PROGRAM & ABSTRACTS

11th Annual Symposium on Graduate Research and Scholarly Projects

April 24, 2015
Rhatigan Student Center

Kerry Wilks, GRASP Chair
2015 GRASP SYMPOSIUM

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# Graduate Research and Scholarly Projects

## 11th Annual Symposium

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As graduate students and later as academics, we are trained to write and research for our fellow academics. Our careers will involve scrutiny on the part of our professors and graduate advisors. Then, after graduation, we will write and present to search committees, fellow colleagues, journal peer reviewers, grant boards, tenure committees, and other specialists who will evaluate our research and our work. Our professional lives will involve creating specialized research with special terms that other specialists evaluate.

It is easy to dismiss non-specialists, the people who don’t understand our equations and our jargon. Today, scientists and scholars face laws that restrict their work, cuts to funding, and repeated insults in popular media in large part because we in the academic world have failed to present our research to a larger public.

This issue is not new, in 1931, historian Carl Becker issued the following:

Berate him as we will for not reading our books, Mr. Everyman is stronger than we are, and sooner or later we must adapt our knowledge to his necessities. Otherwise he will leave us to our own devices, leave us it may be to cultivate a species of dry professional arrogance growing out of the thin soil of antiquarian research. Such research, valuable not in itself but for some ulterior purpose, will be of little import except in so far as it is transmuted into common knowledge. The history that lies inert in unread books does no work in the world.

Now, over 80 years later, Becker continues to challenge us all. We need to be better at talking about what we do to more than other specialists. We need to be able to talk about our work and its significance using ordinary language. It is nothing less than the key to our very survival as scholars.
# GRASP ORAL PRESENTATIONS

**Moderator: Dr. Jay Price**

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ABSTRACTS
ORAL PRESENTATIONS

11th Annual Symposium on Graduate Research and Scholarly Projects
Investigating Rover Operations as Part of an Experimental Demonstration of Rover-CubeSat Collaboration

Suvessa Chakrborty,* Christina Wilson
Faculty: Atri Dutta
Department of Aerospace Engineering, College of Engineering

Recent years have seen the growing interest in nano and pico satellites in the space industry and academic research as well. The low launch costs, short development time, availability of off-the-shelf electronic components are the driving factors behind the use of such satellite platforms in space missions. These low-cost platforms can be used to validate new space technologies and to perform scientific research related to the Earth, its atmosphere and its climate. Our interest lies in the use of a cubesat (typically cross-sectional area 100 cm$^2$, length 10-30 cm and mass 1-4 kg) to do autonomous operations using the limited onboard computational capability. More specifically, the study focuses on the development of an experimental test-bed for WSU’s first cubesat and mining rover. There has been a burgeoning interest in the space industry to mine the Moon, asteroids and potentially other celestial bodies, and our key motivation is to investigate the use of cubesats as part of such missions. To this end, we first present a few mission scenarios demonstrating the potential use of cubesats in future lunar and asteroid mining operations. A cubesat could be used to monitor the celestial body surface and send terrain-mapping data to rover to optimize its path based on global information. Second, we present an overview of the experimental set-up comprising the rover and the cubesat. The rover is based on four (100mm diameter) wheel drive, battery-operated (12V Ni-MH 1800mAh), 4 dc motors (120 rpm, 17W) attached with four wheels and capable of executing forward, backward, rotating and sliding movements. Finally, we investigate various aspects of collaboration between a resource-limited cubesat and the mining rover. We assume that a set of instructions are already available from the cubesat for the rover to execute. In our lab experiment a handheld computer, which is considered as a mission control center, sends a series of commands to the microcontroller board of cubesat through serial communication via a transceiver. The rover executes a series of movements based on these instructions. We also allow for communication delays between the cubesat and the rover. The developed experimental setup will pave the way for conducting future experiments related to dynamics and control of cubesat/rover combination or even a team of cubesats and rovers. The developed setup is also a step towards enabling WSU’s participation in NASA’s lunar mining robotics competition in the future.
Healthcare Asset Replacement Problem Under Technological Change And Deterioration

Emmanuel des-Bordes
Faculty: Esra Buyuktahtakin

Department of Industrial and Manufacturing Engineering, College of Engineering

In this paper, we study the multiple style and type parallel asset replacement problem (MUST-PRES), which determines an optimal policy for keeping or replacing a group of assets that operate in parallel under a limited budget and a fixed purchasing cost. Operating assets generally suffer from deterioration, which results in high operation and maintenance costs and decreased salvage value, while technological improvements make it possible for new assets to operate more efficiently at a lower cost. In order to address these issues, we formulate a multi-objective optimization model, which minimizes fixed and variable costs of purchasing new assets, while considering a combined effect of technological change and deterioration as a gain and loss in capacity, respectively. The optimization model also allows some demand to be unmet due to strict budget limitations while imposing a penalty when demand is not met in each period. We apply our model to a case study of healthcare assets involving two different types of assets: a full-body magnetic resonance imaging (MRI) machine and a smaller-extremity MRI (eMRI) machine. Each MRI and eMRI machine has two types: high-field and low-field. We perform computational experiments and sensitivity analysis using key model parameters, and present study results for four cases of technological change and deterioration to illustrate optimal replacement strategies. Numerical results show that the proposed optimization model provides valuable insights and strategies for companies, decision-makers, and government entities on optimal asset replacement as well as healthcare asset management.
The Incidence of Hospital-Acquired Venous Thromboembolism and the Use of Preventive Prophylaxis

Judy K. Dusek
Faculty: Elaine E. Steinke
School of Nursing, College of Health Professions

Purpose: To identify the incidence of hospital-acquired venous thromboembolism (HAVTE) in medical and surgical patients with risk factor(s) on admission, and evaluate the use of recommended prophylaxis (mechanical and pharmacological) according to the 2008 American College of Chest Physicians (ACCP) guidelines. Several problems are at stake without adherence to the guidelines which include the Center of Medical Services who has stopped reimbursing hospitals for additional care required to treat patients who develop venous thromboembolism (VTE).

Methods: The hospital database was queried from January 2011 through December 2012 for all patients admitted without VTE and diagnosed with HAVTE during their hospitalization. A data collection sheet was used to abstract and record the data from the medical record for each case from the sample population of both medical and surgical patients. Each risk factor score for both pre-existing and acute/changing conditions were given a weighted number according to severity of risk factor in relationship to VTE as determined by evidence-based literature.

Results: Medical records identifying HAVTE (n=46) were reviewed; with two eliminated, and a total sample of 44 patient records. The sample was comprised of 24 (55%) males and 20 (45%) females with an overall mean age of 63 (Range=24-91). High pre-existing risk factors (>4) occurred in 19 patients (43.2%), with VTE incidence of 18% deep vein thrombosis, 54% pulmonary embolism, and 28% both. Eight (18.2%) patients did not receive any VTE prophylaxis within 48 hours after admission. Of those patients in our study who died (n=6), two (33.3%) had a risk score above 4.

Conclusions: The incidence of HAVTE was much higher than anticipated during 2011 and 2012. ACCP guidelines were not followed in medical and surgical patients based on admission risk assessment score. Quality improvement efforts are needed to improve VTE rates and to minimize risk to patients. An automated process through the electronic medical record that triggers actions related to VTE prophylaxis is being implemented in the study hospital. The goal is to prevent VTE and to lower the rates found in this study to zero percent mortality.
Isolation and Characterization of Bacterial Communities in the Clean Room Environment of NASA’s Jet Propulsion Laboratory-Spacecraft Assembly Facility in Pasadena, CA

Timothy Eberl
Faculty: Mark Schneegurt

Department of Biological Sciences, Fairmount College of Liberal Arts and Sciences

NASA’s Jet Propulsion Laboratory-Spacecraft Assembly Facility (JPL-SAF) in Pasadena, California is known for its work in the assembly of spacecraft capable of traversing the harsh environments on extra planetary bodies, like Mars. Facilities like JPL-SAF, which use “clean rooms” to assemble these craft, are concerned with the presence of microbial populations in these environments and in the assessment of risk microorganisms may pose in the contamination of equipment during assembly. Because of the supposed lack of organics for use as microbial nutrition, these clean room environments are typically considered to be “extreme” conditions for microbial growth. In recent years, research has shown that species of both archaea and bacteria can be isolated from samples taken from various clean rooms currently in use in the fields of medicine, manufacturing, and chemistry. Understanding the microbial communities that live in these environments may shed some light on methods for control and the prevention of contamination.

Multiple samplings collected from various distinct locations inside and outside the JPL-SAF location in Pasadena, CA were cultivated, morphologically studied, and subjected to various biochemical and phenetic tests to assess their ability to survive in these clean room environments. Special attention was paid to subjecting isolates to halophilic tolerance tests, due to the relatively high percentages of salt that is thought to exist on the surface of extra planetary bodies NASA is interested in sending craft to study, particularly Mars. These salts include magnesium sulfate, sodium chloride, and perchlorates, which have been found in differing concentrations in Martian soils. Fresh DNA was extracted from the bacterial isolates and 16S rRNA genes were amplified using universal bacterial primers. Sequences were then screened, aligned, and phylogenetic trees were generated using parsimony analysis. Growth of bacteria in clean rooms, particularly those involved in spacecraft assembly, has implications with regards to the possible forward contamination of extra-planetary bodies during exploration.
Follicle-Stimulating Hormone Glycoform Interactions With Their Cognate Receptor

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Follicle-stimulating hormone (FSH) plays an essential role in the regulation of reproduction, as FSH KO female mice are sterile. FSH regulates ovarian granulosa and testicular Sertoli cell function by binding to its cognate receptor (FSHR), a member of the G protein-coupled receptor family. Human FSH exists as a heterogeneous mixture of glycoform, differing in the number and location of β subunit glycans. Recently, it has been reported that hypo-glycosylated hFSH binds and activates hFSHR more than fully-glycosylated hFSH (Bousfield et al. Molecular and Cellular Endocrinology 382: 989-997, 2013). We analyzed the kinetics of FSH/FSH receptor complex endocytosis using $^{125}$I-hFSH$^{21}$, $^{125}$I-hFSH$^{24}$ glycoform tracers and recombinant hFSHR-expressing Chinese Hamster Ovarian (CHO) cells as a model system. No difference in endocytic rate was observed for hypo-glycosylated hFSH/FSH receptor complex and fully-glycosylated hFSH/FSH receptor complex. However, a greater endocytic rate for both hypo-glycosylated hFSH/FSH receptor complex and fully-glycosylated hFSH/FSH receptor complex was observed when we use a non-steroidal allosteric modulator 9032A. The mechanism of how the binding of the modulator causes conformational changes of hFSHR remains to be determined.

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The Relationship Between Eye Gaze, Parent-Child Attachment and Language Acquisition

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The process by which infants and young children acquire language is nothing short of complex and astonishing. Environmental elements and social interactions coupled with internal, biologic mechanisms instigate and facilitate language acquisition. Although, it seems that credit should be equally distributed between these processes, the literature suggests the crux of the problem lies within the infant’s interactions (e.g., infant communicative attempts, such as eye-gaze), social relationships (e.g., infant-caregiver attachment) and possible internal states (i.e., temperament). That is to say, that these factors have a greater influence on the development of language than predisposed genetic influences. The use of eye tracking as a way to measure and gauge infant attention (i.e., gaze patterns) and to understand very young, prelinguistic children’s acquisition of language has gained popularity in recent years (Colombo, 2001; Farroni, Johnson, Brockbank, & Simion, 2000; Hood, Willen, & Driver, 1998). Furthermore, eye tracking has been used to recognize the role of mother’s attachment on the child’s perception of visual cues (i.e., social cues or linguistic cues) associated with language development (Bruner, 1999; Csibra, 2010; Murray & Yingling, 2006). The purpose of this study was to determine if differences over age exist in infant looking behaviors between familiar and unfamiliar faces. Eye gaze behaviors of 3 month-old infants were recorded and monitored in two-week intervals over a period of one month using the Tobii X120 eye tracker. Infants were seated in a highchair and shown black and white images of their mother and unfamiliar people. Data collected included information on fixation count and duration, visit count and duration, order of fixation and pupil size. Single subject design was used, such that participants two through five served as replications of participant one. Visual analysis of the data indicated similarities and differences between the familiar and unfamiliar experimental conditions on each of the dependent variables across age. For both experimental conditions, the data suggest that internal facial features (i.e., mouth, nose, eyes) are visited more often and have more fixations that are longer in length than external facial features (i.e., hair, shoulders, neck). For the familiar face condition, the data suggests that the nose area of interest (AOI) is a unique area to this condition across age, such that a greater percentage of fixations occurred within this area, as well as a greater percentage of look time occurred at this region. In contrast, for the unfamiliar face condition, a greater total percentage of look time occurred within and a more diverse representation of the AOI regions. This data suggests that within this condition more scanning like behaviors occurred.
Effect of Texting While Walking on Reactions, Attention and Gait

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The dramatic increase in cellular device usage has significant impacts on daily living. The dangers of distracted driving have been well documented, but this interest has yet to shift to distracted walking. There has been a substantial rise in injuries being reported due to texting while walking (TWW). Whether this rise in injury rates is due to being distracted or because of altered gait mechanics, which can negatively affect reactions, remains unclear. This study was performed to examine the effect TWW has on selected parameters of gait, attention to the surrounding environment, and if texting increases the potential to put a pedestrian in an adverse position to react to harmful stimuli. Forty healthy participants (15 male, 25 female, 22.27 ± 2.54 years) participated in the study. Participants performed two trials while walking on a treadmill at a self-selected speed: one walking trial and one TWW trial. Participants were instructed to verbally react to visual stimuli that appeared on a projection screen 8 feet in front of them. For half of the participants, a researcher holding a 4-foot stuffed animal walked directly in front of the treadmill during the texting trial. The OWL camera system and motion analysis software were used to study gait biomechanics, reflective marker coordinates were utilized to calculate lower extremity joint ranges of motion using the Canadian Society of Biomechanics model, and a post study questionnaire was issued to examine attention to the manipulated environment in which participants were placed. We hypothesized that there would be a change in gait mechanics, especially total range of motion of the lower extremity joints, during the texting trial. We also postulated that attention to the environment would be substantially reduced. Results suggest that texting while walking has no significant effect on gait mechanics, particularly total range of motion at the ankle, knee, or hip. There was a significant reduction in attention to the environment, with participants of the texting trial missing approximately 10% of visual stimuli. Of the 20 participants that a researcher walked in front of, only 3 could recall a person walking in front of them, and no participant could name the object being carried. This information leads us to the conclusion that being distracted may be to blame for the increase in accidents while texting, not changes in gait mechanics. This requires further investigation.
The Relationship Between Religion and Older Adults' Physical Health

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Many studies have argued that religiosity has a favorable effect on longevity, particularly for the older population. This had led to various social service agencies, health practitioners and religious communities to accommodate the religious needs of the older population (Barkan & Greenwood, 2003). Previous research has debated which aspects of religion such as service attendance, frequency of prayer, importance of a higher being can predict levels of physical health. If it does not boost, than it may have protective effects on health, according to researchers. The purpose of this study is to examine the influence of religiosity on physical health in older adults. The Health and Retirement Study (HRS) is a nationally representative survey of noninstitutionalized, pre-retired and retired adults in their later years of life in the United States. This data were used to analyze the relationship between physical health in older adults and religiosity. Religiosity, or levels of religious activity, was measured by the religious attendance and religious salience. Physical health was measured by respondents’ self-rated health. The control variables included age, race/ethnicity, educational attainment, gender and marital status. Social support was also considered control variables since researchers suggest social relationships are one of the bases of religion (Krause & Cairney, 2009). Descriptive, bivariate and multivariate analyses were conducted. The data indicate that frequent religious attendance was associated with better perception of one’s health. Higher levels of religious salience were associated with worse perception of health. The strongest finding was that higher educational attainment was associated with better ratings of health. Of the religious variables, higher religious attendance was a better predictor of better health ratings. Having feelings of isolation was associated effect with worse health, and also had a large effect on self-rated health.
The Death of the Medicine Man: A History of the Rhetoric Used Towards Medicine Men at the Turn of the Century

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While there has been extensive research done on portrayals of Native Americans within American, and even international media, the role of Medicine Men within these portrayals has been marginalized. This appears to be a major oversight since Medicine Men represent the healers, political leaders and priests of their tribes—guiding many of their culture’s decisions. Within this paper both quantitative and qualitative analyses were conducted on newspaper and book portrayals of Medicine Men between 1880 and 1920.

