
Spring 2010 Honors Colloquium ~ Wayne State College ~

Eva Rosberg

Title: Black and White Wealth Inequality: Race Through the White Lens

Instructor: Dr. Monica Snowden

Sarah Salisbury

Title: The Quantum-Chemical Study of Pyrazinacenes: Aza Analogues of Acenes

Instructor: Dr. Paul Karr

Brianna Twohig

Title: Lenin and Stalin: The Growth and Spread of 20TH Century Communism

Instructor: Dr. Randy Bertolas

Megan Zavorka

Title: Studies in Natural Pigmentation Based Paints: An Investigation of the Interaction of Selected Pigments With a Traditional Casein-Based Binder

Instructor: Dr. Mary Ettel

Wayne State
College



**Natural and Social
Sciences
Undergraduate
Research**

Date: 05/03/10

2009-2010

Presentations for 2009

Northland Chapter American College of Sports Medicine Quiz Bowl ~ Seattle, WA May 2009

Kelly Brink, Peter Ray, and Darren Richter

Abstract: The team won the 2nd Annual American College of Sports Medicine (ACSM) Student Bowl at the 56th annual ACSM meeting held in Seattle. The Quiz Bowl competition involved answering open-ended short answer questions in 3 rounds of Jeopardy (single, double, final) during which questions became progressively more difficult as point values increased. Questions were devised by experts in their respective academic areas and covered a variety of topics commonly taught in undergraduate exercise science curriculums to include: anatomy and physiology, biomechanics, electrocardiogram interpretation, environmental physiology, exercise physiology, exercise prescription, metabolism, mixing chamber (variety of categories), nutrition, pathophysiology, pharmacology, and strength and conditioning. Students were given just 10 seconds to answer questions and incorrect answers resulted in associated point values being subtracted from the teams running score. Score keepers were positioned at each teams table and 3 expert judges (past-presidents of ACSM) ruled on answers that were viewed as questionable in accuracy.

Advisor: Dr. Donovan Conley

Research Projects ~ 2009

Adam Hanzlik, Eric Henn and Landen Stender

Title: Effects of Playing Video Games on Reaction Time

Abstract: We have found no previous studies that have shown an increase or decrease in reaction time after playing video games.

Purpose: To examine the effects of gaming on reaction time to see if the reaction time increases after they played a game.

Method: 11 subjects (8 male and 3 female) volunteered to participate into the subject. 5 subjects were picked to play a game and then they had to take the ruler drop test then play for 15 minutes and do a follow up ruler drop test. Another 5 subjects took the ruler drop test and did absolutely nothing for 15 minutes and then they do another ruler drop test. The mean of age is 22.8 and the standard deviation 4.077.

Result: There was no significant difference between the two groups' times. Both groups' times got quicker from pretest to posttest. Neither group showed more of a change than the other.

Conclusion: The ruler drop test had a learning effect which affected the results. Subject's times got quicker because they were more use to the test procedure. The subjects should have been provided with a pilot practice session before actually performing the ruler drop test.

Advisor: Dr. Tammy Evetovich

Nebraska Academy of Science ~Lincoln, NE April 2010

Jacob Mathieson

Title: Turn the Heat Down or Don't

Abstract: The purpose of this study is to help determine whether or not more energy is used by a residence if the internal temperature is held constant or if energy is saved by lowering the temperature at times. A simple theoretical calculation determined that energy will be saved. This neglects several variables that could influence a residence's energy consumption. So I measured the energy consumption of three domiciles; an apartment, a 50 year old house, and a brand new house. I compared the energy use when the temperature was held constant and when it was varied. The energy consumption vs. average external temperature was plotted and compared to the theoretical calculation.

