mg/ml of nicotine for two hours/day, five times/week. Weekly body weights, lean/fat mass using ECHO-MRI, and behavioral tests (open-field, rotarod, and grip-strength) were performed on all groups. At the end of 8-weeks, the mice were euthanized. Lipid/glucose profile was measured in the blood. Results indicated a significant lowering of body weights through the 8-week period for most groups compared to C57-sed, which correlated with a loss of lean mass (MRI). There were no observable differences in the behavior tests or cardiometabolic panel among the groups. While there was a decrease in the mRNA expression of catalase in the liver of C57-exercise, vape, C57 and Cat-tg vape + exercise, there was a corresponding increase in FGF21 in C57-vape, C57 and Cat-tg vape + exercise compared to C57-sed. This shows possible induction of reductive stress due to vaping, which needs further verification.

Keywords: Cardiovascular, metabolism, vaping, oxidative stress

UGP-67

Title: Evaluation of Mitochondrial Metabolic Pathways in Breast Cancer Cell lines

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Sponsoring Institution: School of Medicine

Abstract

Remodeling of energy metabolism is described as one of the major hallmarks of cancer. It contributes to their heterogeneity and survival in a dynamic environment with reduced nutrient and oxygen levels. Defects in oxidative phosphorylation (OXPHOS) can also cause a switch in energy metabolism from oxidative to aerobic glycolysis, also known as the Warburg effect in cancer. Metabolic pathways leading to energy generation by OXPHOS play crucial roles in supporting high energy demands in cancer. To determine the remodeling of these metabolic pathways, we evaluated the expression of OXPHOS components, the tricarboxylic acid (TCA) cycle, and branched-chain amino acid metabolic enzymes by Western blot analyses and mass spectrometry-based proteomics analyses in triple-negative and ER/PR(+) breast cancer cell lines (BCCL). Determination and quantitation of changes in metabolic enzyme expression in BCCLs will be essential to characterize the heterogeneity of energy metabolism in breast cancer and find novel therapeutic targets.

Keywords: Mitochondrial energy metabolism cancer proteomics

UGP-68

Title: Effects of early life opioid exposure on cellular development in the nervous system

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Sponsoring Institution: Department of Biomedical Sciences, Joan C. Edwards School of Medicine, Marshall University

Research Sponsor: National Science Foundation and National Institutes of Health

Abstract

Background: The global opioid epidemic has dramatically increased the number of infants born with prenatal opioid exposure (POE). However, precisely how the developmental trajectory of the brain is affected by POE remains unknown. Our earlier work showed that there is a profound disruption in synapse number in the cortex of 3-week-old mouse pups prenatally exposed to the opioid buprenorphine. We have now begun to extend these studies with a detailed morphological analysis of astrocytes, a heterogeneous population of non-neuronal cells that physically interact with synapses in order to promote and support synaptic function (i.e. the “tripartite synapse”).

Approach: To investigate the effects of POE on tripartite synaptic development, we dosed pregnant mice with a sweetened condensed milk mixture prepared with either buprenorphine hydrochloride or vehicle control daily from gestational day 7 (G7) until postnatal day 11 (P11). To visualize astrocyte cell bodies and their peripheral astrocytic processes (PAPs), prenatal buprenorphine- or vehicle-exposed newborn mice were subjected to either retroorbital injections of adeno-associated viral (AAV) vectors or postnatal astrocyte labeling by electroporation (PALE) to tag astrocytes with a fluorescent label. At P30-35, mice were sacrificed and the brains were prepared for fluorescence immunohistochemistry (IHC) to identify sites of synapses. 3D reconstructions of astrocytes and their associated synapses were then generated from images taken with conventional confocal and super-resolution (i.e. STED) microscopy.

Results: POE promotes long-lasting changes to astrocyte structural development, highlighting a potential therapeutic target to improve synaptic health and overall brain function in individuals exposed to opioids in utero.

Keywords: opioids, synapses, astrocytes, brain, prenatal

Invited High School Students

Poster

HS-1

Student Names: Emily Lyons and Lauren Staton

Project Title - The Ultimate Guide to Sensor Accuracy

High School - Wyoming East High School

Abstract:

Observation/question: What prescription CGM is most accurate between Libre 3 and Dexcom G6. We want to collect honest data for CGM accuracy to show the best option between two major sensors.

