Forward Thinking Poster Session/Colloquy Presentation
Past Award Recipients

2015

An Intersectional Investigation of Minority Stress Theory
Ed de St. Aubin, Associate Professor, Psychology
Lauren Yadlosky

mHealth System for Patients with Arthritis
Sheikh Iqbal Ahamed, Professor, Mathematics, Statistics and Computer Science
Taskina Fayezeen, Md Osman Gani

Improving Services to the Hispanic Community through Technology-Enhanced Pronunciation Training of L2 Spanish-Speaking SLPs
Steven Long, Associate Professor, Speech Pathology and Audiology
Sonia Barnes, Assistant Professor, Foreign Languages and Literatures
Jeffrey Berry, Associate Professor, Speech Pathology and Audiology
Julissa Bello-Almazan, Mahala Berry

Social Innovation Award:
Monitoring Learning Capability in Autistic Populations Using Sensors
Sheikh Iqbal Ahamed, Professor, Mathematics, Statistics and Computer Science
Amy Van Hecke, Associate Professor, Psychology
Niharika Jain, Piyush Saxena

2014

The Role of Biocides in Antibiotic Resistance in Wastewater Treatment
Dr. Patrick McNamara, Assistant Professor, Civil, Construction and Environmental Engineering,
Dr. Daniel Zitomer, Professor, Civil, Construction and Environmental Engineering,
Daniel Carey

Summary: Dan Carey is a PhD student working on this project. Thanks to awards from the forward thinking platform, Dan was able to purchase a computer and travel to Maryland to attend a short-course on bioinformatics. Dan used his newly acquired skills to analyze bioinformatics data for his dissertation. He has submitted his results for publication in *Environmental Science & Technology.* Dan is planning graduate with his PhD in May, 2016.

Removal of Environmental Estrogenic Micropollutants from Wastewater Solids
Dr. Patrick McNamara, Assistant Professor, Civil, Construction and Environmental Engineering,
Dr. Daniel Zitomer, Professor, Civil, Construction and Environmental Engineering,
Thomas Hoffman

Summary: Thomas Hoffman was able to purchase lab supplies to help conduct his research. Thomas submitted a paper for publication in May to *Water Research* and has since graduated. Thomas is now a consulting engineering for HDR in Folsom CA.

Resilience in Adolescents Who Survived a Suicide Attempt from the Perspective of the Registered Nurse in a Psychiatric Facility
Dr. Abir Bekhet, Assistant Professor, College of Nursing,
Denise Matel-Anderson

Summary: The purpose of this qualitative study was to explore components of resilience (i.e. risk and protective factors) in adolescents who survived a suicide attempt from the perspective of nine nurses working with adolescents on two inpatient psychiatric units. The study used resilience theory as a guided theoretical framework which proposes that resilience is the interplay between risk factors and protective factors in face of adversity. ***On analysis of the focus group responses, three overarching categories emerged including risk factors, protective factors, and future recommendations of suicide prevention strategies.*** The perspectives gained from this study will be used to develop future nursing interventions to help adolescents overcome their risk factors and to build on their protective factors.

2013

Recovering from Foreclosure: An Experimental Study of a Community Outreach Campaign
Dr. Amber Wichowsky, Assistant Professor, Political Science,
Colleen Ross, Anabelle Martinez, members of POSC 4281

Anaerobic Membrane Bioreactor for Sustainable Wastewater Treatment
Dr. Daniel Zitomer, Professor, Civil, Construction and Environmental Engineering, Matt Seib

Sensorimotor Adaptation of Connected Speech using Multiple Acoustic Cues
Dr. Jeff Berry, Assistant Professor, Speech Pathology and Audiology; Dr. Michael T. Johnson, Professor, Electrical and Computer Engineering, Brittany Bernal

2012

Porting XINU to Raspberry Pi
Dr. Dennis Brylow, Associate Professor, Mathematics, Statistics and Computer Science, Matthew Bajzek, Farzeen Harunani, and Tyler Much

Neural Responses to Social Skills Intervention in Adolescents on the Autism Spectrum: An Extension of the PEERS Research Project
Dr. Amy Vaughn Van Hecke, Assistant Professor, Psychology and Sheryl Stevens

Case Study of the Implementation of the Co-principalship in a K-8 School District
Dr. Ellen Eckman, Associate Professor, Educational Policy and Leadership and Amy Porter

2011

Legal and Extra-Legal Factors Impacting Domestic Violence Injunctions in Milwaukee
Dr. Heather Hlavka, Assistant Professor, Social and Cultural Sciences; Dr. Sameena Mulla, Assistant Professor, Social and Cultural Sciences, Kate Hanson, and Chelsea Pierski

The Human Powered Nebulizer in the Treatment of Airway Diseases in El Salvador
Dr. Lars E. Olson, Associate Professor, Biomedical Engineering; Dr. M. Therese Lysaught, Associate Professor, Theology; Christopher Hallberg, Clinical Trial Coordinator; Ellen Hawkinson, Katelynn Kramer, Brian Laning, Sarah Schmiedel, and Andrew Weingart

Parent and Family Outcomes of PEERS: A Social Skills Intervention for Adolescents with Autism Spectrum Disorders
Dr. Amy Vaughn Van Hecke, Assistant Professor, Psychology, and Jeffrey Karst

2010

The Amader Gram Breast Care Palliation Study: Phase 1
Dr. Sheikh Iqbal Ahamed, Associate Professor, Mathematics, Statistics and Computer Science, Ferdaus Kawsar, Mohammad Tanviruzzaman, Md. Munirul Haque, and Mohammad

Adibuzzaman

Speech Adaptation for Rehabilitation
Dr. Jeffrey J. Berry, Assistant Professor, Speech Pathology and Audiology and Mary Bolgert

The Halo Effect of Faith Communities: An Exploratory Study on Crime and Religious Social Capital
Dr. Noreen E. Lephardt, Adjunct Assistant Professor, Economics and Brenden Mason

Role of Mechanical Stress in LPS-Induced Damage of Periodontal Cells in Vitro
Dr. Dawei Liu, Assistant Professor, Orthodontics and Yaroslav Yarmolyuk, DDS

2009
The Influence of Cultural Variables on Latino/a Adolescent Sexual Activity
Dr. Lisa Edwards, Assistant Professor, Counselor Education and Counseling Psychology, Brittany N. Barber and Keyona Jarrett

Effects of Mechanical Vibration on Orthodontic Tooth Movement
Dr. Dawei Liu, Assistant Professor, Orthodontics and Andrew Rummel

Pre-service Elementary Teachers' Knowledge of Relational Thinking
Dr. Marta Magiera, Assistant Professor, Mathematics, Statistics, and Computer Science; Dr. John Moyer, Professor, Mathematics, Statistics, and Computer Science; Dr. Leigh van den Kieboom, Assistant Professor, Educational Policy and Leadership, Ashley Zenisek and Edwin O'Sullivan

2008
Role of Endurance Exercise Training in Protection of Ischemic Heart Disease
Dr. Robert Fitts, Professor and Chair, Biological Sciences, Ms. Patricia Colloton, Research Associate, and Brooke Rogers

Contribution of the Frontal Lobes to "Successful Aging"
Dr. Kristy A. Nielson, Associate Professor and Chair, Psychology, and Andrew Newsom

Novel Properties of Bean Root Nodules Harboring a Bacterial Respiratory Mutant and What These Properties May Reveal about Oxygen-triggered Regulation of the Symbiosis
Dr. Dale Noel, Professor, Biological Sciences, and Robert Stone

What's the Best Rehabilitation Prescription? Identifying Factors that Enhance Recovery of Gait after Stroke
Dr. Sheila Schindler-Ivens, Assistant Professor, Physical Therapy, and Shannon Knoblauch

2007
A Pilot Study to Develop a Behavioral Intervention to Support Self-regulated Pushing during Second Stage Labor: A Focus Group of Certified Nurse-Midwives as Informants
Dr. Lisa Hanson, Associate Professor, Nursing, and Kathryn Osborne

Mold Detection using Acoustic Wave Sensors
Dr. Fabien Josse, Professor, Electrical and Computer Engineering; Dr. Susan Schneider, Associate Professor, Electrical and Computer Engineering, and Meetalee Dalal

Father Involvement in Caring for Adolescents with Diabetes: An Investigation Piloting New Techniques in Pediatric Research
Dr. Astrida Kaugars, Assistant Professor, Psychology, and Christopher J. Fitzgerald

2006
Mentoring and Collaboration: Undergraduate, Graduate and Professional Research in Literature and Law
Dr. Christine L. Krueger, Associate Professor & Director of Core Curriculum, English, and Colleen Willenbring and Kaye Wierzbicki

Role of CamKinase Alpha in Renewal and Reinstatement of Fear
Dr. Matthew J. Sanders, Assistant Professor, Psychology, and Jocelyn Miller

Imaging of the Human Brain during Pedaling
Dr. Sheila Schindler-Ivens, Assistant Professor, Physical Therapy, and Jay Mehta

2005
Cross-Cultural Development and Testing of the Risk Information Seeking and Processing (RISP) Model
Robert J. Griffin, Professor, Journalism, Franziska Borner, Jan Gutteling, Associate Professor and Ellen Ter Huurne, doctoral student, University of Twente, The Netherlands

Neurotoxicity of BMAA in Cortical Cultures
Doug C. Lobner, Associate Professor, Biomedical Sciences, and Peachy Mae T. Piana

Sexism and Rape Myth Acceptance: A System Justification Perspective
Debra L. Oswald, Assistant Professor, Psychology, and Kristine Chapleau

Marquette International Research Poster Session
Historical Award Winners

2015

"International Research to Improve Planning, Care and Functional Outcomes in Children With Orthopaedic Disabilities: Manila Philippines."
Dr. Gerald Harris
Professor, Biomedical Engineering

2014

"Engineering Synthetic Feedback to Promote Recovery of Self-feeding Skills in Stroke Survivors." (in partnership with the University of Genoa)
Dr. Robert Scheidt, professor, Biomedical Engineering
Alexis Krueger, graduate assistant, Biomedical engineering

"The Nahuatl in Central American Mapping project."
Dr. Laura Matthew, associate professor, History Department
Benjamin Nestor, graduate assistant, History Department

2013

"Designing Human-Computer Interfaces for Elderly People in Taiwan"
Dr. Sheikh Iqbal Ahamed
Professor, Mathematics, Statistics and Computer Science

"Untold Stories: An African Society and the Second World War (Nigeria)"
Dr. Chima J. Korieh
Associate Professor, History Department

Judges:
Dr. Joyce Wolburg, Associate Dean and Professor, Diederich College of Communication
Dr. Lars Olson, Interim Bio-Medical Chair, Biomedical Engineering

2012

"The Mechanism of 'Chinese Traditional Teeth Tapping' in Maintaining Alveolar Bone"
Dr. Dawei Liu, DDS
Associate Professor, Dental Developmental Sciences/Orthodontics

"mHealthMTT: Bridging the Gap in Communication Using a Mobile Based Intervention for Maternal and Child Healthcare in Rural Bangladesh"
Dr. Iqbal Ahamed
Associate Professor, Mathematics, Statistics and Computer Science

Judges:
Dr. Anne Pasero, Chair and Professor of Spanish, Foreign Languages & Literatures
Dr. James Marten, Chair/Professor, History
Ms. Michelle Schuh, Assistant Dean, College of Health Sciences

2011

"Circulations: Death and Opportunity in Southern Pacific Mesoamerica, 1450-1620"
Dr. Laura Matthew
Assistant Professor, History

"Findings from the deployment of e-ESAS: a remote symptom monitoring system for rural breast cancer patients in Bangladesh"
Dr. Iqbal Ahamed
Associate Professor, Mathematics, Statistics and Computer Science

Judges:
Dr. Ellen Eckman, Associate Professor/Chair, Educational Policy and Leadership
Dr. John Pustejovsky, Associate Professor of German/Chair, Foreign Languages & Literatures
Dr. Ruth Ann Belknap, Associate Professor, College of Nursing

2010

Dr. Stephani Richards-Wilson
Assistant Dean for Recruitment and Retention, Klingler College of Arts and Sciences
Dr. M. Therese Lysaught
Associate Professor/Director of Graduate Studies, Theology

Dr. Lars Olson
Associate Professor, Biomedical Engineering

Dr. Sharon Chubbuck
Associate Professor, Educational Policy and Leadership

2009

"The "Itinerant Museum": Agrarian Reform, Peasant Revolt, and the Cultural Policy of Spain's Second Republic"
Dr. Eugenia Afinoguenova
Associate Professor of Spanish, Foreign Languages an Literatures

"Vamos Juntas: A pilot participatory action research project to assist Spanish speaking immigrant women in moderating life stressors"
Dr. Ruth Ann Belknap
Associate Professor, College of Nursing

"Muslim Outreach for Interfaith Dialogue: Al-Risala Movement's Mission for the 21st Century"
Dr. Irfan Omar
Associate Professor, Theology

"Emergency dental care training for refugee health providers: An answer to dental care access in long-term refugee camps"
Dr. Toni Roucka
Assistant Professor and Predoctoral Program Director of General Dentistry, General Dental Sciences

Table of Contents

COLLOQUY PRESENTERS

INTERNATIONAL POSTER PRESENTERS

COLLOQUIES

Project Title: A computational approach to detect cancer-related microRNA-gene module drivers
Faculty Name: Serdar Bozdag, Assistant Professor, Mathematics, Computer Science, and Statistics
Student Name: Brittany Baur

Introduction: microRNAs (miRNAs) are small molecules of RNA that decrease gene expression by cleavage or destabilization of the messenger RNA (mRNA) transcripts of a gene. This prevents the mRNA transcript from being translated into a functional protein. miRNAs target the mRNA transcripts of genes through base pairing if the miRNA sequence is complementary to the mRNA sequence. miRNAs can target many genes and a gene could be targeted by multiple miRNAs. The expression of certain key miRNAs is known to be altered in cancer cells [1]. Since miRNAs regulate the expression of genes, changes in the expression of key miRNAs in cancer could have widespread, downstream effects. A miRNA and its target genes are known as a "driver" if the effects of a disruption in miRNA expression, and corresponding changes in the expression of its target genes, promote cancer cell survival and proliferation.

Significance: Algorithms for detecting miRNAs that promote cancer cell growth are important to study because they could aid in the development in therapeutic drugs. Correctly identifying the targets of a miRNA is also important because the target genes could be oncogenes or tumor suppressors.

Innovation/Forward Thinking: A few algorithms have been developed to identify important driver miRNAs and associated target genes that are disrupted in cancer. Our approach is different because our algorithm will associate miRNAs with potential targets via biological processes. Certain biological processes are known to be dysregulated in cancer tumors, such as apoptosis and cell cycle [2,3]. If a miRNA is disrupted in cancer, and the targets genes are involved in one or more of these processes, that miRNA is more likely to be a driver. Therefore, biological process information could be used to aid in miRNA-gene module driver detection. To our knowledge, no other approach has associated a miRNA with target genes via biological processes. Our approach will identify likely miRNA drivers, associated targets and processes that are disrupted as a result of the changes in expression of the miRNA driver and corresponding target genes.

By discovering miRNA targets through disrupted biological processes, we hope to increase the accuracy of predicting known miRNA-gene relationships over existing methods. Additionally, we will explore new statistical approaches to simultaneously improve the discovery of driver miRNAs and their targets. One goal is to incorporate prior information about known relationships between miRNAs and target genes in databases to guide the discovery of novel interactions. This could include databases of known interactions. It could also include sequence information with regards to how likely the miRNA is to bind to the gene's mRNA transcript based on the RNA sequences of both.

Student Involvement: Brittany Baur will write and run the code and analyze the results. This project is one of her aims in her dissertation.

References:

1. Lu J, Getz G, Miska EA, Alvarez-Saavedra E, Lamb J, Peck D, et al. MicroRNA expression profiles classify human cancers. Nature 2005 06/09;435(7043):834-838.
2. Lima RT, Busacca S, Almeida GM, Gaudino G, Fennell DA, Vasconcelos MH. MicroRNA regulation of core apoptosis pathways in cancer. Eur J Cancer 2011;47(2):163.
3. Kim Y, Yu J, Han TS, Park S, Namkoong B, Kim DH, et al. Functional links between clustered microRNAs: suppression of cell-cycle inhibitors by microRNA clusters in gastric cancer. Nucleic Acids Research} 2009;37(5):1672-1681.

Keywords: Cancer, Computational Biology, gene expression, microRNA expression

Project Title: Presenting a Unified Investigation of Intrapersonal and Interpersonal Emotion Regulation
Faculty Name: Nakia Gordon, Assistant Professor, Psychology
Student Name: Samantha Chesney

Introduction: Emotions-and the regulation of them-are both deeply personal and inescapably social. Effective emotional management is unlikely a product of solely self-regulation, but instead results from the ability to integrate moments of intrapersonal (individual) and interpersonal (social) regulation. Indeed, the variety of emotional situations with which we are presented in our daily, social lives necessitates the ability to regulate our affect and manage how we feel. Research to date has focused on the intrapersonal aspects of regulation, establishing a foundation for how single regulatory strategies can influence a regulator's well-being.[1] Recent studies expanding on this research indicate that a more appropriate way to measure intrapersonal emotion regulation is by assessing multiple strategies and capturing the variability in each person's abilities to regulate themselves.[2] However, this has yet to be investigated in contexts that allow us to understand the role of intrapersonal regulation in social situations. The proposed study addresses the integration of intrapersonal and interpersonal regulatory processes to present a unified investigation of the duality inherent in social regulation of emotional events.

Significance: Pairs of close, personal friends will be asked to participate in an emotional conversation task that requires a variety of regulatory abilities to manage affect. Intrapersonal emotion regulation will be assessed using an established approach that characterizes an individual's use of six different regulatory strategies.[2] Interpersonal regulation will be assessed on both state and trait levels[3] to answer novel questions about the intersections between social regulation, affect, and relationship quality between friends. Specifically, this study addresses the following:

- Aim 1 evaluates how context-specific interpersonal emotion regulation influences a target individual's positive and negative affect.
- Aim 2 addresses whether state interpersonal emotion regulation occurring during emotional conversations is indicative of perceived relationship quality.
- Aim 3 uses a trait-level analysis to model regulatory interdependence between the two individuals of the friendship dyad and evaluate the degree to which intrapersonal emotion regulation influences the use of interpersonal regulation.

Innovation/Forward Thinking: By proposing a novel paradigm to investigate emotion regulation, this study addresses three primary limitations in the current literature. First, the proposed study employs a dynamic systems approach to address both intrapersonal- and interpersonal-levels of analysis in social emotion regulation. Both trait and state emotion regulation will be assessed to offer insight as to how social regulation may be successful or damaging. Second, this proposal includes a novel laboratory task to assess regulatory practice, allowing for questions to be asked about the natural state regulation occurring in a given emotional situation. Finally, the proposed study capitalizes on advanced statistical analyses to model bidirectional, interdependent socioemotional processes.[4] Establishing this method as a meaningful way to investigate emotion regulation will initiate a novel and enduring line of research in affective science.

Student Involvement: The proposed study serves as Ms. Chesney's dissertation project, and she will take the lead on this project with the support of her mentor, Dr. Gordon. Ms. Chesney has prepared a novel paradigm and is working to facilitate recruitment. She will coordinate data collection and perform required statistical analyses.

