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2017 UNDERGRADUATE RESEARCH POSTER SESSION

Abstracts

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2017 Undergraduate Summer Research Award Poster Session

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An Investigation into the Effectiveness of Brief Guided Meditation

College of Education and Human Services

Student Researchers: Karen Barrientos, Samantha Butterbaugh, Nicholas Chambers, Jamie VanDewerker, and Jessica White,

Faculty Advisors: Douglas Wajda, Jeremy Genevese, and Kenneth Sparks

Abstract

Meditation has many benefits for reducing stress and anxiety, by inducing a relaxation response. It is unclear how guided meditation compares to other forms of relaxation.

PURPOSE: The purpose of this study is to determine if a guided meditation mp3 is as effective as other methods of relaxation.

METHODS: Skin conductance and breaths per minute were measured on 30 male and female adults while reading, meditating, and watching a video, each on three different occasions. Prior to the study each participant rated their psychological state of being using questionnaire styled scales. A repeated measures ANOVA and a related measure nonparametric test in IMB SPSS were used to analyze the physiological and psychological responses across subjects.

RESULTS: There was a significant difference ($p < 0.05$) between the book and meditation in GSR and respiration rate. A significant difference ($p < 0.05$) was found between the book and video in physiological state and in respiration rate. There was also a significant difference ($p < 0.05$) between the meditation and video in physiological state, GSR, and respiration rate. The DASS and Freiburg Mindfulness Inventory tests showed that the anxiety, stress, and depression rates of each participant did not affect the testing modalities.

CONCLUSIONS: The data collected shows that a guided meditation mp3 is an effective method in reducing stress and anxiety levels in the majority of individuals.

Go Skate! The Physiological Responses and Perception of Training on Inline Skates

College of Education and Human Services

Student Researchers: Karen Barrientos, Samantha Butterbaugh, Nicholas Chambers, Jamie VanDewerker, and Jessica White

Faculty Advisors: Emily Kullman, Kristine Fondran, and Kenneth Sparks

Abstract

It is unclear how inline skate training affects the performance and enjoyment of other modes of exercises.

PURPOSE: The purpose of this study is to determine if inline skating is an effective and enjoyable alternative method of exercise when compared to running and using the elliptical.

METHODS: Each participant's functional movement, body composition, and efficiency in running, skating, and using the elliptical was assessed before and after the skate training program at 80% of each participant's age-predicted heart rate. The skate training program consisted of three 45-minute training sessions for 6 weeks. After all training and testing was completed each participant was given a questionnaire regarding their perceptions of enjoyment and preferred method of exercise. A repeated measures ANOVA in IBM SPSS was used to analyze the differences between pre- and post-tests on exercise efficiency, body composition, and functional movement.

RESULTS: While there were no significant differences in weight or resting heart rate, there was a significant change in blood pressure, body fat percentage and lean mass. There were also significant improvements in the elliptical average heart rate, the skate VO2 and the distance traveled during skating. In addition, there was significant improvement in the FMS trunk stability push-up. All of the subjects considered participating in inline skating in the future.

CONCLUSION: Inline skating is an enjoyable method of exercise that also provides an effective workout that carries over to other forms of exercise, and improves core strength.

Cardiorespiratory Responses and Gender Differences Between Exercising on the Simply Fit Board and the Ab Rocket Twister

College of Education and Human Services

Student Researchers: Karen Barrientos, Samantha Butterbaugh, Nicholas Chambers, Jamie VanDewerker, and Jessica White

Faculty Advisors: Kenneth Sparks and Eddie Lam

Abstract

One of the biggest problems in fitness is finding a workout method that is effective yet enjoyable.

PURPOSE: The purpose of this study is to compare the Simply Fit Board and Ab Rocket Twister across genders and ultimately to determine which product is more enjoyable.

METHODS: Heart rate, Rate of Perceived Exertion, ventilation, oxygen consumption, and total kilocalories were all measured on 21 males and 20 females while using the Simply Fit Board and Ab Rocket Twister for 10 minutes at 75% of their age predicted maximal heart rates. At post-testing, each subject completed the Perception of Exercise Experience questionnaire. A repeated measures ANOVA in IMB SPSS was used to analyze the cardiorespiratory responses and their differences across gender.

RESULTS: Between the two products there was a significant difference ($p < 0.05$) between all of the test variables except VO2 and total kilocalories. The results across gender also showed that there were significant differences in VO2 and total kilocalories. The post-test questionnaire showed that the Simply Fit Board was more enjoyable than the Ab Rocket Twister.

CONCLUSION: The data collected displayed that the subjects preferred the Simply Fit Board over the Ab Rocket Twister; however, both products burned the same amount of calories.

Development of the Parenting Style and Practices Scale (PSPS) in examining parenting practices and children's academic performance

College of Education and Human Services

Student Researchers: Morgan Kubisch, Danielle Poissant, and Beth Friedman-Romell

Faculty Advisors: Grace H. C. Huang and Eddie T. C. Lam

Abstract

What roles do parents play in fostering children's academic success in school? There is a general consensus that confirms the importance of parenting styles and practices on children's academic performance (e.g., Pinquart, 2015). However, there is a lack of up-to-date systematic parenting scales with acceptable validity and reliability. For this reason, it limits our understanding of parenting related studies in the current context. Developing a questionnaire is critical to conduct cross diverse comparisons which would broaden the generalizability of the related research. Adopting the review of literature research approach, the purpose of this study was to develop a scale that contains essential elements of parenting styles and practices. Using this instrument tool, the goal would be to examine the relationship between parenting practices and children's academic performance. Through a thorough literature review, the Parenting Styles and Practices Scale (PSPS) was developed. The PSPS includes four factors: (a) parental expectations, (b) autonomy, (c) discipline, and (d) parental involvement in education. Each factor includes 10 variables. The next step would be to examine the psychometric properties of the PSPS on a sample. The ultimate goal is to implement the PSPS to a wider population and make the scale available for adoption in the parenting research community.

Heritage Language and Culture: The Cleveland Slovenian Experience

College of Liberal Arts and Social Sciences

Student Researchers: Kristen Burns, Lacey DiFranco, Dallas Turner, Samantha Paskert, and Joseph Peal

Faculty Advisor: Lydia Grebenyova

Abstract

Slovenians have played an important role in the history of Cleveland. From their origins being centered around St. Clair Avenue to their more dispersed state today, Cleveland is home to the largest population of Slovenians outside of Slovenia itself. Our study sought to explore the differences and similarities between native and heritage Slovenians. For data collection we used the picture word recognition test, sentence acceptability judgements test, and the cultural questionnaire. We designed these tests to study the Slovenian Clevelander community and shed on the under-studied subjects of "heritage linguistics" and "language attrition". Heritage speakers, or speakers that learned a language from family and outside of the country that it is spoken, are a unique group of people who have traits of both first and second language ability levels. Language attrition is a phenomena in which a language is definitively a first language but one begins to commit errors which they would not if they had stayed in an environment of only their own native language. These phenomena are fascinating and our data reflects the effects American English language and culture have caused on the language and culture of Cleveland Slovenians, previously unknown in the field of Linguistics.

Bisexuals' Partnerships: The Link Between Binegativity and Relationship Satisfaction

College of Liberal Arts and Social Sciences

Student Researcher: Emily Pohorence

Faculty Advisor: Kimberly Fuller

Abstract

Bisexual individuals face a number of distinct forms of discrimination compared to heterosexual, lesbian, and gay individuals. Further, bisexual individuals face a double discrimination where not only do heterosexual individuals discriminate against bisexual people, but individuals identifying as a sexual minority also perpetuate this stigma. This can be seem even more so in partnerships. This form of discrimination is known as binegativity, or the view of bisexual people as a lesser value, more likely to be bad partners, and several other negative opinions. The purpose of this study was to understand how binegativity of both current partners predicts relationship satisfaction. Further, the differences between previous partners' sexual orientations are assessed for differences in levels of binegativity.

The Creative Fusion of Cuban and Cleveland Dance Artists

College of Liberal Arts and Social Sciences

Student Researchers: Uliana Spiridonova, Katie Parchem, Rachel Torowski, Anne Gaeckle, and Eric Kish

Faculty Advisor: Lynn Deering

Abstract

In Summer 2017, as part of The Cleveland Foundation's Creative Fusion Project, in partnership with DANCECleveland, the acclaimed Cuban dance company Malpaso visited Cleveland to perform and be the featured guest artists for the CSU Summer Dance Workshop. This project's purpose was to investigate, assimilate, and participate in the Cuban Contemporary technique class with Malpaso providing a unique opportunity for CSU dance students to experience the Cuban technique of modern dance, a fusion of North American Modern Dance, European ballet, and traditional Afro-Cuban dances and rhythms. The CSU dancers and film student researched the roots of this Cuban dance form, interviewed the Cuban dancers on their experiences and training, and interacted in a close up and personal creative environment. This exchange was documented through writing, photography, video, and the kinesthetic experience of shared dance sequences which were used to develop an aesthetic expression of the information via the creation of movement compositions. The process was documented by the film student resulting in a visual archive reflecting this inter-cultural experience. The appreciation of the uniqueness of the art of dance as a non-verbal form of communication that easily crosses cultural boundaries became evident to the researchers, and will inform their future creative process work.

