



HONORS COLLEGE

The University of Texas at Arlington

HONORS RESEARCH SYMPOSIUM PRESENTATION ABSTRACTS

NOVEMBER 16, 2018

RACHEL AGOSTINO, EXERCISE SCIENCE

Title: *The Relationship Between Body Composition and Fitness Parameters*

Faculty Mentor: Dr. Judy Wilson

The purpose of this research study was to investigate the relationship between body composition and fitness parameters. Seven recreationally active males, age: $20.7 \pm (1.1)$ years, height: $183.6 \pm (9.2)$ cm, weight: $79.2 \pm (9.9)$ kgs, volunteered for this study. Body composition and anaerobic measurements were taken and analyzed using correlational statistics. Results indicated a strong inverse correlations between body fat percentage and peak power (-0.836) and body fat percentage and mean power (-0.841). There was a weak correlation between body fat percentage and total work (0.390). Results show that the lower the body fat percentage, the more muscle mass is available to produce power yielding a high correlation. Results are supported from the literature and are good indicators of health in college-aged males.

KYLE ALYSON CHI, BIOLOGY

Title: *Dissecting the Role of the Insulin Receptor Signaling Pathway on Regenerative Organ Growth in Snakes*

Faculty Mentor: Dr. Todd A. Castoe

The genes and regulatory activity of the Insulin Receptor Signaling pathway (IRS) are highly controlled within tissues that undergo regenerative growth. Recently, IRS has been implicated in driving extreme post-feeding organ growth in snakes, but its precise role in this growth remains unknown. Here, we analyzed gene expression before and after feeding in three snake species using Ingenuity Pathway Analysis (IPA) to identify which specific components of the IRS are possibly involved in regenerative growth. Genes involved with cellular stress response, transcription, and protein synthesis, such as SGK, EIF4E, and TSC2 were uniquely activated in the python and rattlesnake, both species known to exhibit regenerative growth, at one day post feeding. Overall, significant activation of IRS genes and regulatory molecules in regenerative species indicate an active role of IRS during regeneration in snakes and provide a new perspective on IRS regulation of tissue growth in vertebrates.

NIYOUSHA DAVACHI, PHYSICS

Title: *Higgs Boson Decay and Dark Matter*

Faculty Mentor: Dr. Andy White

ATLAS, one of the four major experiments at the Large Hadron Collider (LHC), uses precision measurements to study subatomic particles. As a result, in 2012, the discovery of Higgs boson was announced which is thought to be the origin of the mass for subatomic particles. Unexpected astronomical observations in stars' velocity curves can only be explained by a lot of invisible matter called Dark Matter (DM). Since DM particles are thought to have negligible interaction with normal visible matter, it may be detectable in LHC as missing energy and momentum that escapes the detector. However, verifying that this missing energy is indeed DM needs an accelerator with much higher precision, satisfied by future linear colliders such as the International Linear Collider. We will present different possible ways that this missing energy can be explained and whether it can be verified given the precision of future linear colliders.

SHIVA DHEER, INFORMATION SYSTEMS

Title: *Prioritizing Information Systems Adoption - A Case Study*

Faculty Mentor: Dr. Jerry Hubbard

In the case of small businesses, several unique factors lend to delicate decision-making processes regarding any implementation or adoption of technology. Technical, economic, and organizational factors typically evaluated in the analysis phase of the Systems Development Life Cycle (SDLC) served as bases to investigate whether the degree of urgency in deciding to implement information systems led to particular results for a multi-tiered corporation fitting specifications outlined in the Small Business Act. Survey procedures focused on capturing quantitative data regarding employee perceptions of technology currently in place, and interview procedures focused on capturing qualitative data regarding how decisions to prioritize adopting technology are made. Key results include an employee consensus on the quality of technology, similar recommendations for improvement, a sense of trust in the company's leadership team, and a discussion on how broader applications of this type of study can prove beneficial to the focus company and other small corporations.

EFRET GHIRMAZION, NURSING

Title: *The Effects of Postpartum Depression on Maternal-Infant Bonding among Mothers Experiencing a Preterm Birth with Neonatal Intensive Care Admission*

Faculty Mentor: Dr. Cheryl Anderson

Maternal-infant bonding is crucial for cognitive, social, and emotional infant development. Postpartum depression (PPD) places the developing bond at risk and can lead to bonding impairment. Phase 1 of this ongoing study examines the prevalence of PPD symptoms and relationship between PPD and maternal-infant bonding among mothers of premature infants. To date 23 mothers completed the Edinburgh Postnatal Depression Scale and the Postpartum Bonding Questionnaire. One in four mothers reported either past or current depression. A significant correlation between PPD and PBQ scores was found. Lacking sufficient sample diversity, a secondary study aim to explore ethnic differences for PPD and bonding was not explored. Limitations include current sample characteristics, and timing and type of measurement tools. Mothers of preterm infants have been recognized by researchers as an at risk population with immediate and later peaking of depressive symptoms, especially minority mothers; thus, practice implications include initial and later postpartum assessments.