Project Advisor: Dr. Adam Davis

Spring 2010 Honors Colloquium ~ Wayne State College ~

Brittany Cody

Title: C-Kit Signaling and the Regulation of Retinal Stem Cells

Instructor: Dr. Douglas Christensen

Marisa Hingst

Title: Sustainability Throughout the Midwest: A Review of the Disconnects, Issues, and Promises for a Greener Future

Instructor: Dr. Randy Bertolas

Joshua Hohnholt

Title: Influential Cities of an Influential Time: The Cultural Importance of Corinth, Ephesus and Philippi in Ancient History

Instructor: Dr. Randy Bertolas

Joshua Riesberg

Title: The Origins of Democratic Government: Comparing the Ancient Athenian Democracy to the Democratic Republic of the United States of America

Instructor: Dr. Randy Bertolas

Kendra Timm

Title: Enhancing Laboratory Safety Instruction: Introducing MSDS Sheets Into the Freshman Laboratory

Abstract: Material Safety Data Sheets (MSDS) are ubiquitous in both the public and private sectors. Federal Right-to-Know laws have mandated that MSDS be available to any individual who works with or is exposed to chemicals in their place of work. The utility of MSDS to any individual is controlled by the ability to interpret the information summarized in safety sheets as well as access to the sheets. Most freshman level laboratory materials do not address the safety information in MSDS when they present safety guidelines for laboratory activities. Supplemental materials and activities designed to introduce MSDS to General Chemistry students will be presented.

Advisor: Dr. Mary Ettl

Sarah Salisbury

Title: Comparison of the Computed UV/VIS Spectra of Pyrazinacenes at Various Model Chemistries

Abstract: A series of edge-sharing condensed oligopyrazine analogues of acenes, the pyrazinacenes were synthesized and characterized by our colleagues.¹ A pyrazinacene was chosen for our investigation and optimized to a stationary point on the Born-Oppenheimer surface. Next, frequency calculations were run to confirm optimization to a minimum. Finally, the UV/VIS spectrum was computed using TD-DFT with the B3LYP/6-31G (df, p), B3LYP/6-31G (2df, p), and B3LYP/6-31G(3df, p) model chemistries. The spectra computed with the various model chemistries were then graphed using an in-house developed method and compared to the experimentally determined spectrum.

Advisor: Dr. Paul Karr

Kelly J. Brink and Peter J. Ray

Title: Dynamic Warm-up Optimizes Sprint Performance In Collegiate Track Athletes

Abstract: Previous research has shown that passive stretching negatively affects sprint performance (Nelson, A.G. et al., *J. Sports Sci.* 23:449-454, 2005) however, the affect of other stretching or warm-up methods on sprint performance is unclear.

Purpose: To compare the effects of no warm-up (NW), low volume proprioceptive neuromuscular facilitation stretching (LVPNFS), high volume proprioceptive neuromuscular facilitation stretching (HVPNFS), static stretching (SS), and dynamic warm-up protocols (DW) on 36.7 m sprint performance in National Collegiate Athletic Association Division II track athletes.

Methods: Ten male healthy trained collegiate track athletes (mean \pm SD, age=20.9 \pm 0.97 y, height=183.6 \pm 5.9 cm, mass=78.96 \pm 7.29 kg, body fat=6.3 \pm 0.97 %) volunteered to participate in the study. Subjects completed each of 5 randomly assigned warm-up protocols to include: 1) NW, 2) LVPNFS, 3) HVPNFS, 4) SS and, 5) DW prior to 36.7 m sprint performance. Two and 5 sets of stretching were completed for the low and high volume PNF protocols respectively. The PNF stretching protocols used a contract (5 sec at 75% maximum effort) - relax (10 sec) - stretch (10 sec at moderate tension) sequence that targeted calf, hamstring, and quadriceps muscle groups. The static stretching protocol included 2 sets of the same stretching exercises held for 20 sec. The DW protocol consisted of high knees, gluteus maximus kicks, lunges, leg swings, and dynamic quadriceps and hamstring stretches. The best of two timed 36.7 m sprints was used to determine sprint performance following each protocol. One min rest was provided after each warm-up protocol and 3-5 min rest was given between sprints. A minimum of 48 h was required between testing sessions.

Results: Repeated measures one-way ANOVA analysis with Tukey post-hoc tests indicated that average 36.7 m sprint performance using DW (4.860 \pm 0.131 sec) was significantly ($p < 0.05$) lower than NW (4.953 \pm 0.184 sec), LVPNFS (5.079 \pm 0.148 sec), HVPNFS (5.043 \pm 0.185 sec), and SS (5.054 \pm 0.172 sec) warm-up methods.