African Clawed Toads Responses to Varying Two Lateral Line Stimuli Separated by Variable Delays

College of Sciences and Health Professions

Student Researchers: Kevin Goth and Austin Shaffer

Faculty Advisor: Jeffrey Dean

Abstract

African Clawed Toads are a model organism for research on sensory integration due to their lateral line system that allows them to sense water movement. This study further investigates the choices made by toads when presented with two lateral line stimuli in the form of surface waves. When such stimuli are initiated simultaneously, toads tend to turn towards the more rostral stimulus or the nearer stimulus, waves from which arrive first. We introduced a delay between stimuli to allow the waves from the farther stimulus to arrive first.

Toads were more likely to respond to a single stimulus than they were to a double stimulus (25% versus 18% of trials, respectively). In these responses to double stimuli, toads generally turn as accurately toward one stimulus or the other as they do toward single stimuli; this indicates a choice rather than a confused or mixed response. As before, both proximity and stimulus angle affect the choice; toads prefer the more rostral stimulus and the closer of the two stimuli. Finally, delaying one stimulus increased the toads' choice of the first stimulus to arrive.

African Clawed Toads Response to the Choice of Lateral Line Stimuli

College of Sciences and Health Professions

Student Researcher: Casey Iyasere

Faculty Advisor: Jeffrey Dean

Abstract

African clawed toads (Xenopus laevis) use their lateral line system to detect prey. The African clawed frog can determine the distance of the origin of a surface wave. This allows the frog to differentiate which stimulus is more important for prey capture. The African clawed toads were put into a glass basin which was filled with water. Above the water basin are four rods that are controlled through a computer program which allow the rods to touch the surface of the water. After recording, each frame was examined in the videos to determine the turn angle and stimuli distance of the frog. When testing responses to two stimuli, the frog responds more when there are two stimuli than one stimulus. During the experiment, a prediction was that the frog will respond to the nearest stimuli than the farthest stimuli when two stimuli are present. For one stimulus, the frog responded better at the back than the front. Like the single stimulus, the double stimuli had more responses towards the back of the frog than the front of the frog. When there are two stimuli, the frog's response frequency is greater than the response frequency for one stimuli. Multiple stimuli will allow the frog to obtain more stimuli choices which will increase the response frequency.

**Supported by the McNair Scholars Program*

An Evaluation of Unionidae diversity in the Rocky River and how Population density has Changed Over Time in comparison to Observations made over 15 Years ago

College of Sciences and Health Professions

Student Researcher: Jamil Wilson

Faculty Advisor: Robert Krebs

Abstract

This study was undertaken to determine the changes in freshwater bivalve population since the survey conducted in 2001 in the northern region of the Rocky River, Ohio, USA. During our study, we discovered 69 live specimens and 58 shells most of which were found in two distinct locations near the top and bottom of the area surveyed. Our finds consisted of eight species in comparison to the nine that were seen in the same area of the 2001 study. Our results showed that Leptodea fragilis populations have decreased in the main stream of the Rocky River since the observation 2001, others species populations such as Lasmigona costata have slightly increased. However, the overall population of unionid mussels in this area have decreased and seeing as mostly older specimens were found, it appears as if they have not been reproducing despite the improvement of the water quality that has been taking place over the past 15 to 16 years.

** Supported by the McNair Scholars Program*

Express recombinant Tb12990 protein from E. coli for DNA binding analysis

College of Sciences and Health Professions

Student Researcher: Alexander Lotozynski

Faculty Advisor: Bibo Li

Abstract

Trypanosoma brucei is a parasitic protozoan species, causing sleeping sickness in humans and nagana in livestock. Its vector, the tsetse fly, feeds on an infected host and passes the parasites into the bloodstream of other mammalian hosts. The unique challenge for elimination is its complex process of antigenic variation, where the parasite regularly switches its major surface antigen, VSG. When the parasite enters the mammalian host, the host responds by making a corresponding antibody against its major surface antigen, VSG. However, although most parasites are eliminated, a small population can escape due to their altered VSG coat. The expression sites for VSGs are near the telomeres of T. brucei. Our lab has found that telomere proteins, including TbRAP1, TbTRF, and TbTIF2, suppress this VSG switching. TbRAP1 also regulates the VSG silencing. Using TbRAP1 as bait in Yeast Two-Hybrid screens, we identified Tb12990 as a potential TbRAP1-interacting factor. Sequence analysis suggests that Tb12990 might be a homologue of the vertebrate telomere protein TbTPP1. In order to examine whether Tb12990 has any telomere DNA binding activities as its homologues, we intend to express its recombinant protein in E. coli. We have cloned Tb12990 in pGEX-4T- 2 and pET-15b. We will next purify the Tb12990 from E. coli.

Fungal colonization of the invasive plant, lesser celandine

College of Sciences and Health Professions

Student Researcher: Allison Paolucci

Faculty Advisors: Emily Rauschert (CSU) and David Burke (The Holden Arboretum)

Abstract

Lesser celandine (*Ranunculus ficaria*) is an invasive spring ephemeral in Northeast Ohio. This problematic invasive plant forms a dense vegetative mat on forest floors. As a result, *R. ficaria* prevents the establish of many native species of flora. Despite, the growing concerns about the impacts of this species, little is known about the mechanisms underlying its variable success. This study focuses on determining the presence of beneficial fungal associations as a possible explanation for enhanced plant performance. Samples were gathered from eight sites in the Rocky River Metroparks, Ohio along a disturbance gradient from the riverbank. Microscopy was used to determine the presence of fungal colonization within the roots of *R. ficaria*. Cloning and a TRFLP (terminal restriction fragment length polymorphism) analyses were conducted to determine the community composition and relative abundances of the root fungi. Site-based analyses were then conducted to determine if fungal associations could account for variances in establishment and success across test sites.

Morphological study and biochemical characterization of the Alveolate flagellate Colpodella sp. (Apicomplexa) in a diprotist culture with Bodo caudatus

College of Sciences and Health Professions

Student Researchers: Lauren Dulik and Raghavendra Yadavalli

Faculty Advisor: Tobili Y. Sam-Yellowe

Abstract

Plasmodium falciparum, the causative agent of severe human malaria shares the presence of apical complex organelles with the free-living predatory alveolate, *Colpodella* sp. In this study we investigated morphological, biochemical and molecular characteristics of *Colpodella* sp. in a diprotist culture containing *Bodo caudatus* as prey. *Colpodella* attaches to its prey using the apical end. Attachment lasted for approximately 20 minutes while the cytoplasmic contents of the prey were aspirated into the posterior food vacuole of *Colpodella* in a process known as myzocytosis. Indirect immunofluorescence assay (IFA) using *P. falciparum* rhoptry specific antibodies showed intense reactivity with cytoplasmic vesicles of *Colpodella* but not *Bodo caudatus*. DNA isolated from a pellet of the diprotist culture was used in polymerase chain reaction (PCR) with oligonucleotide primers designed to target the *P. falciparum* (strains 3D7, DD2, FC27 and FCR8) rhoptry genes Rhop-3, Rhop-1 and RAMA. An approximately 2,906 bp single fragment was amplified from *P. falciparum* (strains 3D7 and FCR8) and diprotist DNA using RAMA primers. Similarly, DNA fragments of a similar size were amplified from the same DNA templates using primers targeting a highly conserved fragment of the18S rRNA used to identify a colpodellid associated with a human infection. Primers targeting conserved regions of the 18S rRNA of kinetoplastid species amplified a DNA fragment of 650 bp in *P. falciparum* (strains 3D7, DD2, FC27 and FCR8) and diprotist DNA. In addition, the kinetoplastid primers amplified a second fragment of approximately 2 kb from the diprotist DNA. Primers targeting the *P. falciparum* Rhop-1 gene amplified a 690 bp DNA fragment in all four *P. falciparum* strains but amplified a fragment of approximately 2 kb from diprotist DNA. Primers for the *P. falciparum* Rhop-3 gene target amplified a 660 bp DNA fragment in all four *P. falciparum* strains while DNA fragments of 2 kb, 800 bp and 500 bp were amplified from the diprotist DNA template. DNA sequence analysis of PCR amplified diprotist DNA identified the Rhop-3 gene demonstrating conservation of the Rhop-3 gene in *Colpodella* sp.

Identifying Potential Causes of Human Birth Defects through Genetic Studies of Worm Development

College of Sciences and Health Professions

Student Researchers: Solomiya Pushchak and Kaveri Khanna

Faculty Advisor: Aaron F. Severson

Abstract

We will use the roundworm *Caenorhabditis elegans* to study the process of meiosis, which is involved in the formation of gametes (sperm and eggs). Its small size, rapid life cycle, transparency and well-annotated genome allows researchers to track the effects of mutations that disrupt gametogenesis. Our preliminary data demonstrated that a genetic screen for mutations that increase the viability of embryos produced by worms lacking SPO-11, a critical factor regulating meiotic chromosomal inheritance, can identify genes required for the accurate transmission of the genome from one generation to the next. To further test this hypothesis, we will continue this screen to identify additional regulators of meiosis. Our results will be relevant to human genetics, since key regulators of gametogenesis are highly conserved in both worms and vertebrates. Thus, we can learn about the causes of human birth defects by examining worm development. Consequently, these mechanisms will be relevant to understanding gametogenesis in humans and may aide in preventing genetic instability.