References:

4. Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. Journal of personality and social psychology, 85, 348-362. doi:10.1037/0022-3514.85.2.348
5. Chesney, S. A., & Gordon, N. S. (2016). Profiles of emotion regulation: Understanding regulatory patterns and the implications for posttraumatic stress. Cognition and Emotion, 1-9. doi:10.1080/02699931.2015.1126555
6. Hofmann, S. G., Carpenter, J. K., & Curtiss, J. (2016). Interpersonal emotion regulation questionnaire (IERQ): Scale development and psychometric characteristics. Cognitive therapy and research, 40, 341-356. doi:10.1007/s10608-016-9756-2

Keywords: emotion, management, friendship

Project Title: Does race matter? The role of race and emotion in response to images of police brutality
Faculty Names: Nakia Gordon, Assistant Professor, Psychology; Simon Howard, Assistant Professor, Psychology
Student Name: Camille Lester

Introduction: Currently in the United States, the detrimental effects of police brutality are a serious concern for both law enforcement and citizens. The concept of race is a social construct that has created explicit and implicit racial hierarchies in the U.S., which influences policy and policing practices1, 4. Implicit racial bias is understood to be an unconscious anti-ethnic bias in the form of stereotypes, attitudes, beliefs, or feelings, which lead to conscious attitudes that predict a subset of real world behavior. These behaviors often include avoidance, colorblindness, intolerability, and depthless emotional connection to ethnic groups2,5 . Indeed, a decade of experimental studies on police shootings demonstrates a racial bias against blacks such that white participants both endorse shootings against blacks more as well as are quicker to "shoot" blacks in experimental protocols 3. There is a great deal of emotional and cognitive labor involved in navigating racialized interactions and institutions upheld by implicit bias for ethnic groups2,3,4. The relationship between police brutality, mental health, and emotion suggests that it would be beneficial to better understand the role that racialized violence plays in intergroup interaction and levels of emotional engagement.

Significance: While there are empirical studies investigating the relationship between police brutality and race, few studies have explored the role of emotion and resulting behavior. Investigating these relationships could aid in informing the field on the role of implicit racial bias in intergroup interactions and provide information for potential community wide interventions. The intent of this study is to assess the influence of racial identity on levels of emotional engagement or avoidance after viewing images of police brutality. Participants will view images of police brutality, rate their emotions, and then engage in a task that implicitly measures the extent to which participants are willing to interact with a member of a different racial group.

Innovation/Forward Thinking: Extrajudicial police shootings have occurred in Milwaukee inciting protests from community members. There is no clear understanding of how systemic racial bias and racial identity influences emotional reactivity in intergroup interactions. The current study is innovative because it will respond to the need for answers about better understanding reactions to police brutality and the consequences on intergroup interactions. This study will provide a basis for better understanding community relationships.

Student Involvement: Ms. Lester will be involved in research design, recruitment, implementation, analysis and manuscript preparation.

References:

7. Evans, L., Feagin, J.R. (2015). The costs of policing violence: foregrounding cognitive and emotional labor. Critical Sociology, 41(6), 887-895.
8. Mekawi, Y., Bresin, K. Is the evidence from racial bias shooting task studies a smoking gun? results from a meta-analysis. Journal of Experimental Social Psychology. doi: http://dx.doi.org/10.1016/j.jesp.2015.08.002
9. Richardson, L.S. (2015). Police racial violence: lessons from social psychology. Fordham Law Review 83(6), 2961-2976.
10. Scott, J.P., DiLilo, D., Maldonado, R.C., Watkins, L.E. (2015). Negative urgency and emotion regulation strategy use: associations with displaced aggression. Faculty Publications, paper 666, 1-18.
11. Wu, Y. (2014). Race/ethnicity and perceptions of police: a comparison of White, Black, Asian, and Hispanic Americans. Policing and Society, 24(2), 135-157.

Keywords: Race, Police Brutality, Emotion, Implicit Bias

Project Title: "Created in 'Her' Own Image": Gendered Religious Iconography and its Effects on Women's Willingness to Challenge Male Authority
Faculty Names: Simon Howard, Assistant Professor, Psychology; Debra Oswald, Associate Professor, Psychology
Student Name: Mackenzie Kirkman

Introduction: Historically, religion has been associated with both positive (e.g., prosocial behavior) and negative outcomes (e.g., prejudice). Often our perceptions of supernatural agents (i.e., Jesus, God) influence these outcomes (Howard & Sommers, 2015). For example, viewing God as authoritarian decreases forgivingness while viewing God as benevolent increases forgivingness (Johnson, Li, Cohen, & Okun, 2013). Recently, behavioral scientists have been interested in the relationship between masculine perceptions of God and conservative gendered ideology (e.g., men are better suited for politics). Correlational work suggests that the more masculine individuals believed God to be, the more conservative their gender ideology tended to be (Whitehead, 2012). Although Whitehead offers some insight on the implications male perceptions of God may have in society, his work is correlational which prevents determinations of causality. The present research will be the first experiment to explore the effects of gendered religious iconography on our psychological processes. Specifically, we will explore how gendered religious iconography influences women's willingness to challenge male authority. Half of our participants in our study will read a passage that depicts God as male, through the use of male pronouns, whereas the other half of our participants will read a passage that depicts God as female by using female pronouns. We hypothesize that women exposed to a female depiction of God will be more likely to challenge male authority than women exposed to male depictions.

Significance: Ninety-five percent of Americans believe in God and almost half of those believers recognize their God as "He" while only a handful recognize their God as "She" (Whitehead, 2012) which illustrates the need for experimental work in this area. If our predictions are supported this research has the potential of making a major impact in the field. If we demonstrate that a small manipulation (i.e., using female versus male pronouns to describe God) can impact our judgments, then this work has serious implications in domains effected by gender such as politics (e.g., support for female versus male politicians), labor (e.g., salary negotiations), and family (e.g., challenging husbands on major decisions) to name a few.

Innovation/Forward Thinking: Currently, no experimental research exists investigating the impact of gendered religious iconography on our psychological processes (e.g., judgments, attitudes). This is a major gap in the field and our lab has the opportunity to become the authority in this research area. There is great potential for this type of work to be awarded funding from the John Templeton Foundation.

Student Involvement: Mackenzie Kirkman (grad student) has been involved in the planning stages of the study and will be involved in the dissemination of findings related to this project.

Keywords: God, Gender, Religion

Project Title: Take Your Best Guess: Assessing Cognition in Adolescents with Type 1 Diabetes
Faculty Name: Astrida Kaugars, Associate Professor, Psychology
Student Name: Natalie Benjamin

Introduction: Type 1 diabetes mellitus (T1DM) is one of those most common chronic illnesses in children and adolescents worldwide[1]. Diabetes-related outcomes pose many challenges to adolescents learning to provide self-care; thus, it is important to gain further understanding about how symptom awareness and blood glucose levels impact cognitive performance and other aspects of daily functioning. Because of potential serious consequences of poor metabolic control, it is important that individuals with T1DM recognize their symptoms of high or low blood glucose (BG) levels and use this information to guide their decisions about checking their BG and making appropriate adjustments. However, adolescents with T1DM vary in their ability to detect symptoms, not all individuals have the same symptoms relating to the same BG levels, and subjective symptomatology is not always an accurate or reliable indicator of objective BG levels. Thus, adults and children with T1DM sometimes make clinically serious errors in their BG estimations, which can lead to erroneous corrective treatments[2]. Research also shows that children and adolescents with diabetes perform more poorly on various neuropsychological and cognitive assessments, especially in the areas of psychomotor speed, mental flexibility, and attention, than do children without diabetes[3].

Significance: Existing research in this area does not address the relationship between immediate blood glucose levels and cognitive performance in adolescents with T1DM. Symptoms such as headaches, nausea, or shakiness may impact an adolescent's ability to attend to tasks or information, especially in school settings. Thus it is necessary to investigate how adolescents' subjective diabetes-related symptoms might impact their daily functioning, specifically in cognitive domains. The present study aims to examine the similarities and differences between objective and subjective diabetes-related variables and their respective relationships to cognitive performance. Many studies examining psychological and physiological variables in individuals with T1DM use a long-term measure of metabolic control; conversely, the present study aims to assess BG levels immediately before completion of various cognitive tasks in order to better understand how participants' objective BG levels at the time of the task may be related to task performance. This study will also assess adolescents' ability to estimate their current BG level and the potential relationship between their estimation accuracy and their cognitive performance.

Innovation/Forward Thinking: There are two particularly unique aspects to this study. First, assessing objective and subjective symptoms immediately before cognitive tasks and examining which variables are better predictors of performance on tasks of processing speed and executive functioning is a new paradigm. Second, the study will use a novel analysis technique, error grid analysis, to assess adolescents' accuracy in estimating their BG levels. These findings will directly inform medical, mental health, and educational professionals about the impacts of diabetes-related indicators on adolescents' functioning in school and other settings.

Student Involvement: Natalie Benjamin, a clinical psychology graduate student, will carry out research-related activities under the direct supervision and in collaboration with Dr. Astrida Kaugars. Ms. Benjamin will be responsible for all aspects of the study implementation, data collection, and result dissemination.

References:

12. Dabelea, D., Mayer-Davis, E. J., Saydah, S., Imperatore, G., Linder, B., Divers, J., & Liese, A. D. (2014). Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2009.Â Journal of the American Medical Association, 311,
13. Gonder-Frederick, L. A., Zrebiec, J. F., Cox, D. J., Kovatchev, B. P., Ritterband, L. M., & Clarke, W. L. (2004). BG detection in school-aged children with T1DM and their parents. Diabetes, 53, A17.
14. Moheet, A., Mangia, S., & Seaquist, E. R. (2015). Impact of diabetes on cognitive function and brain structure. Annals of the New York Academy of Sciences, 1353, 60-71. http://dx.doi.org/10.1111/nyas.12807

Keywords: Diabetes, Cognition, Adolescents

Project Title: Biosolids Reuse: Continuous Flow-Through Column Testing of Biosolids-Derived Biochar to Sorb Micropollutants
Faculty Names: Patrick McNamara, Assistant Professor, Civil, Construction and Environmental Engineering; Brooke Mayer, Assistant Professor, Civil, Construction and Environmental Engineering
Student Name: Lee Kimbell

Introduction: The specific research goal of this project is to determine if biosolid-derived biochar can be used at the end of a wastewater treatment plant for extra treatment to remove micropollutants, similar to how household water filters are used as additional drinking water treatment steps to filter water in our homes. Typically, these household water filters employ activated carbon to remove contaminants, our idea is to utilize biosolid-derived biochar as a filter for the micropollutants that are of increasing concern.

Significance: The Milwaukee Metropolitan Sewerage District (MMSD) operates our local wastewater treatment plants, and produces a very useful product from the biosolids generated on site during treatment processes. The goal of this project is to examine the effectiveness of this product, biosolid-derived biochar (which is produced from Milorganite), for removing contaminants of emerging concern from wastewater. These contaminants are referred to as micropollutants, and include chemicals such as pharmaceuticals, hormones, antimicrobial compounds, and many other organic compounds that are of high concern due to their capability to impact reproduction in fish species and disrupt ecosystem functionality after being discharged from wastewater treatment plants into receiving waters such as Lake Michigan and the Milwaukee River. Additionally, elevated concentrations of several of these compounds have been linked to increasing health problems and antibiotic resistance that can pose significant health risks for humans utilizing these sources for various purposes.

Innovation/Forward Thinking: As contaminants, such as micropollutants, continue to enter our wastewater and eventually our lakes and streams, it is our responsibility as a forward-thinking society to develop technologies capable of removing these compounds. This research project is based on the motivation to protect our most precious resource, water, by utilizing a waste byproduct (biosolid-derived biochar) as a filtering mechanism for wastewater. Water is an essential resource for human life, and as populations continue to increase the demand for high quality water supplies will increase exponentially. Additionally, the development of a sensor to obtain continuous measurements of micropollutants in the wastewater will be a novel development and could provide numerous applications to monitor water quality for scientists and other researchers.

Student Involvement: Lee Kimbell (Marquette graduate student) will be conducting research to determine the effectiveness of biochar as a micropollutant removal technology. Included in this task will be construction of the reactor, making biochar from MMSD's Milorganite, and conducting applicable research and tests using biosolid-derived biochar as a micropollutant removal technology.

Keywords: Biosolids, Biochar, Triclosan, Micropollutants

Project Title: Changes in neurological activity in response to intervention: Examining fMRI biomarkers of anxiety among adolescents with ASD
Faculty Name: Amy Vaughan Van Hecke, Associate Professor, Psychology
Student Name: Alana McVey

Introduction: Autism spectrum disorder (ASD) is characterized by difficulties with social relationships, communication, and the presence of restricted or repetitive behaviors or interests. Anxiety commonly cooccurs with ASD, affecting approximately 40% of individuals with autism (van Steensel, Bögels, & Perrin, 2011). Previous research has shown significant differences in patterns of amygdala activation in ASD versus typical development (TD), namely lower activation in ASD than TD. However, more recent research has uncovered that this pattern may be masked among a sample with ASD not phenotyped for anxiety. That is, individuals with both ASD and anxiety show *heightened* amygdala activation, as would be expected among a TD sample with anxiety. When these individuals are teased apart, the pattern of decreased amygdala activation among individuals with ASD without anxiety and increased activation for ASD with anxiety is uncovered (Herrington, Miller, Pandey, & Schultz, 2016). Social skills interventions have been found to be efficacious for improving social and communication behaviors among individuals with ASD. In particular, the Program for the Education and Enrichment of Relational Skills (PEERS®) has been well-validated across several sites, and has also been shown to result in decreased self- and parent-report of social anxiety for adolescents (Schohl et al., 2014) and young adults (McVey et al., in press) with ASD. It is likely, then, that adolescents with ASD, especially those with high social anxiety at the outset of intervention, would also show changes in brain activity that corresponds with decreased anxiety. No known study to date has examined changes in amygdala activation across a well-validated intervention.

Significance: The proposed study would potentially provide evidence for a neurological biomarker of treatment effects of PEERS® on social anxiety. Additionally, this may also support the idea that anxiety in ASD is similar in presentation to anxiety in TD.

Innovation/Forward Thinking: Previous studies have examined neurological activity in response to PEERS® via electroencephalogram (EEG; Van Hecke et al., 2013), however no known study to date has looked at changes in neural activation with the regional specificity provided by fMRI across intervention.

Student Involvement: Alana J. McVey, third year doctoral student in the clinical psychology program, conceptualized of this study.

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Keywords: autism spectrum disorder, anxiety, social skills intervention, fMRI

INTERNATIONAL POSTERS

Project Title: Globally Food and Nutrition Level Detection Using Smartphone Camera Image Spectrum
Faculty Name: Sheikh Iqbal Ahamed, Professor, Math, Statistics and Computer Science
Student Name: Md Kamrul Hasan

Introduction: There is an urgent need of food nutrition detection and follow up the intake in underdeveloped countries. We are aiming to develop a system that can detect the food from a captured image by smartphone. In addition, we propose a system that can detect the nutrition level of that food

Significance: One of the critical problem in underdeveloped countries are optimal nutrition in vulnerable populations. In addition, they have the problem with nutrition policies and programs, such as food fortification or dietary supplementation. The main issue comes from the lack of up-to-date, comprehensive and reliable data on individual dietary intake. In low income country (LIC), their used methods to measure dietary intake took a lot of time. Again, it is costly, and skill/labor intensive. For this reason, we need to develop and evaluate improved methods to measure food and nutrient intake using innovative technology

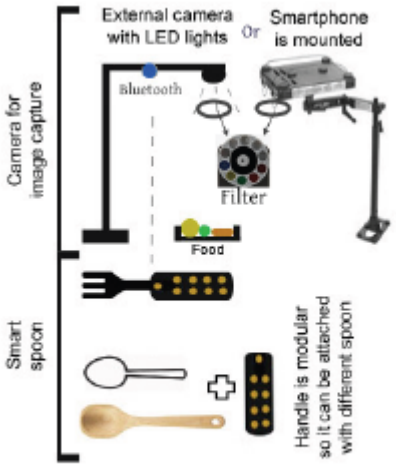

Figure 1: Image capturing and user's input collection by smartphone camera or by external camera

Innovation/Forward Thinking:
We are thinking a technology that can have enhanced imaging methods to measure food intake. In addition, we need and appropriate image recognition software to identify individual food images and convert food intake to nutrient intake. We also be sure that the solution is suitable to the challenges encountered in LIC settings. For example, lack of electricity or alternative power sources, poor lighting, unreliable internet connection and dietary practices that include shared food plates.

We propose an innovative technology to measure food and nutrient intake which is adaptable to the context of poor and rich people. This is an active imaging method that will overcome the limiting factors of the existing methodologies. This novel technology will use smartphone camera for capturing the food image. Besides, we offer the technology with an external camera that is supported by Bluetooth and Wi-Fi modules. In both cases, we will use the smartphone application to show the response from the user and the cloud server. We will use low cost filter in front of the mobile camera shown in Figure 1 for spectral analysis of food. The proposed system will allow the user to capture image easily whether he or she is in the kitchen, at home or at a restaurant. The user will communicate with the system interactively using voice and keypad input. The keypad will be developed on a round shaped handle in such a way that spoon handle of different sizes can be attached to it. The mobile, external camera and keypad are shown in Figure 1

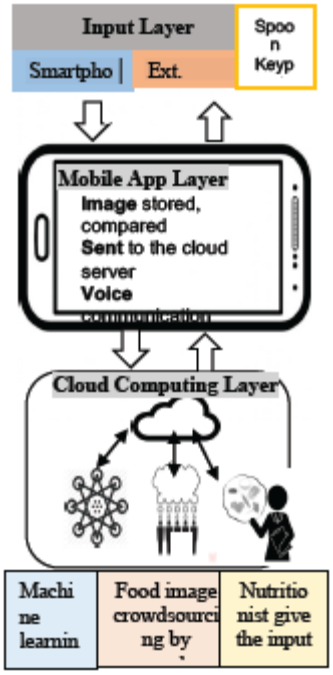

Figure 2: Block diagram of the image analysis process, food detection and nutrition level measurement

Student Involvement: Design and implement the prototype, setup the cloud server, test the collected data, compare the result, produce the final prototype.

Keywords: Image analysis, spectrum analysis, food nutrition detection

Project Title: Social Media Usage Patterns of Chinese International Students in the U.S. and how it influences their process of Intercultural Adaptation.
Faculty Name: Sumana Chattopadhyay, Associate Professor, Digital Media and Performing Arts
Student Name: Yumin Yan

Introduction: The study examines social media usage patterns of Chinese international students in U.S., and investigates the relationship between their social media usage and intercultural adaptation. It addresses three questions: firstly, whether the lengths of time that Chinese international students stay in the United States influence their social media usage. Secondly, what types of social media they use while in U.S. Thirdly, whether social media usage influences the students' intercultural adaptation.

A sample of 300 participants will be obtained through the Qualtrics online survey. The research model and the hypotheses will be tested through a hierarchical regression model. In order to measure the students' intercultural adaptation, the study will use the Sociocultural Adaptation Scale (1999). The study will also apply Gao and Gudykunst's (1990) 8-item scale to analyze psychological adaptation. Based on Kaplan and Haenlein's (2010) framework, the students' social media usage patterns will be measured by how they use six different types of social media.

Significance: This study will help explain international students' cultural adaptation processes in U.S. and how they relate to social media usage. It will also help university campuses around the country to effectively guide international students to successfully adapt to their new country of residence.

Innovation/Forward Thinking: The emerging of international students can be recognized as an epitome of the accelerating globalization. With changes in demographics, it is inevitable for different cultural norms and values to emerge and potentially cause tension (Allen, 1995; Henderson, 1992).
Brunner and Boyer (2007) mentions that colleges and universities have faced increasing pressure to increase the diversity of student bodies. If a university chooses to ignore diversity issues, it may risk losing a significant strategic opportunity, and possibility incur many costs (Levine, 1991). There are also some researches show that retention rates and students' overall satisfaction are positively correlate to the diversity of the student body (Bowen & Bok, 1998; Chang et al, 1999). Therefore, understanding intercultural adaptation will not only benefit international students, but also help colleges and universities to improve the diversity of student body and guarantee operations.