Conclusions: We conclude that performing DW prior to a maximal effort 36.7 m sprint is significantly better than NW, LVPNFS, HVPNFS, and SS warm-up methods. The data from this project suggests that a dynamic warm-up protocol should be used to optimize sprint performance in collegiate track athletes.

Project Advisors: Donovan S. Conley, FACSM and Tammy K. Evetovich, FACSM.

Research Projects ~ 2009

JD Roberts, Mychal Lanik and Ashley Brookhouser

Title: The Effect of Different Warm-Up Routines (Static Stretch and Cycling, Dynamic) on Hamstring and Lower Back Flexibility.

Abstract: Instructional methods in the past have taught students that static stretching has improved flexibility; however, it is unknown whether a different warm up activity (cycling, dynamic) could be substituted with little or no affect on the flexibility in the hamstrings and lower back of the subject.

Purpose: To examine the effect of different warm-up routines (static stretch, cycling, dynamic-lunges, high knees, marching to a rhythmic movement) on hamstring and lower back flexibility (Sit & Rest Test).

Methods: Thirteen (6 male, 7 female) college-aged non-collegiate athletes from Wayne State College volunteered to participate in the study. Students came in on three separate occasions and performed a different warm up activity. Before and after each warm up activity, the participants sit & reach measurements were recorded. Each warm up activity lasted 5 minutes with a 20 second break between the completion of the warm up activity and the final testing.

Results: There were no three-way or two-way interactions involving group, thus the data were combined across gender. Further, there were no significant interactions involving treatment which would indicate that the subjects responded similarly from pre to post regardless of treatment. Subsequently, the data were collapsed across treatment and just compared from pre to post using a paired t-test. The t-test revealed a significant increase in flexibility from pre (30.4 ± 8.6 inches) to post (32.2 ± 8.2 inches).

Conclusion: We are able to conclude that as educators, we can use a variety of different warm up exercises, not solely static stretching, and will not see a major difference in the flexibility of our students.

Ryan Lennerton, Brian Sulzman and Logan McPhillips

Title: Does the Wii Increase Heart Rate Enough to Qualify as Physical Activity?

Abstract: No previous studies have been done to prove if the Nintendo Wii game system increases heart rate enough to qualify as physical activity as defined by the ACSM. Many believe that playing the Wii, and including the Wii into PE curriculum plans is an effective way to get students active through technology.

Purpose: The purpose of this study was to determine if the Wii game system and Wii Sports Tennis game increases heart rate as much as physically playing tennis.

Methods: 13 college students (7 females, 6 males) all participated in playing Wii Tennis sitting down, standing up and physically playing tennis. The subjects came in three (3) different days and performed one of the activities per day. Their resting heart rate was taken each day and then after each five (5) minute period during the activity. Each activity was performed for fifteen (15) minutes with a two minute rest observed between each five (5) minute period.

Results: There was a significant difference ($p < 0.05$) in heart rate during physical activity (140.6 ± 26.6) compared to playing Wii Tennis sitting down (79.8 ± 10.5) and standing up (95.1 ± 16.3).

Conclusion: The Wii game system did not increase heart rate enough to qualify as physical activity. Physically playing tennis was the only activity that sufficiently and consistently increased heart rate enough to meet the qualifications.

Advisor: Dr. Tammy Evetovich

Nebraska Academy of Science ~Lincoln, NE April 2010

Kassandra Connell and April Wylie

Title: Understanding Antibiotic Resistance

Abstract: The mechanism of β -lactam antibiotic resistance is studied using ampicillin resistant bacteria. One known mechanism of resistance for microbes to penicillin is the inactivation of penicillin by lactamase (which hydrolysis of the amide bond in penicillin). Deactivation of lactamase has been shown to occur with the use of sulbactam, which is similar in structure to ampicillin. When the amide bond in sulbactam is hydrolyzed, it forms a stable imine which irreversibly binds to the lactamase. A series of plant extracts and synthetic compounds are studied to see if the effects of sulbactam can be increased or duplicated. Antibiotic resistant bacteria (*E. coli*), ampicillin, sulbactam, and extracts are screened for possible inhibition of antibiotic resistance. Data on the combination of extracts in the presence of antibiotic and/or sulbactam, on the effects of the growth of the *E. coli* will be presented.