** Supported by the McNair Scholars Program*

Expression Validation of miR-149-5p target genes in prostate cancer

College of Sciences and Health Professions

Student Researchers: Grant Wethington and Savita Singh

Faculty Advisor: Girish Skukla

Abstract

Prostate cancer (PCa) is one of the leading causes of mortality in men. Current therapeutics for PCa are androgen depletion by castration or/and anti-androgen based treatments. Androgens are necessary for Androgen receptor (AR) to function as a transcription factor, AR then regulates the expression of genes which promote cancer cell proliferation. However, despite the therapeutic interventions recurred AR signaling, which is facilitated by the acquisition of mutations in AR and its amplification, cholesterol biosynthesis and alterations in the steroidogenesis continue promoting PCa carcinogenesis. Our research is focused on regulatory small RNA molecules know as microRNAs (miRNA) in PCa. Numerous miRNAs fine-tune the expression of multiple genes involved in posttranslational modification, cell proliferation, organogenesis, energy balancing and developmental regulation thus affecting cell proliferation, differentiation, and cell death. miRNA "replacement therapy" is highly promising as it can target the expression of carcinogenesis promoting AR and androgen signaling, the holy grail of PCa therapeutics. In this research project, we have tested the efficiency of miR-149-5p in controlling AR expression using a sensor luciferase reporter assay system in PCa cell culture model. We found a significant downregulation of AR reporter gene in PCa cells indicating the efficacy of miR-149-5p in controlling the growth of AR based tumors. Our result indicates miRNA mediated regulation of genes involved in PCa and therapeutic potential.

The Effects of Cell Cycle Position on Skeletal Myoblast Differentiation or Apoptosis

College of Sciences and Health Professions

Student Researchers: Asma Saleh and Briana Boslett

Faculty Advisor: Crystal M. Weyman

Abstract

Programmed cell death (apoptosis) is induced by the same culture conditions as differentiation in skeletal myoblasts, yet these processes result in mutually exclusive physiological endpoints. Dissecting this coordinate regulation could enable selective manipulation relevant to the alleviation of muscle degeneration, the effectiveness of regeneration, or treatment utilizing skeletal myoblast transfer. Analysis of asynchronous cultures of myoblasts in growth media (GM) were determined to have 50% of cells in G1 phase, 30% of cells in S phase and 20% of cells in G2/M phase. When skeletal myoblasts in GM are switched to differentiation media (DM), roughly 70% of cells undergo differentiation and 30% of cells undergo apoptosis. This led us to the hypothesis that the 30% of cells undergoing apoptosis in response to DM may also be the 30% of cells in S phase. To confirm the potential role of the cell cycle, we began by performing a mitotic shake-off to synchronize cells in M phase. Cells were then monitored for progression to S phase by BrDU incorporation into newly synthesized DNA. Results show that cells peak in S phase 7 hours after mitotic shake-off. Future studies will investigate the potential for myoblasts in different cell cycle phases to undergo apoptosis.

**Partially Supported by the McNair Scholars Program*

A Preliminary Study of Phosphorus Variations in Lake Erie and its Major Tributaries

College of Sciences and Health Professions

Student Researchers: Shiying Lu and Huawen Li

Faculty Advisor: Fasong Yuan

Abstract

As a recurring symptom of eutrophication in Lake Erie, massive blooms of harmful algae pose a threat to safe drinking water supply and recreational water use. Causes of the recent re-eutrophication in the lake include changes in the tributary phosphorus loading and/or increases in the internal nutrient loading potentially mediated by the colonization of zebra and quagga mussels. This study is to investigate the phosphorus variations in different nearshore locations of the lake and its major tributaries for a better understanding of the lake's trophic conditions. A total of 21 water samples were collected from Lake Erie and its major tributaries from Detroit Michigan to Buffalo New York. These samples were filtered and measured on phosphorus before and after digestion to determine the concentrations of soluble reactive phosphorus (SRP) and total dissolved phosphorus (TDP), using an automated discrete analyzer. Our results showed that the average concentrations of SRP and TDP in its major tributaries were significantly greater than those in the lake. The concentrations of SRP and TDP in tributaries were 0.003-0.118 and 0.002-0.112 mg/L, respectively. The concentrations of SRP and TDP in the lake were 0.00-0.01 and 0.003-0.014 mg/L, respectively.

Exploration of Nanomaterials-based electrochemical sensors for peroxynitrite detection

College of Sciences and Health Professions

Student Researchers: Ousama Al-Mahmoud and Haitham Kalil

Faculty Advisor: Mekki Bayachou

Abstract

Peroxynitrite (PON, ONOO-) plays an essential role in several cardiovascular dysfunctions and other diseases triggered by oxidative stress. The precise detection of this analyte in biological systems is of paramount importance not only to understand the genesis and development of diseases, but also to design and assess efficient therapies. We fabricated highly sensitive and selective electrochemical sensors based on transition metal-decorated graphene nanocomposites as catalytic interfaces for peroxynitrite quantification. The interfaces of metal-decorated graphene nanostructures were immobilized on carbon electrodes by electro-grafting, electro-depositing, and drop-casting techniques. The morphology and surface chemistry of the nanostructured materials were characterized using Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Analysis (EDXA), and X-ray Photoelectron Spectroscopy (XPS). The electrochemical catalytic activities of the prepared interfaces were measured using cyclic voltammetry and amperometry, and Electrochemical Quartz Crystal Microbalance (EQCM). The results showed that the incorporation of the metal nanoparticles into graphene sheets have significantly increased the sensitivity of the peroxynitrite sensors. The presence of metal-functionalized graphene oxide amplified the current response to PON aliquots in aqueous solutions. It also allowed the application of less positive potentials and thus resulted in more differentiation between peroxynitrite and other interfering analytes that have higher oxidation potentials.

Identification of selective anti-trypanosome agents from compound library LOPAC

College of Sciences and Health Professions

Student Researchers: Cody Orahoske and Myah Marbury

Faculty Advisor: Bin Su

Abstract

Sleeping sickness disease (human African trypanosomiasis) is still a major health threat to a large number of people in 36 countries of sub-Saharan Africa. Currently, the estimated infection cases in these areas are between 300,000 and 500,000. *Trypanosoma brucei gambiense* and *Trypanosoma brucei rhodesiense* are the pathogens of sleeping sickness in humans. These parasites live and proliferate mainly in the blood and tissue fluids of the infected mammals and are transmitted by tsetse flies (*Glossina spp*.). The disease starts from a bite by an infected tsetse fly and goes through an initial stage, where trypanosomes multiply in the bloodstream and the lymphatic system. The disease will progress quickly without effective treatment, and the trypanosomes will cross the blood-brain barrier and invade the central nervous system eventually. In the late stage, patients will show a variety of neurological symptoms and often exhibit characteristic signs such as an alteration of the circadian sleep/wake pattern, which is how the disease is named "sleeping sickness". The disease will result in wasting of body tissue, coma, and ultimate death. There is an urgent need to develop better chemotherapeutic agents for the treatment of trypanosomiasis. Exploring the new application of existing medicines is a new trend in drug development field. There are multiple advantages of this strategy. First, the manufactory of these agents is mature already. Second, the toxicity profiles of the existing medicines are well established, which can be used to guide the new clinical testing if their anti-trypanosomiasis activity is identified. Third, multiple administration routes of the medicines are well-developed which may include the oral administration formulation. Oral administration route is very critical for the treatment due to the limited medical resource at sub-Saharan Africa area. Our group has developed and validated an easy operating high throughput screening (HTS) cell proliferation assay with *T. brucei* cells, and two mammalian cell lines. Sigma-Aldrich provides a LOPAC compound library (about 1300 chemicals), which consist of all the current clinical medicines and drug candidates in clinical trials, which are used for the high throughput screening process. The results from the screening are summarized.

Synthesis of Sialic Acid Derivatives and Their Immune Cells Modulation

College of Sciences and Health Professions

Student Researchers: Joseph Keil, Lei Yuan, and Yu Zhao

Faculty Advisor: Xue-Long Sun

Abstract

The exterior cell surfaces of macrophages express a dense layer of glycans which are often terminated by sialic acid. Sialic acid is an acidic monosaccharide whose presence on the terminal ends of glycans affects cellular function and properties. In particular, due to its hydrophilic and electronegative features, SAs play important roles in both physiological and pathological processes, such as in regulating cellular interactions with ligands, microbes and neighboring cells and in controlling cellular activation, differentiation, transformation and migration. In this study two sialic acid derivatives were synthesized and characterized, the 5 amine derivative and the 9 amine derivative. This study proposes that by treating cells with amine derivates of sialic acid it is possible to modify the native sialic acid expressed on the cell surface of macrophage, also known as sialylation status and its functionality accordingly. In the studies, the quantification of sialic acid were conducted by using both LC-MS/MS. We also hope to find information regarding the specific mechanisms that are involved in sialic acid binding events as well as possible cellular consequence due to sialic acid binding events. By modifying the sialylation status of macrophage cells it may eventually be possible to modify cellular functions and properties.

RNase L mediates the insulin signaling pathway

College of Sciences and Health Professions

Student Researchers: Oroshay Kaiwan and Danting Liu

Faculty Advisor: Aimin Zhou

Abstract

Diabetes is characterized by hyperglycemia mainly due to defect in insulin secretion and/or action. Regulation of glucose transport and use by insulin is central to the maintenance of whole-body glucose homeostasis. One of the potential mechanisms associated with insulin sensitivity is the activation of insulin receptor (IR) and subsequently transduces the signal through phosphorylation of insulin receptor substrate1 (IRS1) and activation of the PI-3K/Akt pathway. RNase L, an interferon (IFN)-inducible enzyme, plays an important role in IFN functions against viral infection and cell proliferation. However, a direct link between RNase L and insulin sensitivity has yet to be clearly established. In this study, we found that RNase L plays an important role in glucose homeostasis through impacting IR which is a trans-membrane receptor activated by insulin. The phosphorylation status of IR was significantly reduced in the cells deficient RNase L. As a result, activation of IRS1, the downstream substrate of IR, and the PI3K/AKT pathway was significantly inhibited in RNase $L^{-/-}$ cells. Further investigation of the molecular mechanism underlying the role of RNase L in mediating the activation of IR revealed that RNase L might regulate the cleavage of the precursor of IR via the ubiquitin/ proteasome system. Our results suggest that RNase L may be a novel target in the design of therapeutic strategies for diabetes.