The findings of this research show that there was a significant decrease in the number of times Native American’s were represented, while there was a massive increase in the number of references to Medicine Men. Newspapers increasingly focused their negative attacks on Medicine Men since they were perceived as the “power structures” within Native American societies. These attacks followed three basic strategies: to point to the failure of Medicine Men in holding their cultures together, to comicalize them and to represent them as anti-modern.

I argue that this change in representations coincided with a negative rhetorical turn in the use of the term “Medicine Man.” Before 1890 the term held no special negative connotation, but it soon came to mean something significantly more negative. By 1900 the term was used to connote a lack of scientific prowess or being a “quack.” Those who peddled bad medicines were termed “Medicine Men.”

These two factors, I argue, led to a rhetorical genocide that was committed against Native American cultures. By attacking the rhetorical “power structures” within Native cultures newspapers and authors were destroying the eroding their identity. Medicine Men, then, represent the source of much Native American identity, since they have the power of politician, priest, healer and historian for their tribes. What occurred was cultural genocide through rhetorical genocide.
Industrial Hazardous Monitoring Robot

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Accidents happening in chemical and process industries can be prevented by a gas monitoring system. Most of the existing systems use a distributive sensing, which is a tedious and complex process in terms of technology as well as cost. To overcome these hindrances in a simple prospective manner, we proposed an idea of a mobile monitoring robot which is cost effective and also an accurate sensing unit. It senses the hazardous gases as well as the fire and smoke by avoiding obstacles in its way, thereby alarming and sending a message to the authorities.

Industrial hazards are negative effects caused by an industry on human beings, environment, flora and fauna. Industrial hazards are of various types of dangerous chemical hazards that are often due to harmful gases like methane, carbon dioxide, carbon monoxide and ammonia. The levels of these gases have to be monitored continuously with a gas monitoring system.

Most of the industries are equipped with a distributive sensing based gas monitoring system that consists of a large number of sensors installed along the length and breadth of the industry and requires a central processing system. Since the data reception is parallel, data acquisition system requires large number of channels. In addition there is a need for advanced microcontrollers to process this data, resulting in a more complex system.

In this paper we discuss a portable gas monitoring system developed using simple gas sensors that overcomes the drawbacks of the existing system. Having only a single set of mobile sensors for the whole plant also makes the system cost effective.

The proposed system is equipped with three gas interfaced with microcontroller via signal conditioning elements. The system is also connected to the outside world by means of Global system for mobile communications (GSM). These gas sensors are mounted on a mobile robot implemented with obstacle avoiding algorithm, enabling it to move freely in the industry. Whenever the gas sensor detects a gas, the robot stops, gives an alarm and sends a message to the concerned operator using the GSM modem. Such mobile gas monitoring system with GSM technology requiring no human intervention at any stage makes it the first of its kind and finds a number of applications in an industry associated with harmful gases.
Evaluating Balance Capacities of Male Youth with Intellectual Disabilities

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Little is known about the gross motor skills of children with intellectual disabilities (ID). Six test items from the Bruininks-Oseretsky Test of Motor Proficiency (BOT-2) were used to evaluate the static and dynamic balance capacities of 99 males (ages 8-18 yrs) with ID, without Down syndrome: Standing with feet apart on a line-eyes open (BAL-1) and eyes closed (BAL-4), walking forward on a line heel-to-toe (BAL-5) and freely (BAL-2), standing on one leg on a line (BAL-3) or on a balance beam (BAL-7). For each age group, a minimum of 10 assessments were required for data analysis. A Microsoft Access 2010 database was developed and queries were written and ran to calculate mean and standard deviation of scores for each test item. Results were compared to the highest possible scores (ceiling scores, black line) and criterion scores (95% of ceiling scores, gray line) for each item established by BOT-2 standards for non-disabled youth (Figures 1 and 2). A total of 735 assessments indicated that the mean scores for all age groups were above criterion for BAL-2 and only two age groups (10 and 11 yrs) were below criterion for BAL-1. Mean scores for BAL-3 did not reach criterion until mid-adolescents, only one age group for BAL-5 and no age groups for BAL-4 and -7 were above criterion. Present results indicate that mean item scores were consistently below ceiling and most fell below the criterion level thus indicating substandard balance capacities of male youth with ID. Future research should include males with Down syndrome (DS) and females with ID, with and without DS.
A Travelling Salesman Problem with Limited Resources: 
An Optimization Approach

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In this paper, a mathematical model is developed to address two problems: the first problem is on healthcare delivery planning in which the objective is to diagnose and treat as many patients as possible by determining the locations to be visited assuming that patients have ability to travel a predetermined distance, e.g., to clinics in different locations. For example, a doctor may plan to visit many locations with Ebola patients in a country in Africa. In the case of a natural disaster, where there may be significant damage to the existing infrastructure, a similar scenario may happen. The second problem considers a politician who would like to visit as many locations as possible while attracting voters who would consider travelling to the campaign centers from other locations. In both applications, it is assumed that there is a limited budget and duration to achieve these objectives.

These problems are modeled as a mixed integer mathematical model – a variation of travelling salesman problem with covering, budget and time constraints. The resulting mathematical program is known to be an NP-Hard problem. The objective is to find the best sub tour to maximize the demand that can be served using the limited resources.

In order to solve this problem efficiently in a reasonable amount of time, a hybrid genetic algorithm is developed. In this algorithm, instead of mutation, a second level of optimization based on clustering method is proposed. This method is compared with the traditional genetic algorithm. Extensive computational results are presented to measure the efficiency of the proposed method. It is observed that where there is very limited budget and time, or very extensive resources, solving the resulting problem takes significantly less computational resources. The computational experimentation provides also insights about the effect of budget and distribution of potential visit locations on service rate and profit.
The Effects of an Eight Week Circuit Training Program on Individuals With Parkinson’s Disease

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Parkinson’s disease is the second most prevalent neurodegenerative disorder in adults 65 and older. Various forms of exercise have been shown to decrease the disabling effects of this progressive disease. The purpose of this study was to determine if a circuit-based exercise program improved strength and balance, which could be key factors in a fall prevention program for this population. Fourteen participants completed a circuit exercise program, attending two sessions per week, for eight weeks. Exercise sessions included treadmill walking, upper and lower body strengthening, stretching, balance and coordination exercises utilizing free weights and Therabands. Baseline and eight-week measurements were recorded. Paired t-tests were used to analyze changes between pre and post-test data gathered from the 10 meter walk test, scores on the Berg Balance Scale, Timed Up and Go, and lower extremity strength utilizing a hand-held dynamometer. Significant differences were noted by an increase in the Berg Balance Scale (+5.5 pts) and muscle strength of knee extension (R = +16.10 lbs, L = +12.33 lbs) and knee flexion (R = +4.65 lbs, L = +10.88 lbs). The results of this study suggest that circuit training programs may be beneficial for increased balance and strength in individuals with Parkinson’s disease.
Hospitalization of Older Adults: The Use of Teams in Reducing Complications and Length of Stay

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The number of older adults is rising, and the incidence of injury in this population is increasing. Older patients are at higher risk of experiencing complications when hospitalized due to an injury; this is likely due to a decrease in physiologic reserve and a higher incidence of comorbidities. After being admitted to the hospital, especially due to trauma, older adults typically experience a decline of at least one activity of daily living. Many studies have explored hospital related complications of older adults, but few addresses the impact that a team based approach may have on reducing complications. The purpose of this evidence-based clinical review article is to provide hospitals and healthcare providers with the advantages of using a team based approach in older adult care. A primary literature search of peer-reviewed articles published from 2005 to 2015, obtained from MEDLINE, Cochrane Library, and CINAHL databases, concluded that a multidisciplinary team composed of: therapists (physical, occupational, respiratory), a pharmacist, and primary care provider reduces complications and decreases length of stay in hospitalized older adults. Providing a variety of therapies on an early and frequent basis can help maintain functionality and preserve independence. A chart review by a pharmacist will help reduce occurrences of adverse drug reactions that are more frequent in older adults that have physiologic changes due to age. Primary care providers help direct the team, determine baseline functionality, and extend continuity of care. Each team member plays a pivotal role in the treatment of these patients. Implementing a multidisciplinary team reduces complications, decreases length of stay, and improves functional outcomes in the treatment of hospitalized older adults.
Vesicoureteral Reflux in a Six Month Old Infant Presenting with Fever of Unknown Source: A Case Report

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Introduction: Vesicoureteral reflux (VUR) is a condition more commonly found in pediatric patients that results in backflow of urine from the bladder to the kidneys. Occurrence varies based on age, sex, family history, race and urologic anomalies. Children ages 2-24 months with recurrent urinary tract infections are at risk for having VUR. Management of VUR including screening, diagnosis, and treatment, are continuing to change based on newer evidence.

Case description: A 6-month-old female came to the clinic with 8 days of fever and no clear source. A urinalysis with microscopic examination was performed with results that indicated a urinary tract infection (UTI), so the child was treated with antibiotics. Ten days later, a renal ultrasound (RBUS) was performed showing bilateral grade 1 hydronephrosis. This was followed with a voiding cystourethrogram (VCUG) which showed grade 2 VUR on the right. The child was started on continuous antibiotic prophylaxis (CAP) until a repeat VCUG and RBUS at 12 months of age demonstrated full resolution of hydronephrosis and VUR.

Discussion: Pediatric patients with a febrile UTI commonly present with a fever of unknown origin. An estimated 5% of children ages 2-24 months presenting with a fever of unknown origin will have a UTI and one third of children diagnosed with a febrile UTI also have VUR. Current research has shown the prevalence of VUR in the general population is underestimated at 0.4% to 1.8%, as some cases are asymptomatic, with 50-85% of low grade reflux (grade I-III) spontaneously resolving. There is a strong association between UTIs and VUR but current evidence has not shown an absolute association with renal scarring, prompting several key changes in guidelines.

The American Academy of Pediatrics provides guidelines for managing the initial UTI in febrile children, the most recent published in 2011. The diagnosis of UTI should be based off an abnormal urinalysis with microscopic examination and positive urine culture (at least 50,000 colony forming units per ml). Initial treatment of a UTI with oral antibiotics is just as effective as parenteral administration. A VCUG is not recommended routinely after the first febrile UTI, only if there is an abnormal RBUS or recurrent UTIs.

The American Urological Association provides guidelines for the management of primary VUR which were updated in 2010. In the 1997 guidelines, treatment choices were CAP or surgery based on reflux grade, age of diagnosis, and laterality of involvement with an annual VCUG follow-up. Current guidelines have standards, recommendations and option policies. On initial evaluation a child should undergo a general medical exam including presence of bladder and bowel dysfunction symptoms and if present the provider should obtain a RBUS. CAP is recommended regardless of the grade of VUR if the child is less than one year of age with a history of a febrile UTI or with VUR grade III-V without a febrile UTI. If all conservative treatment options have been attempted and the child is having breakthrough UTIs then surgical intervention should be considered.
According to the CDC, one in four women experience Intimate Partner Violence (IPV) in their lifetime, and for those women who live in rural areas the experience increases to one in three. In the State of Kansas, 28.6% of the population lives in a rural area (census.gov) with 89 of 105 Kansas counties being classified as rural (kdheks.gov). The purpose of this extended literature review was to explore potential obstacles faced by those who experience Intimate Partner Violence in rural areas in the United States with speculation regarding potential implications for Kansas.

Review of existing research indicates that few published studies to date focus on the unique issues of IPV in rural areas. While initial safety planning issues such as finding emergency shelter, coordinating neutral drop off/pick up sites for non-custodial perpetrator/parent visitation, and related legal assistance are issues that need to be addressed for all IPV victims, research suggests that the traditional service routes may create larger barriers for rural victims who do not want to uproot all aspects of their lives. For example, entering the shelter system involves the loss of one’s whole local support system with the potential for displacement to an urban environment.

The few published studies specific to rural IPV suggest two needed avenues for educational interventions: (1) fostering rural community awareness overall and (2) increasing modes of intervention among rural medical resources. In terms of community interventions, generating awareness of stereotypes held about IPV in rural populations in necessary. Additionally, there is often a general lack of information in regards to resources available in the community, among those who may need services as well as among those who provide services. In generating awareness and networks among service providers, it is important that rural medical providers be part of community safety planning initiatives. Research suggests that medical service providers can be an excellent point of contact for Intimate Partner Violence screenings as well as resource and referral agents. Unfortunately, medical care options are not always as readily available in rural areas regardless of affordability issues.