Advisors: Dr. David Peitz and Dr. Doug Christensen

Josh Yost

Title: Pushing Arrows: The Stepwise Development of Arrow pushing Skills in Organic Chemistry

Abstract: The introduction to mechanisms in organic chemistry is often the first exposure by a student to this way of understanding and explaining reactions. The difficulty of this process is demonstrated by the multitude of texts and articles published to help students understand this perspective on organic reactions. A series of problems were developed to help students understand the concept of reaction mechanisms. The worksheets developed use a "build up" approach to get students to understand the rules and principles of organic mechanisms. The worksheets start from simple one step reactions, to interesting pharmaceuticals, to biosynthesis mechanisms. This approach allows students to gain a better understanding of reaction mechanisms and to give them the knowledge base to be confident in predicting future reaction mechanisms.

Advisor: Dr. David Peitz

Kilie Stover, Karisa Stover and Josh Sypal

Title: Localization and Genetic Engineering of a Novel Coiled Coil-Helix Coiled Coil-Helix Domain Containing Protein, CHCHD6.

Abstract: The novel mitochondrial protein Chchd6 contains a coiled coil-helix coiled coil-helix (CHCH) domain. Involvement in localization and sub-cellular function of this protein is unknown. The CHCH domain contains two cysteines within each helix structure in a C-X9-C motif. This particular domain has been found in other mitochondrial proteins such as Cox17, which is a copper binding protein thought to be required for metallation of a mitochondrial transmembrane protein; as well as Mia40, a protein that assists in the translocation of proteins into the inner-membrane space. Known proteins containing similar motifs were used to define the potential function of Chchd6. The Chchd6 DNA sequence was cut from the cDNA cloning vector pDNR-LIB, and ligated into the vector pFLAG in order to express a FLAG-tagged Chchd6 protein in mammalian cells for observation. With the FLAG-tagged protein, we hope to determine localization of Chchd6. Using bioinformatic techniques, several post-translational modification sites were found to be used as possible mutation points. By mutating these specific sequences and observing mammalian-expressed wild-type and mutant proteins in an epifluorescent scope, the localization and function of Chchd6 may become better understood. *This work was funded by the Nebraska IN-BRE grant NIH grant # P20RR16469.*

Karisa Stover, Josh Sypal and Kilie Stover

Title: Genetic Engineering of a Novel Mitochondrial Protein, CHCHD3.

Abstract: Chchd3 is a novel mitochondrial protein with undetermined function. Chchd3 contains two domains, one an unknown domain and the other a coiled-coil helix coiled-coil helix (CHCH) domain. The CHCH domain consists of two helical Cys-x9-Cys motifs. This domain is also found in the mitochondrial protein Cox17, which functions in the binding and delivery of copper. The function of Cox17, as well as other CHCH domain-containing proteins, was taken into account while trying to determine the function of Chchd3. Previous work determined that Chchd3 is a mitochondrial protein. Through the use of online motif analysis programs, four specific phosphorylation sites, as well as glycosylation and myristylation sites, have been identified. By mutating these sequences, it may be possible to determine their involvement in the function and localization of Chchd3. In this work, the Chchd3 DNA was cut from the cDNA cloning vector pCMV-Sp.6 and ligated into a pFLAG vector with the intent to express the Chchd3 protein with a C-terminal FLAG tag for observational use in mammalian cells. With the flagged Chchd3 protein, we will be able to determine the effects of mutations on localization. *This work was funded by the Nebraska IN-BRE grant NIH grant # P20RR16469.*

Advisor: Dr. Sharmin Sikich

K.J. Christensen, J.H. Hefner and D.R. Molacek

Title: Difference in Hand-Grip Fatigue and Recovery Between Male and Females Using a Detecto Hand-Grip Dynamometer

Abstract: Previous studies have shown that women exhibit different fatigue characteristics than men. Women are often able to sustain the contraction for a longer duration than men before task failure occurs. Similarly, women experience less of reduction in maximal force during sustained or intermittent maximal contractions. (Hunter, Exercise Science Program Marquette University)

Purpose: The purpose of this test was to study the difference in hand-grip fatigue and recovery rates between male and female Division II collegiate basketball players.