Hypothesis: We believe that the Dexcom will prove more accurate due to its' size and the length of the carbon fiber tubing that stays under the skin. **Materials:** Alcohol pads,

antibacterial soap, Dexcom G6 sensor, Libre 3 sensor, Livongo blood glucose tester, lancets, test strips, and lancet device. **Procedure:** Prepared stomach skin with alcohol wipes and antibacterial soap. Allowed it to air dry while preparing the sensor applicators. Applied the sensors and pushed the button to release the needle to go under the skin. The sensors were worn for a warm-up time, and once the readings were measured every 3-5 hours. Hands were cleaned with soap and warm water and alcohol pad when readings were completed. **Data Analysis:** From the data, we see that the Dexcom provided more accurate readings compared to blood tests. The data shows more points of accuracy compared to the Libre. **Conclusion:** We found our hypothesis to be correct compared to the research and collected data.

UGP-69

Title: Create

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Mentor: Dr. Briana Nannen, nannen@marshall.edu

Sponsoring Institution:

Research Sponsor:

Abstract

In the Spring of 2024, the Marshall University Chorus will put on a concert entitled Create. This concert is intended to highlight the values and attributes of Marshall University's student body and surrounding community through songs written and performed by the students themselves. The concert will feature at least fifty minutes' worth of music composed by me, Jenna Toms, a senior student of Music Theory and Composition in Marshall University's School of Music. While I will be responsible for composing all the music for this recital concert, this will not be an individually done project. The University Chorus in the fall and spring semesters will be the primary inspiration for the music created. Class time will include hands on songwriting and workshopping sessions in which the students will collaborate to create thematic ideas, lyrics, instrumentation ensembles, and other decisions that go into writing a song. This opportunity will give the students a platform to speak out on subjects that matter to them and a chance to connect with the music on a more personal and intimate level. For myself, this will provide the space to work in a simulated commission-based work environment, allowing me to further my professional skills in preparation for success beyond my college career.

In an attempt to expand the celebration of creation to a larger medium and audience, Dr. Nannen and I would like to invite film and visual art students presenting capstones in the Spring to join us on the day of the recital. We will open up the art gallery in Smith, formally known as the Birke Art Gallery, as a place for visual art students to display and present pieces of their own capstone or other creative projects. We also plan to provide film students with an opportunity to present their own work during the gallery open house. These efforts will extend beyond the Marshall campus to include students from Huntington High School in an effort to be more collaborative and inclusive with those in our community.

Keywords: Music, Creativity, Inspiration, Composition, Collaboration

Poster

HS-2

Student Name: Alexandria Harper

Project Title -

High School -

Poster

HS-3

Student Names: Manvitha Sanjaya

Project Title - DNA Damage and Repair Mechanism in Duckweed (*Spirodela polyrhiza*) Under Ultraviolet (UV-B) Radiation Stress

High School -George Washington High School, Charleston West Virginia

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Abstract:

In living organisms, genomic DNA is a critical macromolecule; its stability and integrity are vital for the normal functioning of cellular processes, such as DNA replication and DNA repair.

Sunlight is a significant source of ultraviolet (UV) radiation. Excessive exposure to solar UV-B (280-315 nm) radiation can cause damage to DNA structure by introducing bulky DNA photoproducts. Among the lesions induced by UV-B, cyclobutane-pyrimidine dimers (CPDs; 80-90%) and [6-4] pyrimidine-pyrimidone photoproducts ([6-4] PPs; 10-20%) are most abundant. If unrepair, these photoproducts negatively affect the physiological processes of living organisms causing DNA replication stress, genomic instability, mutagenesis, and tumorigenesis.

Spirodela polyrhiza, a member of the duckweed family. In this study, *S. polyrhiza* plantlets were exposed to different UV-B exposure times. After UV-B exposure, plantlets were incubated under normal growth conditions for recovery and sampled at 0 h, 12 h, and 24 h for genomic DNA damage analysis. The genomic DNA was probed on a slot-blot experiment for antibodies against the (6-4) PPs or CPDs to detect the damaged DNA and nucleotide excision repair capacity.

Our results suggest that duckweed plantlets at 0 hours of recovery had the strongest DNA damage signals; thus, in these samples, the DNA repair system did not have enough time to repair the DNA damage caused by the UV-B radiation. Weaker signals were observed in the 12-hour and 24-hour recovery times post-UVB, showing that with more recovery time, the NER mechanism has time to repair most of the damaged DNA in the duckweed plantlets. DNA damage and the repair mechanism in duckweed are dose-dependent. Our work suggests that duckweed is ideal for studying UV-B-mediated DNA damage as an alternative to the mammalian system to understand the effect of climate change on plant and human health.

HS-4

Student Name: Sydney Renee Bostic

Project Title -

High School -