Effects of palatal anesthesia on timing of muscle contraction during suckling in infant pigs

College of Sciences and Health Professions

Student Researcher: Nadet Najjar

Faculty Advisor: Andrew Lammers

Abstract

Abstract not provided

** Supported by the McNair Scholars Program*

Methods to Increase Efficacy of Pro-Active Balance Training Among Older Adults

College of Sciences and Health Professions

Student Researcher: Angelica Houston

Faculty Advisor: Debbie Espy

Abstract

In the health care field, doctors and researchers rely on objective information to make conclusions about a person's health. However, concepts such as pain and balance rely on subjective information to properly assist a patient. The key innovations regarding the assessment of pain began in 1939, starting as a list of 44 words sorted into five groups. Now, the pain scale comes in many forms, from a numeric score ranging 0-10 (Numeric Rating scale or NRS), to a scale of faces with appropriate descriptors with it (Visual analog scale, or VAS). Such as pain, balance is subjective, and what may be challenging to one-person in regard to balance may not be the same for another. There is no validating rating scale of balance exercise intensity scale for older adults, and ways to measure balance intensity for older adults does not exist. In this study, participants will use video games and balance training surfaces to be assessed on their balance using a rate perceived ability scale, determining the validity of the RPS scale. A consistent and valid way to rate balance exercise intensity would help individuals with balance challenges, and will help professionals, such as physical therapists, help their patients.

** Supported by the McNair Scholars Program*

Validating the Rate of Perceived Stability Scale to Gauge Balance Training Difficulty

College of Sciences and Health Professions

Student Researchers: Lorenzo Bianco and Preston Groft

Faculty Advisors: Debbie Espy and Ann Reinthal

Abstract

An effective way of measuring balance training difficulty is needed to properly conduct balance training. The instructor must ensure that the subject is partaking in the proper balance training difficulty. If the difficulty of the training is too hard, the subject may be at higher risk for injury. If the difficulty is too low, the subject may not receive all the benefits of the program. The purpose of the research study was to validate the Rate of Perceived Stability (RPS) scale. We recruited 25 subjects over the age of 50. The subjects were community ambulators with no musculoskeletal issues. The subjects completed three clinical balance tests and had their motion data captured while playing the gaming conditions. Subjects were asked to give an RPS score at certain times during the gaming. The scores should correlate with the perception of their own stability. We hypothesized that the subjects' rank of gaming condition difficulty should match the RPS scores assigned to the condition. A clear majority of subjects matched their easiest gaming difficulty with their lowest RPS score and their hardest gaming difficulty with their highest RPS score. Only four subjects perfectly matched their gaming difficulty with their respective RPS scores, and only two subjects had zero matches.

Moving Multi-Directional Harnessed Balance Training from the Clinic to the Community

College of Sciences and Health Professions

Student Researchers: John DeMarco and Hannah Simon

Faculty Advisor: Ann Reinthal

Abstract

Individuals such as the elderly and disabled frequently have trouble balancing, and therefore have a higher fall risk. A fear of falling can significantly impact mobility, thereby limiting participation in life activities. Balance training programs are often ineffective, because they are not intense enough or related to real life. Our lab has developed a clinic-based intense, engaging multi-directional harnessed balance training program that addresses these concerns. This work describes the process of transitioning the clinic-based training program into a community setting, specifically community gardening. We developed a harness system for a community garden high tunnel with raised beds. We incorporated inexpensive active assist mechanisms to assist standing up. We also equipped the harness system with a wearable sensor system including pressure sensors, a heart rate monitor, and a position motion tracking system. We developed analysis software for the system allowing us to quantify changes in balance. As compared to a non-harnessed environment where falls are possible, we hypothesize that the harness will provide the confidence to practice and thereby develop skill with more challenging balance activities in a real-life environment. We also hypothesize that the active assist mechanism will provide leg strengthening opportunities, further improving balance.

Effects of Task Requirements on Choice of Upper Extremity Use in Subjects Chronic Post-Stroke

College of Sciences and Health Professions

Student Researchers: Trevor Foster, Andrea Matanovic, and Amanda Videmsek

Faculty Advisors: Maureen Whitford and Linda Quinn

Abstract

Purpose: To explore how task requirements influence reaching in people post-stroke.

Subjects: Eleven subjects chronic post-stroke with mild to moderate stroke severity

Methods: Participants performed sitting reaching tasks under six conditions: object size (small or large), object location (Right or Left) and speed (slow or fast). Subjects were not instructed how to reach. The number of hands used, arm choice (paretic (P) or nonparetic (NP)), and if they reached contralaterally were recorded. Qualitative self-efficacy data was also collected.

Data Analysis: A general estimating equation model was used to calculate odds ratios, controlling for side of weakness and hand dominance. Descriptive statistics were run and qualitative comments reviewed for trends.

Results: All reaches were one-handed. Speed and object size were significantly associated with NP UE use ($p = 0.002$ and $p = 0.03$ respectively). The odds of using the paretic UE were 10.4 times lower (95% CI: 2.3 - 46.9) for the fast speed and 2.4 times lower (95% CI: 1.1 - 5.4) for the large size. Subjects only reached contralaterally with their NP UE (36.7% of time).

Conclusions: Subjects chronic post-stroke with mild/moderate severity use their P UE less to reach for objects that are larger and when reaching faster.

Improving the Development of the I-Chart For Use in Biopharmaceutical Manufacturing Operation

College of Sciences and Health Professions

Student Researcher: Kimberly Schveder

Faculty Advisor: Linda Quinn

Abstract

The Shewhart control chart is a statistical tool used by pharmaceutical companies, as well as chemical and other batch manufacturers, to help detect errors in the manufacturing process and ensure control of product quality. One particular type of control chart is the I-chart. The average run length (ARL) statistic of the I-chart can easily be determined when output from the manufacturing process is normally distributed with known population parameters. This paper investigates the impact on the ARL statistic when the I-chart is based on mean and standard deviation estimates obtained from small sample sizes of less than 50 batches. The methodology of Quesenberry (1993) is employed to ascertain the impact of small sample estimation on I-chart performance and provide recommendations for how I-charts should be constructed to account for the uncertainty of using a small number of batches to construct them.

** Supported by the McNair Scholars Program*

Achieving Atomically Smooth Surfaces and Ultra Sharp Platinum-Iridium Tips for Deposition of Organic Molecules

College of Sciences and Health Professions

Student Researcher: William Myers

Faculty Advisor: Jessica E. Bickel

Abstract

Organic materials are used in traditional solar cells and in flexible electronics. Unfortunately, the conductivities of organic semiconductors are significantly lower than their inorganic counterparts. This project examines the crucial first steps to enhancing the conductivities of these organic materials by crystallization via surface reconstructions. For this, the surface must be not only atomically smooth, but also atomically clean because there must be both enough room for the molecule to lie on and no possible adsorbates for the deposited material to react with. In this work, we looked at two substrates, gold and silicon. For the gold, we examined two annealing methods: hot plate and flame annealing. The hot plate method is the more viable, producing terrace widths of ~150nm, which is 50nm wider than achieved by flame anneal. For the silicon, a simple cleaving method in a nitrogen environment produced step edges of width ~20nm. These surfaces are characterized with Scanning Tunneling Microscopy (STM), however, atomic resolution has yet to be achieved in either case, possibly due to other adsorbates obscuring the surface. For the best STM images, we also need an atomically sharp, conductive tip. To achieve this, we used a two-step procedure for electrochemically etching platinum-iridium wire. The final step is a micro-polishing etch which utilizes H_2SO_4 to finely etch the tip down to exhibit radii of curvature of 70-100 nanometers with completion determined visually. In order to improve on this process, we are currently developing a circuit that will electrically determine completion which will result in more reproducible tips.

Synthesis Optimization and Characterization of Polymeric Microgels

College of Sciences and Health Professions

Student Researchers: Samantha Tietjen and Samantha Hudson

Faculty Advisor: Kiril A. Streletzky

Abstract

Microgels are spherical particles suspended in solution, comprised of crosslinked polymer chains. Due to the amphiphilic property of the parent polymer, microgels display a temperature dependent de-swelling property, and therefore have the potential to be used for drug delivery. In this case, microgels were synthesized using hydroxypropyl cellulose (HPC) polymer and divinyl sulfone (DVS) cross-linker, as well as dodecyltrimethylammonium bromide (DTAB) surfactant to decrease particle size and promote microgel monodispersity. Synthesized particles were then characterized using dynamic light scattering (DLS) for both temperature and angle dependence to determine hydrodynamic radius, Rh, at a range of temperatures showing a transition from the swollen to de-swollen states. Previous studies suggest that increasing the concentrations of either the chemical cross-linker or the surfactant reduce Rh. Primary experiments focused on the variation of DVS and DTAB concentrations. Increasing the DVS:HPC ratio from 1 to 30 results in microgels that decrease in swollen size from 190 to 150nm and deswollen size from 95 to 65nm. However, at higher DVS:HPC ratio synthesized particles grow rather than shrink with increasing temperature. Surprisingly, increasing the surfactant concentration resulted in an increase in Rh; this might be related to DTAB effect on polymer transition temperature. Additionally, DLS experiemnts revealed a dependence of Rh on microgel concentration in samples. Rh at infinite dilution was extrapolated from the concentration dependence. Continued work with the synthesis procedure also revealed the importance of a meticulous synthesis procedure; most notably in regards to polymer stock preparation, pH and temperature control, and consistent stirring.