NOWMI HAIDER, BIOMEDICAL ENGINEER

Title: *3D Printing of the Cancer Trap to be Tested In Vivo for Metastasis of Cancer*

Faculty Mentor: Dr. Liping Tang

The goal of this project is to create a cancer trap that can capture cancer cells. This will be used on patients who have metastatic cancer. The cancer trap will be a cylindrical implant that is porous to let the cancer cells in and will be filled with a hydrogel, which can release cancer cell specific chemokines for a long period of time. Once the cancer trap is placed in subcutaneously in the body, the hydrogel will release chemokines to create a chemotactic gradient which can lure the immigration of cancer cells through the pores of the cancer trap. Cancer cells can be recovered from the cancer trap via needle aspiration for cancer diagnosis or be killed by chemotherapy or radiation. By use of this cancer trap, it can be possible to kill all of the cancer cells in a localized area and early detection of cancer cells is possible.

JACQUELINE KIRBY, NURSING

Title: *Examining Nurses' Behavior and Attitudes Regarding Opioid Medications and Opioid Educational Resources*

Faculty Mentor: Dr. Deborah Behan

Nurses are responsible for the pain assessment and administration of opioids and rely on pain indicators to ascertain the necessity of pain-relieving drugs. Nurses tend to depend on professional experience rather than classroom teaching to make decisions in the clinical settings. To further understand nurses' behavior and attitudes regarding opioid medications and the resources nurses use to aid them in clinical decisions regarding opioids, a survey was administered to graduate nursing students at a large university. Subjects most commonly reported non-verbal cues and requests specific to drug names and doses as significant indicators of drug-seeking behavior. While most of the participants reported to administer opioids in the workplace, they do not feel the administration of opioids is necessary most of the time. Although most respondents chose employer resources as their main source of information, participants reported to be moderately confident in the usefulness of their education resources at their employer.

REGAN KUBICEK, MECHANICAL ENGINEERING

Title: *Pressure Ulcer Prevention Using Soft Non-Grasp Manipulation*

Faculty Mentor: Dr. Alan Bowling

The object in this study is the human body, and the goal is to manipulate the size and duration of contact forces acting on the skin to prevent the formation of pressure ulcers (PUs). In doing so, the primary product of this experiment is to create a "Forcebed" capable of shaping itself to the human form in order to collect a time history of pressure distribution across the subject's body. This method of redistributing forces prevents any form of direct grasping on the patient's body. We refer to this method of object control as soft, non-grasp manipulation. This is accomplished through a soft flexible human-robot interface in tandem with a parallel closed chain rigid mechanism. The device presented in this work is a novel approach to the detection and prevention of pressure ulcers.

JONATHAN SAMUEL LALL, NURSING

Title: *The Relationship Between Spirituality and Pain Resiliency in Geriatric Individuals Who are 65 Years or Older with Chronic Pain*

Faculty Mentor: Dr. Deborah Behan

Understanding the relationship between pain resiliency and spirituality can possibly change how we educate patients on resiliency of pain. Therefore, the purpose of the study is to examine relationships between an individual's spirituality and their resilience to chronic pain. Forty-two subjects from a church in south-central USA participated in this study. A survey was administered to assess the age, presence of chronic pain lasting 6 or more months, membership at a protestant church/religious organization, spirituality, and pain resiliency. Based on survey responses, the majority of the subjects exhibit a relatively high degree of positive spiritual coping beliefs, high pain resiliency, high behavioral perseverance, high Cognitive/Affective Positivity, and low negative spiritual coping beliefs. This study's findings promote an increased emphasis on the spiritual component of holistic care within medical professions including the use of spiritual care as a non-pharmacological, noninvasive approach to aide in the treatment of chronic pain.