Methods: Twelve female and twelve male Division II collegiate basketball players volunteered to be in this study. The subjects completed an informed consent before participation. Subjects performed three maximal repetitions on a Detecto Hand Grip Dynamometer. Then the subjects were put through a fatiguing protocol until they fell below seventy percent of their maximal value. They were then given a three minute break followed by three more maximal repetitions. If they did not reach their beginning maximal value, they were given another three minute break and three more maximal repetitions. If the maximal value was still not reached they got one more trial and then the subject was finished.

Results: There was a significant two-way interaction involving group, indicating that the groups responded differently from pre to post. Follow-up paired t-tests revealed there was no significant change from pre (60.1 ± 9.1 kg) to post (59.9 ± 7.5 kg) inches for the male subjects but there was a significant increase in grip strength from pre (32.5 ± 2.9 kg) to post (34.7 ± 3.7 kg) for the female subjects. The paired independent t-test revealed no significant difference in fatigue time between males (1.56 ± 0.95 min) and females (1.94 ± 1.43).

Conclusion: We concluded that there is a significant increase between Pre and Post measurements in female subjects. There was no significant difference between Pre and Post measurements in male subjects. We also concluded that there was no significant difference in fatigue time between male and female subjects.

Advisor: Dr. Tammy Evetovich

Jacob Mathieson

Title: Turn The Heat Down Or Don't

Abstract: The purpose of this study is to help determine whether or not more energy is used by a residence if the internal temperature is held constant or if energy is saved by lowering the temperature at times. A simple theoretical calculation determined that energy will be saved. This neglects several variables that could influence a residence's energy consumption. So I measured the energy consumption of three domiciles; an apartment, a 50 year old house, and a brand new house. I compared the energy use when the temperature was held constant and when it was varied. The energy consumption vs. average external temperature was plotted and compared to the theoretical calculation.

Project Advisor: Dr. Adam Davis

Research Projects ~ 2009

Travis Cinfel, Dacia Ganseboom, Cody Wiltgen and Ashley Walters

Title: Effect of Listening to Music on Heart Rate and Rate of Perceived Exertion During a Fixed Rate Treadmill Test

Abstract: There is limited research on the effects of listening to music and its effect on exercise.

Purpose: To examine the effects of listening to music on exercise, including heart rate and rate of perceived exertion during a treadmill test on college-age students between 19-35 years old.

Methods: 17 college age students (11 male, 6 female) volunteered to be subjects in the study. Mean \pm SD; age = 20 ± 1.3 ; height = 69 inches \pm 3.4; weight = 173.9 ± 37 lbs. Subjects performed a 3 minute warm-up at 3 mph followed by a 5 minute test at 5 mph on a treadmill. Heart rate was taken and recorded at rest, after warm-up, and post-test. Rate of perceived exertion was also assessed post-test. 3 trials were performed with, no music, workout music, and meditative music.

Results: Two separate one way, repeated measures ANOVA was used to analyze the data from post-test HR and RPE. The critical P value was 0.05. There was no significant difference for heart rate between any of the three trials. RPE, however, did show significant difference between trials. Using a Tukey post-hoc test there was a significant difference between meditative music and both workout music and no music but there was no significant difference between workout music and no music.

Conclusion: We conclude that there is no significant difference in heart rate whether you listen to meditative music, workout music, or no music. RPE, however, was affected by meditative music compared to workout music and no music.