Using the new provisions of the Affordable Care Act along with best practices recommended in the research, suggestions for building capacity for addressing IPV across medical providers in Kansas will outlined.
Effects of Cervical Versus Thoracic Manipulation on Cervical Range of Motion, Pain Rating, and Neck Disability Index Scores

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Neck pain is the cause of approximately 25% of patient visits to outpatient physical therapy annually. Complaints include headaches, neck pain, decreased range of motion, and decreased quality of life. This study looked at two different, yet common treatments for neck pain. Thirty subjects with a history of neck pain and/or headaches within the past three months were recruited and randomly divided into three equal groups (n=10). One group received cervical manipulation, another group received thoracic manipulation, and the final group served as the control and did not receive a treatment. Manipulation is defined as a high-velocity thrust at the end range of motion. Cervical range of motion (ROM), numerical pain rating scale (NPRS), and neck disability index scores (NDI) were measured prior to and immediately following each respective intervention at baseline (week 0), week 2, and week 4. We hypothesized that cervical manipulation treatment would have the greatest effect on ROM, pain, and NDI scores. Our study demonstrated no significant difference between cervical manipulation, thoracic manipulation, and control groups in regards to the NDI, NPRS, and cervical ROM. Trends towards improvement were displayed in the cervical group for flexion and bilateral rotation and thoracic group for bilateral rotation. NPRS and NDI scores also demonstrated trends toward improvement with the cervical group showing the most improvement for both scores. With the trends toward improvement, when treating patients with mechanical neck pain one can assume that either cervical or thoracic manipulation could be beneficial not as the sole treatment but as an adjunct to an overall intervention. However, these results can only be generalized to populations that fit the inclusion and exclusion criteria used in this study.
Synthetic Models for the Active Site of the Nickel Superoxide Dismutase Enzyme (NiSOD)

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The superoxide molecule is a highly toxic unavoidable byproduct of aerobic respiration, which is the process by which nutrients are converted into useful energy in cells. If not regulated, superoxide causes significant cellular damage, leading to various diseases such as cancers, rheumatoid arthritis, osteoporosis and some neurological diseases such as Alzheimer’s and Parkinson’s disease. Superoxide dismutases (SODs) are enzymes which are responsible for detoxifying superoxide by helping to convert it into molecular oxygen and hydrogen peroxide, thereby protecting biological systems from oxidative damage.

Among the four different SODs known, nickel-containing superoxide dismutase (NiSOD) has been discovered recently in *Streptomyces* species and cyanobacteria. NiSOD has a strikingly different geometry from other SODs and the relationship between the structure of NiSOD and its function is still not fully understood.

Our research group has been synthesizing and studying two series of synthetic model compounds which reproduce the structure of the NiSOD active site, which is the part of the enzyme responsible for its function. All these models have been characterized by various physical methods, including single-crystal X-ray crystallography and electronic spectroscopy. We will assess the ability of the model compounds to perform the enzymatic function by reacting each compound with superoxide and these results will give us a better understanding about the structural importance of NiSOD for superoxide decomposition.

Using the information gained from this study, we will be able to understand how the NiSOD enzyme works and suggest a new direction to design molecules which will successfully replicate the NiSOD function and which may be starting points for clinical treatment of diseases related to superoxide toxicity.
Automatic Talk Back and Exoskeleton System Using Brain Neural Computer Interface (BNCI) for ALS Patients

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In this project we execute an effective model for ALS patients to enhance their mobility and increase the possibilities of interaction such as talking, sending an email, and playing video games. The model additionally caters to their everyday requirements empowering a simple cooperation without controls such as joysticks, buttons and switches. In this model we design a talk back system and exoskeleton interfaced to the human brain using Brain Neural Computer Interface (BNCI). The system converts EEG signals generated by the human brain to electronic commands that are processed by the computer. The logic unit then differentiates between a control signal and a communication signal. Accordingly, the output of the logic unit is directed either to the exoskeleton or the text to speech converter. The subjects are initially trained to ensure maximum effectiveness of the system. In the training, signals are collected while they concentrate on various objects. Secondly, they are given a simple task to be accomplished, such as thinking about a word, moving right hand finger, etc. Once the effectiveness is ensured, the system is deployed to the patient. The control unit is responsible to control the whole system. After deployment the control unit compares with predefined logic and is used to control legs and limbs fixtures automatically. The system uses non-invasive EEG-electrodes placed on the scalp to detect and receive brain signals. In addition to EEG electrodes, force detecting sensors are placed on the body to maintain stability. For example if the volunteer leans forward, the sensor detects and moves forward (just like a segway). In addition to the system we also design a virtual gaming software where volunteer learns how to move and control the actuators by practicing them using a gaming environment.
Resilience Quantification and Allocation for Design of Complex Engineered Systems

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Continued growth in terms of scale, complexity, and prolonged system useful lives has become increasingly apparent for complex engineered systems. This growing global trend has challenged system designers to design affordable and effective complex engineered systems. Previous research efforts have been focused on protecting an engineered system against failure events, in other words, ensuring high reliability. Improving reliability in a system is often associated with the exponential behavior of improvement costs. At one point, it is not affordable to improve system reliability because the improvement costs increase substantially as the system reliability level approaches the maximum achievable reliability. Therefore, most recent research have given attention towards developing an adaptive engineered system that is able to respond to and recover from adverse disruptive events, such as natural disasters, man-made accidents, and vicious attacks. This type of system is also known as a resilient system. Resilience in an engineered system implies the capability of a system to autonomously sense adverse changes in health conditions, withstand failure events, and to recover from the effects of these unpredicted events.

This paper is dedicated to exploring the gap between quantitative and qualitative assessments of engineering resilience in the domain of designing complex engineered systems, thus optimally allocating resilience into subsystems level could be achieved. Engineering resilience can be quantified based on the probabilities of passive survival rate (Reliability) and proactive survival rate (Restoration). As the assessment tool of engineering resilience, Bayesian Network approach is proposed. The optimization of engineering resilience allocations are further employed at the subsystems level so that the system development cost could be minimized while satisfying a system target resilience level. A supply chain resilience allocation case study is employed to demonstrate the proposed approach. The proposed resilience quantification and allocation approach using Bayesian Networks would empower system designers in the conceptual design stage, to have a better grasp of the weakness and strength of their own systems against disruptions. This research also aims to provide a fundamental methodology to develop a more effective, readily-used design tool that can optimally allocate resilience attributes for complex engineered systems.
ABSTRACTS:

POSTER PRESENTATIONS

11th Annual Symposium on Graduate Research and Scholarly Projects
Dynamic Validation of Customer Satisfaction Surveys

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Customer surveys are efficient tools for measuring customer satisfaction. A great attention has been given to techniques for analyzing customer feedback in recent years since customer satisfaction plays a major role in an organization's success. Indeed, customer feedback analysis is a challenging task and few guidelines have been provided on the dynamic validation of the instrument used. In addition, many experts and researchers have different opinions on the definitions of quality and customer satisfaction, and there is an agreement that only the customer has the right to judge the quality of products used or services provided.

A typical survey consists of quantitative and qualitative questions. Respondents to quantitative questions are limited to answer questions without further explanations whereas qualitative questions allow respondents to add any comments and reflect customers’ perceptions and expectation toward product used and service provided.

The customer’s responses to open-ended questions are complex to analyze due to difficult measurements of responses, meaning and variations in respondents concepts. A singular qualitative data analysis is widely used in several researches. Moreover, there is a lack of explanation of different methods of qualitative data analysis and how to use them with computer software.

Three techniques to analyze customer feedbacks were used, including Critical Incident (CI), Concept Mapping (CM), and Cluster Analysis (CA). Additionally, advanced statistical and qualitative data analysis software was utilized to analyze data obtained from customers.

This study is aimed at the development of a dynamic validation technique that can be used to update survey items based on customer response to open ended questions. An illustration of the proposed customer feedbacks technique is provided through a case study involving applications of several qualitative and quantitative data analysis techniques. The results supported the need for dynamic validation and indicated its ability to identify new requirements and emerging patterns of customers’ expectations.
Correlations and Normative Data of Gluteal Strength and Endurance

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Study Design: Non-Experimental Correlation Study

Objective: The purpose of this study is to gather normative data and correlations for measures of gluteal strength, power, and endurance for 18-35 year-old healthy adults. Clinicians can use this data as guidelines for enhanced evaluation of gluteal function. Normative data found using measures of gluteal strength, power, and endurance can be used to better predict a safe return to the patient’s prior level of function.

Background: Currently there is little research regarding correlations between gluteal strength and endurance and how the addition of gluteal endurance training to gluteal strengthening during the rehabilitative process will provide increased readiness for return to activity.

Methods: Forty males and females aged 18-35 (average = 24.8) with no history of surgery in the last year, no history of lower extremity or back pathology, and not currently pregnant were chosen from a sample of convenience. Gluteal strength was measured with maximal isometric contractions, gluteal power was measured via vertical jump, and gluteal endurance was measured using repeated single leg bridging.

Results: There was a high correlation between gluteus maximus (GMax) strength and gluteus medius (GMed) strength (r = 0.822). There were moderate correlations between gluteal strength and endurance (GMax: r = 0.466, GMed: r = 0.454), as well as gluteal strength and vertical jump height (GMax: r = 0.477, GMed: r = 0.558). There were low correlations between vertical jump height and endurance (r = 0.278) in addition to height and endurance (r = 0.179). There was a negative correlation between self-reported hours of cardiovascular training and endurance (r = 0.226). Low correlations were found between hours of strength training and gluteal strength (GMax: r = 0.089, GMed: r = 0.127) and vertical jump height (r = 0.151).

Conclusion: The results of this study suggest gluteal endurance training in addition to power and strength training may provide a more comprehensive prevention strategy to minimize the risk of injury in healthy subjects.
International Student Transition to the United States

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International student populations are found on almost all college campuses in the United States, with the majority of these students having come to the United States specifically for the purpose of attending universities at either the graduate or undergraduate level. Many of these students are sponsored by the universities that they attend; this not only means that the university provides assistance in sponsoring a visa for the United States, but that it also serves as the main information source about the new home these students are intending to move to and settle.

The research below addresses the problems of international student transition by trying to understand the students’ quality of life from a basic daily-needs level, as well as from social-identity and personal-identity levels. It specifically addresses the difficulties and advantages that international students face when they come to the United States for school, either at the undergraduate or the graduate level.

The participation of the research, which was done via survey, was the entire graduate and undergraduate international student population of the university (2,157 students), of which 332 responded (15.4% response rate).

The results of the survey show that they (the international students) were not adequately prepared for basic life in the United States. Many of them felt that they lacked basic resources and they lacked the information necessary to find them. Many international students found the American students to be stand offish, and to be “fake” as well as not friendly in the way that many of them are accustomed to in their home countries. Some of the significant findings are the correlations between being asked to people’s homes and the easiness of making friends in the US ($r=.392, p<.01$) as well as a negative correlation between overall perceived friendliness of Americans and easiness of making friends ($r=-.354, p<.01$).

The greatest impact on overall happiness was a significant correlation between having reliable transportation and food availability ($r=.790, p<.01$), with social life ($r=.564, p<.01$) and with being able to fulfill religious needs ($r=.443, p<.01$).

There are many potential ways to help International students overcome these hurdles when coming to the United States, the best ways that have been indicated by this study are increasing resources to aid in transition by better outlining life in the US. For example: availability of transportation, food and the easiness of creating social connections.
A Comparison of Gaze-Based and Gesture-Based Input for a Point-and-Click Task

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Alternative input devices to the computer mouse are becoming more affordable and accessible. With greater availability, they have the potential to provide greater access to information for more users in more environments. However, most user interfaces are built to be mouse-driven, and the adoption of these new technologies may depend on their ability to work with these existing interfaces. This study examined performance with gesture-control and gaze-tracking devices and compared them to a traditional mouse for a standard Fitts’ Law point-and-click task. Participants were capable of using both gesture-controlled and gaze-tracking devices to control an on-screen keyboard quickly and accurately enough to complete the majority of trials. However, both devices were significantly slower than the mouse, and were more prone to miss-clicks and failures. Our subjective measures indicate that participants found these alternative input devices to be more taxing than the familiar mouse.

In order to make effective use of these devices, researchers, designers, and developers must find control schemes which take advantage of the alternative devices’ benefits while curtailing the drawbacks. While this study does show that these alternative input devices can be used to control a computer’s cursor in a point-and-click environment, it is inefficient, error-prone, and difficult for the user.
Physician Assistant Student Assessment of Body Mass Index in Children Aged 3 to 5 Years Using Visual Cues

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Introduction: Greater than one out of three pediatric and adolescent patients are overweight. Overweight five-year-olds are four times more likely to become overweight or obese in adulthood when compared to normal weight children. Early identification of an overweight status has been found to lead to improved management of obesity. Waiting until a later age may inhibit clinicians from timely identification, diagnosis, and treatment of overweight or obese pediatric patients. Clinicians are not consistently assessing body mass index (BMI) in pediatric patients. Instead, clinicians often utilize visual cues but have a tendency to underestimate weight when relying solely upon visual cues.

Purpose: This study aims to determine physician assistant (PA) students’ and recent PA program graduates abilities to accurately assess BMI in patients aged three to five years based solely upon visual cues.

Methods: Current PA students and recent PA program graduates completed an online survey to accurately categorize Body Mass Index (BMI) for age by visually assessing pictures of children. Pictures of three children (aged three to five; one obese, one overweight and one with healthy weight) were shown to respondents first with no additional height and weight data for visual assessment and then again with height and weight data provided. Respondents were requested to categorize the children in the proper Body Mass Index categorization. Responses were scored as accurate or inaccurate.

Results: There were a total of 98 PA students or recent graduates that completed the online assessment (28.9% Year 1, 39.8% Year 2, 31.6% Recent Graduates). Under half (39.8%) reported experience working with pediatric patients, but 50% reported having been trained to use the BMI-for-age growth chart. One fourth (26.5%) reported being confident to accurately predict BMI for age just by looking at a child. Almost all (92.9%) responded that BMI-for-age is important for child’s overall health. Child 1 (obese 3 year old boy): no respondents (0%) accurately categorized with visual assessment alone; and 10% categorized accurately when height and weight data were provided. Child 2 (healthy weight 4 year old girl): 81.6% accurately categorized with visual assessment alone; 54% categorized accurately when height and weight data provided. Child 3 (overweight 4 year old girl): 6% categorized accurately with visual assessment alone; 15% categorized accurately with height and weight data provided.