Student Involvement: The student gets involved in this study from three perspectives: designing the study, analyzing the data, and recruiting participants.

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Keywords: Intercultural adaptation, Social media, Chinese international students

Project Title: Global Mobility Outreach to Improve Clinical and Research Outcomes
Faculty Name: Gerald Harris, Professor, Biomedical Engineering
Student Name: Jacob Rammer; Rebecca Boerigter

Introduction: The Orthopaedic and Rehabilitation Engineering Center (OREC) at Marquette has developed a mobility assessment system for lower and upper extremity evaluation of children with orthopaedic disabilities. The goal of the research is to improve care through objective assessment of motion during critical functional activities. The system components were developed at Marquette [1,2] to provide kinematic analysis of gait and upper extremity motion during daily living activities and manual wheelchair propulsion.

International Component: Over the past four years, OREC has developed international research collaboration with colleagues at the Philippine General Hospital (PGH) in Manila, Philippines. Partners include specialists within the Departments of Orthopaedic Surgery and Rehabilitation (PM&R). OREC contributors include faculty and students from the Biomedical Engineering Department at Marquette, as well as physicians and therapists.

Significance: The system supports research to improve treatment planning, follow-up and long term assessment of interventions. For example, it is currently being used for development of an electronic auditory shoe insole feedback device to promote gait training in stroke patients. It is being used in another research project to evaluate surgical outcomes from tendon transfers, lengthenings and osteotomies to improve gait. A third project is evaluating 20 manual wheelchair user athletes with a goal of characterizing propulsion strategies. The system is also used for education and training of over 30 medical residents. Over the past year, colleagues in Manila have used the system to evaluate over 100 children, and over 200 children in the last 3 years. The overarching goal is to conduct independent research that is eventually sponsored by the Philippine Government. A notable accomplishment towards this goal was recent funding by HHS, NIDILRR for post-doctoral fellowships with optional rotations at PGH.

Innovation/Forward Thinking: Innovative biomedical engineering support has provided the opportunity to install and improve lower cost alternatives to more expensive research labs. Communication and technical support through our 'sister' lab at Marquette allows rapid responses to challenges and inclusion of our Manila colleagues on new multi-center research projects. Use of the system improves clinical treatment while also supporting a culture of better education. Most recently we have been working to enhance the capacity of the lab by adding additional technologies and resources as well as upgrading the current hardware and software. It is anticipated that these efforts will promote additional innovative research and clinical opportunities for the children served by PGH as well as further the education of the next generation of residents and clinicians.

Student Involvement: Graduate students and postdoctoral fellows in OREC travel to Manila biannually to provide system updates, upgrades and assist students and physicians at PGH with ongoing research projects. Additionally graduate students provide ongoing technical support, troubleshooting, and communication for therapists, residents, and physicians to ensure outreach labs can maximize clinical impact and advancement.

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Keywords: International Outreach, Community Rehabilitation, Pediatric Disabilities, Clinical Education

Project Title: Pragmatic Intervention for Short-Term Study Abroad
Faculty Name: Todd Hernández, Associate Professor, Foreign Languages and Literatures
Student Name: Araceli Pantoja

Introduction: Our research assesses the impact of an experimental intervention designed to enhance the pragmatic performance of students who participate in Marquette short-term study abroad. The intervention has five goals: to provide background information to students on pragmatics; to encourage participants to consider the relationship between language use and context; to make the students more aware of the pragmatic norms of the host culture; to increase the amount of practice students have with Spanish; and to provide the students with guided reflection and feedback about their language development. Results of our work constitute an important step toward understanding the effect of instruction on second language pragmatic development during study abroad.

Significance: Pragmatics is concerned with language use in context. It includes such matters as speech acts, directness and indirectness, politeness, and deference. Because study abroad is considered an ideal environment for language development, researchers have turned their attention to how pragmatic performance is acquired during this immersion experience. Some scholars suggest that students often do not have adequate exposure and practice with the language to promote significant pragmatic development.[1] Others argue that students lack sufficient awareness of strategies to make the most of the study abroad environment.[2] As a consequence, some researchers have begun to advocate teaching pragmatics as a core aspect of study abroad.[3] However, few empirical studies exist on the effect of pragmatic intervention on study abroad outcomes. It thus remains unclear how to best integrate pragmatics into the study abroad experience.[4]

Innovation/Forward Thinking: Our research addresses this lacuna by assessing the impact of an experimental intervention on the request performance of students participating in Marquette study abroad in Spain. Requests are one aspect of pragmatics that has received increasing attention in the literature. A request, which involves one person asking another to perform an action (e.g., provide goods or services, give information, or share an object), is one of the most common communicative acts in social interaction. A request is itself a face-threatening speech act that tends to benefit the speaker while it does not provide a benefit to the interlocutor. Language learners must have pragmalinguistic and sociolinguistic competence in the foreign language to perform a request without being perceived as rude, offensive, or demanding.

Student Involvement: Our research expands on a presentation Araceli Pantoja developed under my guidance for the Undergraduate Student Research Symposium that the Department of Foreign Languages and Literatures hosted in Spring 2016. Her duties will include: recruiting participants; designing the intervention; transcribing and coding data; co-presenting at a research conference; and co-authoring an article.

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Keywords: Study abroad, Pragmatics, Second language acquisition, Requests

Project Title: Health Education: Addressing Public Health Needs at Hillside Health Care Center
Faculty Names: Abiola Keller, Director of Clinical Research and Clinical Assistant Professor, Department of Physician Assistant Studies; Joshua Knox, Clinical Assistant Professor, Department of Physician Assistant Studies;
Student Names: Natalie Pascutoi; Anna Perino; Molly Beadle; Madeline Cernuda

Introduction: Hillside Health Care Center (HHCC) is a non profit clinic located in southern Belize. This clinic provides primary care services without charge to Belizeans in the Toledo district, the least developed region in the country. A study conducted by the Pan American Health Organization found that 25.1% of all Belizean deaths are contributed to non-communicable diseases (Pan American Health Organization, 2012). As non-communicable, chronic diseases becoming increasingly more prevalent in Belize, improving management of these is essential.

Significance: The Toledo district relies on HHCC as one of the main sources of medical care. However, limited resources and low health literacy limit effective management of chronic disease. A prior community health needs assessment conducted at HHCC determined that patient education was the primary way to improve health outcomes and patient care (Scholcoff, Amick, Dekker, & Doobay-Persaud, 2015). Therefore, this project aims to improve self-management skills through the implementation and evaluation of accessible, culturally sensitive, and evidence-based educational materials. In 2015, the most common reasons for patients to visit the clinic were for family planning and diabetic care (Hillside Health Care International Data and Impact Analysis, 2015), so this project focuses on education in these high need areas. In 2016, this project was started by Anna Perino and Natalie Pascutoi, who implemented and evaluated a validated diabetic educational video series at HHCC. These initial efforts were well received by patients and staff; however, local staff training was limited due to a lack of financial resources.

Innovation/Forward Thinking: Molly Beadle and Madeline Cernuda will address improvement of family planning education at HHCC during their visit in January, 2017. They will implement standardized educational materials for female patients of childbearing age and provide training for local staff, village health care workers, and female patients. Through key informant interviews with providers and patients, they will develop a protocol that will deliver individualized reproductive health plan for each female patient and improve overall maternal and infant health.
We hope that Marquette University physician assistant students will return to HHCC every year to continue health education projects. These students would be designated to implement and improve health education on primary care topics. In doing this, our goal is to strengthen our international relationship with the clinic, staff, and local community and to improve the cultural relevancy and sustainability of our educational programs.

Student Involvement: Natalie Pascutoi and Anna Perino initiated the international public health project in January, 2016. Madeline Cernuda and Molly Beadle will be continuing the project in January, 2017.

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Keywords: Belize, Health, Literacy, Education

Project Title: Application of mechanical vibration to enhance the stability of teeth after orthodontic treatment
Faculty Name: Dawei Liu, Associate Professor, Orthodontics
Student Name: Nicolas Branshaw

Introduction: Orthodontic brace treatment is highly rewarding in today's dentistry. Retention (against relapse) is the final stage of orthodontic treatment and aims to maintain the teeth in their corrected positions after the completion of orthodontic treatment. Certain form of retention (fixed or removable) is routinely prescribed for long periods as the teeth have a strong tendency to return to their initial positions after active orthodontic tooth movement, which however can compromise oral hygiene and give patients discomfort. Undoubtedly it is highly demanded to enhance tooth stability at its new position, which prevents relapse and accordingly shortens the retention time for the patients. Studies have shown that mechanical vibration has anabolic effects on bone mass and its architecture both in orthopedics and dentistry. However, no studies have been done to study using mechanical vibration to enhance orthodontic retention. Therefore, in this project we are going to investigate whether mechanical vibration promotes the stability-determining alveolar bone formation after active orthodontic tooth movement is completed in a mouse model.

Significance: Mechanical vibration can positively influence skeletal homeostasis and possesses anti-resorptive potentials in animal studies. Therefore, we design this project to investigate the effect of mechanical vibration on orthodontic tooth retention. Twenty 8-week-old inbred strain C57BL/6 male mice will be used and randomly assigned into two groups: 1) control group (N=10), and 2) mechanical vibration (MV) group (N=10). All of the mice will receive 10g force from a coil spring to move maxillary right 1st molar anteriorly for 2 weeks, followed by a retention period of 2 weeks. In MV group we will apply mechanical vibration (30Hz, 0.3g) 5min/day on the maxillary right 1st molar throughout the retention period while the control group treated under the same condition but without vibration. Micro-CT will be used for tooth movement measurements (retention effect, use contralateral molars as self-comparison), bone volume fraction (BVF), and tissue density. Additionally, hematoxylin-eosin (HE) staining and tartrate-resistant acid phosphatase (TRAP) staining will be performed on tissue sections for histological and histomorphometric analysis. Descriptive statistics will be used to examine the distribution of BVF, tissue density, 1st molar movement, osteoclast surface area, and the number of osteoclasts per unit of surface area. Each parameter will be compared between the control group and MV group using paired t test statistical analysis ($p<0.05$ is considered significant).

Innovation/Forward Thinking: To the best of our knowledge, we are the first to study mechanical vibration on bone formation in a mouse OTM retention model. The results of this project can potentially provide us an opportunity to apply mechanical vibration to enhance the stability of orthodontic treatment results and accordingly shorten retention period.

Student Involvement: Dr. Nicolas Branshaw and Dr. Yuan Gao will fully participate in this project. They will completely be involved in designing and implementing experiments, analyzing data and writing research paper.

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Keywords: Vibration, Teeth, Orthodontics

Project Title: Application of mechanical vibration to regenerate bone in experimental periodontitis
Faculty Name: Dawei Liu, Associate Professor, Orthodontics
Student Name: Yuan Gao

Introduction: Periodontitis is a prevalent oral inflammatory disease which leads to alveolar bone loss and exerts an adverse impact on systemic health. Many surgical techniques have been used in treating bone loss in periodontitis, such as implantation of various types of bone graft and/or bone substitutes, root surface demineralization, guided tissue regeneration, growth and differentiation factors, enamel matrix proteins or various combinations, turned out to be effective but invasive. Studies have shown that mechanical vibration has anabolic effects on bone mass and its architecture. However no knowledge is available on the effects of mechanical vibration on the regeneration of alveolar bone in periodontitis. Therefore, in this project we are going to establish a mouse periodontitis model and investigate whether mechanical vibration helps regenerate alveolar bone in experimental periodontitis.

Significance: Our study is to investigate whether mechanical vibration provides a noninvasive way to heal bone loss in periodontitis. The project is designed as follows. Twenty 8-week-old inbred strain C57BL/6 male mice will be assigned into two groups: 1) control group (N=10), 2) mechanical vibration (MV) group (N=10). To induce periodontal bone loss, a 5-0 silk ligature will be tied around the maxillary left 2nd molar for 7 days. Suture will be applied and tied gently to prevent damage to the periodontal tissue. The contralateral molar tooth in each mouse will be left untied to serve as control for measurements. After 7 days, we will apply mechanical vibration (30Hz, 0.3g) 5min/day on the maxillary left 2nd molar for 7 days in MV group while the control group treated under the same condition but without vibration. Micro-focus computed tomography (micro-CT) will be used for alveolar bone loss (ABL) measurement (use contralateral molars as self-comparison), bone volume fraction (BVF), and tissue density. Additionally, H/E staining and tartrate-resistant acid phosphatase (TRAP) staining will be performed on demineralized tissue sections for histological analyses. Descriptive statistics will be used to examine the distribution of BVF, tissue density, osteoclast surface area, and the number of osteoclasts per surface unit. Each of the parameters will be compared between the control group and MV group using paired t test statistical analysis ($p < 0.05$ is considered significant).

Innovation/Forward Thinking: To the best of our knowledge, we are the first to study the effect of mechanical vibration on alveolar bone regeneration in experiment periodontitis model. This project aims to uncover the effects of mechanical vibration on bone formation and potentially provide us an opportunity to apply mechanical vibration to help regenerate alveolar bone in periodontitis.

Student Involvement: Yuan Gao an international visiting scholar will fully participate in this project. She will completely be involved in designing and implementing experiments, analyzing data and writing research paper.

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Keywords: China, Periodontitis, Vibration

Project Title: Molecular diagnosis of multi Schistosome parasites from filtered urine from school children in Zambia

Faculty Name: Nilanjan Lodh, Assistant Professor, Clinical Laboratory Science
Student Names: Steven Charles Krenzke; Austin Cyrs; El Shaimaa Mohamed Elmansour Mahmoud; Megan Jane Hessler

Introduction: Schistosomiasis is one of the major neglected tropical diseases (NTDs), with more than 200 million people infected and close to 800 million at risk. In sub Saharan Africa two major human schistosomes namely Schistosoma mansoni and S. haematobium often occur sympatrically largely affecting children. In the age group of 6 – 15 year's infection prevalence and intensity peaks, which impacts the growth delays, delayed cognition, attention deficit, poor performance in school and a negative effect on the overall growth and quality of a child's life. Recognizing the public health impact of Schistosomiasis, the World Health Organization (WHO) is urging member states to regularly treat at least 75% and up to 100%, of all school-aged children at risk of morbidity. As control strategies based on targeted mass drug administration (MDA) to succeed it is essential to have a simple, easy to operate sensitive test. This is very important because low level active infection often occurs after MDA, and it is essential that these cases are detected and treated repeatedly to eliminate the parasite population.

Significance: Current available diagnostic tools, such as egg detection in stool by Kato-Katz (KK) and Circulating Cathodic Antigen (CCA) for S. mansoni and detection of eggs or blood (haematuria) in urine for S. haematobium lacks sensitivity in low intensity settings. CCA also produces false positive results. We have detected S. mansoni and S. haematobium parasite specific small repeat DNA fragment from filtered urine on filter paper by Polymerase Chain Reaction (PCR). The test is superior in sensitivity and specificity to KK, haematuria or CCA. We are now optimizing this test for Zambian school aged children. We are testing samples obtained from endemic regions in Zambia to make comparisons between existing diagnostic tests and PCR amplification of parasite DNA extracted from urine, and to implement the later process in the field in the future.

Innovation/Forward Thinking: The proposed diagnostic is the target of a major mass treatment program, which will address the issues like sensitivity, specificity and logistics about sample collection and handling. However, standard diagnostic procedures, both parasitological and clinical, lack sensitivity (e.g. KK) and specificity (e.g. haematuria and CCA).To evaluate the control or intervention programs, more sensitive and specific tests need to be introduced. As elimination campaigns progress, infections become less severe and the tests will become less effective, missing detection of asymptomatic carriers who are the source of continued transmission. To address this, we are testing our technique in Zambia in an ongoing Schistosomiasis control intervention (mass and targeted chemotherapy distributed through the schools). The proposed study is using filtered urine specimens obtained from school children in Ghana to detect both Schistosoma mansoni and S. haematobium by highly sensitive and specific PCR.

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Keywords: Schistosomiasis, Filtered urine, PCR, Diagnostics

Project Title: A preliminary assessment of Olympic sponsorships 1996-2016: The best, worst and what they did to deserve it.
Faculty Name: James Pokrwycznski, Associate Professor, Strategic Communication
Student Name: Allison Claussen

Introduction: This work-in-progress takes a look at the successes and the not-so-successful uses of one of the most expensive sponsorship opportunities in sports, sponsorship of the Olympic Games. This assessment will cover global or TOP partners of the Olympics, which usually range from 8-12 in any given Games. There are 11 Olympic Games that cover the span from 1996-2016, since this era was the beginning of the Olympics staggering their winter and summer games every two years instead of having both Games in the same year.

Significance: The objective is to allow major sponsors or potential sponsors of future Olympics to better understand what makes for a successful Olympic sponsorship. In particular focus will be on the impact of sponsorships that leave positive legacies in various communities where these companies do business.

Innovation/Forward Thinking: The assessment will evaluate the strategies and tactics used by the TOP Olympic partners including what was done to activate their sponsorship in the host city as well as the advertising, promotional events (contests, competitions, giveaways of tickets and Olympic merchandise, etc) that each partner used globally with particular attention on the efforts in the U.S., the biggest Olympic market in the world.

Student Involvement: Allison Claussen is the graduate student and research assistant involved with the completion and presentation of this poster session topic. She has been a part of the research process by conducting additional research of sponsorship activities and marketing tactics, and gathering secondary sources about trends in international marketing and brand involvement for all 11 Olympic Games. Allison has also been a part of the review process for this project by summarizing, conceptualizing, and editing scholarly information into a presentable format.

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Keywords: International Advertising, Olympic Sponsorship, Advertising Effectiveness, Brand Awareness

POSTERS

Project Title: Energy Minimization in Chip Multiprocessors Using Deep Neural Networks Guided Hybrid DVFS and Task Migration Techniques
Faculty Name: Cristinel Ababei, Assistant Professor, Electrical and Computer Engineering
Student Name: Milad Ghorbani Moghaddam

Introduction: The evolution of the internet and emergence of mobile devices created an environment where we interface computing continuously. Much of the computation (e.g., web searches, e-mail services, social networks, etc.) consumed by this emerging market resides in massive datacenters also called warehouse scale computers. The energy consumed by these datacenters has been increasing continuously. A significant portion of this energy is consumed by the chip multiprocessors (CMPs) inside the thousands of servers in these datacenters. We are interested in developing methods to reduce this energy consumption, in order to reduce operation costs and improve reliability. Dynamic Voltage and Frequency Scaling (DVFS) and thread migration techniques are two popular methods for reducing the energy consumption in CMPs. We propose to combine these two techniques into a new method guided them by specialized deep neural networks, which are trained with self-collected data.

Significance: The proposed method will help to reduce energy consumption in datacenters.

Innovation/Forward Thinking: The proposed method is new and has not been implemented before.

Student Involvement: Milad is a PhD student who will work on this project.