GODSWILL NWAOSU, BIOLOGY

Title: *Caspase Allosterity and pH Dependence*

Faculty Mentor: Dr. Clay Clark

We examined the role of pH on N-43 and caspase-7 (proteins responsible for cell death) The results show these proteins under varying pH levels affect substrate specificity. When comparing K_{cat} (amount of product produced), N-43 and WTCP-7 shows an optimal K_{cat} at pH 6.5 and 7.5 respectively and a catalytic efficiency (proteins affinity for certain reactants) at 6.5 for WTCP-7 and 7.0 for N-43. The k_m (concentration of reactant required for half saturation of protein) values for caspase-7 is higher than that of N-43. In addition, we show that as pH increases from 5 to 9, changes in k_m values for pH below 6.5 followed by an exponential increase for both enzymes and a rapid decrease in k_m for WTCP-7 after pH 8.5 is observed. N-43 maintained a steady growth rate beyond the scope of study.

CHRISTINA PERRY, NURSING

Title: *The Impact of Clustered Care on Patient Perception of Sleep Quality and Noise Levels in a Hospital Setting*

Faculty Mentor: Dr. Deborah Behan

The hospital setting houses a multitude of uncomfortable conditions that deprive patients of adequate rest needed to heal (Dennis, 2010). The goal of this study was to identify whether or not clustering care improves patient perceptions of quality sleep and rest. Clustering care was provided by laboratory, respiratory, and nurses in a unit where patients were stable enough to have two-hour rounding. In this interventional design, all subjects that were stable enough to have their care clustered were surveyed regarding rest and sleep. Data was collected from a total of 200 patients admitted to a hospital step-down unit in the south-central United States. Surveying was done the following morning using five questions. In conclusion, subjects reported noise levels as okay and the most disturbing noise being the IV or from outside their room. Patients also listed hourly rounding and people coming in and out of their room as interrupting sleep.

NATALIE ROBINSON, NURSING

Title: *Reduction of Anxiety in Nursing Students During an Augmented Reality (Mixed-Reality) Dressing-Change Scenario – A Pilot Study*

Faculty Mentor: Dr. Deborah Behan

Simulation is a common experience for training and testing in nursing school and can be used to create many different scenarios (Cobbett and Snelgrove-Clarke, 2016). It can be used for clinical training such as dressing changes. Faculty sometimes use simulation as a way to allow students to make mistakes and actually cause adverse consequences for patients. Consequently, it has been reported that simulation causes anxiety among nursing students. The purpose of this study was to create a learning experience that would reduce anxiety. Subjects were allowed time for acclimation to Augmented Reality (AR), task learning time, and testing time. Recording were for self-debriefing. A mixed-method design was used for this study. Subjects felt using AR provided a good learning tool as well as it reduced anxiety. In conclusion, this mode of training and testing can be used for many different scenarios in clinical training for nursing students and professional nurses.

KATLYN RODGERS, SOCIAL WORK

Title: *Trauma-Focused Cognitive Behavioral Therapy in Treating Traumatized Children and Adolescents – A Systematic Review*

Faculty Mentor: Dr. Regina Praetorius

Trauma-Focused Cognitive Behavioral Therapy (TF-CBT) is a widely preferred evidence-based intervention for trauma-exposed children and adolescents. The purpose of this study was to systematically review the literature on TF-CBT to identify the effectiveness of this treatment on children and adolescents who suffer from Post-Traumatic Stress Disorder (PTSD) or exhibit Post-Traumatic Stress Symptoms (PTSS). A search was conducted using inclusion criterion to locate studies that used TF-CBT or similar CBT branded interventions. Eleven studies were selected, and articles then went through data analysis. The results indicated statistically significant reductions in PTSD/PTSS after TF-CBT and CBT interventions were used. Reductions in PTSD/PTSS were seen not only with wait-list control groups, but also with child-centered therapy, non-directive supportive therapy, and therapy-as-usual. The findings of this study suggest that TF-CBT or similar CBT treatments are an effective method and can be used with traumatized children and adolescents experiencing PTSD or PTSS.

SARA STEARNS, BIOLOGY

Title: *The Evolution of Vertebrate Brain Architecture in Response to Divergent Natural Selection - Concerted vs. Mosaic Evolution?*

Faculty Mentor: Dr. Matthew Walsh

Variation in vertebrate brain size and structure is well documented. Two theories explain how brain architecture evolves in response to varying selective pressures. One states individual brain structures evolve in concert, while the other posits structures evolve independently in a mosaic pattern. We tested whether brain architecture evolves in concert or as a mosaic in response to divergent selection pressure using a single species. The Trinidadian killifish (*Rivulus hartii*) inhabits streams differing in predation intensity. We compared the telencephalon, optic tectum, cerebellum, and dorsal medulla of 2nd generation lab reared fish from sites with and without predators. Males from sites without predators had consistently larger brain structures than males from sites with predators, and all four regions were positively correlated. No such genetically-based shifts in brain structure size were observed in female fish from either site, consistent with previous work. These results support the concerted theory of brain evolution.