Developing Methodologies for Wet-Sample Electron Microscopy Imaging

College of Sciences and Health Professions

Student Researcher: Daniel Terrano

Faculty Advisors: Petru Fodor and Kiril A. Streletzky

Abstract

Scanning Electron Microscopy (SEM) is widely used to analyze the size, shape, and composition of material systems. However, using this tool for analyzing systems such as particles suspended in solution requires drastic sample alterations, such as precipitation and fixation. Besides altering their environment, this exposes the particles to the harsh conditions within an electron microscope, such as high vacuum and electron beam exposure. To this end, the first goal of this study was to develop methodologies for imaging wet samples using electron microscopy. This is realized by creating a sandwich structure containing the solution of interest between a partially electron transparent window and the aluminum stub. The ability of the developed imaging cells to provide good imaging conditions is demonstrated with a variety of samples including polystyrene spheres, polymeric microgels, and spindle-shaped nanoparticles. As some of the systems investigated are temperature sensitive, the second goal of the project was to develop a temperature controlled stage that can be integrated with the SEM. In the future, this heating stage will be used alongside the wet samples to image microgels above and below their critical solution temperature.

Purification and Crystallization Trials of the Dihydroorotase from Methanococcus jannaschii

College of Sciences and Health Professions

Student Researcher: Amy Dadisman

Faculty Advisor: Jacqueline Vitali

Abstract

Dihydroorotase is the enzyme that catalyzes the third step of the *de novo* biosynthesis of pyrimidines. *M. jannaschii* is a hyperthermophillic archaeon that can serve as a model organism for research purposes. This experiment is a first step toward elucidating the structure of the dihydroorotase in *M. jannaschii*. The enzyme was purified by salting out and heating the solution and then putting the supernatant through cation exchange chromatography and hydrophobic interaction chromatography. Twenty-four conditions were tested to determine if a crystal of dihydroorotase could be formed. Two of these conditions led to preliminary crystal formation. These findings can be utilized to determine which other conditions to test to form a crystal. Once a crystal is formed, it can undergo X-ray crystallography to determine its structure. The structure of dihydroorotase in *M. jannaschii* can elucidate what structural characteristics allow this archaeon to survive in extreme heat and provides further understanding of the diversity within the dihydroorotase family of proteins. It can also give further insight into this pathway in humans.

How High Does the Lower Atmosphere Go?

College of Sciences and Health Professions

Student Researchers: Vladimir Sworski and Justin Flaherty

Faculty Advisors: Shawn Ryan and Thijs Heus

Abstract

The Atmospheric Boundary Layer (ABL), consisting of the bottom few kilometers of the troposphere, is a region with strong mixing of moisture and winds. This region's activity has a large impact on weather and climate models. In this study, we use a high resolution computer model: Large Eddy Simulation (LES). Statistics produced require a strong understanding of the height of the ABL. The purpose of this study was to create a method for determining this height accurately and consistently, as previous models demonstrated significant error.

Reconciling Linear Measurements of Fractal Cloud Structures

College of Sciences and Health Professions

Student Researcher: Nicholas Barron

Faculty Advisors: Thijs Heus and Shawn Ryan

Abstract

Clouds are a large unknown in meteorological predictions. Most of the issue can be derived from the odd shape of clouds. So, in order to correct the measurements of clouds, a thorough investigation of fractal cloud structures must be performed. Using the results from this study, a reconciliation method can then be constructed and applied to linear measurements of clouds.

What Determines the Shape of a Cloud?

College of Sciences and Health Professions

Student Researcher: William Calabrase

Faculty Advisors: Shawn Ryan and Thijs Heus

Abstract

Current climate models and weather forecasts suffer due to an uncertainty associated with the behavior of clouds, which directly impact the energy exchange between the earth and the Sun. This impact is determined in part by the shape of the clouds, thereby making the study of what affects cloud shape an area of interest. To characterize the shape of cumulus clouds we study the behavior of the cloud overlap ratio, or the ratio between the average cloud fraction and projected cloud cover. In this study, we used a high resolution computer model to 1) determine how the cloud overlap ratio is related to the height and layer depth of clouds where it is defined, 2) to study how the overlap behaves under different physical circumstances, and 3) to study how the fractal nature and wind shear impact cloud shape. We found that the shape is sensitive to cloud layer depth, the fractal nature and wind shear; but not to cloud height, time of day or location of the cloud field.

The Factor Structure of Time Beliefs and Perceptions: Predicting Punctuality, Procrastination, and the Use of Time

College of Sciences and Health Professions

Student Researcher: Sierra Bonifant

Faculty Advisor: Maria Rowlett

Abstract

The purpose of this research on time and personality is to evaluate one's perception of time and how behavior plays a role with procrastination. In addition, time can also coincide with personality factors, such as vigilance, compulsiveness, avoidance, and the Big 5. Substantial evidence has concluded that time perception and behavior are important factors that play into, and give value to, personality. A principal factor analysis concerning the perception of time and measurement of behavior resulted in a six-factor solution: Negative View of the Past, Sluggishness, Goal Setting, Risk Taking, Timeliness, and Impatience. Justification was found through "factor scores" that were used to create a presumption of procrastination. Total procrastination was assessed for each participant through a series of time behavior surveys. It was recorded that those who tend to procrastinate scored higher on Negative View of Past, and Risk Taking, and lower on Goal Setting and Timliness. The following factor structure provides an alternative to the most widely used, but often, ineffective scales.

**Supported by the McNair Scholars Program*

A Survey of After School Programs in the Greater Cleveland Area

College of Sciences and Health Professions

Student Researchers: Alissa Mullen and Ashley Wilson

Faculty Advisors: Shereen Naser and Liz Goncy

Abstract

Increasing rates of homicide and crimes in Cleveland in recent years among young adults suggests a need to improve efforts for early prevention and intervention. After-school programming may provide one such opportunity. The first goal of this study was to compile information on community after-school programs available to Cleveland youth, particularly those with an aim to reduce risk behavior related to juvenile delinquency. The second goal was to document which programs focus on the four factors shown to most reduce juvenile delinquency: building positive peer relationships, emphasis on drug use reduction, development of social skills, and character development.

First, student researchers collected data through networking and reviewing publicly available information on after-school programs in Cleveland, east Cleveland, and Cleveland Heights working with youth ages 10 or older. 77 programs were identified and included in a database along with information such as program location, hours, youth served, mission statements, and contact persons, to create a membership directory of available programming. Students then identified 31 programs to interview either face-to-face or over the telephone to gather more information. To date, 10 have agreed to complete interviews with 4 completed. Our poster will present preliminary information about these programs.

Adjacent-letter Flanking Bigrams Affect Lexical Decision Performance

College of Sciences and Health Professions

Student Researchers: Nicole Russo and Lea Araya

Faculty Advisor: Albert F. Smith

Abstract

In a lexical decision task in which target strings were flanked by pairs of bigrams, Grainger, Mathot, and Vitu (*Acta Psychologica*, 2014) found, for words, better performance when flanking bigrams contained target-string letters (e.g., BI BIRD RD; RD BIRD BI; IB BIRD DR; DR BIRD IB) than when they did not (e.g., CE BIRD NT); better performance when flanking bigrams contained letters ordered as in the target (e.g., BI BIRD RD; RD BIRD BI) than switched (e.g., IB BIRD DR; DR BIRD IB); and that only letter order within bigrams—not bigram order relative to the respective target—affected performance. Palinski (CSU Master's thesis, 2016) replicated these findings. In each of those experiments, on 80% of trials, flanking bigrams were composed of letters from the target. We conducted a new experiment in which only 50% of trials involved flanking bigrams whose letters were in the target. We again found, for words, more efficient responding when flanking bigrams contained target letters than when they did not and when flanking-bigram letters were ordered as in the target than switched. These effects do not depend on the proportion of trials on which flanking bigrams are composed of target letters.

Differential Effects of Adjacent-Letter and Open Flanking Bigrams on Lexical Decision Performance

College of Sciences and Health Professions

Student Researchers: Lea Araya and Nicole Russo

Faculty Advisor: Albert F. Smith

Abstract

Some models of word identification hypotheses units responsive to bigrams—letter pairs—that may not be adjacent in a letter-string stimulus. Grainger, Mathot, and Vitu (2014) and Palinski (2016) found, for words, responding was more efficient when flanking bigrams contained target-string letters than when they did not. They also found that responding was more efficient when flanking bigrams contained letters ordered as in the target than switched but whether flanking bigrams were ordered as in the target did not affect performance. Palinski (2016) replicated the results of Grainger et al. (2014) and conducted a second experiment that included four additional conditions in which the flanking bigrams consist of letters separated by one letter in the target (ex. FO FROG RG; RG FROG FO; OF FROG GR; GR FROG OF). Although, for nonadjacent letter bigrams, the pattern of performance over conditions was like that in Grainger et al. (2014) and Palinski (2016) Experiment 1, for adjacent bigrams, the pattern was different. To investigate the stability of these results, we repeated Palinski's second experiment. We replicated her results. The effect of adjacent-letter flanking bigrams may depend on whether nonadjacent-letter flanking bigrams are encountered in the experiment.