Conclusions: Physician assistant student and recent graduate visual assessment for categorization of BMI is unreliable; however, categorization with height and weight data provided is improved but also not reliable. Training in BMI assessment may lead to early recognition of the pediatric patient’s weight status, which can be advantageous in beginning interventions to prevent future health concerns.
Ceramics and textiles have been an aspect of the human life for thousands of years. They were created out of need, craft, desire, or purpose but often started out to be a symbol of luxury and wealth. Both ceramics and textiles have marked different time periods, reflected different civilizations, and technologies that have been mastered. The methods and materials used in order to make them have expanded enormously as we learned more about each medium. Contemporarily, artists have utilized these materials both inside and outside of the traditional forms of craft. Some artists have even combined them in order to create objects, installation, sculpture, etc. My intention is to formulate knowledge and research about early Islamic wares and pottery in contrast to contemporary ceramics and textiles through pattern, imagery and decoration in order to discover new ornament to utilize in my own studio practice.
Texting While Driving Using Google Glass: Promising But Not Distraction-Free

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Texting while driving is risky, yet common. Smartphones are not the only devices though which are capable of texting. Google Glass is an upcoming head-mounted display (HMD) that allows users to text via a voice-based interface. This study investigated the effects of texting with Google Glass on driving performance compared to texting with a smartphone. Participants completed a standard car-following task in a driving simulator. There were three possible texting methods: manual texting with a smartphone, voice-based texting with a smartphone, and voice-based texting with Google Glass. All texting methods impaired driving performance compared to the drive-only condition. Texting with Google Glass, however, was less disruptive to driving performance compared to texting with the smartphone for both manual and voice-based texting. The results suggest that the Google Glass configuration may be beneficial to driving performance. However, Google Glass may still be harmful to driving safety.
Community Food Assessments: Retail Inventories and Interviews in Low Food Access Areas

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Morbidity and mortality rates have been linked to poor diet and nutrition and individuals in underserved populations are often at a greater risk for experiencing poor health outcomes due to low access to healthy and nutritious foods. Public health researchers have begun to examine the impact of social, cultural, and economic factors on diet and nutrition. This study utilized an inventory of local stores and combined it with qualitative data to create a unique approach towards understanding a low food access environment in Wichita, Kansas.

A list of food retailers located in the city of Wichita was created using local resources. From that list, 277 food retailers were surveyed to collect price and availability data on certain food items. Qualitative data was collected through interviews from 75 participants living in low food access areas in three zip codes in Wichita.

Various store types were surveyed for food products and found that healthy food was more expensive in low income areas. Qualitative interviews revealed that individuals who live in low food access areas have additional challenges when it comes to eating healthy. Cost, distance to store, and the quality of food items and grocery stores are typical factors discussed in studies about low food access areas.

The findings of this study are consistent with the national literature on low food access areas. Several areas in Wichita had limited geographic access to fresh fruits and vegetables. In lower income areas, healthy food items such as fruits and vegetables were more expensive. These findings were further supported by qualitative interviews conducted in low food access areas. Both the cost and access of healthy, quality food were described as major challenges. These results suggest that understanding food access is a complicated issue that requires a multifaceted, environmental approach.
Effects of Co-ingesting Carbohydrates and Caffeine on Anaerobic Recovery

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Introduction: Carbohydrate ingestion has been shown to improve anaerobic recovery by restoring muscle glycogen and indirectly stimulating creatine uptake. Caffeine has been shown to improve athletic performance by affecting factors such as balance, gross motor recruitment, and focus. Co-ingestion has been shown to increase the rate of glycogen synthesis, however the effects of a practical dose of caffeine equivalent to that found in most commercial pre-workout supplements has not been previously investigated.

Purpose: The purpose of this study was to examine and infer the possible effects of the co-ingestion of a practical dose of caffeine with carbohydrates on athletic performance.

Methods: 16 subjects participated in three different trials using three different treatments. Each of the treatments contained one of the following: carbohydrates, carbohydrates and caffeine, caffeine.

Results: ANOVA determined that there was no significant difference among treatment groups regarding peak-to-peak power values or among the comparison of the co-ingestion group to the caffeine group regarding 30-second power values. ANOVA determined a statistically significant difference among 30-second power values regarding the co-ingestion to the carbohydrate group (p≤.05). Paired-sample t-tests were run, and a negative correlation among the co-ingestion and carbohydrate group at the 30-second mark (r=-.472) was calculated.

Conclusion: Our results conclude that the ingestion of 200mg of caffeine does not significantly improve short-duration anaerobic capacity.
Effects of a Single Bout of Shoulder Horizontal Adduction Contract Relax Stretching

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The research purpose was to determine how long the effects of a single session of horizontal adduction (HA) contract relax stretching (CRS) of the posterior shoulder will last. CRS is a technique where a muscle contraction is held in the target muscle group followed by a passive stretch of the same muscle group. Current research has shown CRS improves both shoulder flexibility and range of motion (ROM). 32 asymptomatic male and female (male=8, female=24) graduate students participated in a repeated measures randomized control trial. Participants were randomly selected to determine which shoulder received treatment. Participants were instructed to perform the CRS on their selected treatment shoulder. Therefore, the participants each served as their own control. Goniometric measurements were taken for internal rotation (IR), external rotation (ER) and horizontal adduction (HA) prior to intervention and up to 24 hours following. Paired T-Tests with Bonferroni adjustments were utilized. A significant ROM difference in IR of the stretched shoulder from pre to immediately post measurements (p=.014), post to one hour (p=.033), and post to 24 hours (p=<.005) was found. Furthermore, a subsequent change in HA from immediately post to six hours (p= .030) and immediately post to 24 hours (p=.033) was found. No difference was detected in ER. CRS improved IR and HA ROM immediately following stretch and returned 24 hours later (IR pre mean value = 48.000, immediate post =52.031, and 24 hrs post =45.750; HA pre mean value = 6.843, immediate post =9.625, and 24 hrs post = 7.000). Due to this research we would recommend that posterior shoulder stretching be implemented more than once in a 24 hour period for optimal benefits which includes increased ROM.
Peripheral artery disease (PAD) characterized by atherosclerotic blockages of the arteries supplying blood to lower extremities and affects approximately 10 million lives in the United States. Patients diagnosed with PAD have increased risks of limb loss and mortality. The classic symptom of PAD is intermittent claudication (IC), defined as walking-induced calf pain and gait dysfunction relieved by rest. In more advanced disease (critical limb ischemia), the patient experiences pain at rest and/or tissue loss. Functional testing, such as the ankle brachial index (ABI), measured as the ratio of systolic blood pressure in the ankle to that in the arm, is the most common test for the diagnosis of PAD. The ABI can identify reduced blood flow (due to blockages in the arteries) based on blood pressure differences. However, there is a need to measure more than just abnormal blood flow, there is a need to measure the secondary effects on the end organ (skeletal muscle). In this study, we evaluated the hypothesis that differences in muscle elemental composition correlate with clinical diagnosis and may be used to characterize severity of muscle damage. The objective of this study was to compare elemental composition including sodium, potassium, calcium, magnesium and sulfur in myofibers of gastrocnemius biopsies from control subjects and PAD patients at different stages of disease. We evaluated gastrocnemius biopsies from three subjects including one control (person without PAD), one claudicating patient (ABI<0.9) and one critical limb ischemia patient (ABI<0.4). Using a scanning electron microscope and energy dispersive X-ray spectroscopy (EDS), differences in elemental concentrations between control and PAD muscle samples were quantified. In total, 15 myofibers were analyzed, 5 from each tissue specimen. An analysis of variance was performed to identify significant differences in muscle elemental concentration. A statistical analysis of variance revealed significant differences in elemental concentrations for sodium (p=0.0001), potassium (p=0.0094), calcium (p=0.003), magnesium (p=0.0001) and sulfur (p=0.004) among control, claudicating and critical limb ischemic muscle samples. Scanning electron microscopy and EDS were able to characterize changes to the elemental concentration in PAD muscle, which correlated with clinical diagnosis of PAD. These findings may aid in providing a foundation for the development of specialized preventive and rehabilitative treatment plans by providing new targets for treatment based on the underlying altered elemental concentrations.
Optimizing Nurse-staffing Strategies for Inpatient Settings Using a Stochastic Modeling Approach

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The Health Resources and Services Administration (HRSA) projects a shortage of 5,900 registered nurses in the state of Kansas and a deficit of 36 percent nationwide by 2020. The national nurse shortage along with rising patient acuity levels have led to an increase in nurse workload, causing nurse workforce to experience high levels of burnout. There is growing concern that nurse burnout could adversely impact the quality of care provided. Consistent evidence from observational studies suggests that inadequate nurse staffing in hospitals and heavy nurse workload threaten patient safety and quality of care. According to the Agency for Healthcare Research and Quality (AHRQ), every additional registered nurse per patient is associated with a risk reduction in hospital-related mortality by 9 and 16 percent in intensive care and surgical units, respectively. To address this issue, hospitals often use recommended nurse-to-patient ratios to staff different inpatient units. However, patients in a unit may have different acuity levels based on the severity of care needed. This may impact the staffing needs of the unit potentially rendering a fixed nurse-to-patient ratio ineffective. In this study, we quantify the impact of patient acuity on staffing needs of an inpatient unit and develop nurse-staffing strategies that take this effect into account. In particular, a stochastic model is proposed and solved to quantify the trade-off between the staffing level of the inpatient unit and different performance metrics such as the probability of excessive delays in providing care, which are used to measure the extent of timely delivery of patient care. Healthcare managers can use the information provided by the model to identify the staffing level that yields the desired trade-off between all metrics for a given patient mix. The proposed model will capture the uncertainty associated with the volume and duration of care for different acuity levels. This will be achieved through the application of queueing theory and discrete-event simulation techniques. The results obtained from applying the model to an inpatient unit demonstrate that patient acuity may greatly impact the staffing needs and that fixed nurse-to-patient ratios can lead to inadequate staffing levels.
Driving While Reading Using Google Glass Versus Using a Smartphone: Which is More Distracting to Driving Performance?

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Reading text on a phone while driving leads to impaired driving performance. This impaired performance could possibly arise in part from the visual distraction caused by looking at the phone instead of the road. Wearable devices, such as Google Glass, might also impair driving performance, however to a lesser extent than a smartphone. By displaying information in a more accessible manner, visual and manual distractions are less pronounced. This study compared reading text using Google Glass or a smartphone while completing a simulated naturalistic driving task. When using Google Glass, drivers exhibited less lane variation and fewer lane excursions, but their driving performance was still impaired. The results show that reading text using Google Glass may impair driving performance to a lesser extent than reading text using a smartphone.
Unique Considerations of the Older Adult Trauma Assessment

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Trauma is the fifth leading cause of death among individuals over the age of 65 years, and this population is expected to double by the year 2050. As the number of older adults increase, so will the number of patients in this age group that suffer injury. Older adult trauma assessments are complicated by altered physiology, co-morbidities, and polypharmacy, which eventually alter the utilization of diagnostic studies and subsequent outcomes. As people age, body systems experience a decline in function resulting in slower physiological responses to injury. Preexisting co-morbidities, which are found in approximately 60% of the older adult population, also pose challenges in adult trauma assessments. These preexisting chronic diseases require patients to be on many different medications, including: beta-blockers, anticoagulants and corticosteroids that alter physiologic response to injury and impact medical evaluation. Current knowledge regarding proper assessment of older adults who suffer injury may not be sufficient to maintain functional status and reduce mortality in this population. Older adults run a significant risk of sustaining functional deficits and death from a traumatic event because of physiologic changes that occur with aging and the additional confounders in these patients. This article is to aid healthcare providers in understanding the unique characteristics of older adult trauma patients and point out the need for further research in this area of trauma.

This research is based on a comprehensive literature review of MEDLINE and CINAHL.

The complexities of aging confound the physical examination and triage processes in older adult trauma patients, leading to the improper utilization of diagnostic tools and possible undertreatment. It is speculated that some of this disparity is due to a lack of training in gerontology and underutilization of protocols involving the older adult fall patient. An understanding of the physiological changes of aging, the confounding factors unique to older adults, and the specific injuries associated with older adults is critical in the proper assessment of their injury. To decrease mortality in this population, additional training in gerontology improves outcomes, and thus, will prove necessary in the coming years. More research is needed to provide clear guidelines to be used in older adult patients who sustain traumatic injuries.
Analytical Model of the Van Allen Radiation Proton Flux for Applications in Low-Thrust Trajectory Optimization

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As electronic propulsion systems such as ion thrusters, arc jets, and Hall thrusters become more powerful and able to produce more thrust, they become a much more enticing mechanism to transfer a spacecraft from an initial injection orbit to its final orbit. This means that designers and operators will be able to utilize electric propulsion in order to drastically improve fuel efficiency and by extension make lighter payloads. However, with this increased fuel efficiency there is also a few drawbacks, mainly in that the lower thrust generated by the electric systems require a much longer time-of-flight to move from the lower initial orbit to the higher goal orbit. This longer time spent in the transit introduces a new wrinkle when it comes to calculating the optimal transfer trajectory and is due to the presence of the Van Allen radiation belts. As the spacecraft moves through these regions that surround Earth, it is impacted by thousands of particles which can damage the exposed solar arrays, limiting the amount of power that is able to be generated and therefore decreasing the amount of thrust produced. Chemical propulsion fueled transfers minimize the effects of solar array degradation due to the particles within the Van Allen belts by firstly utilizing a very quick transfer time and secondly by keeping the solar arrays stowed and shielded during the transfer. Lowering of power output capacity and therefore lowering of maximum available thrust will also lead to longer transfer times which lead to more damage and so on. In order to more accurately account for this in an all-inclusive optimization scheme, numerical data is taken from the latest available source, the newly released Ap9/Ae9 measurements, and is then used to determine a simple analytical expression for use within the optimizer that will allow for quicker computation and more accurate trajectory designs. Communications satellites, due to their large power requirements to perform their mission, can possibly support the use of multiple thrusters during the transfer when power generation for its mission is not necessary, making them ideal candidates for all-electric orbit raising. Due to this, the application for this method will be limited to transfers ranging from Low Earth Orbit (LEO) to Geosynchronous Orbit (GEO).
Machines

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I have a fascination with analog technologies in how they work and also in how we relate to them. They require a certain amount of physical interaction and care for them to be used. Through the design and construction of these machines, I have found a renewed appreciation for the design, execution and complication of these technologies.

Art throughout time has largely been viewed at a distance. It is studied and looked at, yet engagement has only been a recent development in the art experience. I use analog technologies such as drawing machines that use pulley systems and wheels to make the mark on the paper and phonographs that make sound. I build these machines to not only create a dialogue with the viewer visually but to also have an all-encompassing experience through the use of sound and movement as well as touch.

Clay is a medium of tactility. Through the use of cups, bowls, and other utilitarian vessels, ceramic objects have been a catalyst for experience. These vessels set the tone for conversations and interactions that bring art to our daily lives. With my sound machines, I have taken the ceramic object and turned it into a sound object or a record. The goal here is to create a different exchange of ideas through the repurposing of an old material.