MIRIAM TEPPER, SOCIAL WORK

Title: *Understanding the Connection between Clinically Diagnosed Attention Deficit Hyperactivity Disorder and/or Depression, with Childhood Abuse or Maltreatment - A Qualitative Interpretive Meta-Synthesis*

Faculty Mentor: Dr. Regina T. Praetorius

Attention Deficit Hyperactive Disorder (ADHD) is a chronic neurological disorder diagnosed in children who show symptoms of inattention, and/or hyperactive/impulsive behaviors. Considering that these symptoms overlap with some symptoms of abuse and neglect, it is necessary to further explore how to differentiate. A Qualitative Interpretive Meta-synthesis (QIMS) analyses was used to research completed studies on students who were abused or neglected. 148 school aged students and 14 agencies were included in this paper. Results: Six major themes were produced: 1) setting the stage, 2) the unexpected role of school, 3) how it started, 4) how it ended, 5) long term effects of abuse, and 6) intervention/prevention methods. Conclusion: Child victims may exhibit the similar symptoms of ADD/ADHD while trying to cope with abuse, however, this does not mean they have the neurological disease. Therefore, it is imperative that teachers/relevant school personal receive added training in identifying these differences.

CHLOE THOMASIAN, ARCHITECTURE

Title: *The City as a Campus - A Case Study of Arlington, Texas*

Faculty Mentor: Oswald Jenewein

The city of Arlington Texas has spent 1.1 billion dollars of tax payer money towards the construction of three major sports stadiums from 1994 to today. Based on data on average apartment size and construction costs, this work demonstrates how the amount of tax payer money invested into Arlington's sports stadiums could have been used to develop about 13,000 apartment units. These units, whether public housing, student dormitories, or both- would help central Arlington to become a denser and therefore more walkable urban landscape. Furthermore, the investigation shows that four story apartment buildings could accommodate the total amount of units if built on empty and mostly empty lots, as well as on top of major parking lots.

MARAH TOWNZEN, MATHEMATICS

Title: *A Mathematical Analysis of a Model of Drug Action on Intracellular Calcium Dynamics*

Faculty Mentor: Dr. Hristo Kojouharov

The dysregulation of intracellular Ca^{2+} dynamics is a hallmark feature of several types of cancer. Administering a combination of a drug that blocks store-operated Ca^{2+} entry and a drug that inhibits tyrosine kinases is a novel chemotherapeutic approach currently being explored. Using data from experimental trials of these drugs, an existing model of Ca^{2+} dynamics was modified via the Michaelis-Menten theory of enzyme kinetics to reflect the behavior of the cell upon administration of the drugs. Mathematical analyses were performed to determine the overall repercussions of this modification. This included sensitivity analysis to reveal the model's sensitivity to changes to particular parameters and stability analysis to find if the model will approach equilibrium. With the goal of predicting drug action in mind, this expanded model is a step in the right direction but still needs refinement to increase accuracy and have real-world applications.

JESSICA TUNG, BIOLOGY

Title: *Characterization of Scleractinian Coral Caspases in Comparison with Human Homologs*

Faculty Mentor: Dr. Clay Clark

Coral bleaching is an immune response that rejects compromised symbionts. *Porites asteroides* and *Orbicella faveolata* are coral species falling on opposite ends of the immunity spectrum. Disease-resistant *P. asteroides* employs adaptive autophagic mechanisms when immunocompromised, while disease-sensitive *O. faveolata* activates caspase-mediated apoptosis. Presented here is a characterization of caspases homologs found in *O. faveolata* (O.fav-3a, O.fav-3b) and *P. asteroides* (P.ast-3, P.ast-7). O.fav-3a and P.ast-7 retain a human initiator/inflammatory CARD-like domain despite high sequence similarity to executioners. Experimental results show that O.fav-3a and P.ast-7 prefer aspartate in the P1 position, corroborated by activity against canonical substrate DEVD-AFC. O.fav-3b and P.ast-3 prefer valine at P1, but inactivity against VEID-AFC suggests additional specificities. A crystal structure of P.ast-7 bound with DEVD inhibitor reveals 1. an H-bond network coordinating the substrate with a unique RYP insertion, and 2. an N-terminal peptide bound near the active site that may serve as a regulatory exosite.