Keywords: Neural Networks, Chip Multiprocessors

Project Title: Smart Spectacle Clip for the Elderly People to Train and Prevent Falls
Faculty Names: Sheikh Iqbal Ahamed, Professor, Mathematics, Statistics, and Computer Science; Roger O. Smith, Professor, R2D2 Center, University of Wisconsin-Milwaukee
Student Names: Md Osman Gani; G.M.T. Ahsan; Amit K. Saha

Introduction: Elderly people are the fastest growing segment of the population in the world. According to the Administration on Aging (AoA), the older population, 65 years or older people, numbered 46.2 million in 2014. They represent the 14.5% of the US population and by 2060, there will be more than twice their number in 2014 [1]. Falls are the leading cause of accidents in elderly people. It is also the primary cause of serious injuries and accidental deaths in elderly people. It is more common than strokes [2]. Research has identified the leading risk factors that contribute to falling. These are vision problems, lower body weakness, difficulty with walking and balance, and home hazards (broken or uneven steps). Most of the falls are caused by a combination of the above risk factors. These risk factors can be changed or modified to prevent falls. Healthcare providers (rehabilitation therapist) can help to cut down risk by reducing fall risk factors. One of the important risk factors is vision problems. Wearing multi-focal glasses while walking leads to falls [4]. Though nowadays most presbyopes choose the progressive lenses, conventional bifocal and trifocals have some advantages over progressive lenses. They provide wider lens areas for reading and computer work than progressive lenses. The people with bifocal or progressive lenses also uses another pair of glasses for indoor and outdoor activities such as walking. These different types of lenses can make things seem closer or farther away than they actually are and leads to fall, if they forget to wear the correct glass [5]. Thus our goal is to develop a portable smart spectacle clip to remind the subject when to change glasses. The smart clip will recognize and track the activities. It will remind and warn the user to change the glasses suitable for the activities. The repeated reminder will help training the subject to wear right glasses for the activities. Also, the real-time warnings will help prevent the falls.

Significance: Each year, 2.8 million older people are treated in emergency departments for fall injuries. One out of five falls causes a serious injury such as broken bones or a head injury. The direct medical costs for the fall related injuries are $31 billion annually. Falls can cause broken bones (wrist, arm, ankle, and hip fracture), and head injuries. As a result fear, anxiety and depression are getting increased. Efficient fall prevention system that can alert the subject before a fall actually occur have a great impact on improving life quality, security, reducing risk of serious injury, and death. Such system based on wearable sensors will be cost effective and provide mobility to the user. Using our smart spectacle clip, the elderly people can be trained to change the glasses when necessary. It will also warn the subject to change the glass to prevent fall.

Innovation/Forward Thinking: In previous years there have been lot of research conducted to detect fall of a subject and there are only few works done in preventing fall. By paying close attention to one of the important risk factors, we will be able to train and prevent falls. Our goal is to design and develop a cheap smart spectacle clip which can be clipped with the spectacle. The device will have accelerometer sensor to recognize different activities (sitting, walking, taking stairs). The device will be designed to be easily clipped with different types of spectacles. Our goal is to make it cheap and portable. It will offer four modules 1) recognize human activities from the accelerometer sensor, 2) automated warning to prevent fall, 3) sound notification to change glasses and 4) emergency notification if there is any falls. The reminder and warning from this smart device will help to train to wear right glasses and prevent related falls. To our best knowledge, this is the first smart spectacle clip to train and prevent fall.

Student Involvement: Osman, Ahsan, and Saha will work on the design and development of the wearable sensor clip. They will also work on the automated activity recognition and notification module.

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Keywords: Fall, Vision, Elderly

Project Title: Title: Novel Data Collection Technique Using Smartphone Camera for Image and Spectrum Analysis
Faculty Name: Sheikh Iqbal Ahamed, Professor, Math, Statistics and Computer Science
Student Name: Md Kamrul Hasan

Introduction: Continuous hemoglobin level monitoring is a big challenge for anemic patients since they need to measure hemoglobin and glucose level invasively using finger-prick or venous blood sample. Noninvasive measurement technique is an extraordinary research invention that can overcome the challenges faces by these invasive measurement techniques. Most of the time, the physical condition of older people and premature babies doesn't support invasive blood testing as well. Therefore, an accurate, cost effective, portable and user-friendly noninvasive solution is the need of the hour.

Significance: Mobile Health (mHealth) technology is one of the best way to help us in this problem. mHealth system has already proved its capabilities as a tool for heart rate monitoring, sleep monitoring, telemedicine, point of care tool, e-ESAS, breast cancer care, and palliative care etc. The smartphone camera is one of the important inbuilt sensor with the device. In this poster, we will present how the smartphone camera can be used for data collection of a noninvasive blood hemoglobin measurement system.

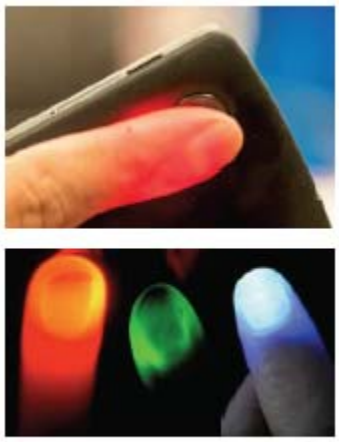

Fig 1: Fingertip video collection under different lighting condition.

Innovation/Forward Thinking: We have selected fingertip as the measuring site for noninvasive blood research. The fingertip has couple of light absorbers like skin, tissue, venous blood, arterial blood, and hemoglobin etc. For each heartbeat, there is a surge of arterial blood and increases arterial blood volume across the measuring site. For this reason, we got more light absorption in this phase. We recorded a 10 seconds video of the enlighten finger and measured the mean pixel intensities for each frame. We can draw the pixel intensities 'as a waveform'. Then, we can see the peaks with each heartbeat and troughs between heartbeats from the waveform. Now, we can calculate the light absorption by subtracting trough from the peak. Based on the data analysis, we can produce the reflection spectrum and use for further research [1].

We can use mobile camera supported by its own flash light to record the video. To get the best picture of data inside the fingertip, different lighting condition provided us important information in the video. For example, red light and green lights are absorbed by the blood hemoglobin components in different ratio. If we can capture the video under different light source, then there is a good possibility to extract unique fingerprint for blood component detection [2]. Here, we used three different light source: red, green and blue. A single color light was turned on to enlighten the fingertip. Then the mobile camera video is turned on with flash. Afterwards, we recorded a 10 seconds video for the red light. Similarly, we recorded the video for green and blue lights. We can produce the data for further analysis using partial least square and Support vector machine algorithm to predict the hemoglobin level.

Student Involvement: Design and implement the prototype, test the collected data, produce the final prototype.

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Keywords: Noninvasive blood analysis, video analysis, RGB image analysis

Project Title: Detection of crisis event among veterans suffering PTSD
Faculty Names: Sheikh Iqbal Ahamed, Professor, Math, Statistics and Computer Science; Stephen Yau, Professor, Computer Science and Engineering, Arizona State University; Zeno Franco, Assistant Professor, & Katinka Hooyer, Primary Care Research Fellow, Department of Family and Community Medicine, Medical College of Wisconsin
Student Names: Tanvir Roushan; Nadiyah Johnson; Jiachen Ma; Arun Balaji Buduru

Introduction: Mental health (MH) problems have significant negative impacts on US military veterans, with those in combat related positions at risk for Post-Traumatic Stress Disorder (PTSD). Trauma impacts between 15-20% of military veteran [1][2], and a PTSD diagnosis significantly increases the propensity to engage high risk behaviors, including alcohol/substance abuse, impulsivity, and angry outbursts. These behaviors raise veterans' risk for interpersonal violence, suicide and unintentional injury to themselves and others [1]. MH problems also correlate with cardiovascular disease, diabetes and early mortality. Despite improvements in evidence based therapy for PTSD undertaken by the Veteran Health Administration (VA), PTSD remains treatment resistant and is typically chronic. As a result, the VA's National Center for PTSD suggests re-conceptualizing PTSD not just in terms of a psychiatric symptom clusters, but focusing instead on specific high risk behaviors associated with it, as these may be directly addressed through targeted behavioral change efforts [3]. Obtaining accurate, timely information about high risk behaviors from MH patients is a key element in improving the detection, prediction and early intervention for psychological crisis events.

Significance: Anger is one of the least well understood human emotions, with markedly fewer research studies as compared other major emotions or mood states. Reasons for this may include psychologist fear of clients who are aggressive or combative. Notably, despite the recognized risks associated with anger, including poor health outcomes (e.g., elevated heart disease, stroke incidence), disrupted social functioning (e.g., marital dissolution, being fired from jobs), and incarceration (e.g., for interpersonal violence, damage to property, drug use), the Diagnostic and Statistical Manual (DSM) used by psychologists and psychiatrists does not have a diagnostic category specifically addressing anger as a psychological problem.

We will address this problem by focusing on illuminating patterns of "precursor behaviors" that immediately precede the expression of angry outburst by fusing gesture, speech, and physiological data captured first in laboratory simulated anger events, and later in real-world settings with US military veterans prescreened to be at high risk for future anger episodes. This work will be accomplished in conjunction with the Dryhootch Partnership for Veteran Health, a long standing community-academic research partnership.

Innovation/Forward Thinking: By beginning to tackle the problem of predicting anger from behavioral cues, our proposed system provides opportunities to implement preventive intervention earlier in the anger cycle than is possible in current clinical care paradigms, which can ultimately improve the wellbeing of veterans suffering from anger related PTSD. The recent advent of big data and artificial intelligence techniques enable us to develop state-of-the-art technologies to better understand and tackle the complexity of treating MH problems in this population. Our proposed risky behavior prediction approach aims at providing an adaptive recognition system that can recognize risky or abnormal behaviors by providing observations of behavior without distortion induced by recall bias. The core IoT infrastructure of our system can also be generalized and applied to other automatic smart MH and healthcare systems.
Student Involvement: Tanvir and Jiachen, graduate students of MSCS department have been working on the research which focus on recognizing abnormal behavior among veterans with PTSD. Doctoral candidate Arun from Arizona State University is developing a machine learning model that generates the labels and features of the machine learning aspect of this project to detect crisis event pre-cursors.

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Keywords: mental health, crisis event

Project Title: Autism Intervention, an AI approach
Faculty Name: Sheikh Iqbal Ahmed, Professor, Math, Statistics and Computer Science
Student Name: Piyush Saxena

Introduction: The learning capability of individuals with ASD (Autism Spectrum Disorder) is inversely proportional their anxiety level at any time. This in turn impacts their ability to express themselves, form relationships and function in society.

The Program for the Enrichment and Education of Relational Skills, or PEERS is a manualized and evidence based program run by the Autism clinic in the department of Psychology. The goal of the 14 week program is to teach young adults with ASD to function in society.

The program relies on hand filled questionnaires and surveys to gauge the progress of the individual after each session and at the beginning and the end of the program. This has provided crucial insight into the effectiveness of the program

There is variability within the population of teens with ASD. The program is not effective for the entire population. Surveys are not a good indicator of the progress of the individual.

It is not possible to monitor the impact of session on the individual in real-time.

The program is not scalable and not be implemented without dedicating significant resources in terms of both capital and trained personnel

Significance: This will provide groundwork for understanding mental illness in a robust statistical and machine learning framework.

Innovation/Forward Thinking: This study will provide a robust statistical/AI model to monitor and predict the emotional state of an individual. This can be expanded to many other mental disabilities and thus understand how individuals with disabilities react to audio and visual stimuli.

Student Involvement: System Development, Testing, ML Algorithm

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Keywords: Mental illness, Autism, Machine Learning, Artificial intelligence

Project Title: Monitoring and Predicting human emotion, a computational framework
Faculty Names: Sheikh Iqbal Ahmed, Professor, Mathematics, Computer Science, and Statistics; Amy Van Hecke, Associate Professor, Psychology
Student Name: Piyush Saxena

Introduction: There has been a tremendous research in algorithms that predict the physical activity of an individual[1][2]. However, much needs to done in the field of emotional state prediction. While there are, many works out there that rely on emotion prediction using facial image data for machine learning algorithms, the accuracy remains low. In our work, we will model the emotional state of an individual using physiological data that represents both the sympathetic nervous system and the para sympathetic nervous system. The pipeline will include,

1. Validating the emotion states of individuals using an online survey
    a. The participants will watch a series of 9 videos representative of 6 emotional states. After each survey the students will fill out a questionnaire rating the 6 emotional states on a scale of 0-10. The video set being used was validated by another study [3].
2. During this process the students will also be wearing a sensor watch that will record the heartrate and electrodermal activity [4].
3. Statistical modelling
    a. Emotional state = f (heart rate, electrodermal activity)
4. Machine learning engine
    a. The validation app mentioned in 1 has been completed and we have begun collecting the data. This is an IRB approved project.

Significance: This project will be the groundwork for future emotion modelling artificial intelligence engines.

Innovation/Forward Thinking: This is a unique interdisciplinary project that that is a collaboration between social sciences and computer science. We are able to capture data (mathematics and computer science) that allows us to predict an outcome within social science.

Student Involvement: Piyush will be analyzing the collected data from 120 subjects to prepare individualized prediction models. The models will be tested on the remaining data set.

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Keywords: Emotion, Prediction, Computation

Project Title: An Interface for Making Decisions for Accessibility Purposes
Faculty Name: Sheikh Iqbal Ahamed, Professor, Math, Statistics and Computer Science
Student Name: Drew Williams

Introduction: In the field of assistive technology, individuals often need to gather and sift through lots of data. This data is then analyzed and summarized – giving therapists the necessary information for making decisions about a patient. (Smith, 2002) Because each patient's needs can vary wildly, it's important that humans make the final decisions rather than depending on a computational assessment of the data.

This sort of task is often completed via AT assessments – however, many of these assessments are paper-based. Additionally, they do not follow a single standard. Developing a usable and standardized interface for assistive technology assessments can help save time for patients and practitioners alike, and streamline the summarization process.

To solve this problem, we present xFACT: an application for developing decision-making interfaces. xFACT allows a user to build assessments built on a trichotomous tailored sub-branching scoring system. Questions start out broad and can be answered with a yes, no, or maybe. If a user is uncertain about a question, the survey branches and asks more detailed questions. Non-applicable questions can be removed from the assessment for that session, allowing for the assessment to be tailored a user's particular needs.

Significance: Relying on consistent assessments for practice purposes could help occupational therapists save time, by helping them adapt to new assessments created with xFACT easily and quickly. Additionally, answering a question in a TTSS-structured assessment requires far less of a cognitive load than assessing questions on a scale. Ensuring that occupational therapists can use the assessment without loads of training will help how quickly it is adopted.

Furthermore, assessments for numerous aspects of assistive technology and occupational therapy exist; however, many of them are not digitized. Developing xFACT will help in the digitization process for these surveys, by providing a framework for porting them to an application.

Innovation/Forward Thinking: Most assessment frameworks seek to give a singular answer for a question, such as "is x the proper technique to use for this patient." xFACT leaves this judgement up to the user, only seeking to gather and score data surrounding the question. This is unique, and may make the system more attractive to those reticent to trust a computational opinion. It can also lead to xFACT being used in other sorts of situations, such as built environment accessibility assessments. (Williams, 2015)

Student Involvement: Drew Williams is the current lead developer on this project, and is working to update legacy code from the late 2000s/early 2010s to a more modern format. She is developing a cross-platform desktop application with the guidance of the team at UW-Milwaukee and Dr. Sheikh Iqbal Ahamed.

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Keywords: mobile devices, decision making, accessibility, human-computer interaction

Project Title: A Mobile Method for Determining Access Ratings for the Built Environment
Faculty Name: Sheikh Iqbal Ahamed, Professor, Math, Statistics and Computer Science
Student Names: Drew Williams; Amit Kumar Saha

Introduction: A variety of different guidelines and requirements exist for determining that built environments are accessible for individuals of all abilities. These include researched best practices, ergonomics guidelines, and the requirements for buildings set in place by the Americans with Disabilities Act. (Americans with Disabilities Act, 1990) The process of understanding which measurements to take, remembering all of the measurements that need to be taken, and taking them can be daunting. Solutions for this problem exist (Tanviruzzaman, 2012), although they can be expensive and cumbersome. An inexpensive and mobile solution would be preferred.

To solve this problem, we have created Access Tools: a mobile phone application. The application consists of both an accessibility assessment that adapts to the structure the user is measuring, (Williams, 2015) and a variety of on-board tools that use the sensors of a smartphone to measure ramp slopes, lighting level, sound levels, and different distances in the built environment. (Johnson, 2015 and Tanviruzzaman, 2012) In-application tutorials guide the user through the measurement process, and a cloud database allows all measurements to be backed up for further analysis.

Significance: In many cases, architects and building managers want to provide the best experience for consumers of all abilities, but they cannot spend the time required to understand the in-depth. Providing a usable and mobile solution for built environment assessment can help individuals understand accessibility requirements and guidelines, and fix problems where they are found. This can promote creating more accessible businesses and provide a better quality of life for individuals with disabilities.

Innovation/Forward Thinking: Our solution provides an all-in-one approach to the task of built environment accessibility assessment, requiring very few outside tools and relying on the sensors already present in a smartphone for our measurements. Furthermore, the assessment guides the user through measurements they need to take, so the user does not need to research and determine the best measurements to take for the environment they are assessing.

Student Involvement: Drew Williams has designed the interface for Access Tools, completed initial development, and worked on development of the mobile slope tool and the interfaces of the sound and light tools. Amit Saha Kumar works on the cloud database and integration of it with Access Tools, and further development and refinement of the initial Access Tools application.

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Keywords: mobile devices, sensors, accessibility, human-computer interaction

Project Title: The Mediating Effects of Positive Cognitions on Dementia Caregivers' Burden and their Care Recipients Behavior Problems
Faculty Name: Abir K. Bekhet, PhD, RN, H.S.M.I. Associate Professor, Nursing
Student Names: Karie R. Kobiske, MSN, BSN, RN; Denise Matel-Anderson, MSN, RN, CCRN

Introduction: By the year 2050, there is a projection that the number of American people diagnosed with dementia will raise to 16 million; triple the current number of 5.4 million.[1] Eighty percent of the care provided for persons with dementia is provided by unpaid caregivers.[1] Dementia caregivers are at high risk for developing physical and psychological health problems and they experience a high rate of clinical depression as a result of the burden of caregiving. [2] This study was designed to address the gap in the current state of research with family caregivers of persons with dementia. Specifically, the present study targets caregivers' positive cognitions, a protective factor that may buffer the effects of chronic burden on their care recipients' challenging behaviors.

Significance: Previous research have shown that positive thinking is associated with better quality of life, greater life satisfaction, enhanced psychological and physical well-being, and a sense of meaning. [3] To date, previous studies have not examined the mediating effects of positive cognitions on the relationship between caregivers' burden and their Care Recipients Behavior Problems as proposed in this study. The study will provide direction for the development of a future positive thinking training intervention to help dementia caregivers to combat their burden that will in turn improve their care recipients' behavior problems.

Innovation/Forward Thinking: This study is innovative in testing the potential mediating effects of positive cognitions between dementia caregivers' burden and their care recipients' behavior problems. This is an initial step toward implementing a cognitive intervention among dementia caregivers. Dr. Bekhet plans to extend this descriptive study to test a cognitive intervention using the Positive Thinking Skills Scale that was developed by Dr. Bekhet and was published in Western Journal of Nursing Research[4]. IRB approval will be obtained once the proposal gets funded. Denise and Karie will use the information gained from this study to build on their PhD dissertations as they are interested in positive thinking, resilience, and mental health. Denise and Karie are currently PhD students at Marquette and Dr. Bekhet is their advisor. This study will facilitate further research of the students and faculty.

Student Involvement: Denise and Karie will take the lead on this project with the support of and collaboration with Dr. Bekhet. Both will recruit the study participants (n=80), collect the data, and entering the data into SPSS. Dr. Bekhet, Ms. Matel-Anderson, and Ms. Kobiske will clean the data and analyze the results. Matel-Anderson plans to study resilience in adolescents who survived a suicide attempt. Kobiske plans to study dementia caregivers and resilience for her dissertation. This study will open avenues and thoughts for their dissertations in terms of understanding ***the positive thinking as a protective factor*** for the resilience concept. The information gained from this study will help them to develop proposals that integrate some of the resilience enhancing factors and use them as intervening variables to help caregivers and adolescents rise above their challenges and become resilient.