Does Lexicality Affect Classification Performance of Two-Letter Strings?

College of Sciences and Health Professions

Student Researchers: Lea Araya and Nicole Russo

Faculty Advisor: Albert F. Smith

Abstract

Some models of word identification hypotheses units responsive to bigrams—letter pairs—that may not be adjacent in a letter-string stimulus. Grainger, Mathot, and Vitu (2014) and Palinski (2016) found, for words, responding was more efficient when flanking bigrams contained target-string letters than when they did not. They also found that responding was more efficient when flanking bigrams contained letters ordered as in the target than switched but whether flanking bigrams were ordered as in the target did not affect performance. Palinski (2016) replicated the results of Grainger et al. (2014) and conducted a second experiment that included four additional conditions in which the flanking bigrams consist of letters separated by one letter in the target (ex. FO FROG RG; RG FROG FO; OF FROG GR; GR FROG OF). Although, for nonadjacent letter bigrams, the pattern of performance over conditions was like that in Grainger et al. (2014) and Palinski (2016) Experiment 1, for adjacent bigrams, the pattern was different. To investigate the stability of these results, we repeated Palinski's second experiment. We replicated her results. The effect of adjacent-letter flanking bigrams may depend on whether nonadjacent-letter flanking bigrams are encountered in the experiment.

Can't Shake the Blues: Do Worry and Attention Flexibility Enervate Cognitive Emotion Regulation Outcomes?

College of Sciences and Health Professions

Student Researcher: Evan Basting

Faculty Advisor: Ilya Yaroslavsky

Abstract

Depression is a mood disorder that is characterized by enduring feelings of sadness that are often accompanied by psychovegetative symptoms and attentional deficits that result in functional impairment. Depression is often hallmarked by biased attention towards negative information that once activated, remains in depressed persons conscious awareness. Generalized anxiety disorder (GAD) often co-occurs with depression, and is also characterized by enduring negative information processing in the form of worry that consumes a significant amount of an individual's thought processes. Both disorders are marked by emotion regulation deficits in the form of responses that usually reduce distress, but that fail to work for those with either disorder. Despite the high rates of co-occurrence, relatively little is known about the effect that GAD has on the relationship between depression and emotion regulation outcomes. Given that worry is a cognitive process that evokes and maintains negative information in conscious awareness, it is feasible that GAD may interfere with the effects of emotion regulation responses that leverage cognitive resources to bring forth and maintain positive emotions, such as by recalling pleasant memories (positive autobiographical memory, PAM). Deficits in attentional processes may further reduce PAM's effectiveness. This study examined these possibilities among community dwelling adults.

Is it in the eyes? A pupillometry study of stress reactivity and Borderline Personality Disorder

College of Sciences and Health Professions

Student Researcher: Zachary Tokar

Faculty Advisor: Ilya Yaroslavsky

Abstract

Borderline Personality Disorder (BPD) is characterized by unstable mood states, chaotic interpersonal relationships, and behavioral dysregulation in the form of self-injurious acts that results in notable functional impairment. Emotion dysregulation, marked by strong shifts in emotional states away from baseline levels across subjective and physiological substrates, is believed to reflect one mechanism in the relationship between BPD and functional impairment. However, it remains unclear whether emotion dysregulation represents a general tendency to experience both positive and negative emotions keenly, or to specifically be sensitized to negative mood states. The present study examined the relationship between BPD symptoms and emotion dysregulation across neutral, negative, and positive valenced emotional states in a sample of twenty-two community dwelling adults with histories of psychiatric disorders. Emotion dysregulation was measured via subjective affect ratings and pupillary responses that index sympathetic nervous system reactivity when participants recalled neutral, stressful, and pleasant events that occurred during the prior 3 months. Results and clinical implications are discussed.

Using Modified Dean Flow Designs to Increase Mixing Performance

College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researcher: Joshua Clark

Faculty Advisors: Chandra Kothapalli and Petru S. Fodor

Abstract

We are using numerical solutions for the Navier-Stokes equations and the concentration - diffusion equation to model fluid flow and reactant distribution in serpentine type channels for micromixers/microreactors development. These mixers exploit centripetal forces on the fluid to induce cross-sectional fluid mixing, aka Dean flows. Various modifications are used to increase the mixing character of these cross-sectional flows. We found that the performance of these mixers exceeds that of unmodified channels and we currently assess their performance relative to other state of the art methodologies used to induce mixing on the microscale.

Implementation of Groove Based Designs for Engineering Fluid Flow in Micromixers

College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researcher: Tahir Butt

Faculty Advisors: Chandrasekhar Kothapalli and Petru S. Fodor

Abstract

Mixing on microscale is important for the development of miniaturized chemical reactors that use small quantities of reactants and allow better control over the reaction conditions and products. Nevertheless, achieving rapid mixing in this type of micro-reactors is challenging due to the lack of turbulence and slow diffusion on the microscale. In this work we implement micromixers designs based on surface groove/ridge patterns targeted at inducing cross-sectional flows that both extend the interface between the different reactants, as well as induce chaotic advection. We discuss the fabrication of these structures using soft-lithography in PDMS employing a mold and their optical characterization needed in order to evaluate their mixing performance.

Going Green: Experimental Adaptation of Scenedesmus Dimorphus to Marine Conditions

College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researchers: Mohammed Kalil and Morgan Cohara

Faculty Advisor: Joanne Belovich

Abstract

Algae has gained some interest as the need for alternative fuels becomes more pressing. Reliance on fossil fuels is causing our environment and economy harm, and is not sustainable moving forward. Lipid rich algae strains can be used in the production of biofuels, and provide an alternative fuel source. One challenge facing the prospect of algae as a fuel source is that lipid rich algae grows exclusively in freshwater. Considering the scarcity and cost to use freshwater for algae growth, interest has grown in the possibility of adapting lipid rich, freshwater algae to a seawater environment. Seawater can have up to 35 grams of NaCl salt per liter more than freshwater. The Scenedesmus Dimorphus algae was chosen as the interest of this research due to its high lipid content. Also, it is very robust and well researched. Algae is grown in a controlled environment with varying salinity levels in either a bioreactor unit or 2-liter glass bottles. The objective of this research is to gradually adapt the S. dimorphus to increasing salt levels and reach a total specific gravity level of 1.010, which is about 16 grams NaCl per liter, compared to 1.025 TSG level that of seawater.

Evaluation of cetane values of glycerolipids extracted from algae Scenedesmus dimorphus grown in various salinity concentrations using gas chromatography and mass spectrometry (GC-MS)

College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researchers: Paul Lin and Chandana Mannem

Faculty Advisors: Joanne Belovich and Yan Xu

Abstract

Algae's ability to store lipids, renewability, and potentially safer for the environment has made it a promising alternative fuel source. An industry rating for a biofuel's potential is the cetane value, which is a measure of a fuel's quality related to various glycerolipid concentrations. Growing conditions will affect lipid profile in algae, thereby affecting the cetane value. This project will attempt to identify changes in the centane value of the algae Scenedesmus dimorphus grown in various salinity concentrations. Scenedesmus dimorphus is the algae chosen for this experiment because of its ability to rapidly grow under harsh conditions. In this experiment the growth conditions were controlled in bioreactors and shaker baths.

Total lipids were extracted from dry mass algae with the Bligh-Dyer method, which allows for the extraction of the glycerolipids with the solid phase extraction method. Upon the final extraction, a transesterification reaction is carried out in order to convert the glycerolipids into FAME (fatty acid methyl esters), which allows the GC-MS (gas chromatography and mass spectrometry) instrument to better quantify the lipid concentration.

Salt Concentration and pH Affect the Size of Elastin-Like Polypeptide Nanoparticles

College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researchers: Bryce Noe, Ilona Tsuper, Daniel Terrano, and Richard Schmitt

Faculty Advisors: Nolan B. Holland and Kiril A. Streletzky

Abstract

The transport of therapeutic drugs to specific tissues in the body can be accomplished using nanoparticles that encapsulate the drugs. Elastin-like polypeptides (ELP) is a class of materials that can reversibly form such nanoparticles in response to environmental cues. FLPs transition from soluble compounds to a phase separated system under particular solution conditions and have been used to produce temperature responsive surfactants. When these ELP surfactants are above their transition temperature, they spontaneously form energetically stable spherical micelles. When the temperature drops below the transition temperature, the micelles break apart and the ELP goes into solution. The size of these micelles can change depending on the solution conditions, including pH and salt concentration. We studied how the size of the micelles are affected by these solution conditions by using dynamic light scattering to determine the diameter of the ELP micelles. When the salt concentration increased, we found that there was a region of constant size followed by a region of linear increase in diameter. Following the linear region, there is a jump in micelle size. As the pH of the solution increased from neutral pH, the diameter drastically increased. As pH decreased from neutral pH, the diameter slightly increased.