Chris Miller, Jessi Gatzemeyer and Jeff Schweiger

Title: Effects of Static Stretching Versus No Stretching on Single Leg Vertical Jump Between Genders

Abstract: Recent studies have suggested that different types of warm up activities could affect an athlete's vertical jump test results (Gourgoulis et al., *J. Str. Cond. Res.*, 17(2):342-344, 2003; Church et al., *J. Str. Cond. Res.*, 15(3):332-336, 2001). However it is unclear whether static stretching has an effect on the normal population of college students.

Purpose: To examine the effects of static stretching on vertical jump height between genders of the normal population of college students.

Methods: Fourteen students from Wayne State College performed a single leg vertical jump test with and without stretching. On the first visit students performed a vertical jump test with or without stretching. On the second visit, students performed another vertical jump test utilizing the opposite technique they used during their first visit.

Results: Paired t-tests revealed no significant changes in vertical jump height. A two (group=male and female) by two (time=pre and post) by two (leg=dominant and non-dominant) mixed factorial ANOVA with repeated measures was used to determine differences in vertical jump height. An alpha of $p < 0.05$ was considered statistically significant for all analyses.

Conclusion: We conclude that there were no significant differences in jump height between the non stretching protocol and following the stretching protocol.

Advisor: Dr. Tammy Evetovich

Nebraska Academy of Science ~Lincoln, NE April 2010

Ian Engebretsen

Title: Kinetic Assessment of Staphylococcus Aureus Biofilm Matrix Growth.

Abstract: Previous studies have indicated that *S. aureus* biofilm age is directly related to macrophage intimacy with the biofilm surface. The purpose of this study is to identify whether the age of the biofilm allows for a more extensive extracellular matrix to be formed which in turn causes a decrease in macrophage intimacy to the biofilm surface. This will be achieved by culturing 4, 6 and 8 day old *S. aureus* biofilms (*S. aureus* contain GFP for imaging). The biofilm will then be marked or stained with TOTO 3, wheat germ agglutinin, or anti-*S. aureus* PGN. These will be used for visualization of eDNA, polysaccharide intercellular adhesion, and peptidoglycans respectively. The extracellular matrix will then be imaged and measured for thickness and density among the three age groups. Imaging is done with confocal microscopy. In order to transport the fragile biofilms to the confocal facilities a method will need to be developed to fixate the biofilm. *This work was funded by the Nebraska IN-BRE NIH grant #P20RR16469.*

Advisor: Tammy Kielian

Joshua Sypal, Karisa Stover and Kilie Stover

Title: Characterization of the Domains of the Novel Mitochondrial Proteins, CHCHD3 and CHCHD6.

Abstract: The proteins Chchd3 and Chchd6 are novel mitochondrial proteins with an undetermined localization and function. Both of these proteins contain an unknown domain and a coiled coil-helix coiled coil-helix (CHCH) domain. The CHCH domain is characterized by two Cys-X9-Cys repeats. This domain is also found in other mitochondrial proteins such as Cox17, which is utilized in copper metal binding, and Mia40, which assists in moving proteins into the inner membrane space. Bioinformatics tools were used to research the CHCH domain as well as the unknown domain for conserved residues and potential links to other known proteins. The hydrophathy plots of Chchd3 and Chchd6 were generated to determine if they contain trans-membrane regions. Secondary structure predictions were also used to compare the structure of Chchd3 and Chchd6. Conserved residues could be targeted for mutation in an effort to characterize residues responsible for localization and/or function. *This work was funded by the Nebraska IN-BRE grant NIH grant # P20RR16469.*

Advisor: Dr. Sharmin Sikich

Nebraska Academy of Science ~Lincoln, NE April 2010

David Seger

Title: Use of *Listeria Monocytogenes* InlC as a Possible Component in a Drug Delivery System.

Abstract: *Listeria monocytogenes* is a bacterial pathogen known to induce phagocytosis in non-professional phagocytes. The mechanism by which this occurs involves bacterial surface proteins called the Internalins. An additional excreted internalin (InlC) protein may enhance forced phagocytosis and is the subject of this study. The *inlC* gene has been cloned into pET-46 (Novagen) and will be housed in *E. coli* CD41 (Lucigen) for protein over-expression and purification purposes. Upon successfully isolated, future studies will focus on tagging of the protein (utilizing a MAT tagging system) and determining if the protein is internalized in mammalian cells. Successful results make the protein a possible candidate as a component of a drug delivery system. *This work was funded by the Nebraska IN-BRE NIH grant #P20RR16469.*

Advisor: Dr. Doug Christensen

Derek Moormeier

Title: Use of *Listeria Monocytogenes* InlB as a Possible Drug Delivery System.