I am using these mechanisms that make sound and marks that create an all-encompassing understanding. The goal with these machines is to imbue the art experience with life. The creation of these devices also allows us to question our existence in relation to others through the interactive process.
Tool Rake Face Temperature Distribution by Near Infrared Thermography While Using YAG Tools to Machine Ti6Al4V

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Ti6Al4V is the most commonly used titanium alloy in the aerospace, automotive, chemical, and biomedical industries. The alloy is attractive due to its high strength to weight ratio, corrosion resistance, and compatibility with the human body. However, the alloy has poor machinability due to severe abrasion, which leads to short tool life. Among efforts that have been undertaken to optimize the machining of this alloy stands out the use of computer simulations. These simulations may allow determination of process conditions that result in longest tool life. To be useful, however, these models have to be validated experimentally. Typically, model validation involves the measurement of cutting forces and chip thickness, and neglects critical outputs such as tool temperature and its distribution. Out of these neglected outputs, the temperature distribution at the tool rake face is the most difficult to obtain, since normally this face is not accessible to the necessary instruments. During the course of the research to be presented herein, access to the tool rake face was obtained with the use of optically transparent, very hard Yttrium Aluminum Garnet (YAG) cutting tools. A novel technique, called near infrared thermography was implemented to measure the full field distribution of the rake face temperature while machining Ti6Al4V over a wide range of conditions spanning industrially typical speeds and feeds. The expectancy is that the data can be used to produce better machining models for process optimization. The YAG tool wear performance was evaluated to obtain preliminary data about their potential as an industrial cutting tool material. It was found that peak temperature along the tool rake face is in the order of 1000°C and occurs at a distance from the cutting edge of 1 to 1.5 times the feed. It was also found that after half a meter of cutting the depth of the crater on the tool rake face formed by wear is typically less than 10 micrometers.
Consistency of Coach’s Eye (TechSmith Corp) for Assessing Elbow Flexion Compared to Range of Motion Values by Goniometry

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Introduction: Coach’s Eye is a 2-D motion analysis mobile application. Sport coaches commonly use the app to measure movement and joint range of motion angles. Its validation has been previously reported in comparison to a 3-D motion analysis system and showed to be a poor alternative to measuring hip flexion.

Purpose: The purpose of this study was to compare the Coach’s Eye analysis to goniometry using reflective markers to identify joints.

Methods: Prior to recording it was made sure that the plane of motion was parallel to the recording device. 15 subjects performed elbow flexion thrice recorded by the app (on an iPad [Apple Inc]). The anatomic landmarks marking the fulcrum and lever arm boundaries are marked by fluorescent paper markers based on the rules of goniometry. Snapshots of the movement to be measured were taken and lines connecting the fluorescent markers were drawn using a capacitive stylus followed by measuring the angles between them. Simultaneously joint angle data was measured with goniometry by an experienced physical therapist. Statistical analysis was done on the joint angle values obtained by goniometry and Coach’s Eye.

Results: A paired sample t-test determined that there was no significant difference between methods of measurement.

Conclusion: The 2D app demonstrated excellent reliability and appeared to be a responsive means to detect clinical change when a reflective marker at the measured joints is used. For both the methods the only limiting factors for accuracy seem to be identifying anatomical landmarks and connecting them either with the goniometer’s arms or with lines drawn in the app. This study shows that Coach’s Eye can be used to measure joint range of motion values with accuracy on par with goniometry when reflective markers are used. Further studies are warranted to establish it as a clinical tool.
Development of a Fall Risk Reduction Toolkit for Latino Older Adults across Kansas

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Introduction: Falls are a significant cause of morbidity and mortality among older adults. Many falls are preventable by increasing physical activity, reviewing and modifying medications, identifying vision problems, and modifying home safety. In 2010, Radebaugh et al. developed the Falling Less in Kansas (Falling LinKS) Toolkit, an education resource of evidence-based fall prevention and awareness strategies. The Toolkit was developed using a community-based participatory research approach tailored to the preferences of older adults in rural Kansas communities. Soon after, rural Latino older adults were identified as an underserved population with regard to fall prevention materials. Studies suggest involving members of a minority community in the development of written materials in their language is essential to the translation process, and is often overlooked.

Purpose: The purpose of this study was to develop a culturally relevant Spanish version of the Falling LinKS Toolkit tailored to Latino older adults in Kansas. The intent of the Spanish-version Toolkit is to reduce disparity in healthcare education and reduce falls among Latino older adults in Kansas.

Methods: This study employed a mixed methods approach of qualitative focus groups and quantitative survey data. Spanish language focus groups were conducted with two samples of Latino adults over age 50 (n = 15 urban participants and n = 5 rural participants). Inductive thematic data analysis was used to evaluate results for readability, usability, aesthetic appeal, cultural relevance and linguistic fluency. A previously published, Latino-specific survey was adapted and administered to learn about participants’ fall history, risk factors, and attitudes.

Results: Eighty-eight percent of participants agreed that lifestyle changes and exercise would reduce fall risk, while 76% viewed falls as unpreventable accidents. Self-identified falling risk factors included dizziness, wearing sandals, and uneven walking surfaces. Overall, participants agreed the Toolkit was practical and user-friendly, and liked the home exercises and medication information sections. Participants also recommended including a discussion of dizziness and fall risk prevention, and safe footwear in inclement weather.

Conclusion: Focus group and survey feedback will guide creation of a culturally-relevant Spanish version of the Falling LinKS Toolkit for Latino older adults across Kansas that extends beyond literal translation. We hope this Toolkit will be extensively utilized and ultimately reduce the incidence of falls among Latino older adults.
Kinematic Analysis of Human Rolling

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Rolling is an important developmental motor skill that not only affords comfort but also injury prevention. People who cannot roll, whether due to age or disability, are at greater risk of developing bedsores. People use different techniques to roll. For example, some people use their arms to arms to roll whereas others do not. The purpose of this study was to identify which rolling technique requires less mechanical energy.

For this study, data were collected from ten healthy college-aged subjects (male to female ratio 6:4) by a video-based motion capture system (Motion Analysis Corp., Santa Rosa, CA). Subjects laid on a firm surface in the supine position and rolled to their right into a side-lying position under two conditions, i) arms uncrossed (free to move naturally) and ii) arms crossed over the chest (to mimic arms not used in rolling). Five trials were collected for each type of rolling and for each subject, resulting in 100 trials total. Data were then imported into biomechanics simulation software (OpenSim) to calculate the centers of mass (COM), linear (v), and angular velocities (ω) of the body segments. The potential and kinetic energy of the body segments were calculated to determine the mechanical energy of rolling for both techniques. A statistical analysis (two-factor repeated measures ANOVA (α = 0.05)) was performed to identify differences in mechanical energy between the two rolling conditions.

![Figure 1: Mean mechanical energy for rolling with the arms crossed and uncrossed. Error bars represent ± 1 standard deviation.](image)

The mechanical energies for rolling with the arms crossed and uncrossed were 60.1 ± 12.1J and 72.6 ± 13.8J, respectively (Figure 1). The statistical analysis indicated that there was a significant difference (p = 0.007) between the mechanical energy measures for rolling with the arms crossed and uncrossed. The mechanical energy was lower for rolling with the arms crossed than with the arms uncrossed. This information could be useful to individuals and care providers for individuals who have difficulty rolling.
Exploring the Role of ABA in Plant Defense Against the Necrotrophic Pathogen *Macrophomina phaseolina*

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*Macrophomina phaseolina* is a major agricultural pest causing reduced crop yield across many continents including Asia, Europe, North, and South America. As a necrotrophic fungus, *M. phaseolina* destroys plant tissue to acquire nutrients, causing the disease charcoal rot in many plant hosts including agriculturally important legumes such as soybean and alfalfa. Charcoal Rot leads to leaf yellowing, root rot, and eventually plant death in infected plants. The disease can result in significantly reduced crop yield especially during hot and dry years when plants suffer from drought stress.

Plants can respond to drought stress with guard cell closure, effectively limiting water loss. This process is driven by the phytohormone abscisic acid (ABA) which is produced in drought stressed plants to induce drought tolerance. ABA-treated plants are more tolerant to drought stress, whereas, plants defective in ABA synthesis or ABA signaling are susceptible to drought. However, the effects of drought resistance on infection are unclear, as some drought resistant cultivars of soybean have demonstrated partial resistance to *M. phaseolina*, and others show increased susceptibility. To investigate if promoting a drought response using exogenous ABA application may aid in plant defense against *M. phaseolina*, plants of the model legume *Medicago truncatula* were grown in a sterile environment on media containing varying concentrations of ABA. Using *M. phaseolina* infected wheat seeds; plants were inoculated with the pathogen and then observed for the development of chlorotic and necrotic tissue as a measure of disease severity. Anova analysis and Tukey’s honesty significance test of this data suggest that treating plants with low doses of ABA (10-20 µM) significantly accelerated disease progression, suggesting that ABA production and signaling may be detrimental to plants infected with *M. phaseolina*.
Influence of Negotiation and Practice Setting on Salary Disparities between Male and Female Physician Assistants

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Background: The gender gap has been reported in many professions. Analyses of national salary figures between male and female physician assistants (PAs) have been published. Starting salary differences can have a compounded effect on one’s lifetime career earnings as can number of hours worked per week, years of experience, practice specialty, and location of practice setting (rural vs urban). Evaluations of differences in practice settings and negotiation strategies on starting salary outcomes and the role gender may play in these differences have not been fully investigated. If gender is associated with willingness or likeliness to negotiate, use of more or less effective negotiation strategies, or choice of practice setting, this could partly explain the gender gap.

Purpose: Investigate associations between gender and willingness or likeliness to negotiate, use of more or less effective negotiation strategies, choice of practice setting and salary.

Methods: A list of all registered active PAs licensed in KS and practicing in KS, MO, OK, CO, or NB were obtained from the Kansas Board of Healing Arts (n=912); email address were available for 437 of these. The survey asked direct questions regarding age, gender, years of experience, hours worked per week, practice specialty/setting, community size, current salary and benefits, and previous experience with negotiation. A 31-question, previously published, validated, Likert scale survey was used to measure the likelihood of using different negotiation strategies (collaborating, competing, compromising, accommodating, and avoiding). The study was approved by the WSU IRB; completion of the survey indicated consent. Descriptive data are reported as means, standard deviation, frequencies, and percentages. Data were analyzed using t-test, Chi-square and Spearman rank tests as appropriate.

Hypothesis Statement: Lower annual salary among PAs will be associated with female gender, lower willingness and likeliness to negotiate salary, use of less effective negotiation strategies, and choice of practice settings typically associated with lower salaries.

Benefits of Research: There is evidence that negotiation skills can be learned and practiced. Assuming that awareness of one’s willingness to negotiate or one’s choice of negotiation strategies can lead to the ability to change, the results of this study may support development of education and training to reduce the gender salary gap. Currently practicing PAs and new graduates may benefit from this knowledge and awareness through negotiation of economically fair employment contracts regardless of gender and although this research is aimed at PAs, results could be extrapolated to a number of other professions.
Assessment of Arterial Function Recovery after Surgical Revascularization in PAD Patients with Micro-Vascular Insufficiency using Computational Model Analysis

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Peripheral arterial disease (PAD) is characterized by atherosclerotic blockages of the arteries supplying blood to the lower extremities, which cause a progressive accumulation of ischemic injury. Despite revascularization treatment intervention some PAD patients require follow up secondary treatment due to a continued decline in limb function, quality of life and walking parameters. Standard revascularization surgical procedures restore blood flow in the main arteries via bypass surgical grafting. Nutrient transport and oxygen transfer take place at the level of the microvasculature and capillaries. However, an assessment of the microvascular circulation is lacking. Microvascular dysfunction, a ‘no flow’ phenomena that may occur at the level of microvasculature, may impair tissue oxygenation as well as nutrient transport and may therefore be a contributor to the continued decline in limb function and walking parameters. Microvascular dysfunction may be one of the dominating factors to be studied to understand the failure of the arterial function recovery. Multi-physics simulation software was used to model the phenomena to assess the effectiveness of the standard lower limb revascularization treatment in PAD patients who may have microvascular dysfunction. Typical invasive revascularization surgery using artificial bypass grafts to restore blood flow may fail to be effective if the PAD patient has microvascular dysfunction. This model identifies the need to measure the microvascular circulation in the compromised limbs of PAD patients to optimize diagnosis and treatment strategies that reflect the underlying pathophysiology.
Fluid Structure Interaction (FSI) Modeling of Abdominal Aortic Aneurysm (AAA) Growth Rate

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An abdominal aortic aneurysm (AAA) occurs when there is a bulge formed in the large blood vessels that supply blood to the abdomen, pelvis, and legs. Abdominal aortic aneurysms pose a serious risk of rupture and can be life-threatening. Diagnosis of a life-threatening AAA is based on measuring the diameter of the enlarged aorta. The diseased aortic wall is characterized by an intraluminal thrombus (ILT), which is deposition of fatty acids, leads to narrowed aorta blood vessel, and creates high pressure in the aneurysm sac. The objective of this study was to model the growth of the aneurysm, by combining medical imaging and computational fluid dynamics (CFD) in a time dependent study to determine wall stress, deformation, and fluid flow dynamics over a certain period of time. This model may aid in clinical decision making to determine the optimum time for surgical intervention by providing patient specific aneurysm growth-rate data to avoid potential premature aneurysm rupture. A CT scan from an AAA patient was reconstructed into a 3D CAD file, exported into multi-physics simulation software and simulated as a fluid structure interaction model. Hypertensive blood-flow was simulated in the aorta wall, modeled with degradation of aorta wall material properties over time using the Holzapfel Ogden strain energy equation. The deformation in the wall over time was plotted using the time dependent study to predict the growth for the enlarged diameter. The results indicate that vortex formation, in the aneurysm sac, creates circulation zones and promotes fatty acids deposition on the aorta wall for ILT formation. Combining the results of wall deformation along with wall stress and blood velocity with respect to time, the model was able to estimate the growth of the AAA and predict a time to rupture.
Attitudes of Vietnamese Americans Concerning Communication Disorders

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Health care professionals are increasingly challenged when providing patient-centered care for individuals from culturally and linguistically diverse backgrounds as the demographics continue to change in the United States. This is uniquely challenging for professionals providing care to persons with communication needs. In this study, a survey was conducted to assess the attitudes of Vietnamese Americans concerning communication disorders.

Method: Survey responses of 73 participants from Vietnamese backgrounds were analyzed according to three adult age ranges: youngest (18-20 years), middle (21-27 years), and oldest (32 years and older). Questions were asked to determine possible attitudes toward (1) communication disorders and (2) potential hindrances in seeking services for communication disorders. Ten questions were utilized to survey participants' attitudes toward communication disorders. A total attitude score was calculated by averaging the means of the ten questions. Three questions were used to survey possible hindrances in seeking health care and a total hindrance score was calculated. Descriptive and comparative statistics were used for comparisons of participants’ attitudes.