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Keywords: Positive Cognitions, Caregivers, dementia, Care recepients challenging behaviors

Project Title: The Mediating Effects of Perceived Social Support and Positive Thinking on the Relationship between Self-esteem and Resiliency among Undergraduate Students
Faculty Name: Abir Bekhet, Associate Professor, College of Nursing
Student Name: Denise Matel-Anderson

Introduction: While death from other causes has decreased, the increasing number of deaths by suicide for adolescents has become a national tragedy. Deaths by suicide have become the second leading cause of death for youth in America today. Resilience theory, which proposes that resilience, is the interplay between risk and protective factors in the face of adversity will provide the theoretical framework for this study. Low self-esteem is conceptualized as a risk factor in this study and it is defined as "competence, value, and worthiness of respect" (Modrcin-Talbott, Pullen, Ehrenberger, Zandstra & Muenchen, 1998). Protective factors can enhance resilience by reducing the effects of the risk factors and minimizing negative reactions, thereby contributing to the adolescents' resiliency and positive outcomes. The protective factors to be examined in this study are perceived social support and positive thinking. Perceived social support is the individuals' perception of the persons in their life that are available, provide advice and assistance when needed. Positive thinking is defined as specific positive thinking patterns that enhance mental health and increase one's ability to effectively manage daily activities. Previous research showed that resilience promotes healthy development, emotional protection, and prevention of mental illness (Larson & Dearmount, 2002; Wallace, 2012) during adolescence. However, to date no research has been done to investigate the mediating/moderating effects of perceived social support and positive thinking on the relationship between self-esteem and resiliency among adolescents as proposed in this study.

Significance: Adolescents have been defined as a vulnerable population throughout the literature. Adolescents were found to have, different risk and protective factors than other age groups. Resilience promotes healthy development, emotional protection, and prevention of mental illness during the years of adolescence. Understanding adolescent resiliency in relation to perceived social support and positive thinking, as proposed in this study, will enable the development of interventions and services with the goal of decreasing adolescents' suicidal attempted and mortality and increasing their psychological well-being.

Innovation/Forward Thinking: This study is innovative because it recognizes the vulnerability of the adolescents and potential influencing factors. The findings from this study will provide insights regarding the possible mediating effects of perceived social support and positive thinking on the relationship between self-esteem and lack of identity and adolescent resiliency in undergraduate students. Denise will use the findings from this study for her PhD dissertation. The findings from this study will inform the creation of a suicide prevention program for adolescents. Denise is currently a PhD student at Marquette University College of Nursing and Dr. Bekhet is her advisor/chair.

Student Involvement: Denise will take the lead on this project with the support of and collaboration with Dr. Bekhet. Denise will recruit undergraduate university students for the study. Denise will obtain the IRB for the study, will collect the data, and analyze the results under the supervision of Dr. Bekhet.

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Keywords: Social, Positive Thinking, Relationships

Project Title: Identification and analysis of dysregulated competing endogenous RNA interactions in cancer
Faculty Name: Serdar Bozdag, Mathematics, Computer Science, and Statistics
Student Name: Duc Do

Introduction: microRNAs (miRNA) are short noncoding transcripts, which play an important role in gene silencing. When binding to messenger RNA (mRNA - transcript of a protein coding gene), a miRNA can degrade the mRNA or inhibit its translation to protein. Dysregulation of miRNA-mRNA interaction has been shown in cancer development and metastasis [1]. Recent experimental evidences showed that miRNA could also target non-coding transcripts such as long non-coding RNA (lncRNA) [2]. Thus, it suggests a new layer of gene regulation, called ceRNA-ceRNA interaction (CCI). A CCI involves two RNA transcripts (ceRNAs), which "compete" with each other to attract some common miRNAs. Hypothetically, CCIs can cause changes in the total abundance of miRNAs in a cell, altering the miRNAs' gene silencing effect and thus disrupting the normal levels of gene expression. There have been recent experimental studies that show aberrant CCI activities in cancer tissues [3]. However, experimental identification of CCIs is time consuming and capital intensive. In this project, we propose a computational approach that integrates the expression profiles of mRNA, lncRNA, and miRNA to systematically identify CCIs that are dysregulated in cancers. From those dysregulated CCIs, we will construct and analyze dysregulated ceRNA network to discover the aberrant CCIs with significant biological importance.

Significance: CCIs [4] are shown to be involved in various cell differentiation processes; thus dysregulation of CCIs can play an important role in cancer development. However studies on finding important CCIs and their implication in cancer are still in early stages. The significance of this study lies in our computational pipeline which can genome-wide screen and detect many important CCIs on different types of cancer. We applied the prototype of our computational method on a publicly available breast cancer dataset. Our preliminary results indicated that hub genes in the dysregulated ceRNA network are known breast cancer-related genes. Several ceRNAs in the network also demonstrated high prognostic power to predict patients' survival rate. Thus, dysregualated CCIs can be served as a new type of biomarkers and therapeutic targets for cancer drugs.

Innovation/Forward Thinking: Our proposed computational pipeline requires a simple data integration strategy; thus it can be used to identify dysregulated CCIs on different types of cancers. A comprehensive comparison of dysregulated CCIs selected from different cancer types can reveal important universal or cancer-specific ceRNA regulators. In addition, for a specific type of cancer, we can apply the same computational pipeline on different datasets to validate the results. Our approach currently quantifies the association strength between different ceRNAs. Regarding potential research extension, from the association-based measure, we plan on inferring the causal regulatory relationship between those ceRNAs, thus further clarifying the functional mechanism of CCIs.

Student Involvement: This project is a part of Duc Do's dissertation work under supervision of Dr. Serdar Bozdag. Duc Do will be in charge of designing and testing the computational experiments.

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Keywords: endogenous competing RNA, gene regulation, cancer genomics

Project Title: Disaggregation problem: How much is a daily gas flow of a monthly gas bill?
Faculty Name: Ronald. H Brown, Associate Professor, Electrical and Computer Engineering
Student Name: Maral Fakoor

Introduction: Natural gas Local Distribution Companies (LDCs) usually want to purchase the amount of natural gas that their customers will need every day. If an LDC is going to provide services to new geographic zones defined as operating areas, or if a national gas demand model (for example consumption models for some states in the US) is to be built, available data may be only the monthly and billing cycle natural gas consumption.

Significance: In natural gas LDCs too little or too much purchased risks either trading gas on the spot market at a premium price, or paying penalties to pipeline companies. Especially, when there is an unusual condition like unexpected weather. Hence, there is a need to have an accurate daily forecast to reduce the operational cost of LDCs and subsequently to reduce the price for the natural gas customers. Daily natural gas flow forecasting uses mathematical models based on domain knowledge.

Innovation/Forward Thinking: In our model daily gas flow data are what we really need to build accurate gas forecasting models. If the interval data are the only data available for training, this can cause large errors when trying to forecast daily flow. So we need to disaggregate monthly and billing cycle data to daily data. In this project we want to build forecast model by minimizing the gas flow forecasting errors for a target area.

Student Involvement: For disaggregating monthly and billing cycle data there are some models which are used for other projects. But we need to implement a method which is more dependent on our constraints such as weather condition like temperature and wind.

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Keywords: Disaggregation, estimation, time series forecast, natural gas

Project Title: Surrogate Data in Natural Gas
Faculty Name: Ronald Brown, Associate Professor, Electrical and Computer Engineering
Student Name: David Kaftan

Introduction: Surrogate data comes from one data set and is transformed to behave like another data set. For example, natural gas data from Minneapolis can be transformed to behave like natural gas data in Milwaukee. The surrogate data may include data points with characteristics different from the original data set, leading to a more rich and diverse data set.

Significance: Natural gas demand forecasting is a crucial process in the natural gas industry. Without an idea of how much natural gas might be needed in the future, natural gas utilities are likely to end up with too much or too little gas for a particular day. This leads to hefty fines for the utilities, which in turn are passed onto the consumers. The most difficult days to forecast natural gas are often the days whose characteristics appear least frequently, such as extreme cold days. One promising method for improving forecasting on days with infrequent characteristics is use of surrogate data.

GasDay lab forecasts natural gas demand for utilities across the country. As a result, the lab has possession of a wealth of natural gas consumption data. These data sets feature different spacial and temporal resolutions. They come from locations with large varieties of climates and human behaviors. Therefore, the use of demand data from one data set to forecast demand on another data set becomes a non-trivial problem.

Innovation/Forward Thinking: Current state of the art methods for transforming data sets to work as surrogate data include Brown's Method and Paul Kaefer's Universal Surrogate Data Algorithm [1]. Recent advances in machine learning offer promising paths for generating data. This includes Goodfellow's Generative Adversarial Network [2] and DeepMind's WaveNet [3]. Early experimentation of these methods show promising results when applied to natural gas data sets. Further experimentation and expanding on Brown's and Kaefer's methods holds promise for improving natural gas forecasting.

Student Involvement: Student and professor will work together to address the problem.

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Keywords: Data, Energy, Data Science, Machine Learning

Project Title: Changing Impact of Prior Day Weather on Daily Gas Demand
Faculty Name: Ronald Brown, PHD, Associate Professor, Electrical and Computer Engineering
Student Name: Jarrett Smalley

Introduction: It is important for natural gas distributors to have accurate predictions of future natural gas demand. Forecasters need to understand the relationship between the dependent variable (gas demand) and any independent variables which may impact it. This gas demand, for residential and commercial customers, relies mostly on daily temperature. It has been noticed that previous day weather has an impact on gas demand, the significance of this impact has been seen to be variable, but what this depends on has not been found. This may be due to thermodynamic effects and human behavioral responses to weather. This work uses historical demand and temperature data to analyze the possible impact of prior day weather depending on different variables.

Significance: Properly understanding a possible relationship between a previous day's weather and some, unknown, variable(s) would greatly improve current GasDay forecasting models. Prior Day Weather Sensitivity (PDWS) is an indicator variable, introduced by Kaefer [1], which describes the impact factor of prior day weather. Here, we evaluate PDWS on different temperature and change in temperature ranges, finding a resultant relationship. We then incorporate this relationship into a forecasting model. This modified model had improved forecasts over a model which ignored this relationship.

Innovation/Forward Thinking: There is an abundance of possible future work which might be done in this area of research. Other variables might be investigated to find similar results to those that were found herein. This work might be extended into other temperature driven demand domains as well as in domains which might investigate the effects of recency in human behaviors.

Student Involvement: This work is a part of research that the student is doing in the GasDay Laboratory. Drs. Ronald Brown and George Corliss will act as advisors to Jarrett Smalley's work.

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Keywords: Energy Forecasting, Regression, Recency Effect, Prior Day Weather Sensitivity

Project Title: Spatial Analysis of Computer Science Course Offerings in Wisconsin Public High Schools
Faculty Name: Dennis Brylow, Associate Professor, Mathematics, Statistics, and Computer Science
Student Name: Heather Bort

Introduction: The Preparing the Upper Midwest for Principles of Computer Science (PUMP-CS) project at Marquette University has the ambitious goal of preparing at least 100 high school teachers for computer science classrooms by the 2016-17 school year. This goal will be met in an effort to contribute to Wisconsin's share of the 10,000 teachers requested for the NSF's CS10K Project. While Wisconsin is one of the few states with clearly defined licensing standards for K-12 computer science teachers, we suffer from a lack of programs that provide the necessary courses for a teacher to qualify for the license required by the WI Department of Public Instruction to teach those course that have more than 25% computer programming content. With almost 500 public high schools in the state, there were fewer than 40 of those schools with students enrolled in an AP CS face-to-face course for the 2014-15 school year.

As part of the effort to meet the PUMP-CS goal of preparing teachers for offering computer science courses, Marquette is hosting annual cohorts of high school teachers for Exploring Computer Science (ECS) professional development sessions. We have been leveraging the ECS program to develop the diverse teaching talent recruited for PUMP-CS, providing ECS training as part of an alternative pathway to secondary licensure for K-12 computer science.

Significance: While we continue to fill our cohorts each summer and have increased the number of schools offering computer science courses in our state by just over 10%, we are not reaching the level of successful adoption reported in places like Los Angeles [1], Ohio [2], or Chicago [3]. Even programs that are not based on ECS have reported success and provided insight to the factors affecting the high school computer science landscape [4]. We have found that many of the teachers that go through our program are at schools that already have some experience with offering computer science or they have been involved in some other program\activity to promote CS ED (i.e. CS4HS, SIGCSE, CSTA, etc.). We would like to find a way to increase the participation by schools outside of our current community of practice, to find a way to identify schools in our state that could benefit from a CS ED initiative and to determine what type of help we could offer. Can we identify CS ED "density-challenged" regions and improve the likelihood of sustainable CS programs in the schools that make them up.

Innovation/Forward Thinking: Identifying why phenomena occur in certain places and not others is a common theme throughout social science research. Indeed, there is a common interest in geography across social science fields where certain theories allude to assumptions that spatially proximate groups are likely to behave in a similar way and the groups that are more distant are less likely to exhibit those behaviors. The role of space and geography has been explored in many ways; the geographic patterns of suicide, democratization, spatial patterning of homicide rates, and of course Snow's work on the London cholera epidemic. Geospatial analysis methods have been used within education research as well, for example, to study regional science attainment in St. Louis and educational level changes in Finland [5]. While all of these research efforts have very different contexts, they are all focusing on principles of geospatial analysis. All of the researchers found that, within their context, place matters. Geographical place is an inherent factor in scaling CS ED initiatives and there have not yet been publications exploring, in geospatial context, the patterns of adoption and geographic clustering of CS courses at the high school level.

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Keywords: Computer Science, Wisconsin, Spatial Analysis, High School

Project Title: Monitoring Errors of Real Time Models
Faculty Names: George Corliss, Professor Emeritus, Electrical and Computer Engineering and Mathematics, Statistics, and Computer Science; Ronald Brown, Associate Professor, Electrical and Computer Engineering
Student Name: Andrew Tran

Introduction: When using a forecasting model, the goal is to accurately predict upcoming events so that we are prepared. Weather forecasts, stock market prices, or traffic forecasts are used to help mitigate issues like exceptional weather, bad investments, or being late to work. Bad forecasts may lead to poorly informed decisions, where this issue can be associated with most forecasting models.

Significance: Real time models use data that directly comes from its system once available. Often during data collection, this data cannot be cleaned before being used in the model as the forecasts needed are time critical, and the data may be inaccurate. The model will use the data as if it were correct, and will forecast some event on "bad" data. Therefore, the transitive property will create a "bad" forecast. The term bad is focused towards the misinformation of data, because the forecast can be objectively good while still using incorrect input information that does not reflect the true system.
Real time error monitoring focusing on bad forecasts and residual errors. Detecting bad forecasts can improve user support of the forecasting model and maintain the quality of the input data. Quality assurance of data reduces time and costs that would typically be used to repair the bad forecasts and bad data.

Innovation/Forward Thinking: Errors will occur with any forecasting model. The goal is anticipating these errors and to look for abnormalities. An algorithm will be used to define the severity and type of error propagating to the forecast. Finding single errors can be easy, where these values tend to be large outliers. The difficulty is finding errors that do not conform to single point, additive outliers. Additive outliers look at errors with input data that propagate to the forecast then the values become normal after the outlier. The algorithm for this error monitor must be robust and detect systematic changes or innovation of errors. The innovative outliers do not conform with historical system data, but can be the accurate representation of the system. The data quality inspection will create a score of the model based on its probabilistic value of being correct. An ensemble of these probabilistic errors will be averaged together to garner a score based on characteristic errors that are typical of the system.

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Keywords: Forecasting, Real-Time models

Project Title: Resilience in preschoolers exposed to adversity: Is parental warmth enough?
Faculty Name: John Grych, Professor and Chair, Psychology
Student Names: Kristen Yule; Christina Caiozzo

Introduction: Early childhood is a critical period for the development of children's self-regulation skills, which in turn foster their ability to master specific developmental tasks during the preschool years (Masten, Burt, & Coatsworth, 2006). However, exposure to adversity during these years is associated with a range of maladaptive outcomes, including peer rejection, internalizing and externalizing symptoms, and academic problems (Kim & Cicchetti, 2010).

Significance: Parental warmth consistently predicts greater competence and fewer maladaptive outcomes in children exposed to adversity (Horning, Rouse, & Gordon, 2002), but less is known about specific parenting behaviors that promote developmental competence in preschoolers from high-risk families. Understanding how caregivers can promote resilience in children exposed to adversity has crucial implications for developing more effective prevention programs. Therefore, the current study's goal was to examine if particular caregiver behaviors predict indicators of resilience above and beyond parental warmth in a sample of high-risk preschoolers. We utilized a multi-method, multi-informant design to test whether emotion coaching and validation of children's emotions are related to key developmental tasks of early childhood (emotion regulation, social competence, school readiness) and lower symptoms of psychopathology.

Innovation/Forward Thinking: Families are being recruited from Head Start programs in a Midwestern city (Mage=4; 53% male; 94% African American). We plan to recruit a total of 120 caregiver-child dyads by the end of the calendar year and currently have a total of 83 dyads. Preschoolers and their caregivers engage in a video-recorded interaction (Shipman & Zeman, 1999), where they discuss children's emotional experiences. Caregivers' validating and invalidating responses (Schneider & Fruzzetti, 2002) are coded from the interaction. Caregivers also report on their warmth and emotion socialization strategies. Preliminary analyses of parent- and teacher- report data (observational data currently being coded) show that parental warmth is positively correlated with emotion coaching ($r=.64$, $p<.01$), child emotion regulation ($r=.36$, $p<.01$), social competence ($r=.44$, $p<.01$), and school readiness ($r=.48$, $p<.01$), and negatively correlated with symptoms of psychopathology ($r=-.22$, $p<.05$). Additionally, parent emotion coaching behavior is positively correlated with child emotion regulation ($r=.43$, $p<.01$), social competence ($r=.63$, $p<.01$), and school readiness ($r=.62$, $p<.01$), and negatively correlated with symptoms of pathology ($r=-.25$, $p<.05$). We also examined whether caregivers' emotion coaching behavior moderated the association between parental warmth and reports of child adjustment. Results of hierarchical regression analyses showed that emotion coaching behaviors interacted with parental warmth to predict child emotion regulation ($b=.57$, $SE=.11$, $p<.01$), school readiness ($b=.19$, $SE=.08$, $p<.05$), and symptoms of psychopathology ($b=-.65$, $SE=.18$, $p<.01$). Simple slopes analysis indicated that parental warmth predicted more adaptive emotion regulation ($\beta=.38$, $p<.05$), school readiness ($\beta=.33$, $p<.05$), and fewer symptoms of pathology ($\beta=-.33$, $p<.05$) at higher levels of emotion coaching but not at lower levels. Future analyses plan to examine whether observed caregiver behaviors predict children's functioning. Results from the study can increase understanding of the specific behaviors caregivers can engage in to promote resilience in young children.