Abstract: *Listeria monocytogenes* is a Gram-positive food borne pathogen with a special ability to internalize into mammalian cells. Many proteins are important in the organism's survival in host cells. However, the internalin proteins InlA and InlB play vital roles of binding to the host cells membranes and initiating the internalization and spread of the bacterium. This innate ability has become of special interest in trying to create a drug delivery model by attaching a drug to the protein itself. The *inlB* gene was housed in pET-44 (Invitrogen) for expression in various *E. coli* cell lines. Expression trials were performed with successful Western blots exhibited via *E. coli* C41-DE3 (Lucigen). Immediate future steps will include fluorescent tagging of the protein and monitoring whether or not it is naturally taken in by human cell lines in vitro. *This work was funded by the Nebraska IN-BRE NIH grant #P20RR16469.*

Advisors: Dr. Doug Christensen and Dr. Shawn Percy

Midwest Model United Nations

~ Chicago, IL November 2009

Jennifer Draper

Matt Wuebben

Matthew Schaaf

Lucas Nelsen

Robert Royster

Curtis Hanzlik

Ben Schultz

~All students represented Iceland in different capacities.

Advisor: Dr. Joe Blankenau

Experimental Psychology Research Symposium

~ Wayne State College Fall 2009

Mikayla Beiermann, Meghan Leary, and Misty Rystrom

Title: Effect of Acute Stress on Self-Esteem in Undergraduate College Students

Mike J. Betzen, Seth J. Borer, Jessica L. Borrenpohl,
and Sarah S. Salisbury

Title: More Yak Please? Effects of Perceived Social Acceptability on Food Neophobia

Beau Boryca, Lacey Murtaugh, Ashlee Radenz, and Trent Tullberg

Title: First Impressions and Relationships

Project Advisor: Dr. Dan Miller

Life Sciences Senior Presentation ~ Wayne, NE Fall 2009

Tiffany Witt

Title: A Re-Examination and Comparison of the Morphology of *Trichomonas Gallinae*

Advisor: Dr. Glenn Kietzmann

Nebraska Undergraduate Sociological Symposium ~ (UNK) Kearney, NE Fall 2009

Michael Chittenden

Title: Stress and Adaptability in Families with Developmentally Disabled Children

Abstract: This paper summarizes the literature on the stressors and adaptations of families with developmentally disabled children. Stressors include the lack of training regarding behavioral techniques, communication issues, managing family dynamics, and the lack of monetary resources. Some factors related to both stressors and adaptations are gender, educational level of parent and child, occupation, socio-economic status, and family support systems. Recommendations to address these issues include early childhood intervention, parent-to-parent networks, and provisions for residential and vocational services. The need for increased funding for services, long-term studies to identify “best practices” for families and specialized “disability” family counseling are also emphasized as next steps.

Advisor: Dr. Jean Karlen

Eva Rosberg

Title: Black and White Wealth Gap

Rachel Schmitz

Title: Living Latino/a in the Midwest: An Analysis of Cultural Perspectives Through the Lens of Latino-Owned Businesses

Advisor: Dr. Monica Snowden

Life Sciences Senior Presentations ~Wayne, NE April 2010

David Seger

Title: *Listeria monocytogenes* internalin C in drug delivery

Jessica Wimmer

Title: Community Composition of Aquatic Insects and Invertebrates from Streams in Nebraska's Pine Ridge

Pariss Bethune

Title: The Effects of Odor on Light Exercise

Tessa Wietfeld

Title: Physical Therapy Treatments and Parkinson's Disease

Derek Moormeier

Title: *Listeria monocytogenes* internalin B in Drug Delivery

Joe Brogie

Title: *Salmonella* invasive A and C in Drug Delivery

Samantha Thompson

Title: Susceptibility of Naked DNA to UV light in Forensic Analysis

Matt Thies

Title: Plant Extracts as Antimicrobial Treatment

Allison Friedmann

Title: A Comparison of Bird, Invertebrate, and Small Mammal Granivory at an Iowa Prairie