Results: Total attitude scores across all three age groups revealed generally positive attitudes regarding communication disorders. Statistical testing revealed that the middle age group had significantly more positive attitudes than the oldest group concerning specific attitudes (e.g., individuals with speech disorders should not be ridiculed, are not less intelligent, and should not be hidden from other people). Results on the hindrance questions indicated that there were significant differences between the oldest participants and the other two groups. The youngest and middle groups responded similarly, stating that financial, ethnic identity, and language barriers did not deter them from seeking health care services for communication disorders; however, the oldest group indicated that these factors might be barriers.

Conclusions: There is a need for health professionals to be knowledgeable in order to appropriately serve clients from diverse backgrounds. In this study, individuals from Vietnamese backgrounds tended toward more positive attitudes toward communication disorders. In addition, the oldest group noted that there may be barriers to receiving health care services for communication disorders. With this study, professionals may have an increased understanding and knowledge when providing care to individuals and families from Vietnamese backgrounds.
Effects of Muscle Fatigue on Proprioception in the Elbow Joint of Both the Upper Limbs

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Proprioception is a cumulative neural input to the Central Nervous System from specialized nerve endings called mechanoreceptors. The brain unconsciously utilizes this to provide constant sensory input to achieve desired movements. Fatigue on the other hand is defined as the inability of the muscle to produce minimum power output to complete a full range of motion and the reduced functional capacity due to fatigue increases the perception of task completion.

Purpose: The purpose of the present study was to evaluate the effects of muscle fatigue on proprioception in the elbow joint of 28 college-aged individuals (12 males and 16 females; 24.64 ± 3.2 years).

Methods: The subjects were seated with eyes-closed, passive and active elbow flexion angles were measured before and after weighted arm curls that continued until muscle fatigue resulted. Pre and post joint angles were measured with goniometry (123.86 ± 3.47 and 130.46 ± 11.94 degrees, respectively). SPSS software was used to run a paired sample t-test to measure the errors in joint angles.

Results: Findings suggest a significant difference (p=0.004) in proprioceptive recall of arm position following muscular fatigue. Suggesting that muscular fatigue may influence a person’s perception of where their limb may or may not be positioned but interestingly found no statistically significant difference while dominance of the limbs was taken into consideration.

Conclusion: Our results suggest that once a mobility muscle reaches fatigue, the unconscious ability to recall a previous body position is significantly impaired. A better understanding of the neurological factors of fatigue and its effects on proprioception has the potential to be a useful tool for injury prevention and performance enhancement.
Prevalence of Urinary Incontinence in High School and Middle School-Aged Female Athletes

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Purpose: The purpose of this study is to determine the prevalence of urinary incontinence (UI) in middle school and high school-aged female athletes in order to implement preventative education in the future, as well as to determine the association between prevalence and quality of life. This study also investigates whether or not the young athletes that do experience UI have ever received formal training in pelvic floor exercises that have been previously proven as effective in the treatment of UI.

Methods: The study includes 49 middle school and high school aged female athletes. Permission was granted from the parent/guardian(s) through consent forms as well as from the subjects themselves through assent forms. Once consent and assent were granted, a second meeting with the team was scheduled to administer the survey, which consisted of the ICIQ-FLUTS questionnaire as well as one created by the investigators titled “Female Urinary Incontinence Survey.” Furthermore, prevalence of urinary incontinence and the effect it has on quality of life was investigated.

Results: Among the 49 participants, 27 young women (55.1%) reported urinary leakage. The mean age was 15.6 (± 1.3) years of the total participants and 15.6 (± 1.1) years for those that reported leakage. Of the 49 participants, 26 played volleyball with 16 out of 26 (61.5%) reporting leakage; 25 played basketball with 14 out of 25 (53.8%) reporting leakage; 12 played softball with 5 out of 12 (19.2%) reporting leakage; 7 played track field events with 5 out of 7 (19.2%) reporting leakage; 4 running track with 2 out of 4 (7.7%) reporting leakage; and 9 participate in other sports including swimming, rodeo, cheer, and soccer with 4 out of 9 (15.4%) reporting leakage. Out of those reporting leakage (27), 17 (63.0 %) reported feeling embarrassed, 4 (14.8%) reported feeling afraid, and 5 (18.5%) reported feeling bad about themselves. Among the young athletes that reported UI, 55.6% reported no previous education on the performance of pelvic floor exercises (Kegels) in order to prevent the occurrence of UI.

Conclusions: The study found that there is a prevalence of urinary incontinence in middle school and high school aged female athletes. This in turn has a negative effect on the quality of life of these young female athletes causing them to feel embarrassed, afraid, and bad about themselves. Because the study showed that urinary incontinence is occurring at such a young age and that many of these young athletes have never been educated in Kegels, a preventative education program is now being developed in order to enhance the quality of life of these young female athletes.
The Effects of Persistent Asymmetrical Tonic Neck Reflex (ATNR) on Reading Scores in First and Second Grade Children

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This study examined the relationship between a presence of a retained Asymmetrical Tonic Neck Reflex (ATNR) and its effect on reading scores of local first and second grade children. The ATNR, a primitive reflex seen in infants and normally integrated by 6 months, may be present in children up to age eight. ATNR’s retention is associated with certain learning disabilities, behavioral dysfunctions and motor maturation delay. These developmental deficits can also affect reading and motor skills including hand-eye coordination, left-right integration, visual tracking, and the ability to control the hand when writing.

A collection of standardized reading test scores was obtained from 66 first and second grade students. The student sample was additionally tested for ATNR retention level by a licensed school physical therapist. The school from which the participants were selected utilizes the AIMSWeb standardized test to assess student reading levels. This standardized test, at a basic level, measures the number of words a student can correctly read per minute. The AIMSWeb test efficiently and accurately measures a student’s progress because it is time efficient to administer and produces results that intuitively reflect increase in ability. A modified testing procedure was performed by the school physical therapist to obtain a score related with a gradation of ATNR retention level.

The findings showed that there was a significant relationship between total ATNR scores and reading in first grade participants. Those who demonstrated a more integrated reflex, or a higher ATNR score, showed fewer errors and a higher accuracy on the AIMSWeb reading test than those with a more persistent ATNR, or lower ATNR score.

The literature is equivocal as to the association between presence of the ATNR in first and second grades and their reading scores. The results support the findings of previous research demonstrating a link between ATNR retention and a lower reading score. These findings suggest that further research is needed in order to establish an effective integration program.
Establishing an effective pre exercise routine is important when taking on physical activity.

Purpose: The purpose of this study is to examine and compare the acute effects of static and dynamic stretching during warm-up on the performance of the participants with respect to balance and agility.

Method: This study was conducted on adult untrained males between the ages of 18 and 30 years. Fifteen subjects (N=15) volunteered to participate in this study. Before onset of test protocol, participants were explained the procedures of testing and training over three sessions, which was performed on three different days within one week. They were instructed to begin with a three minute warm up jog on each day of testing followed by either non stretch routine (session 1), static stretch routine (session2) or complete a dynamic stretch routine (session 3). After completion of warm up routines, individual’s balance and agility were tested. To measure balance, subjects were asked to complete a 30 seconds static stability on Bosu while standing single-leg. Agility was measured by timed Nebraska agility drill.

Results: Mean differences across conditions were analyzed using a within subject repeated measure ANOVA. If a significant interaction effect was detected, BONFERONNI POSTHOC testing was used to determine mean differences between conditions. Statistical significance was set at p<0.05. Furthermore, COHEN'S D effect sizes were run to determine the size of the effect between conditions. Dynamic stretch and static stretching warm up had a significant effect on agility and balance performance compared to no stretching. However, static stretching had no remarkable effect on balance in comparison to no stretching, but it did influence agility. Dynamic versus static warm-up group performed similarly statistically but based on effect size analysis, the dynamic group had larger effect size than static.

Conclusion: This study reported similar outcomes to those previously published on the effects of stretching on balance and agility that used laboratory equipment. We showed that similar results can be produced by applying low cost field assessment.
Synthesis and Characterization of Ruthenium Complexes as Catalysts for PCET (Proton-Coupled Electron Transfer)

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PCET (Proton-Coupled Electron Transfer) is a process carried out in photosynthesis, but has not been duplicated successfully with materials synthesized in the laboratory. One solution is to exploit the electron transfer capability of photoexcited ruthenium(II) heterocyclic ligand complexes by modifying the ligand with a pendent uracil component capable of both electron and proton transfer. Uracil, is an aromatic heterocyclic organic compound, contains more than one atom with available electrons. Thus, it is capable of electron donating. Moreover, the two hydrogen atoms attached to the nitrogen atoms at position 1 and 3 in the ring, in uracil are also, available for proton transfer. The newly designed complex would then be capable of simultaneously transferring electrons and protons to a substrate such as molecular oxygen to form water. Step one in this project to synthesize the modified ruthenium(II) complexes and characterizing them by various techniques in the laboratory is underway and step two would involve examining the complexes for simultaneous electron/proton reactions.
Effect of In-Plane Fiber Tow Waviness in the Strength Characteristics of Different Fiber Reinforced Composites

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The purpose of this study was to investigate the strength and effectiveness of certain composite materials when induced with 'in-plane fiber tow waviness' in a composite ply. Fiber waviness is usually induced by infusion processes and inherent in fabric architectures. Composite structural details like ply drops and ply joints can cause serious fiber misalignment. These are usually dependent on parameters such as ply thickness, percentage of plies dropped, and location of ply drop, the gap between the plies, mold geometry and pressure, and pressure of the resin which slides the dry fibers during resin transfer molding process. Fiber disorientation due to fiber tow waviness in 'in-plane' direction has been the subject of recent studies on wind turbine blade materials and other aerospace laminates with reports of compression strengths and failure strains that are borderline, depending upon the reinforcement architecture, matrix resin and environment. Waviness is expected to reduce compressive strength due to two primary factors. The fibers may be oriented in such a way that the geometry that results because of the orientation may exacerbate the basic fiber, strand, or layer buckling mode of failure. The waviness could also shift the fiber orientation off the axis of the ply longitudinal direction which eventually results in matrix dominated failures for plies normally orientated in the primary load direction (00). The longitudinal tension and compression behavior of unidirectional carbon fiber composite laminates of different materials (different grades of carbon, glass and Kevlar with different resins) were investigated using finite element analysis tool ABAQUS. Both global and local stress and strain values generated by the finite element model were validated by the traditional mechanics methods using ply/local stiffness matrix and global/reduced stiffness matrix. A precise geometry of waviness on different materials was modeled with different wave severity factor and a parametric study was conducted. Three different defects were modeled where the angle of misalignment ranged from 5 to 15 degrees with a wavelength ranged from 1 inch to 1.5 inch and amplitude which ranged from 0.03 inch to 0.1 inch. This revealed the effect of 'in-plane fiber tow waviness' on the stress distribution and loss of strength in carbon-reinforced composite materials. The results clearly show that the effect of 'in-plane fiber tow waviness' leads to resin rich areas which causes high stress concentrations and decrease in the strength ratio, leading to delaminations, and damage of the composite panels that are unacceptable for applications that require prolonged environmental exposure and stress cycles.
Injectable Hydrogel Provides Growth-Permissive Environment for Human Nucleus Pulposus Cells

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Intervertebral discs within the human spine act as shock absorbers between each of the vertebrae in the spinal column. As we age, disc cells are constantly subjugated to degenerating stress by various mechanical and environmental factors leading to musculoskeletal impairment and lower back pain. Nucleus pulposus cells (NP cells), jelly-like avascular tissue within the middle of the intervertebral disc, are the crucial component of the disc and the starting point for disc degeneration. Research into regenerating the NP cells in degenerating intervertebral discs may provide a breakthrough in treating spine disorders. This experiment is designed to fabricate and characterize hydrogel composites to investigate the growth and viability of human nucleus pulposus (HNP) cells and the gene expression of the extracellular matrix by the HNP cells in the hydrogel. Specifically, we tested collagen type II and hyaluronic acid hydrogels cross-linked with the ethyl-3(3-dimethylaminopropyl) carbodiimide (EDC) and N-hydroxysuccinimide (NHS) crosslinker. The hydrogels were cross-linked using varying concentrations of the crosslinkers. The hydrogel without the crosslinker was used as the control. HNP were seeded into crosslinked and non-crosslinked hydrogels. Results from live/dead assay and alamar blue assay showed cell growth and proliferation in both crosslinked and crosslinked hydrogel. Cell cultured in EDC cross-linked hydrogel exhibited amplified proliferations. Quantitative PCR assay demonstrated the gene expression of extracellular matrix by the cells cultured in non-crosslinked gel and the crosslinked gel. The results of gene expression study indicated the adaption of cells to the environment after long term cell culture in these hydrogels. This study suggests that the type II collagen-HA hydrogel and crosslinked hydrogel with EDC at low concentration is permissive matrix for the growth of HNP cells and can be potentially applied in the NP repair.
Computer Availability Tracking System

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Traditional methods of determining a computer’s availability are time consuming to the users in the library. Remotely checking the computer’s availability needs to have an application which displays the status of the computer, i.e., whether it is available or busy and also gives the corresponding location of the computer. Computer Availability Tracking System (C.A.T.S) is an in-house developed online application designed to track the computer availability that grants students a complete tracking functionality of available computers. It is designed specifically to accommodate student needs and to assist them accordingly. Static IP addresses are fixed and are mostly used in real time application like VoIP protocol. In a DHCP (Dynamic Host Configuration Protocol) environment, IP addresses are dynamic. Dynamic IP addresses may change each time a user logs in by their computer name. It enables the users to bootstrap into the computer with ease and it allocates the IP addresses dynamically. C.A.T.S database has the updated IP address that pings by using the name of the computer by its corresponding IP address. The final result gives a computer availability map with added backend logic SQL server and scripting functionality with ASP.net and C#. C.A.T.S is built to assist the needs of the students by tracking and displaying the status of the computer in the library.