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Keywords: Resilience, Emotion coaching, Preschool, Parenting behaviors

Project Title: A Feasibility Study of Using Hair Cortisol as an Intervention Outcome Measure
Faculty Names: Kristin Haglund, Associate Professor, & Ruth Ann Belknap, Professor, College of Nursing; April Harkins, Chair and Associate Professor, Clinical Lab Science
Student Names: Amanda King; Karen Olson

Introduction: This pilot study tests a novel, arts-based intervention to teach 25 school-age children techniques to modify their bodies' responses to stress by increasing their expectations that they can cope with stressors. The study is based on the cognitive activation theory of stress (CATS). CATS supports the premise that individuals can learn to alter their responses to stimuli, and in turn prevent the physiologic arousal and activation of a systemic stress response (Ursin, & Eriksen, 2004). Stimuli are perceived as less stressful when individuals expect that their responses will prevent the physiologic arousal and activation of a systemic stress response. The current study utilizes a quasi-experimental repeated mixed-measures design. Data is being collected at pre and post intervention including eight brief questionnaires, and biomarkers including height, weight, BMI, waist circumference, blood pressure and heart rate. The forward thinking innovation is to explore the feasibility of measuring cortisol levels obtained from hair specimens.
Significance: Cortisol is a glucocorticoid stress hormone that is the end product of the hypothalamus-pituitary-adrenal (HPA) axis (Noppe et al., 2014). While saliva and plasma cortisol are indicators of acute stress, hair cortisol concentration is a biomarker for assessing chronic stress. Scalp hair is a reliable, readily accessible, non-invasive specimen. Cortisol measurement is reflective of HPA axis function over time. Previous research, primarily among adults, suggested a direct relationship between hair cortisol and BMI, waist circumference, and waist-hip ratio (Olstad et al., 2016). There is increasing interest in measuring hair cortisol in a children, particularly as it correlates to their psychosocial health and development (Focker et al., 2016; Reichl et al., 2016). Hair grows about 1 centimeter per month. The first centimeter of hair proximal to the scalp approximates the last month's cortisol production. Hair samples can be stored at room temperature and cortisol can be measured using a relatively simple method. Reference ranges for children ages 4 to 14 have been established (Noppe et al., 2014).
Innovation/Forward Thinking: It is our intent to learn about using hair cortisol testing in school-age children in a community setting. Aspects of this inquiry include potential barriers, questions or issues that arise from parents, school personnel and children, and processes needed to obtain samples. With this funding we will identify a plan for how to process our specimens including preparing the hair for testing and conducting the lab testing. We will do a cost/benefit analysis of purchasing the pulverizing machine to prepare the hair specimens or subcontracting to have the hair specimens processed. The results and experience gained from this study will contribute to a proposal for external funding for a larger study. We will produce a laboratory manual on the procedures for hair cortisol testing at MU that will be shared with others on campus.
Student Involvement: The intervention is an Afro-Latino percussion performance ensemble which includes therapeutic drumming techniques to promote stress reduction; music lessons including Afro-Latino instruments, rhythms, and songs; social and cultural history of Afro-Latino rhythms; and lessons in stress appraisal and the relationship of stress to health. Professional musicians teach music content. Graduate nursing students assisted with writing proposals to fund this study; creating weekly lessons regarding stress and health; teaching stress content; and data collection. With current funding, one graduate has had external training in the collection and processing of hair cortisol with a specialist at Ohio State University. She will train others in our department.

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Keywords: cortisol, stress, school-age children, arts-based intervention

Project Title: Southeastern Wisconsin LGBTQ+ Community Needs
Faculty Names: Angelique Harris, Associate Professor, Social and Cultural Sciences; Peter Holbrook, President and CEO, Cream City Foundation; Heather Montes Ireland, Postdoctoral Fellow, Center for Gender and Sexualities Studies
Student Names: Christina Nelson; Pajcoob Vang

Introduction: The Center for Gender and Sexualities Studies partnered with the Cream City Foundation to uncover the unmet needs of LGBTQ+ individuals in Southeastern Wisconsin.

Significance: The identification of unmet needs will inform the Cream City Foundation Board regarding fund raising and grant making strategies. The following seven counties comprise the catchment for the interviews and subsequent study of unmet needs: Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha. Participating organizations are currently addressing LGBTQ+ populations in schools, the criminal justice system, social services and health care. Interviews will be conducted through Lambert-Pearcy, LLC to gather data regarding the resonance on the local level with the issues.

Innovation/Forward Thinking: The identification of unmet needs will inform the Cream City Foundation Board regarding fund raising and grant making strategies. Cream City Foundation will then be able to allocate resources to the unmet needs in Southeastern Wisconsin.

Student Involvement: The Center for Gender and Sexualities Studies staff and student research assistants will transcribe, code and assist in writing the report for the Cream City Foundation. Preliminary findings of the unmet needs of LGBTQ+ individuals focus on youth and aging LGBTQ+ populations, poverty, trans* individuals, and racial disparities throughout Southeastern Wisconsin.

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Keywords: LGBTQ+, unmet needs, health disparities

Project Title: Ambivalent Sexism, Pornography Viewing and Attitudes Towards LGBT Hostility
Faculty Name: Simon Howard, Assistant Professor, Psychology
Student Name: Samantha Conner

Introduction: Ambivalent sexism and its link to violence against the LGBT community is a topic not yet deeply explored. It has been shown that there are consistent discrepancies in peoples perceptions towards gay men versus lesbian women, with these discrepancies being even more profound amongst people showing high levels of ambivalent sexism. Another link between violence against the LGBT community could possibly be peoples' exposure to violent pornography, especially content that contains micro or macro aggressive behavior towards LGBT people. This project seeks to explore the correlations between ambivalent sexism, pornography viewing habits, and attitudes towards LGBT violence.

Significance: Violence against the LGBT community is an extremely widespread problem that is being manifested in a unique way as homosexuality is beginning to become more accepted in the United States. With the Supreme Court decision to legalize gay marriage in the summer of 2015, there came with it a lot of celebration and also a lot of hostile opposition. Research by Netta Weinstein and colleagues has shown evidence that often times, homophobia could be indicative of hidden sexual orientation. This could have especially dangerous consequences in regards to violence against LGBT people, and exposure to pornography depicting violence against LGBT people. There has been exploration of the correlations between violence against women and pornography, which has been used as motivation to alter the pornography industry and its agenda; making it more welcoming to women and not fetishing violence against them. Links between pornography, sexism, and violence against the LGBT community could help fuel the fire against the current porn industry. In addition, links between sexism and homophobia may provide further evidence of the damaging role that hyper-masculinity has on society. The inter-sectionalism between sexism and violence against the LGBT community could provide proof for forces working to abolish the gender binary and fix the severe repercussions it has had on society.

Innovation/Forward Thinking: This project will begin sometime in the next few months, beginning by issuing participants the ambivalent sexism inventory, a self-made survey about pornography viewing habits, and a survey assessing attitudes towards violence against LGBT people. If a statistically significant correlation is found, an experimental procedure will be introduced assessing whether or not priming participants with sexual images of homosexuals will cause them to be less condemning of acts of violence towards them. Ideally this would show a causal relationship between LGBT pornography and attitudes towards violence against that community.

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Keywords: Pornography, Sexism, Violence

Project Title: "She's Got Game:" Identity Salience and Black Women's Athletic Performance
Faculty Name: Simon Howard, Assistant Professor, Psychology
Student Name: Marielle Samii

Introduction: In our society there are stereotypes that are associated with our identities (e.g., girls are bad at sports). Because of these associations, research shows that making a stereotyped identity salient in a situation in which that stereotype is relevant can negatively affect an individual's performance. For example, women whose gender was made salient before shooting free throws made fewer free throws compared to women whose gender identity was not made salient (Hively & El-Alayli, 2014). This phenomenon, known as stereotype threat (Steel & Aronson, 1995) has been well documented; however, researchers have primarily focused on a single aspect of an individual's identity (e.g., gender) even though individuals have multiple identities. And at times, the stereotypes associated with individuals' different identities are conflicting. For example, Black people are stereotyped to have superior athletic ability and women are stereotyped to be athletically challenged, therefore the performance of Black women in an athletic domain is susceptible to two very different stereotypes. Stereotype threat theory suggests that Black women's performance should shift depending on which social identity (i.e., race or gender) is made salient. That is, if Black women's racial identity is made salient before an athletic performance situation this should facilitate their performance, whereas if their gender identity is made salient their performance should decrease. The proposed work will recruit Black women athletes and make either their gender identity or racial identity salient to explore the impact identity salience will have on their athletic performance (i.e., shooting free throws).

Significance: Our work will inform our understanding on how individuals with multiple identities can be affected differently depending on which identity is made more salient in a sports performance situation. Additionally, our work will provide much need empirical research on the effects of stereotype threat on Black women. Past research investigating how gender identity influences women's sports performance have overlooked race. In social psychology this is not uncommon and researchers have faced criticism. Our work addresses this criticism. Lastly, our work will have real world applicability for coaches and sports psychologists who work with athletes. Given how many girls (69% of girls from 8 to 17) and women play sports this work has far reaching implications. With a better understanding of the situational factors that may negatively and positively affect Black women's performance, coaches and sports psychologists can create techniques that will buffer against negative factors ensuring athletes' perform optimally.

Innovation/Forward Thinking: We hope to advance our understanding of how identity salience can influence individuals whose different identities have conflicting stereotypes in particular domains. This is an understudied area in social psychology generally and no work to date has explored identity salience with Black women in a sports domain. Future work will explore interventions.

Student Involvement: Marielle Samii (undergraduate) has been involved in the planning stages of the study and will be involved in the dissemination of findings related to this project.

Keywords: Athletic Performance, Black Women

Project Title: "He's a Dual Threat:" How Stereotypes About Quarterback Intelligence Influence Black Quarterbacks' Performance
Faculty Name: Simon Howard, Assistant Professor, Psychology
Student Name: Jason Trovela

Introduction: Stereotype threat (Steel & Aronson, 1995) posits that stigmatized individuals (e.g., Black people) perform poorly in stigmatized domains (e.g., academia) when a stigmatized social identity (i.e., race) or a relevant negative stereotype (e.g., Black people are unintelligent) is made salient before or during a performance situation. For example, when a test was framed as being diagnostic of intellectual ability, Black participants performed worse compared to other Black participants whose test was framed as a problem solving task (non-diagnostic of intellectual ability). Even though the exams are identical, when the exam is framed as being diagnostic of intellectual ability this makes negative stereotypes about intelligence more salient for Black participants resulting in poorer performance. Individuals need not to endorse the stereotype to be susceptible to stereotype threat and these effects often happen outside an individual's awareness. Stereotypes have also been show to negatively affect people' performance in other domains such as sports (e.g., women; Hively & El-Alayli, 2014). The proposed work will recruit Black and White quarterbacks (QB's) to investigate what effect stereotypes regarding intelligence have on their QB performance (passing accuracy). Half of the participants will read a short description about the QB position which will frame the position as one that requires intellectual ability and the other half of the participants will read a description that does not mention intelligence. When the QB position is framed as being one requiring intelligence Black QB's should be less accurate than Black QB's in the non-diagnostic condition and White QB's in either condition.

Significance: Seventy percent of players in the NFL are Black and 29% are White; however, Blacks only make up 17% of NFL QBs, while Whites make up 82%. If Blacks make up the majority of the players in the NFL then why do so few of them occupy the QB position? The answer to this may be explained, in part, by stereotype threat. For example, if a Black high school player gets an opportunity to compete for the starting QB role at practice, but a negative stereotype is made salient before his chance this could result in him performing poorly. His poor performance may diminish his chances at playing QB in high school. Consequently, this reduces his chances of playing QB at both the collegiate and professional levels. Adolescents should have equal opportunities to play the position they want to play without stereotypes thwarting their dreams.

Innovation/Forward Thinking: No research to date has explored the effects of stereotypes on Black QB's performance. We hope to advance our understanding of how negative stereotypes can influence athletes' performance. By identifying situational factors that negatively affect athletes' performance, our findings will be beneficial for both coaches and sports psychologists at every level who work intimately with athletes to ensure that they are performing to their full potential.

Student Involvement: Jason Trovela (undergraduate) has been involved in the planning stages of the study and will be involved in the dissemination of findings related to this project.

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Keywords: Stereotype Threat, Black Men, Athletic Performance, Sports

Project Title: Mental Health Screening and Referral Initiative: Utilizing the PHQ-2, PHQ-9, AUDIT/DAST-10 Screening Tools in Underserved Urban Populations

Faculty Names: Abiola Keller, Director of Clinical Research, Clinical Assistant Professor, Department of Physician Assistant Studies

Student Names: Abigayle Musholt; Tina Rende

Introduction: City on a Hill, an inner city non-profit health organization, provides a monthly medical clinic outreach that serves approximately 300-400 guests on the second Saturday of every month. The clinic provides services ranging from hypertension/diabetes screening and education to dental education and optometry care. While City on a Hill provides many services, one area of health that they do not currently address is mental health.

Significance: Wisconsin has a very high rate of mental health illness (19% of Wisconsin adults) as well as substance abuse (9% of Wisconsin adults) and alcohol dependence (15% of Wisconsin adults). Substance abuse services in Wisconsin cost over $78,000,000 annually. Alcohol use costs Wisconsin residents $3 billion in terms of treatment, impaired driving consequences, and health problems such as heart disease and liver failure. Depression is responsible for $800 million in annual costs for Wisconsin citizens; costs include treatment and medication, jail and other criminal justice system fees, and indirect costs including loss of productivity. In addition to the economic cost to society, depression and substance use disorders also affect the individual physically and emotionally. Patients with depression have a lower quality of life than those who don't suffer from it. Individuals who suffer from substance use disorders can also have a difficult time performing every day activities. For many individuals access to mental health services continues to be limited. Our project addresses this need in an underserved, urban population in the City of Milwaukee.

Innovation/Forward Thinking: The objective of this project is to provide screening for depression, alcohol and substance use for patients at City on a Hill. Patients who screen positive will be offered a referral to a community agency for follow-up services. We will use the Patient Health Questionnaire (PHQ), AUDIT, and DAST to assess for depression, alcohol, and substance use disorder, respectively. With the free screening and referral for further evaluation and treatment, more Milwaukee County citizens living with depression, alcohol, or substance use disorder will have access to the care they need.

Student Involvement: Students at the Marquette University Physician Assistant Program are responsible for conducting the patient screening evaluations, scoring each of the questionnaires, initiating the appropriate referrals, and providing patient education. Students have created a referral network that includes Bread of Healing,Journey Mental Health Center, the Aids Resource Center of Wisconsin, and Alcoholics Anonymous. Students are taking advantage of collaborative efforts of these community service centers to provide improved access to mental health services.

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Keywords: Depression, Substance use disorder, Screening, Referral

Project Title: Application of mechanical vibration to promote osteogenesis of osteoblasts cultured on dental implant material surface
Faculty Name: Dawei Liu, Associate Professor, Orthodontics
Student Names: James Kolstad; Kathleen Vaught

Introduction: Today dental implants are commonly used in rehabilitating oral functions of patients with missing teeth. The fundamental principle of dental implants is called osseointegration â€“ a process of direct structural and functional connection between living bone and the surface of a load-bearing artificial implant. Osseointegration is very critical in determining the long-term success of dental implants, which is influenced by many factors including mechanics. Mechanical vibration has been shown to be anabolic (promoting osteoblastic bone formation) in enhancing bone modeling process e.g. fractures. Recently, whole body vibration has been shown to increase bone formation around implants in diabetic rats (1). Although proposed as an idea (2), so far there is no data showing the enhancement of osseointegration of dental implants by mechanical vibration. Therefore, it is logical to study the effects of mechanical vibration on the osteogenic potential of the osteoblasts cultured on the dental implant material surface. Our hypothesis is that mechanical vibration enhances proliferation and differentiation of osteoblasts cultured on dental implant material surface. If our hypothesis is proved, mechanical vibration can potentially be applied clinically to enhance osseointegration of dental implants, which will eventually promote the success and longevity of dental implants for patients.

Significance: Without knowing whether mechanical vibration promotes proliferation and differentiation of osteoblasts cultured on dental material surface, it is impossible to provide scientific evidence based on which mechanical vibration can potentially be applied to promote the success and longevity of dental implants. In this study, MC3T3-E1 pre-osteoblasts will be seeded at a density of 4x105/well on the discs of dental implant material (to be provided by Straumann Inc.) in 12-well cell culture dishes. The cells will be subjected to mechanical vibration (0.3g, at 0, 30, 60 and 90 Hz respectively) or kept under static culture condition without vibration as control. The cells will be vibrated 1 hour a day for consecutive 14 days. Cell proliferation will be assessed on day 0, 3, 5, 7, 14 by using MTT method. While differentiation will be examined by day 14 using van Kossa staining. One-way ANOVA will be used to compare the differences of each parameter between the vibrated and the non-vibrated groups, with Tukey comparison to be used to find out the difference between various frequencies. P value less than 0.05 is considered statistically significant.

Innovation/Forward Thinking: To the best of our knowledge, no studies have been reported on the effect of mechanical vibration on osteoblasts cultured on dental implant material surface. This project aims to explore the effects of mechanical vibration on proliferation and differentiation of osteoblasts cultured on dental implant material surface, which will provide scientific evidence for us to potentially use mechanical vibration to enhance osseointegration in dental patients.

Student Involvement: James Kolstad DDS, Kathleen Vaught DDS (1st orthodontic residents) will participate in this project. They will be involved in designing and implementing experiments, analyzing data and writing research paper.

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Keywords: Vibration, Osteogenesis, Dental Implants

Project Title: The effects of mechanical vibration on human chondrocytes under loading
Faculty Name: Dawei Liu, Associate Professor, Orthodontics
Student Names: Michael Lenz; Ryan Lubinsky

Introduction: Temporomandibular joint (TMJ) is the only and highly mobile joint in the craniofacial region, which plays an important role in all dental specialties including orthodontics. The relationship between TMJ disorders (TMJD) and dentofacial orthopedic treatment with direct loading on TMJ is of controversy (1). Clinically the diagnosis, management and prognosis of TMJD in orthodontic patients is case by case. Following "do-no-harm" guideline, all new orthodontic techniques especially those potentially exerting load on TMJ should be carefully assessed. Recently, a new orthodontic device called AcceleDent ("AD" by OrthoAccel Inc.) is commercially available to help accelerate orthodontic tooth movement and alleviate orthodontically associated pain, however its potential effect on TMJ is unknown. A previous study showed the effects of high magnitude (>1g) and high frequencies (>200Hz) of vibration on articular chondrocytes (2), which however does not relate to the spectrum of vibration used in orthodontics and not mimic the situation when orthopedic force is loaded on chondrocytes in orthodontics. A recent laser Doppler study showed that the vibration generated from AD device is transmitted to various anatomical locations of craniofacial region including TMJ (3). Now the question is: does mechanical vibration with a spectrum used in orthodontics influence the biological responses of chondrocytes to orthopedic loading? If yes, positively or negatively? To answer this question, we will study the effects of mechanical vibration on the mechanically loaded chondrocytes in vitro. The aim of our study is to investigate the effect of mechanical vibration (0.3g, at 0, 30, 60 and 90 Hz respectively) on the biological responses (proliferation, differentiation and signaling pathways) of human chondrocytes to orthopedic loading.

Significance: The effects of mechanical vibration (<1g and <100Hz) on the biological responses of chondrocytes to mechanical loading is unknown. Clearly, lack of this knowledge will prevent us from recognizing the potential damage dental vibration can do to the TMJ and finding a way to prevent it. Therefore, the effects of vibration on chondrocytes under mechanical loading will be studied as follows. Human chondrocytes (a gift from Dr. Mary Goldring) will be seeded at a density of 4x105/well in 6-well plates. From day 1, the cells will be subjected to a static mechanical loading (a stretching of 10% cell surface area), with or without mechanical vibration (0.3g, with 0, 30, 60 and 90 Hz respectively) 1 hour/day for 14 consecutive days, with the cells only under static load as control. Proliferation of the chondrocytes will be examined on day 0, 3, 5, 7 and 14 by using MTT method. While the differentiation of the chondrocytes will be assessed on day 14 by staining alcian blue, alkaline phosphatase and collagen II all three markers for chondrocyte differentiation. To study the signaling pathways involved, the chondrocytes under loading will be subjected to mechanical vibration for only 1 hour. Gene expressions of SOX9, Wnt5a and Runx2 will be examined by real-time PCR while their protein productions evaluated by Western Blot. One-way ANOVA will be used to test the difference of each parameter between vibrated and non-vibrated groups, with Tukey comparison to be used to find the difference between various frequencies ($P<0.05$ is considered statistically significant).