Light Scattering Study of the Size and Shape of Mixed Elastin-Like Polypeptide Micelles

College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researchers: Ilona Tsuper, Daniel Terrano, Bryce Noe, and Richard Schmitt

Faculty Advisors: Nolan B. Holland and Kiril A. Streletzky

Abstract

Elastin-Like Polypeptides (ELP) can be used to form thermoreversible vehicles for drug delivery systems. The ELP nanoparticles are composed of three-armed star polypeptides. Each of the three arms extending from the negatively charged foldon domain include 20 repeats of the (GVGVP) amino acid sequence. In addition, linear constructs composed of 40 repeats of the same (GVGVP) sequence are introduced into the system. The mixed ELP polymer system is soluble at room temperature and becomes insoluble at the transition temperature (~ 50°C) forming micelles with the foldons on the exterior and linear constructs at the core. Above the transition, the size and shape of the mixed micelles are dependent on the pH of the solution, concentration of the PBS solvent, and the ratio of the linear to foldon concentration. The technique of Depolarized Dynamic Light Scattering (DDLS) was employed to study the structure and dynamics of the mixed micelles at 62^{o}C and maintained at an approximate pH level of 7.3 - 7.5. The ELP foldon micelles have a radius of 10 nm; the introduction of the linear concentration leads to a growth of mixed micelles at a linear rate, when the PBS and foldon concentrations are fixed. A model explaining this linear growth was developed utilizing the molar volumes of the mixed system. Static Light Scattering results seemingly support this model. However, the apparent VH signal found can indicate elongation in the geometry of the particles or anisotropic properties of the core of the mixed micelle.

Fabricating Non-close Packed Colloidal Monolayers for Ion Irradiation Templates

College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researcher: Nandini Padaraju

Faculty Advisors: Christopher L. Wirth and Jessica E. Bickel

Abstract

Due to their unique properties, anisotropic nanoparticles are desirable components for future applications yet there are few processes capable of fabricating nanoparticle impregnated coatings for the manufacturing environment. Our work seeks to develop new masking techniques for the production of the templated substrates that will induce ordered nanoparticle films. Specifically, we are fabricating non-close packed colloidal monolayers onto silicon substrates, which then serve as the template for ion irradiation. The first steps to creating this monolayer are obtaining a spin-coated poly(vinyl alcohol) (PVA) thin film of ~200 nm and a close-packed colloidal monolayer using a peltier heater. We achieved a thin film of PVA with the desired thickness by examining the effects of the RPM and viscosity, measured by a rheometer, on film thickness which was evaluated with atomic force microscopy. Results showed that as the RPM increases and the viscosity decreases, the thickness decreases. To form the colloidal monolayer, a drop of silica spheres suspended in ethanol was placed on a silicon wafer and mounted onto a peltier element inside a closed box with fixed tilt, temperature, and humidity. We show that we can reduce the number of defects in the monolayer by cleaning with a piranha etch.

The Stokes Brothers: The Advent of Black Political Power in America

Maxine Goodman Levin College of Urban Affairs

Student Researcher: Ma'Taya Hammond

Faculty Advisor: Ronnie Dunn

Abstract

Beginning in January of 2017, I conducted research alongside my mentor, Dr. Ronnie Dunn, commemorating the 50-year anniversary of Carl Stokes election as the first African-American mayor of a major US city, and his brother Louis, as the first African-American congressman from the state of Ohio. Our research and the commemoration focused on the political, civil rights, and public policy initiatives and contributions of the Stokes brothers. Our research concentrated specifically on policing during the late 1960's, a period in which many social commentators suggest mirror the racial tensions of today. Mayor Stokes's principal economic development and community revitalization plan, "Cleveland: NOW!" and other governmental documents from the 1960's were used to assess the impact of his public policy initiatives in the area of policing and their implications for public safety today. This research along with that in the areas of housing, education, healthcare, and workforce development will be presented in a report that will be provided to public officials and policy makers to help formulate public policy in these respective fields.

**Supported by the McNair Scholars Program*

Decreasing Stress Levels through Animal Interaction

School of Nursing

Student Researcher: Cyna Abid

Faculty Advisor: Corinne Wheeler

Abstract

The purpose of this qualitative study is to examine college students' feelings after playing with a support dog during a stressful time such as midterm exams and final exams. The goal of the research is to determine how effective the students perceive playing with pets has on decreasing their stress levels during stressful times. The reason this study is being conducted is to focus on the students' experiences and the thoughts and feelings that are occurring within themselves personally during the interaction with the dogs. It is based on their perception and feelings of stress relief rather than their physiologic proof of stress relief. For this study, seven students apart of Cleveland State University's Accelerated Nursing Program voluntarily participated in interacting with three dogs before their exam. During this time, they focused on playing with the dogs and forgot about their study notes or exam. They all interacted with the dogs at the same time, allowing them to see that their classmates are also relaxing. When the students returned from their exam, they engaged in a focus group in which they were asked several questions about their experience when interacting with the dogs. It was found that students did indeed experience a reduction in stress levels and felt more relaxed. Students also reported that they were more focused and concentrated during their exam and attributed that gained focus to interacting with the dogs earlier that day. They felt like they benefited from this experience and wanted more opportunities like it.

**Supported by the McNair Scholars Program*

Dispersion and Characterization of Boron Nitride Nanotubes Stabilized by DNA

Washkewicz College of Engineering

Student Researcher: Camerin McDonald

Faculty Advisor: Geyou Ao

Abstract

Boron nitride nanotubes (BNNTs) are newly emerging nanomaterials with extraordinary mechanical properties as well as thermal and chemical stability. There have been growing interests in both fundamental studies and technological development of BNNTs such as protective coatings for high temperature and hazardous environments due to recent success in large scale synthesis of BNNTs. In this work, various DNA sequences were utilized to stabilize aqueous dispersions of BNNTs. First, we determined the optimum mass ratio of 1:1 for BNNTs:DNA using $(GT)_{20}$ by UV-vis absorbance measurements. Second, the DNA length effect on the dispersion yield of BNNTs was investigated using sequences $(GT)_3$, $(GT)_5$, $(GT)_{10}$, $(GT)_{15}$, and $(GT)_{20}$. Third, mononucleotide repeats of A_8, C_8, G_8, T_8 were used to examine the DNA sequence dependent behavior of BNNT dispersion yield and quality. In addition, various salt concentrations of 0, 50, and 100 mM NaCl was tested to evaluate the effect of salt on BNNT dispersion. We found that the BNNT absorbance remains relatively similar at the given salt concentrations.

Dispersion Stability of DNA-Wrapped Carbon Nanotubes in Biological Media

Washkewicz College of Engineering

Student Researcher: Fjorela Xhyliu

Faculty Advisor: Geyou Ao

Abstract

Single-wall carbon nanotubes (SWCNTs) are among the most widely studied artificial nanomaterials. Their dispersion stability in biological media is a prerequisite for applications development in biomedical imaging and sensing. This project investigates the dispersion stability of DNA-wrapped SWCNTs in RPMI cell culture media with and without fetal bovine serum (FBS). The synthetic SWCNT mixtures were purified into semiconducting enriched fractions and various single species including (11,1), (9,4), and (7,3) using recognition DNA sequences by a polymer aqueous two-phase (ATP) separation method. The near-infrared (NIR) fluorescence, vis-NIR absorption, and pH of DNA-SWCNT dispersions in different biological media were monitored over time. According to optical properties of SWCNTs, we found that while DNA-SWCNTs were mostly stable over a period of 4 weeks in water, aggregations of SWCNTs occurred in media after 3 days, and FBS containing media after 2 hours. Interestingly, the kinetic measurements of single species in media with FBS showed a monotonic decrease in NIR photoluminescence (PL) intensity for (11,1), (7,3), and (6,4), and relatively stable PL intensity for (6,5) enantiomers within experimental time period. However, increase in PL intensity was observed for (9,4), (7,6), and (7,5), indicating different mechanisms for interactions between DNA-SWCNTs and biological media.

Catalytic Gasification: A Sustainable Waste Management Alternative

Washkewicz College of Engineering

Student Researchers: Samuel Sanya, Uchechukwu Obiako, and Eric Lange

Faculty Advisor: Jorge E. Gatica

Abstract

This research focuses on advancing the current knowledge of a catalytic gasification process as a potential in-situ resource utilization and waste management system. This research has significance in a variety of engineering applications, but is of particular relevance towards municipal waste management and advancing space exploration. In this technology, typically referred to as Trash to Supply Gas (TtSG), liquid phase oxidation reactions produce carbon monoxide, carbon dioxide, and water. The oxidation reactions are complemented by two gas-phase reactions: the Water Gas Shift (WGS) and the Sabatier (or methanation) reaction, the main stages in the pathway of producing hydrogen and methane in this technology.

A research grade laboratory reactor is currently being used to study the catalytic gasification mechanism with two model substrates: cellulose and polyethylene. Cellulose and polyethylene exhibit marked differences under the conditions being studied. Cellulose remains solid during catalytic gasification experiments, while polyethylene melts prior to reaction conditions. Following the reaction phase, the reaction products are collected and analyzed with Gas Chromatography (GC), Differential Scanning Calorimetry (DSC) and Scanning Electron Microscopy (SEM).

The current focus of this research is the formulation of the liquid phase oxidation kinetics. The study connects the gas phase kinetics with experimental results, aiming to elucidate the chemical pathway for the liquid phase oxidation. Efforts include the connection of transport phenomena with gas phase kinetics for the formulation of an overall model. The results clearly demonstrate the potential of catalytic gasification as a sustainable waste management alternative.