Designing of the availability maps includes creation of a database with SQL server 2008 R2, and running a C# program on client computers in background that updates the IP addresses in the database at regular intervals of time. Designing includes panel, update panel, timers and image buttons that are done with the ASP.net scripting language. In addition there is a feature to check the list of available software in that particular PC. The tracking system has an available palette of 3 colors, which gives information of the system as to whether it is available, busy or malfunctioned. Besides, glitches in the computer are known by this tracking system. So C.A.T.S is an efficient as well as an easier approach to find the status (availability) of a computer. Future work will address the implementing of last login time and duration of a system when it is busy.
Coping With Pests: Variable Responses of Grassland Species to a Native Soil Pathogen

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Understanding the mechanisms that influence plant species diversity is critical to sustaining current levels of biodiversity. It is now recognized that soil microbial communities impact plant species interactions, but most studies have focused on mutualists such as mycorrhizae and rhizobium, while soil pathogens remain poorly understood. To address this bias, we tested the response of 17 plant species to the native, fungal pathogen *Macrophomina phaseolina*, the causative agent of charcoal rot disease. Species selection was based on anecdotal reports of genera susceptible to infection and common grassland plants in the area. Additionally, these species represented the three most common plant functional groups (graminoids, legumes, non-leguminous forbs) and all species were native to Kansas grasslands with the exception of *Lespedeza cuneata*, an invasive legume that outcompetes many native plants, and *Glycine max* (soybean), an agricultural crop that is a known host plant. Plants were grown under greenhouse conditions with each species exposed to either control soil or soil inoculated with *M. phaseolina*. Following a 3 month growth period, plant biomass was harvested and weighed. Additionally, for species of legumes, the total number and mean mass of nodules was quantified. The presence of *M. phaseolina* generally led to a reduction in total plant mass with the exception of *Asclepias syriaca* which appeared to tolerate the pathogen. Despite reduced performance, only *Amorpha canescens* experienced high levels of mortality (75%) suggesting that this species is highly susceptible to charcoal rot. Root nodule formation occurred in three of the seven legume species examined: *Lespedeza capitata*, *Lespedeza cuneata*, and *Lespedeza virginica*. Of these species, differences in the number and mean mass of nodules was only observed in *L. cuneata* and *L. virginica*. Specifically, although the mean mass of nodules produced by *L. cuneata* remained constant between treatments, the number produced decreased when exposed to *M. phaseolina*. In contrast, the presence of *M. phaseolina* resulted in decreased nodule mass in *L. virginica*, however this also resulted in an increase in the number of nodules produced. These results suggest that the presence of *M. phaseolina* may influence grassland plant diversity by promoting the establishment of unique species assemblages throughout the community. Although most species experienced a decrease in performance, the amount of *M. phaseolina* used was potentially higher than natural levels. Future research should therefore examine varying densities of *M. phaseolina* in the soil and test the effects of *M. phaseolina* on competitive interactions between species.
Effects of Fluoridation on Oral Health and Clinical Guidelines for Fluoride Therapy

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Objective: This review article presents a summary of evidence-based research on the risks and benefits of water fluoridation and serves to offer primary care providers (PCPs) knowledge regarding supplemental application in their clinical practice.

Methods: The literature obtained was selected primarily on relevance of information pertaining to risks, benefits, and clinical guidelines associated with the uses of supplemental fluoride in providing oral health care. Articles were selected from 1982 to present and were selected from reputable health organizations such as the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), United States Preventative Services Task Force (USPSTF), American Dental Association (ADA), and the American Academy of Pediatric Dentistry (AAPD) and peer reviewed journals from MEDLINE, CINAHL, and Cochrane Library. Search terms included: fluoridation, fluoride supplementation, cost analysis fluoride, fluoride risk, fluoride benefits, fluoridated community drinking water, fluorosis, and dental caries.

Results: Water fluoridation was found to be safe and effective in preventing dental caries and improve oral health as long as the concentration remained between the recommended level of 0.7-1.2ppm. Reputable organizations included the WHO, CDC, USPSTF, ADA, and AAPD all agreed that fluoride was essential in the prevention of dental caries in all socioeconomic classes. Enamel fluorosis and impaired intellectual development were adverse effects that occurred when exposed to fluoride concentrations above the recommended therapeutic range. Enamel fluorosis was the only adverse side effect seen with exposure to fluoride levels that was within the recommended range.

Conclusion: Water fluoridation is proven safe and effective in preventing dental caries and reaches all populations regardless of availability to dental services. When water fluoride concentrations are sub-therapeutic, supplemental fluoride is recommended. PCPs are at the frontlines of preventing dental caries and should have adequate knowledge regarding supplemental guidelines and skills to prevent poor oral health of their patients.
Does Sericea Lespedeza Create a Soil Legacy That Impacts Grassland Recovery?

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Sericea lespedeza (Lespedeza cuneata) is a non-native, invasive legume that is a growing threat to Kansas prairies. Current evidence suggests that sericea may alter soil conditions, potentially stimulating its own growth and negatively impacting native species in prairie communities. If correct, sericea may create a soil legacy effect even if control measures have effectively removed sericea, thereby slowing or preventing the recovery of native species.

To test this idea, sericea was sown into 300 experimental plots at a wide range of densities (0 to 10,000 seeds m⁻²) in a prairie plant community located in Northeast Kansas. A fertilization and simulated disturbance regime was applied during the first two years of experimentation, along with appropriate ambient controls, during a previous experiment at the same site to examine the establishment of sericea under these regimes. After a three-year establishment period, the community was burned in the fall and sprayed with herbicide the following year to eliminate sericea. Following sericea control measures, thirteen native species were sown into all plots. The stem density of the sown native species was recorded in an annual census over the next four years. If sericea was found in any plots during this period, the stem density of sericea was recorded and individuals were manually removed. In addition, the percent cover of all species present in each plot was recorded in the final annual census.

A significant effect of historical disturbance (Pseudo-$F_{2, 243} = 2.8, P < 0.001$) and fertilization (Pseudo-$F_{1, 243} = 3.6, P < 0.001$) was detected. Consequently, data were analyzed separately to account for these historical effects. Historical sericea stem density had no significant effect on the density of sown species ($F_{1, 251} = 0.01, P > 0.9$), but had a negative effect on native species cover within the simulated grazing ($F_{1, 107} = 5.3, P = 0.02$) and fertilization treatments ($F_{1, 134} = 4.3, P = 0.04$), however the variation explained by the model was quite low ($R^2 < 0.05$ for both comparisons). Likewise, multivariate analysis of all species also indicated weak effects of historical sericea density. Taken together, these results suggest that sericea does not appear to create a soil legacy if controlled within the first three years of sericea establishment.
Introduction: The alarming rate of coronary artery disease (CAD), which claims about 385,000 lives annually, inspires innovative research in the development of procedures and therapies in cardiology. The coronary artery stent is currently the chosen therapy for restoring blood flow, commonly referred to as revascularization. However, blockage of the vessel may still occur due to irritating factors of the stent, such as vessel wall inflammation and stent migration. Biodegradable products of coronary stents address this problem by natural absorption of the stent into the body.

Purpose: One of the challenges currently facing primary care providers is remaining up to date with advances in medical technology and treatment modalities. While specialists are necessary for coronary artery stent placement, the primary care provider is responsible for the ongoing care of these patients and therefore needs a basic understanding of the wide array of devices available, dual antiplatelet therapy, and signs and symptoms of restenosis. The purpose of this review is to provide primary care providers with current information on appropriate therapy and monitoring of patients with coronary artery stents.

Evidence Based Approach: Search criteria limited to English language articles, publication dates from 2006 to 2015, which discuss the use of bare metal stents, drug-eluting stents and biodegradable stents in coronary arteries. Databases include Medline, CINAHL and Cochrane Library.

Conclusion: With high rates of CAD in the United States, the need for new and improved treatment modalities is imperative. While coronary artery stents are the preferred means of revascularization of an occluded vessel, stents are known to cause vessel wall irritation, leading to restenosis. Bare Metal Stents and Drug-Eluting Stents are the most commonly used stents in the United States. Bioabsorbable stents are the next generation of therapy for coronary artery revascularization. The role of dual anti-platelet therapy in conjunction with these stents is less clear, but will likely continue to change with stent and pharmaceutical advances. A challenge for primary care providers is to stay up to date with current therapies in the ever expanding field of medical technology. This overview provides a resource for primary care providers who are responsible for monitoring patients with coronary artery stents.
Injectable Cross-linked Chitosan Hydrogel for Controlled Drug Release Applications

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Hydrogels are 3dimensional polymeric networks that are able to absorb a significant amount of water or any biological fluid. Hydrogels have shown unique biomechanical properties that make them desirable for biomedical applications such as tissue engineering, medical devices and drug delivery. Hydrogel networks are divided into two types based on the crosslinking process: 1) physical gels that are formed by physical interactions between the polymeric chains, and 2) the chemical gels that formed via covalent bonding. In-situ forming hydrogels can be injected into the body as a fluid and form gel within the body tissue through physical or chemical crosslinking. These injectable hydrogels have gained significant attention as one of the promising classes of drug delivery systems with the potential for controlled release behavior. One of the main advantages of using injectable hydrogels is that they do not require medical surgeries for the replacement. Moreover, various therapeutic agents can be incorporated by simple mixing. The controlled release of the therapeutic drugs reduces the dose of the drug needed compared to the conventional injection methods, and since the drug is not circulated through the whole body, the side effects would be lesser. Various types of natural and synthetic polymeric materials have been formulated as an injectable hydrogels for drug delivery applications. Biocompatibility and biodegradability are the major necessity of a successful controlled release drug delivery system.

Chitosan is a natural polysaccharide structure which is a product of partial deacetylation of chitin, and the second most abundant natural polymer on the earth. Chitosan shows great biodegradability, biocompatibility, immunological, antibacterial and wound-healing properties which makes it a suitable biomaterial for variety of applications including tissue regeneration and drug delivery. In this study, 1-ethyl-3-(3-dimethylaminopropyl)-Carbodiimide (EDC) was used as the cross-linker to form an injectable chitosan/EDC hydrogel as a potential in-situ drug delivery system. The crosslinking behavior was characterized using Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscope (SEM). Also cytotoxicity of the cross-linked chitosan has been evaluated. The FTIR and SEM results confirmed the crosslinking of chitosan and EDC. The results from the cytotoxicity confirmed the biocompatibility, as well.
Emergent Literacy: A Look at How Preschoolers Begin to Develop Spelling Skills

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Reading and spelling success in school relies on early phonological development. Much is known about emergent reading during preschool years, but less is known about spelling, the “hard copy” of phonological processing. The first purpose of this study was (1) to determine if there is a difference in sensitivity between two spelling score systems, invented spelling and bi-gram analysis, as they relate to phonological awareness. The second purpose was to examine the relationship between spelling and phonological awareness scores, letter name and letter sound knowledge. Scores from forty children who have participated with a caregiver in an emergent literacy play group were examined. Participants ranged in age from 3:7 to 5:10, with a mean age of 4:6. Data were gathered from both pre- and post-tests of the Assessment of Primary Literacy Skills (APLS). Analysis of the data suggests that there is no difference in sensitivity between invented spelling and bi-gram analysis. An Analysis of Variance (ANOVA) indicated a significant positive relationship between phonological awareness and spelling scores. A moderate relationship was found between post-test spelling scores and letter name/letter sound knowledge. Previous research found a relationship between spelling and phonological awareness in third graders (Clarke-Klein & Hodson, 1995), but this study demonstrates that relationship as early as preschool. Implications of this study are that phonological awareness activities, even in low intensity programs, may be beneficial to the development of emergent reading and spelling skills. Other implications for educators are that teaching letter names and sounds may improve spelling abilities, especially since several letter names include the letter sound within the name (i.e., S, M, L) which aids in encoding. Spelling provides a window into a child’s phonological processes and children should be given opportunities to use invented spelling.
Evaluation of Reaction Time Using a Mobile Application

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Modern day consumer electronics are incorporating Micro Electro-Mechanical Systems nano-accelerometers that measure the instantaneous acceleration of an object. These devices are used to measure movement from any point on the body. One such device is the iPod and iPhone developed by Apple. A company named SWAY Medical LLC developed an application using these accelerometers to assist in measuring balance to manage concussions. A recent update to the SWAY Balance application included the measurement of reaction time. This is the first mobile application to assess this neurological response with a handheld device. Currently, there is no cost-effective field assessment for determining reaction time. With this application, there is a possibility of determining reaction time.

Purpose: The purpose of this study was to assess the consistency and effectiveness of the application for measuring reaction time.

Methods: 50 subjects participated in 3 different trials of reaction time testing. The individuals came in and read an informed consent. The test was explained to them and asked if there were any questions. From here, the individuals were told to stand legs spread shoulder width apart. The device was placed into their hands. They held the device with straight arms and reacted to the screen color change from white to orange. This was done five times. Sex, general health, and whether or not they were student athletes was recorded, participants were also asked if they played video games. Each participant was asked to test their reaction time in 3 trials with 5 times per trial. The participants overall did the test 15 times.

Results: ANOVA determined that there was no significant difference between the first test and the second test, but between the first and third there was a significant difference.

Conclusion: Currently, there is no data on baseline reaction time for the mobile application. The Reaction Time App has the potential to be a very cost-effective and fast method to assessing reaction time. Further studies are needed comparing the mobile application to validated laboratory equipment to determine its clinical value.
Hydrogels Mediate Cell Migration for Neural Regeneration

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Spinal cord injury is a significant health problem in the world and 500,000 new spinal cord injuries are reported every year. Biomaterial hydrogels are promising scaffolds that can support neural cell migration and conduct axonal regeneration for the injured spinal cord. As cellular substrates, the hydrogels can provide efficient structural support for central nervous system repair. Since natural material based hydrogels are biocompatible and biodegradable, they can provide a permissive and efficient environment for transplanted stem cells and a carrier for the delivery of therapeutic molecules into the animal body.

In this study, collagen type I hydrogel and fibrin hydrogel were fabricated and evaluated for neural cell growth and migration. The collagen hydrogel was crosslinked with polyethylene glycol (PEG) and fibrin/fibronectin (FB/FN) was modified by incorporation of aprotinin, which is a protease inhibitor. Fibronectin that can support neural cell survival, migration, proliferation and differentiation was added into the fibrin hydrogel as a supplemental material.

In the preliminary data of the study, I showed that PEG crosslinking can strengthen the collagen hydrogel and incorporation of aprotinin in the fibrin gel can prevent fibrin gel from degradation caused by cellular enzyme. In this study, the growth of astrocyte and fibroblasts and cell viability in the gels were investigated. The results showed that astrocytes can grow and proliferate in the PEG-collagen hydrogel and FB/FN and PEG and aprotinin in the hydrogel were not toxic to the cells.

In summary, the study demonstrated that chemically modified hydrogels of extracellular matrix proteins are suitable scaffolds to mediate neural cell growth and they can be potentially used as implantable materials to promote neural regeneration. In future studies, the specific extracellular matrix gene expression for the cells grown in the hydrogel will be investigated.
Effect of Light and Nutrient Limitation on Lipid Productivity in *Chlorella kessleri* for Algal Biodiesel Production

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Biofuels, fuels derived from biological materials, are considered an attractive alternative for fixing the ongoing energy crisis, due to their unlimited renewable resources and no net CO₂ release into the atmosphere. The use of food crops such as corn, soybean, castor seeds, rapeseeds is undesirable due to the need for large cultivation areas, high loads on freshwater sources, and competition with food markets.