Innovation/Forward Thinking: So far there is no evidence of the effects of low magnitude high frequency vibration (as generated by the AD device) on the cultured chondrocytes in vitro. Our study will add know knowledge and provide evidence of the impact of vibration on chondrocytes, enabling us to recognize and prevent any possible damage vibration can do to the temporomandibular joint.

Student Involvement: Michael Lenz DDS, Ruan Lubinsky DDS (1st year orthodontic residents) will participate in designing and implementing experiments, analyzing data and writing research papers.

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Keywords: Vibration, Chondrocytes

Project Title: Using a Dual Viral Approach to Evaluate Stress-Induced Drug Seeking
Faculty Name: John Mantsch, Chair and Professor, Biomedical Sciences
Student Name: Michael Nordness

Introduction: A significant barrier to treating drug addiction is the lack of an effective treatment for relapse. In the clinical setting, it has been shown that stress is a significant trigger for relapse. This stress-induced relapse can be modeled in a laboratory setting using the self-administration paradigm, during which rats self-administer drugs such as cocaine and are tested for reinstatement of extinguished drug seeking. Previous research has implicated the mesocortical pathway, which is a dopaminergic pathway from the ventral tegmental area (VTA) to the prelimbic cortex, as highly responsive to stress and as a regulator of motivated behavior. Thus, this pathway is a logical target to evaluate the role of stress in relapse (Mantsch et al 2015). We used immunohistochemistry in postmortem tissue to stain for a marker of neuronal activation, Fos, and found more Fos reactivity in the prelimbic cortex during stress-induced drug seeking, suggesting that the prelimbic cortex is a key region activated during stress-induced cocaine seeking. Furthermore, using immunohistochemistry to dual label Cholera Toxin B (CTb), a retrograde tracer injected into the prelimbic cortex, and cFos, it was determined that the mesocortical neurons that project from the VTA to the prelimbic cortex are significantly more active during stress-induced drug seeking. Based on this data, we hypothesize that selectively inhibiting mesocortical neurons will attenuate stress-induced relapse and the Fos response to stress in the prelimbic cortex. In order to evaluate this hypothesis, a novel, dual viral Designer Receptors Exclusively Activated by Designer Drugs (DREADD) approach will be utilized. This intersectional approach will express an inhibitory GiDREADD on mesocortical nuerons, which will allow selective inhibition of these mesocortical neurons by administering agonist clozapine-N-oxide (CNO). In order to insert this GiDREAD, an adeno-associated virus (AAV) Cre-dependent GiDREADD will be injected into the VTA, while a CAV-2-Cre, retrograde virus will be injected into prelimbic cortex. Using this cutting-edge approach will allow neuronal phenotype and pathway-specific manipulations, which would prove effective when used to evaluate the role of the mesocortical pathway during stress induced relapse.
Significance: Drug addiction, a brain disease resulting in the disruption of normal brain physiology, poses the significant societal burden of over $700 billion annually, with costs ranging from crime to lost productivity (NIDA 2011). In addition to its staggering financial costs, drug addiction has been shown to have a high level of comorbidity with other mental illnesses-for example, anxiety disorders and post-traumatic stress disorder. One difficulty in addressing drug addiction is stress, which has been shown to increase the likelihood of relapse to drug use (Mantsch et al 2015). Thus, further understanding the relationship between stress and relapse is critical for the development of more effective treatments. Through this novel dual viral approach, we be able to evaluate the neuronal pathways implicated in stress-induced drug seeking with a greater specificity than is currently possible. This greater specificity will produce the foundational knowledge necessary to understand and ultimately treat stress-induced relapse.
Innovation/Forward Thinking: This dual viral approach proves innovative in that specific neuron types and pathways can be inhibited or activated by administering an otherwise inert drug. This novel research approach enables the identification of the role of the mesocortical pathway at a level of specificity that has not yet been achieved. In addition, this approach can be combined with other cutting-edge approaches, such as optogenetics. One would effectively be able to manipulate multiple pathways at the same time and thus gain a greater, more comprehensive look at the neurocircuitry involved in drug addiction. Thus, this approach has the potential to uncover specific therapeutic targets, and furthermore, provides a basis for future development of a pharmaceutical to prevent stress-induced drug seeking.
Student Involvement: The undergraduate student Michael Nordness has assisted in conducting immunohistochemistry and in the surgical viral delivery for the dual viral approach. He will have a continued leading role in this project, which will include performing surgical procedures and processing and analyzing postmortem brain tissue.

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Keywords: addiction, relapse, stress, neuroscience

Project Title: Effect of airborne-particle abrasion on topographic and mechanical properties of fiber posts. Preliminary results.
Faculty Name: Georgios Maroulakos, Assistant Professor, General Dental Sciences
Student Names: Ethan Schuler; Collin Egan; Michael Wanserski

Introduction: The most common complication of fiber posts is debonding. Airborne-particle abrasion has been suggested to increase the adhesion of resin cements to the surface of the fiber posts.

Significance: However it is unknown which is the most favorable airborne-particle abrasion protocol. The aims of this study are to compare the surface roughness and flexural properties of four fiber post systems following four different airborne particle abrasion protocols.

Innovation/Forward Thinking: Airborne-particle abrasion of fiber posts is not a well-established clinical procedure. Two hundred posts from 4 manufacturers will be subjected to the following protocols; 0: no particle abrasion - no thermocycling (control), 1: no particle abrasion - thermocycling, 2: particle abrasion for 2 seconds/mm2 - thermocycling, 3: particle abrasion for 5 seconds/mm2 - thermocycling, and 4: particle abrasion for 10 seconds/ mm2 - thermocycling. Each post was observed under a 3D measuring laser microscope, average roughness in 3-D (Sa) was recorded (20X objective lens), and qualitatively evaluated. Then the selected posts will be subjected to thermal cycling fatigue for a total of 6,000 cycles. Lastly, a three-point bending will be performed.

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Keywords: surface roughness, fiber-reinforced posts, endodontically treated teeth,

Project Title: Blooming intensity estimation based on deep learning and multi-target tracking algorithms
Faculty Name: Henry Medeiros, Professor, Electrical and Computer Engineering
Student Name: Philipe Ambrozio Dias

Introduction: Estimating blooming intensity is a challenging problem and several researchers have attempted to develop automated computer vision systems to perform this task. However, their overall performance is still far from satisfactory even in relatively controlled environments (e.g., at night with artificial illumination) (Gongal et al., 2016).

Significance: In order to optimize fruit production, a portion of the flowers and fruitlets of apple trees must be removed early in the growing season. The number of flowers and fruitlets to be removed, however, is determined by the blooming intensity, i.e., the approximate number of flowers and fruitlets present in the orchard.

Innovation/Forward Thinking: This project aims to address this issue by applying novel deep learning image understanding methods (Zhao, Li, & Wang, 2015) combined with recently developed multi-target tracking algorithms (Hoseinnezhad, Vo, Vo, & Suter, 2012) to analyze sequences of images of apple trees collected by a robotic platform at a USDA orchard under natural conditions. These algorithms would measure the trajectory of each flower and fruitlet and use that to estimate the blooming intensity in the orchard. More specifically, we intend to adapt existing saliency detection algorithms based on deep neural networks to make them particularly sensitive to images of apple flowers and fruitlets and robust to the background clutter of an orchard. These algorithms would generate a map that determines the likelihood that groups of pixels correspond to flowers and fruitlets, which could then be used by a tracking algorithm to estimate their trajectories. Given the recent breakthroughs made possible by these techniques, we expect such system to represent a substantial improvement over existing blooming intensity estimation methods.

Student Involvement: Dr. Henry Medeiros is directing the research project. Philipe Ambrozio Dias is working on the implementing and evaluating deep learning and multi-target tracking algorithms for blooming intensity estimation.

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Keywords: Blooming Intensity Estimation, Object Detection, Deep Learning, Multi-target Tracking

Project Title: Stochastic Search Methods for Mobile Manipulators
Faculty Name: Henry Medeiros, Electrical and Computer Engineering
Student Name: Samuel Amoako-Frimpong

Introduction: Robotic manipulators have found applications in wide variety of areas, most prominently, in industrial settings for manufacture and assembly. As we move toward the deployment of more robots in factories and work environments, the need for manipulators to move around unstructured environments as opposed to being in stationary and highly engineered work cells, rises. One problem that arises is the reduction in performance of mobile manipulators as uncertainty from simultaneous motion from the arm and base reduces their overall accuracy [1].

Earlier attempts at controlling mobile manipulators have used deterministic approaches [2][3] like a spiral search around the expected location while the robot was stationary. However, in the event of simultaneous motion of the base and manipulator, these methods tend to break.

This research aims to develop algorithms aimed at reducing this error using stochastic search methods. We intend on using a Kalman filter to estimate the probability distribution of the estimated location and sampling that distribution in search of a target marker.

We believe this approach would significantly improve the accuracy and reliability of mobile manipulators.

Significance: Though fixed manipulator arms and automated guided vehicles have improved the efficiency of manufacturing over the years, they still incur high setup costs due to their high precision requirements.

This imposes constraints on their reconfigurability for multiple manufacturing runs.

This lack of flexibility and high setup costs keeps them out of reach of small and medium scale industries - which account for the bulk of manufacturing.

In improving the accuracy of mobile manipulators, we could lower the barriers of entry regarding the use of manipulators. This would allow more industries improve their efficiencies and maximize profits, reaping the benefits of robot assisted manufacturing.

The expected increase in the accuracy and performance of mobile manipulators would help reduce safety concerns associated with human robot interactions opening them up to applications in a variety of applications ranging from the healthcare to disaster management.

Innovation/Forward Thinking: We propose use of Kalman filters and bayesian methods should allow an increase in the accuracy and speed of mobile manipulators without the use of expensive sensors.

Student Involvement: Dr. Henry Medeiros would be supervising the project while Samuel Amoako-Frimpong would be implementing and testing the proposed methods.

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Keywords: Robotic Manipulators, Kalman Filters

Project Title: Improvement of Deep Learning for Visual Tracking by The Particle Filter
Faculty Name: Henry Medeiros, Assistant Professor (Ph.D), Electrical and Computer Engineering
Student Name: Reza Jalil Mozhdehi

Introduction: Visual Tracking has been a challenging area in computer vision due to large appearance changes. These changes are generally caused by many different situations such as occlusion, deformation, background and clutter. Recently, Deep Convolutional Neural Networks (Deep CNN) have widely employed in visual tracking because they have shown better tracking results in comparison with other kinds of visual trackers. By using the novel nonlinearities like Rectified Linear Unit (ReLU), the depth of these networks has been increased and their results have considerably improved [1].

Significance: Visual Tracking is one of most important fields of computer vision. It has significant applications in many filed such as robotics, surveillance, autonomous driving, automation, medicine, and Unmanned Aerial Vehicles.

Innovation/Forward Thinking: This project focuses on improving the deep convolutional neural networks. The project consists of two phases. In the first phase, a novel visual tracking framework based on the convolutional neural network presented in [2] and the Particle filter is proposed. The hierarchies of convolutional layers are considered as a non-linear counterpart of an image pyramid representation. By many particles around the previous position, our tracker accurately detects the position of the target in each frame. These particles are beneficial to improve the performance of the tracker in critical situations such as "occlusion" and "Deformation". We used the Benchmark Dataset. Our results illustrate that hierarchically convolutional features are improved by the Particle filter. However, this algorithm uses the bounding box with fixed dimensions around the predicted position. In the second phase, we will adjust the dimensions of the bounding box based on the likelihood of particles.

Student Involvement: Dr. Henry Medeiros is directing the research topic and Reza Jalil Mozhdehi is working on the implementing.

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Keywords: Deep Convolutional Neural Network, Visual Tracking, Particle Filter, Benchmark Dataset

Project Title: Improving Bayesian Sensor Fusion with Hierarchical Autoencoders
Faculty Name: Henry Medeiros, Professor, Electrical Engineering
Student Name: Yevgeniy Reznichenko

Introduction: Within the computer vision and robotics communities, there has been significantly growing interest in robotic platforms for objects or pedestrian tracking. The design of such platforms usually involves several main elements: trackers that are flexible enough to detect and follow different types of targets in different scenarios[2]; a robust depth estimation mechanism; a robust mechanism for the detection and removal of false-positives or outliers; and, well tuned motion controls[1]. Sensor fusion is an approach that takes information from multiple trackers and "combines" them to form an estimate that is often better than any individual tracker working alone. It is compelling to infer that this approach would perform better if combined with outlier detection and rejection. Hierarchical Autoencoders [3] have the ability to find abstractions governing normal behavior. With a theoretically larger reconstruction error on outliers, the goal is to use these statistical properties learned by the neural network to detect abnormal tracker operation. Once an abnormal event is detected, the tracker can be reset or ignored.

Significance: The present work could change the way people use small following UAVs (Unmanned Aerial Vehicles). This project aims to improve the technology that is in place for UAVs to become fully capable of autonomously tracking objects. This technology would be useful in industries such as film-making and surveillance. So far, there is no UAV capable of following an object robustly enough using computer vision techniques.

Innovation/Forward Thinking: The proposed outlier detection scheme is a novel method for addressing a fundamental issue in target tracking. Future improvements would involve using a recurrent architecture to further improve detection.

Student Involvement: This is a research project under the guidance of Dr. Henry Medeiros developed by the student Yevgeniy V. Reznichenko, who is researching the different methods available today in the computer vision community. These methods will be tested and evaluated in a small UAV.

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Keywords: Bayesian, Hierarchical Autoencoder, UAV, Image Tracking

Project Title: Detecting Tracking Failures From Correlation Response Maps
Faculty Name: Henry Medeiros, Assistant Professor, Electrical and Computer Engineering
Student Name: Ryan Walsh

Introduction: Tracking methods based on correlation filters have gained popularity in recent years due to their robustness to rotations, occlusions, and other challenging aspects of visual tracking. Such methods generate a confidence or response map which is used to estimate the new location of the tracked target. However, by examining the features of this map, important details about the tracker status can be inferred and compensatory measures can be taken in order to minimize failures. We propose an algorithm that uses the mean and entropy of this response map to prevent bad target model updates caused by problems such as occlusions and motion blur as well as to determine the size of the target search area [1]. Quantitative experiments demonstrate that our method improves success plots over a baseline tracker [2] that does not incorporate our failure detection mechanism.

Significance: The development of new trackers is a popular topic in computer vision circles. While new trackers push new innovations into the field, refactoring and optimizing previous work can be just as powerful. By extension, this work's focus on a correlation filter response failure detector can be applied to any such based tracker. Works like those in [3] and this are important as they improve the reliability of existent and utilized tracking mechanisms.

Innovation/Forward Thinking: The proposed failure detection scheme is novel as it uses the intrinsic characteristics of correlation filter based trackers as a mechanism for improving reliability. Future improvements would involve adding additional metrics and weighting each one, making the system more robust to scaling and background clutter.

Student Involvement: This is a research project under the guidance of Dr. Henry Medeiros and developed by the student Ryan W. Walsh, who is researching target tracking methods in the computer vision community.

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Keywords: Correlation Filter, Target Tracking

Project Title: Surveillance of Wisconsin Organisms for Trends in Antimicrobial Resistance and Epidemiology (SWOTARE)
Faculty Name: Erik Munson, Assistant Professor, Clinical Laboratory Science
Student Name: Erin Hueppchen

Introduction: Antibiotic resistance presents a significant challenge to allied healthcare professionals. Bacteria that are resistant to both commonly-employed and advanced antibiotics increase the risk of morbidity and mortality in hospitalized patients. One means by which hospitals monitor antibiotic effectiveness is the local antibiogram. An antibiogram is a tabular (percentage) summary of antibiotic resistance patterns for common disease-causing bacteria. Such data are derived from routine patient testing performed by a microbiology laboratory on a yearly basis.

Significance: A study recently published by the Wisconsin Clinical Laboratory Network Laboratory Technical Advisory Group2 described results of a Wisconsin antibiotic surveillance project by which hospital antibiogram data were compiled and stratified by geographic region. Significant differences were noted in certain regions of the state particularly with respect to a pair of commonly-prescribed antibiotics. However, certain limitations are inherent to this form of surveillance3. It is assumed that all laboratories perform antibiotic resistance testing and interpretation in appropriate fashion. Moreover, variability may occur with the commercialized testing systems used by these microbiology laboratories.

Innovation/Forward Thinking: With these limitations in mind, an optimal means of performing Wisconsin antibiotic surveillance involves a program by which a centralized testing laboratory standardizes the microbiologic analysis of isolates. Microbiology laboratories located in St. Croix Falls, Spooner, Eau Claire, Marshfield, Weston, Stevens Point, Green Bay, Sturgeon Bay, Manitowoc, Platteville, La Crosse, Viroqua, Fort Atkinson, Madison, Janesville, Appleton, Neenah, Fond du Lac, West Bend, and Milwaukee will forward bacterial isolates to Marquette University on an annual basis for surveillance of trends in antibiotic resistance. Data derived from this surveillance will assist infectious disease practitioners, infectious disease pharmacists, and clinical microbiologists across Wisconsin.

Student Involvement: Ms. Hueppchen is a junior-year undergraduate student with a major in Clinical Laboratory Science. She expressed interest in performing this research upon hearing lectures related to antibiotic resistance in an introductory medical microbiology course. She has also been employed as a nursing assistant prior to her undergraduate career and appreciates the impact that antimicrobial resistance can have on patient care. Ms. Hueppchen will perform resistance testing, analyze data, and present pertinent findings at the American Society for Clinical Laboratory Science—Wisconsin annual meeting.

Keywords: Antibiotic resistance, Wisconsin, Healthcare-associated infection, Patient care

Project Title: Cancer-Related Fatigue, Mitochondrial Function, and Exercise in Cancer Survivors
Faculty Name: Alexander Ng, Associate Professor, Physical Therapy/Exercise Science
Student Names: Aidan Flanagan; Jonathan Eskra

Introduction: Cancer is a disease that affects us all and remains the number 2 cause of death in the U.S. In 2014 there were 14.5 million people with a history of cancer in the U.S., with a predicted 1,685,000 new cases to be diagnosed in 2016 (American Cancer Society, 2015). Because of advances in technology and techniques leading to early detections and safer methods of treatment, survival rates have more than doubled since the 1970s with now over 12 million Americans living with cancer. Along with increased survivorship are acute and long term symptoms associated with treatment or the disease itself. One of the most prevalent and distressing side effects associated with cancer survivorship is cancer-related fatigue (CRF). CRF is a self-reported sense of tiredness or exhaustion related to cancer or its treatment. Seventy to 100% of people undergoing cancer treatment report CRF, and 30-50% of cancer survivors report fatigue lasting months to years after treatment. CRF can affect activities of daily living and decrease quality of life (QOL). Mechanisms of CRF with the exception of anemia are largely unknown. Impairment of whole body or muscle energy production has been hypothesized to be a mechanism of CRF (Alt et.al, 2011; Ng, 2010; Ryan et. al., 2007), but to date there are no studies that directly address this hypothesis. Energy production is a function of mitochondria, which can be impaired with cancer treatment; but this can improve with exercise. Thus, the purpose of our study is to investigate if muscle mitochondrial energy production is related to CRF and if these outcomes are improved with exercise.

Significance: CRF is a significant symptom that can diminish QOL in a majority of cancer survivors. CRF is important yet it remains underreported and undertreated and its mechanisms remain unknown. Interestingly, the only evidenced based non-pharmacological treatment for CRF is exercise. Only when we have a better understanding of the underlying cause of CRF will we then be able to develop appropriate specific treatment strategies in order to address this increasing public health concern.