Assessment of Metabolism–Induced Hepatotoxicity on a 384-Pillar Plate

Washkewicz College of Engineering

Student Researchers: Yana Sichkar, Soo-Yeon Kang, Pranav Joshi, and Kyeong-Nam Yu

Faculty Advisor: Moo-Yeal Lee

Abstract

Microarray bioprinting technology has been explored to create miniaturized 3D cell cultures on a 384-pillar plate, which were combined with drug metabolizing enzymes (DMEs) and test compounds in a 384-well plate for metabolism-induced toxicity assays. Our goal in this study was to demonstrate rapid assessment of metabolism-induced toxicity on the 384-pillar plate and obtain reliable and highly predictive information on compound's hepatotoxicity *in vivo*. Briefly, human cells including Hep3B human hepatoma cell line as well as human embryonic kidney 293 (HEK 293) cell were encapsulated in alginate-Matrigel on the 384-pillar plate. Test compounds and six different DMEs including cytochromes P450 (CYP450) and UDP-glucuronosyltransferase (UGT) were dispensed in the 384-well plate. By sandwiching the 384-pillar plate onto the 384-well plate, human cells were exposed to the compounds and their metabolites generated by DMEs. The cells were stained with luminescent and fluorescent dyes and IC_{50} values were calculated using the luminescence and fluorescence obtained. In summary, our approach allowed us to assess mechanisms of metabolism-induced toxicity in high throughput. Thus, the 384-pillar plate could be used as a high-throughput, early stage, microscale alternative to conventional *in vitro* multi-well plate platforms and provide a rapid and inexpensive assessment of metabolism-induced toxicity at early phases of drug development.

Image Analysis and Quantification of 3D Cancer Cell Migration

Washkewicz College of Engineering

Student Researchers: Stephen Hong, Sean Yu, and Alexander Roth

Faculty Advisor: Moo-Yeal Lee

Abstract

Metastatic tumors are known for their ability to migrate toward circulatory apparatus and detach from the primary tumor. Generally, metastasis is quantified *in vitro* using migration assays that are normally measured in two dimensions (2D). Three-dimensional (3D) migration assays can better mimic cancers by providing similar microenvironments to those observed *in vivo*. Imaging 3D cell cultures requires multiple 2D images stacked along a Z-axis; however, imaged cells would be in-focus at varied z-positions at different time points due to the characteristics of cell migration. Our goal in this study was to analyze in-focus cell images and quantify cell migration in 3D in high throughput. Briefly, Hep3B human hepatoma cell line in alginate was printed on top of a layer of chemoattractants in a microwell chip and cultured over time to model hepatocellular carcinoma. Acquired cell images were analyzed using a Fast Fourier Transform (FFT) to create a histogram of pixel brightness variation within an image. We selected a specific frequency range that would correspond to a sharp change in pixel brightness, a spheroid's edge, while the rest was subtracted to delete out-of-focus cells. In-focus cell images were recreated by reverse FFT, and ImageJ macros have been used to calculate the brightness of each corrected image in our 3D culture. By correlating pixel brightness to cell number, it allowed us to calculate the average position of all the cells in our 3D culture, based on brightness and z-position of the cell image. By measuring the change in average position over time, we created a quantifiable method to measure cell migration in 3D.

Spurious grain formation due to convection at cross-section-changes during directional solidification

Washkewicz College of Engineering

Student Researchers: Noah Weber and Claudine Lacdao

Faculty Advisor: Surendra Tewari

Abstract

Turbine blades are a critical component in high powered gas turbine engines. These components are directionally solidified to have a single grain orientation, which allows them to operate under high temperature and stress conditions. Spurious grain formation is a major concern when forming these turbine blades. The purpose of this study was to study the effect convection has on forming these defects within turbine blades. Two alloys, Pb-5.8%Sb (solutally unstable) and Al-19%Cu (solutally stable) were directionally solidified upward in a positive thermal gradient (thermally stable) in a graphite crucible having abrupt cross-sectional area change from 3.2 mm diameter to 9 mm diameter. In the Lead alloy after the cross-section-expansion there is no observable new grain formation. However, in the Aluminum alloy there is extensive new grain formation after the expansion.

Connected FPGA Thermal Monitoring

Washkewicz College of Engineering

Student Researcher: John Schultz

Faculty Advisor: Pong Chu

Abstract

Field Programmable Gate Arrays (FPGA) are configurable integrated circuits. One area that is very important in integrated circuits is temperature control. Improper heat control can lead to a decreased lifespan and possible failure of the device. Many different circuits can be created on the FPGA to suit a specific project or need. Due to FGPAs being configurable, it is hard to create efficient cooling methods. Our project seeks to monitor the FGPA's temperature with different configurations to eventually increase the efficiency of the thermal management system.

To accomplish this, we programmed a system on the chip system onto the FPGA in order to be able to communicate with sensors. We connected the system to an internal and ambient temperature sensor. We then connected the system to a wireless module that uploads to Adafruit IO and can be monitored in real time.

Transcutaneous Electrical Stimulation for the Production of Functional Motion of a Human Arm

Washkewicz College of Engineering

Student Researcher: Kyra Rudy

Faculty Advisor: Eric Schearer

Abstract

Persons with tetraplegia experience little to no function in their arms and are therefore unable to perform reaching tasks without assistance. While functional electrical stimulation (FES) has shown promise for restoring motion to paralyzed limbs, it is limited by issues such as muscle fatigue and atrophy. A control strategy robust enough to overcome these issues has yet to be developed and some motions are not feasible even with the most sophisticated FES control strategy. In theory, a powered exoskeleton could be used in concert with an FES system to increase the accuracy of control and assist the arm when motions are unfeasible under FES alone. The results of using a powered exoskeleton in concert with transcutaneous electrical stimulation were investigated and compared to the results of using either the exoskeleton or FES alone.

Measuring Wind using a Hovering Drone Network: Met-Masts on the Go

Washkewicz College of Engineering

Student Researchers: Hassan Jaroudi and Mohamad Khattab

Faculty Advisor: Wei Zhang

Abstract

Renewable energy has grown considerably over the past years, with a projected growth of $460 billion per year by 2030. One of these renewable energies is deploying wind turbines to harvest wind energy. Knowledge of wind speed and direction is critical to determine the appropriate site to place wind turbines. The current method of collecting wind data primarily by installing stationary meteorological towers is expensive and limited, because met masts are fixed once built. This research aims at using a network of hovering drones as a platform to measure wind speed, direction, temperature and humidity at multiple elevations, which could potentially supplement the previous methods. The rapid development of drone technology is very promising due to its mobility and cost-effectiveness. The research scope includes: (1) install a contemporary wind measurement system on a drone; (2) hover the drone with the weather sensors and collect wind data in the field; and (3) compare the measurements with local meteorological data to test its accuracy.

Construction of A Weather Station for Measuring Wind using a Hovering Drone Network

Washkewicz College of Engineering

Student Researchers: Adam Stead, Mark Travis, and Rishi Maheshwari

Faculty Advisor: Wei Zhang

Abstract

Our research aims to build and test the effectiveness of the Sparkfun® Weather Station in its ability to record meaningful data while streaming to a remote device in real-time. This is motivated by our plans to utilize a hovering-drone system to collect meteorological data, such as wind speed, wind direction, humidity, pressure, and temperature. This data is essential to evaluate the wind profiles of a given area and assess available wind resource. The weather station was first calibrated by comparing measurements of the cup anemometer against a standard pitot tube in the lab. We found that the measured wind speed from the cup anemometer needs to be corrected with a factor of 1.4 as wind speed is below 4.5 m/s, but no correction is needed beyond. Overall, the easily-upgradable Sparkfun® Weather Station has been found to be an effective and inexpensive way to collect meteorological data wirelessly. The next step of this research is to incorporate the weather station into the hovering drone to enable measuring wind using a hovering drone network.

Development and Verification of a Mechanical Loading Device for Microfluidics

Washkewicz College of Engineering

Student Researcher: Stefan Habean

Faculty Advisor: Jason Halloran

Abstract

Establishing the role that mechanics play in nerve cell (e.g. neurons) function requires experimental testing. Microfluidic based experiments are commonly used to study neuron growth and function, and studies have found mechanics to play an important role in neuron health. External loads can be applied to a microfluidic device using a motor, which presumably influences the mechanical environment of the cells. While a motor can easily apply known displacements, a "load cell" is necessary to measure corresponding forces. In an existing prototype microfluidic loading device, a load cell was integrated and verified. The manufacturer's calibration of the load cell was verified by measuring 4 known weights 32 times each. For repeatability testing with a microfluidic device, force was measured at 0.5 mm increments up to a total of 3 mm displacement (~10% strain). The repeatability test was performed 10 times. For ease of future use, a user interface was also developed that can quickly specify parameterized loading profiles. With the load cell integrated, experiments can be easily setup and general materials testing can also be conducted. Likely of greater benefit, when used with simulation, force-displacement data can relate external microfluidic forces to the actual mechanical environment of tested neurons.

BUDDY: A Virtual Reality Based Computer System for Children with Autism Spectrum Disorders

Washkewicz College of Engineering and
College of Education and Human Services

Student Researchers: Missy Montague and Gabriel Madison

Faculty Advisors: Wenbing Zhao and Xiongyi Liu

Abstract

Autism Spectrum Disorder (ASD) is a neurological and developmental disorder, and it has two essential domains of symptoms: (1) restrictive and repetitive behaviors, such as having a lasting and intense interest in certain topics, and sensory challenges; (2) social impairment and communication difficulties. According to the US Centers for Disease Control and Prevention, about 1 in 68 children has been identified with Autism Spectrum Disorders (ASD) and the prevalence increased by 119.4% from 2000 to 2010. In the US alone, there are more than 3.5 million people who suffer from ASD and autism services cost $236-262 billion annually. In this project, we aim to develop an avatar-based computer program to help children with ASD to improve their social skills by presenting videos and questions designed to teach them what are the appropriate behaviors in different scenarios through modeling and coaching. We utilized the Vizard Virtual Reality Toolkit, the Blender software to perform 3D modeling of the scene, and the Python computer programming language to script the interactions of the avatar and the child with ASD. Several scenarios were designed with the corresponding video clips produced.