Unicellular photosynthetic thallophytes, the microalgae, are being explored as a potential source of biodiesel, owing to their ease of cultivation, low nutrient requirements, little dependence on agricultural land, and ability to grow on waste water. Light-dependent growth is the most widely used technique for biodiesel production from microalgae. However, the inability to achieve a high biomass as a result of poor light penetration complicates the process as well as decreases the yield. Therefore, heterotrophic culture of microalgae in the dark when supplemented carbon source may be a way to overcome the drawbacks of autotrophic growth in mass culture.

Strategies to increase the lipid content of the cells by manipulating their growth conditions are under study to increase lipid productivity from each harvest of batch cultures. Growth of microalgae in the stressful environment induced under low nitrogen conditions is known to cause algal cells to synthesize more lipids. Can other stresses increase lipid yields? The microalga, *Chlorella kessleri*, was grown under heterotrophic conditions with sucrose or lignocellulose hydrolysate as the carbon source. Lignocellulosic material is a readily available renewable source of carbon and its economic feasibility makes it an attractive carbon source. The nitrogen content in the media was manipulated at different concentrations ranging from 0 mM to 30 mM. With an increase in nitrogen deficiency, microalgae growth decreases, but the lipid content of the cells increases. The results from nitrogen starvation will help us to extrapolate to similar lipid increases with other starvation for nutrients such as phosphorus and iron. Therefore, heterotrophic growth of microalgae at different concentrations of phosphorus (0 mM-5 mM) and iron (0 µM-20 µM) is being studied by a cell counting method and chlorophyll measurements each day until stationary phase is reached. Furthermore, lipid content of cells at stationary phase is measured for each growth condition by Nile Red staining and a modified Bligh and Dyer method. Heterotrophic culture of microalgae with these novel strategies to increase the lipid content may become a sustainable alternative to petroleum.
Attitudes Toward Healthcare Entrepreneurship Among College of Health Professions Students

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Background: Healthcare systems in developing countries are largely government-run enterprises. Limited facilities and unequal distribution of clinics creates areas of limited access to healthcare. In response, some private-owned facilities have emerged with the potential to offset the disparities created by governmental inadequacies. Previous research suggests that most entrepreneurs in healthcare have previous medical exposure. To date we have found no research specific to students in health professions programs evaluating interest toward engaging in healthcare entrepreneurship. The attitudes, beliefs, and inclinations of this population may provide insight into encouraging or dissuading factors.

Purpose: To gain understanding of the attitudes, beliefs, and inclinations of health professions students toward entrepreneurship; data which may be useful in creating a model for development and implementation of strategies encouraging students to engage in healthcare entrepreneurship in developing countries.

Methods: A thirty question survey was distributed electronically to all Physician Assistant students at Wichita State University for the classes of 2014-2016 with anticipated further distribution to all College of Health Professions students. The survey asks demographic and background questions such as age, gender, marital status, hometown, program of study, education and professions of parents, and previous entrepreneurial experience. A Likert scale is used to assess students’ predisposing factors, enabling factors, and reinforcing factors toward healthcare entrepreneurship. To date twenty-five of a desired 150 responses have been received. Preliminary data is being analyzed using Qualtrics software. Means with standard deviation and percentages will be used to analyze descriptive data. Frequencies, correlation tests, t-tests, Chi-Square tests and ANOVA will be used as appropriate. Statistical significance is established as alpha ≤ 0.05.

Expected Results and Benefits of Research: Initial review of data shows 72% of respondents had parents who started a business but 71% have had no personal exposure to business classes. Responses are equally split between those who have considered starting a business and those who have not. A majority of responses feel that it would be easier to work for an established healthcare organization and that the current healthcare delivery system in the U.S. discourages starting a healthcare business. Through further data analysis we expect to find additional reasons for decreased entrepreneurial interest include: lack of incentive, lack of funding, minimal encouragement from professional programs or colleagues, and professional immaturity. This study, by targeting students in health professions programs, will find application in developing strategies for future research and understanding areas requiring greater focus in order to overcome current barriers.
Adding Game-Like Elements to an Armored Vehicle Recognition Training

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Fratricide accidents, or friendly-fire accidents, contribute to a large number of military operations casualties. Gadsden and Outteridge (2006) noted that misidentification caused a large number of these accidents. Therefore, fratricide accidents should decrease as effective misidentification error reduction methods are implemented (Gadsden et al., 2008; Keebler, Sciarini, Jenstch, Fincannon, & Nicholson, 2008). This research investigated training techniques that manipulated the structure of training rewards to reduce misidentification errors. Participants were trained to identify armored vehicles in one of three two-alternative forced-choice (2AFC) training conditions. Participants received feedback that emphasized response time, response accuracy, or neutral feedback. The feedback was manipulated using game-like points and sound effects. During training, participants receiving accuracy-emphasized feedback exhibited significantly higher training scores than both the speed emphasized, and control groups. As expected, participants who received speed-emphasized feedback performed significantly faster than the other groups during training. Interestingly, when participants were later tested with a video armored vehicle identification task without feedback, the participants who received the accuracy-emphasized feedback were significantly more accurate than the other groups. Future research should further manipulate the accuracy-emphasized reward structure to identify optimal ways to deliver feedback during armored vehicle recognition training.
Material Experimentation and Documentation

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During my first year of Graduate studies I find myself immersed in material study, notably those indigenous to Kansas. Dealing with themes of time, change, movement, interaction, and play, I have begun to develop a vocabulary that assumes a relevancy to my contemporaries. My objective for this project is to conduct an extensive investigation of material found in our ceramics studio in addition to clay and rocks dug in this region. While making my research available to others I plan to create a database of my discoveries, engaging in this exploration as a student, an educator and an enthusiast. This accessible resource will serve as a reference to those interested in utilizing and unearthing local material. Offering visual evidence and notes on raw/refined materials, its workability, and the multitude of firing ranges they have been subject to.

Working in conjunction with the chemistry department at Wichita State University I plan to do molecular analysis of as many clay samples as possible. This process takes time and sensitive preparation. Choosing only a few materials to demonstrate the benefits of this process will be essential to understanding its capabilities as a tool to be used in the ceramic process. Identifying and documenting the molecular formulas of a material lets us understand how safe it is, what modifications can be made, and how it will react in the firings.

Ceramic artists, teachers, and students have a wonderfully engaging network. To better my understanding and extend my discoveries to the rest of my field favors only further investigation into this limitless pool of resources. The possibilities are both endless and unique, particularly when you start appropriating local material. I find the importance of this project lies in one’s ability to utilize the information made available. My access to commercial material, ceramic facilities, and a passion for locating and utilizing indigenous sources allows for this intense exploration.
DKA in a 12-Month-old Infant With New Onset Type I Diabetes Mellitus: a Case Report

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Introduction: Type I diabetes mellitus (T1DM) has a bimodal peak in the onset of the disease. Most children are diagnosed between the ages of 4-6 and 10-14 years. It can be difficult to diagnose diabetes in children of a very young age, and it is often not high on the list of differential diagnoses for the provider. Without early recognition these children are at risk of developing diabetic ketoacidosis (DKA), a life threatening complication of T1DM. Children are not routinely screened for T1DM and it is more difficult to recognize the symptoms of DKA in a very young child, leaving this population vulnerable.

Case description: A 12-month-old female presented to the emergency department on the advice of a nearby immediate care facility for dehydration and presumed gastroenteritis. The child had been vomiting for several days with loose stools. Her oral intake had decreased over several days and on the day of the visit she had refused to take anything by mouth. The child became increasingly lethargic throughout the day. In the emergency department she was noted to have sunken eyes, dry mucous membranes, and had rapid, deep breathing. The child appeared drowsy, cried on initial exam and responded to pain. While in the emergency department the child’s urine output was noted to be out of proportion to her hydration status. A beside blood glucose meter was unable to evaluate the level and read “high”. The presumptive diagnosis of diabetic ketoacidosis was made and intravenous rehydration was initiated. Laboratory results confirmed ketoacidosis and hyperglycemia.

Discussion: The diagnosis of DKA in a young patient requires a thorough history and physical exam as well as appropriate diagnostic tests. Among children with T1DM, DKA is a serious consequence and responsible for significant morbidity and mortality. The clinician should take into account family history of TIDM, socioeconomic status, lack of health insurance, and level of parental education. Early recognition of DKA would reduce morbidity, mortality and healthcare costs.
Medications Affecting Nutritional Status in Pediatrics: A Clinical Review

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Introduction: Maintaining adequate nutrition in children is vital to growth and development. The most commonly treated health conditions in the pediatric population include attention deficit hyperactivity disorder, infections, seizures, asthma, dermatologic conditions, and type 2 diabetes. The medications used to treat these conditions include amphetamines, antibiotics, antiepileptic drugs, corticosteroids and metformin – all medications with potential effects on nutritional status. Clinicians should be aware of how these medications may affect nutritional status of children through appetite (suppressing or stimulating appetite), gastrointestinal motility (nausea, vomiting, or diarrhea), alteration of taste, and depletion of vitamins and nutrients.

Purpose: The purpose of this clinical review is to optimize patient care by informing clinicians of the various evidence-based nutritional assessment tools and summarizing how commonly prescribed medications can affect a child’s nutritional status.

Evidence-Based Approach to Manuscript Development: Relevant articles were obtained from MEDLINE, CINAHL, and Cochrane Library databases. Searches included only articles published from January 2000 to February 2014. Search terms included combinations of “nutrition” with the previously stated drug classes and adverse effects.

Summary: Amphetamines decrease appetite in 30% of children, but dosing amphetamines after meals or with protein-rich meals, using drug holidays, and giving multivitamins may prevent nutritional deficiencies. Early life exposure before 6 months of age to antibiotics is associated with obesity; therefore, antibiotics should be prescribed only when necessary and should not be used to treat self-limiting or viral conditions. Antiepileptic drugs can cause weight gain, constipation, and vitamin D deficiency. Choosing antiepileptic’s with fewer effects on weight, ensuring a well-balanced fiber-rich diet and vitamin D supplementation can reduce side effects. Chronic oral corticosteroids can cause growth suppression, reduced bone density, dyslipidemia, hyperglycemia, and central redistribution of fat. Carefully selecting when, what dose, and for how long to use corticosteroids as well as monitoring bone density, increasing dietary calcium, and increasing exercise are beneficial. Metformin, a commonly used diabetes medication, causes abdominal pain, diarrhea, and vitamin B12 and folic acid deficiency. Slow dosage titration decreases gastrointestinal side effects and B12 and folic acid supplementation will prevent vitamin deficiencies. Awareness of these medication complications in the pediatric population, as well as knowledge regarding evidence-based nutritional assessment tools, monitoring, and strategies to avoid these complications, will help the clinician and other members of the healthcare team identify and prevent nutrition-related adverse effects of these commonly prescribed medications.
Interprofessional Care and Cesarean Section Rates: A Systematic Review

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The cesarean delivery rate in the United States steadily rose from the mid-1990s until 2009 from 21% to 33%; greater than the upper limit of 15% recommended by the World Health Organization. Non-medically indicated cesarean sections are associated with avoidable maternal complications and risks. Interprofessional models of care are the provision of comprehensive health services to patients by multiple health care professionals. Preliminary evidence demonstrates a correlation between interprofessional models of care and improved outcomes. However, the relationship has not been well studied. The purpose of this systematic review was to determine if interprofessional models of care were associated with lower cesarean section rates.

The review was conducted according to systematic reviews for social science (Petticrew and Roberts, 2006). The practical screen included electronic databases including Pubmed, Cochrane Library, CINAHL, web of science, and grey literature. Search terms included a combination of free-text and thesaurus terms for concepts including “caesarean section, interdisciplinary care, maternal health service, midwifery, and physicians,” combined with a qualitative and quantitative methods filter, respectively. Specific inclusion criteria (e.g., experimental design, time period 1970-2014, cesarean section outcome measure) and exclusion criteria (e.g., non-English publication) were used. A methodological screen was conducted to ensure the search was exhaustive and included a review of the reference sections in each of the retrieved articles. Two reviewers independently assessed all papers against the inclusion criteria, with any disagreement discussed and resolved by study team. Data was abstracted from each article (e.g., study design, participant characteristics, and sample size). No meta-analysis was conducted.

The search returned 1366 articles for review; 1320 were excluded due to lack of interprofessional care, editorial pieces, lack of experimental design/outcome measure, or review articles, after reviewing titles and abstracts. Of the remaining 46 studies, 11 remained after a full-text evaluation. The other 35 were excluded for lack of outcome measure, commentary pieces, or lack of interprofessional care. The included articles were from 1991-2013 and included both US and international settings. The majority of articles 73% (n=8) reported lower cesarean section rates among women receiving interprofessional maternity care. The other three articles reported no difference. Other improvements associated with interprofessional care were more likely to breastfeed exclusively, infants were born at greater birth weights, and more frequent term deliveries.

Interprofessional health care teams work toward promoting client-centered, collaborative, and shared decision-making regarding health issues. This interprofessional model of care could be utilized more often in the U.S. to address high cesarean section rates.
In recent years, all electric satellites have had a growing presence in the space industry. The 702-SP family developed by Boeing is to be used for telecommunication satellites. This spawns the need for analyzing mission scenarios in order to achieve the most efficient way of deploying such satellites.

The purpose of this poster is to analyze the different approaches to Low Thrust Spacecraft Trajectory optimization. One of the methods, developed by the author uses a feedback control law which allows the user to minimize an arbitrary objective set by mission designers. It also allows for a combination of objectives like minimum fuel and minimum time transfers. Minimizing radiation damage is another objective that is of importance in these kind of scenarios due to the long transfer times. The second method is a direct optimization routine. While this method has been around longer, convergence to a solution is not guaranteed and depends on initial guesses provided by the user. The third method is a combination of the first two methods and allows for multi-objective optimization. Extensive research of existing literature has shown that such a trajectory optimization method does not exist. The advantage of this method is that it will be able to overcome the shortcomings of the individual components and provide a comprehensive framework for mission designers to work with. The author will go over the merits and drawbacks of the different methods as well as compare the performance of all the methods for multiple scenarios. Some of these metrics will include rate of change of inclination, radius and fuel mass.

In addition to this, the author will also introduce new performance objectives that could be of interest to mission designers and will discuss the method of implementing them into all of the mentioned methods.
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