Innovation/Forward Thinking: Near-infra-red spectroscopy (NIRS) is a relatively new method to assess muscle mitochondrial function (Ryan, et.al.,2013). To our knowledge, NIRS has not been used to study mitochondrial function, or any other functional limits in cancer survivors. NIRS is cutting edge, non-invasive, and can provide similar conclusions as could be obtained from magnetic resonance studies (Ryan, et.al.,2013). NIRS will be used to assess muscle mitochondrial function in a mixed cancer survivor group before and after 9 wks. of primarily aerobic exercise. Validated questionnaires will be used to assess CRF at the same time points. An innovative aspect of this project is that we will not study exercise per se but rather will use exercise as a means to manipulate mitochondrial function and possibly CRF. To confirm a training effect, we will also assess the 6-min walk distance pre and post exercise.

Student Involvement: Two upper division undergraduate students will have primary responsibility for all aspects of this research. Responsibilities will include, recruitment, data collection, exercise training, data entry, analysis and presentation of results. Students will be mentored and supervised by Dr. Ng.

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Keywords: Cancer, Fatigue, Exercise, Cancer-Survivorship

Project Title: Deep Neural Networks as Time Series Forecasters
Faculty Names: Richard Povinelli, Associate Professor, Electrical and Computer Engineering; Ronald Brown, Associate Professor, Electrical and Computer Engineeringp; George Corliss, Professor Emeritus, Electrical and Computer Engineering;
Student Name: Gregory Merkel

Introduction: Marquette University's GasDay Project specializes in daily natural gas forecasting and uses artificial neural networks and linear regression to model gas demand. Recently, data scientists and machine learning experts have started using deep neural networks to replace backpropagation neural networks in solving their problems and have, in general, found better solutions. The purpose of this project is to use deep neural networks to forecast natural gas and electricity demand and compare their performance to existing methods.

Significance: The GasDay Project actively works with about 30 natural gas utilities which account for approximately 18-20% of the United States natural gas consumption. A small improvement to GasDay's forecasting methods can have huge impact, saving the utilities and their customers millions of dollars annually. If deep neural networks prove to be as effective in energy forecasting as they have been in solving other machine learning problems, it will have a large impact on the energy industry.

Innovation/Forward Thinking: Deep learning technologies have been applied to a variety of high dimensional and non-linear machine learning problems such as stock prediction, speech recognition, motion capture, to video processing. Some researchers have tried to apply these technologies to the energy industry but with limited success, in large part due to lack of data and domain knowledge. The GasDay Project has access to almost one million data points and over 20 years of domain knowledge, which make it well placed to be the first to effectively apply deep neural networks to energy forecasting.

Student Involvement: The majority of the work on this project will be done by the student, Greg Merkel. Dr. Richard Povinelli, along with Dr. Ronald Brown and Dr. George Corliss, will advise him and help determine the direction of the project, but nearly all research and implementation will be done by the student.

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Keywords: Neural Networks, Learning, Forecasting

Project Title: Probabilistic Forecasts in energy domain
Faculty Names: Richard Povinelli, Associate Professor, Electrical and Computer Engineering; George Corliss, Professor Emeritus, Electrical and Computer Engineering
Student Name: Mohammad Saber

Introduction: Modern electricity demand depends on lots of uncertain factors like human behavior, weather, and availability of renewable energy sources (solar, water, wind). So probability forecasts which depicts the whole scenario of future electricity demand by quantifying forecast uncertainties are more preferable than providing only the best guess of the future demand which is called point forecasts. Probabilistic forecast represents forecast in the form of a cumulative distribution function (CDF).

Significance: In the energy industry, forecasts are required for taking production decision and planning. Though electricity cannot be stored easily, excess production of it leads to wastage of valuable resources and increase the production cost. On the other hand, shortage of energy production cause blackout. So accurate energy forecasting is desirable.

Innovation/Forward Thinking: A new method to generate probabilistic forecasts will be studied. Existing methods (Pinball loss function [1], Winkler score [1], CRPS [2],) of measuring probabilistic forecasts are difficult to understand, and encourage tight probabilistic forecast by imposing penalty for wider probabilistic forecast. However finding a tight probabilistic forecasts do not help the electricity utilities in usual days (too cold or high temperature) when electricity utilities need to know the forecast desperately. Existing probabilistic forecast scoring rules are not usable to compare two different methods used on different datasets. A new scoring rule of measuring goodness of probabilistic forecasts will be studied to overcome all these deficiencies of existing techniques.

Student Involvement: The student is involved in this project from the beginning and planning to submit the work as a PhD dissertation in May, 2017.

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Keywords: Forecasting, Electricity

Project Title: Assessing Balance and Motor Memory Deficits After Concussion
Faculty Names: Robert Scheidt, Professor, Biomedical Engineering; Leigh Ann Mrotek, Research Professor, Biomedical Engineering
Student Name: Devon Lantagne

Introduction: Sport-related concussion causes deficits of sensorimotor control that can lead to persistent performance deficits. Recent experimental evidence suggests that early participation in low-risk physical activity can improve outcomes in individuals suffering from subjective (e.g., headache, light sensitivity, irritability), but not objective signs (e.g., loss of consciousness, retrograde amnesia).[1] This project will test for correlation between the amount of low-risk activity and the rate of recovery from concussion using standard balance tests. Specifically, I will test the hypothesis that the time course of recovery differs between groups presenting with objective signs of concussion vs. those presenting only subjective signs.

Significance: The ultimate goal of our work is to understand how deficits of sensorimotor memory and attention resolve during recovery from concussion. The goal of this Forward Thinking project is to conduct a longitudinal study quantifying disturbances of standing balance in concussed and non-concussed individuals. Standing balance is a surprisingly challenging sensorimotor task that is known to be disturbed after concussion, and we will use a laboratory-based force plate to quantify abnormalities in the translation of the body's center of pressure during single- and double-legged stance. This study will establish normative ranges of performance as well as the performance changes that occur acutely after concussion and throughout recovery.

Innovation/Forward Thinking: The results from this study will help us understand how the deficits of sensorimotor control resolve during recovery from concussion. Upon completion, we will compare the results of this study to the results of a sister study that will use a Strength and Coordination Testing robot to examine deficits of sensorimotor memory and prediction – and the time course of their recovery – after concussion. Positive correlation between the results of the two studies will support the conclusion that robotic test procedures can be sensitive measures of sensorimotor memory deficits and their recovery after concussion.

Student Involvement: Devon Lantagne, Ph.D. student, will lead this subproject under the supervision of Dr. Robert Scheidt along with the assistance of Dr. Leigh Ann Mrotek. Mr. Lantagne will collect, analyze, and report force plate balance data in healthy and concussed individuals.

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Keywords: Concussion, Balance, Sensorimotor, Force Plate

Project Title: Learning to use supplemental vibrotactile feedback of limb position enhances goal-directed reach performance
Faculty Name: Robert A. Scheidt, Professor, Biomedical Engineering
Student Name: Nicoletta Risi

Introduction: Deficits of proprioception negatively impact planning and real-time control of movements.

Significance: Unfortunately, stroke survivors often experience impaired proprioception, exhibiting slow, jerky limb movements (Dukelow et al. 2010).

Innovation/Forward Thinking: Our long-term goal is to develop sensory substitution technologies that provide supplemental sensory feedback, via vibrotactile stimulation, to restore closed-loop control of the arm in stroke survivors who lack proprioceptive integrity.

Student Involvement: In a preliminary study, I investigated the extent to which healthy human participants can learn to use supplemental limb position feedback to enhance their performance above the accuracy of intrinsic proprioception during goal-directed reaching movements, in absence of ongoing visual feedback. I encoded hand position feedback into a two-dimensional vibrotactile display such that small-targeted displacements of the hand were clearly discriminable using the supplemental sensory feedback. Fifteen neurologically intact subjects participated in two experimental sessions performed on separate days. In both sessions, subjects grasped the handle of a planar robot and performed 12 blocks of reaching movements with their dominant hand to twenty-five targets distributed in a five by five gird. They received supplemental kinesthetic feedback via a vibrotactile display fixed to their non-dominant arm. I found that all subjects captured all targets accurately when initially provided concurrent visual feedback of the target and a visual cursor representing hand position. Performance degraded dramatically when cursor feedback was subsequently removed: subjects exhibited "proprioceptive drift" (Wann and Ibrahim 1992) and an expanded representation of the cued workspace. Target capture errors in the training blocks exponentially decreased and approached the theoretical limit of performance accuracy (Shah et al. 2016). Benefits of learning generalized to another untrained workspace. A slight decrease in errors from Day 1 to Day 2 suggested that the sensorimotor learning may have been retained across days. The directional error – defined as the angle between the actual movement direction and the ideal movement direction in experimental blocks with no visual feedback whatsoever - decreased with ongoing vibrotactile feedback, i.e. subjects attempted to use the information encoded with vibration to correct their drift. These results suggest that learning to use supplemental vibrotactile feedback of limb position enhances goal-directed reach performance and generalizes across movements. My next steps include testing the technology on stroke survivors and exploring how the range of days between experimental sessions affects the learning trend.

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Keywords: Sensory substitution, Stroke, Sensory augmentation, Proprioception

Project Title: Perception of Synthesized Vibrotactile Feedback on The Arm
Faculty Names: Robert Scheidt, Professor, Biomedical Engineering; Leigh Mrotek, Research Professor, Biomedical Engineering; Maura Casadio, Adjunct Professor, Biomedical Engineering
Student Name: Valay Shah

Introduction: Current research and clinical efforts related to post-stroke arm rehabilitation, focus primarily on motor retraining1, with limited focus on the impact of somatosensory deficits on motor function. However, somatosensory deficits are common in the contralesional arm and may contribute importantly to deficits in the control of functional movement. The goal of this project is to promote functional motor recovery after stroke by creating "sensory substitution" technologies that re-establish kinesthetic feedback control of the contralesional arm by delivering augmented feedback to a body part for which the brain retains the ability to process somatosensory feedback. To meet this goal, we must determine how best to synthesize and deliver supplemental kinesthetic (vibratory) feedback, and to test its ability to enhance stabilization and manipulation behaviors with the contralesional arm. The current project will advance the goal by characterizing the fundamental properties of vibrotactile perception, so that we may then design the most effective way to deliver synthesized kinesthetic feedback to enhance sensorimotor control in healthy individuals and then stroke survivors.

Significance: This project will determine how synthesized vibrotactile feedback is perceived by healthy individuals across the dermatomes of the upper extremity. This information will be needed to design optimal information encoding and delivery schemes for the forthcoming sensory substitution technology. This contribution will be significant because it provides foundational knowledge supporting a new rehabilitation intervention with potential to improve contralesional arm use in many stroke survivors. Further, the results can be utilized in other applications seeking to enhance sensorimotor control using synthesized feedback, such as in teleoperated robotic surgery.

Innovation/Forward Thinking: Previous research studies have looked at vibrotactile perception on the hand, fingers, and forearm2, however there is no evidence of characterized and quantified vibrotactile discrimination thresholds on the dermatomes of the upper extremity. This research will build the foundational knowledge for future studies. This project will quantitatively identify discrimination thresholds such that vibrotactile feedback can be successfully and efficiently delivered. Understanding how synthesized vibrotactile feedback is perceived is a key step in developing a rehabilitative technology to improve motor control in stroke survivors as well applications requiring proprioceptive enhancements.

Student Involvement: Valay Shah will lead the protocol development, human subject experimentation on neurologically intact subjects, and data analysis for the recorded psychophysical data.

Keywords: Perception, Vibration, Discrimination, Stroke

Project Title: "Does Psychophysical Assessment Affect Implicit Learning?"
Faculty Names: Robert Scheidt, Professor, Biomedical Engineering; Leigh Mrotek, Research Professor, Biomedical Engineering
Student Name: Rebecca Slick

Introduction: Many questions exist about how best to promote recovery after concussion. Contributing to this uncertainty are questions about which tools to use to assess, diagnose, and monitor recovery. MU's Neuromotor Control Lab has proposed a novel robotic test capable to quantify deficits of sensorimotor memory and prediction after concussion and patterns of recovery in the months that follow. The test quantifies how well subjects use sensorimotor information obtained during practice of a simple reaching task to improve performance on subsequent reach attempts. Subjects will grasp the handle of the Strength and Coordination Robot and perform 300 quick, "out-and-back" reaches to capture a visual target on a display mounted immediately above the plane of hand motion. During these movements, the robot handle applies a small amount of resistance similar to that provided when stretching a rubber band. The strength of the rubber band varies from reach to reach, such that subjects cannot predict exactly how hard to correctly push the handle from one trial to the next. A variant of the same test can also quantify how concussion impacts perception of performance errors that contribute to motor learning. This variant asks subjects to indicate the accuracy of each reach during training. Three different modes will be investigated: two modes with a post-movement psychophysical estimate that gauges the perception of success and one mode with no estimate. These data will then be analyzed to see if repeatedly having the subjects consciously estimate accuracy impedes unconscious improvements in performance, and therefore, affects implicit learning. From this, we will determine which mode is appropriate to be used for concussed individuals in a future experiment.

Significance: Sport-related concussion causes deficits of memory and attention that can impair motor learning and lead to persistent cognitive and sensorimotor performance deficits. Many current concussion tests are subjective, and can miss signs of concussion. This experiment is the precursor to developing a novel tool for diagnosing concussion that is objective, cannot be deceived and will aid in decreasing the long-lasting effects of concussions in those individuals that currently go undiagnosed.

Innovation/Forward Thinking: The current study will help determine which version of our robotic assessment should be utilized in an ongoing concussion research project. The psychophysical assessments described here have never been examined to see if they impact implicit learning. It is possible that consciously estimating success could potentially affect the results of the subjects' performances as the trials progress. Determining whether the psychophysical estimation affects implicit learning is necessary for the future project "Examining Deficits of Sensorimotor Learning and Performance after Concussion in the Student Athlete" in order to know what modes are proper for that project.

Student Involvement: Rebecca Slick is an undergraduate student and intern in the Neuromotor Control Laboratory. She will be recruiting subjects, collecting, and analyzing data under the supervision of Drs. Scheidt and Mrotek.

Keywords: Psychophysical Assessment, Sensorimotor Memory, Strength and Coordination Robot, Concussion

Project Title: Space-Time model of volume of Greenland ice-sheet
Faculty Name: Elaine Spiller, Associate Professor, Mathematics, Statistics and Computer Science
Student Name: Jiblal Upadhya

Introduction: The Greenland ice sheet (GrIS) is a vast body of ice covering 1,710,000 square kilometers (660,000Â sqÂ mi), roughly 80% of the surface of Greenland. Different satellite based measuring techniques have been used to observe the present-day changes of the Greenland ice sheet. Determining the mass change of the GrIS is a complex problem and the result depends on the type of observation and on the level of complexity of the volume to mass conversion. In this project we will use the laser-based Ice Cloud and Elevation Satellite (ICESat, altimetry) data from National Snow and Ice Data Center in the period of October, 2003-March, 2011. Each mission of ICESat gives elevation height of ice sheet surfaces at high resolution in space and time along mission tracks.Coverage of the whole GrIS is obtained through repeated-tracking and cross-over techniques. Given the non-local (in space and time) nature of the data, finding the ice mass loss or increase over an area at a given location is difficult.

Significance: Study of Greenland ice sheet helps in learning about Earth's climate history. Our research will help in understanding the Global Warming and sea-level rises.

Innovation/Forward Thinking: In this project, we will use the ICESat data, which is observation-based mission that will help in estimating the Spatio-temporal distribution of ice-mass changes in Greenland compared to empirical modeling and energy balance modeling. We will employ the Latent Gaussian Markov model on the ICESat data to find a space-time probabilistic description of the changing ice sheet height using the R- INLA packages. Although the INLA implementation of the model employs techniques for large matrix inversion (a fundamental computational bottleneck), it is not even close to feasible to apply it to the whole spatial area comprising the GrIS. Furthermore, the behavior of the ice sheet near the coast is quite different in the interior of Greenland and this non-stationarity should be reflected in a model of the entire GrIS. To this end we will develop a strategy to apply the INLA model to individual parcels of land and a model to stitch these parcels together yielding a probabilistic space-time model of the height of the GrIS which can be then used to infer changes in volume.

Student Involvement: Student will first work in understanding the ICESat Data Analysis. Second Part involves working with R-INLA package to set up Spatio-temporal model for volume of ice sheet of Greenland.

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Keywords: Greenland, Ice Sheet, Global Warming

Project Title: Changes in EEG Coherence in Adolescents with Autism Spectrum Disorder after the PEERS Intervention
Faculty Name: Amy VanHecke, Associate Professor, Psychology
Student Name: Angie Haendel

Introduction: The differences in neural connectivity of people with autism has been established, however, there is a paucity of studies that look at brain connectivity before and after specific interventions for people with Autism Spectrum Disorder (ASD) (VanHecke et al., 2013). This study will examine neural connectivity (EEG coherence) of adolescents with ASD before and after the Program for the Education and Enrichment of Relational Skills (PEERS) intervention (Laugeson et al., 2012). It will compare those findings to the control group of adolescents with ASD that will not receive the PEERS intervention. The expected results of this study will suggest that neural connectivity in adolescents with ASD increases after the PEERS intervention, whereas the control group shows no significant change in neural connectivity. Findings of this study could impact future treatment plans for individuals with autism and lead to needed research in this area to improve the understanding of ASD.

Significance: Autism spectrum Disorder (ASD) is being considered brain-based disorder and likely rooted in lowered long-distance connectivity (Just et al., 2012), but we have very little understanding about the specifics of that, and whether (or how) the brain can change due to intervention.

Innovation/Forward Thinking: There is currently not any study in the literature that examines how EEG coherence/connectivity might be impacted by efficacious treatment for ASD. Further, analysis of this measure will require collaboration with external colleagues.

Student Involvement: My involvement as a student will consist of completing this research for my dissertation. I will be doing an extensive review of the literature. I will collaborate with my mentor and external colleagues in running the analyses. Finally, I will write the dissertation and disseminate the results as a paper submission to an academic journal. I will also lead the PEERS groups and assist at data collection sessions before and after the treatment.

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Keywords: EEG, Autism, Adolescents

Project Title: Diversification of flagellar standards for fluorescent microscopy
Faculty Name: Pinfen Yang, Professor, Biological Sciences
Student Name: Andrew Koncel

Introduction: Fluorescence microscopy is a major approach that biomedical researchers use to visualize crucial molecules in normal or sick cells in space and time. Recently, there are surging interests in extracting maximal quantitative information from fluorescent images. However, it is technically cumbersome to estimate molecule numbers in average micrographs due to the lack of easy-to-use intensity standards.

Significance: To address this, our research team, including graduate and undergraduate students, converted a ruler-like structure in flagella into fluorescent intensity standards, akin to protein or DNA markers for electrophoresis. Specifically, we engineered transgenic biflagellate green algae, Chlamydomonas expressing a protein in the ruler, RSP3, tagged to a bright fluorescent protein, mNeonGreen (NG). The resulting flagella with 36 NG molecules per every 96 nm glowed evenly. The fluorescent intensity displayed at least a 6 fold linear range.

Innovation/Forward Thinking: They allowed us to estimate the numbers of diverse molecules in algal and yeast cells. We are currently use transgenic techniques to tweak the intensity and wavelengths of fluorescent flagella to meet the diverse needs in fluorescence microscopy. Meanwhile, we are receiving training from the Commons, a collaborative program bringing together academics, businesses and entrepreneurs at southeaster Wisconsin, to develop a business plan for marketing fluorescent flagella.

Keywords: Flagella, Microscopy, Fluorescence