Melissa Bauer

Title: The Effect of Milk Fat Content on Microbial Growth

Jenna Meyer

Title: The Effects of Essential Plant Extracts on Wound Healing

Jon McManaman

Title: Equine Algometry: Average Pain Thresholds

Lucas Marchand

Title: Isolation of DNA from Coral Photosymbiont (zooxanthellae)

John Whitt

Title: Antioxidant Wound Healing: The Effects of Glutathione and Vitamin C on IEC-18 Tissue Culture

Tami Kietzmann:

Title: Mermithid Prevalence and Intensity of Grasshoppers in Wayne County, Nebraska

Lisa Rech

Title: Small Mammal Populations in Disturbed, Restored, and Native Prairie

Travis Langan

Title: The Relationship of Periodontal Disease and Cardiovascular Disease

Cody Benson

Title: The Effect of Plasmid Size on Bacterial Transformation

NACSM ~ St. Cloud, MN March 2010

Andrew Bachman

Title: Effects of Sprint Versus Endurance Training on Mechanical Efficiency in Track Athletes.

Abstract: Mechanical efficiency is the measure of work output compared to work input. It is essentially the amount of work one accomplishes for a particular amount of energy expended and is an important component in human performance. Research has shown that the percentage of Type I muscle fibers can be linked to mechanical efficiency but little is known about how different types of training affect mechanical efficiency.

Purpose: We asked whether sprint or endurance trained athletes would have differences in mechanical efficiency. Our chief aim was to determine anaerobic power, aerobic capacity and mechanical efficiency in pre-competition conditioned male and female NCAA Division II cross country runners and NCAA Division II sprinters/jumpers. **Methods:** Eight cross-country athletes (4 male and 4 females) and eight sprint or power athletes (4 male, 2 female track athletes and 2 female rugby athletes) participated in the study. On non-consecutive days, subjects performed Wingate Tests for anaerobic power, capacity and fatigue index. To determine anaerobic threshold and select submaximal workloads, all subjects then performed VO₂ max testing using cycle ergometry. Finally, gross (GE) and delta efficiency (DE) were calculated from workloads and metabolic costs measured at two workloads (50% and 70% VO₂ Max) and three pedaling frequencies (50 rpm, 80 rpm and self-selected).

Results: The only difference in GE between groups was at 70% VO₂ max at 80 rpm and self-selected (SS) rpm, with the cross country athletes being significantly more efficient ($p = 0.035$ and 0.01 respectively). Delta efficiency was maintained at all pedaling frequencies in the cross country athletes, but was significantly less in sprinters at 80 rpm and the SS rpm pedaling frequencies. Therefore, DE was greater in the cross-country athletes compared to sprinters at the 80 rpm and SS pedaling frequencies ($p = 0.013$ and 0.01 respectively). Interestingly, while the higher pedaling frequencies revealed differences in mechanical efficiency between groups, and selected pedaling frequencies were closer to 80 rpm, both groups were most efficient at the 50 rpm frequencies at both workloads.

Conclusion: Endurance training in cross country athletes appears to be associated with greater gross and delta efficiency than sprint trained athletes at higher sub maximal workloads and higher pedaling frequencies. A possible explanation may be that fatigue in the sprinters but not the cross country runners resulted in decreased efficiency.

Advisor: Dr. Barbara Engebretsen

Fall 2009 Honors Colloquium ~ Wayne State College

Andrew Bachman

Title: Differences in Mechanical Efficiency Between Types of Athletes and Gender

Instructor: Dr. Barbara Engebretsen

Amber Hansen

Title: Private vs. Public: An Analysis of Water Privatization Practices in Latin America

Instructor: Dr. Joe Blankenau

Jack Lafleur

Title: Manufacturing Criminals – Jacobson V. United States

Instructor: Dr. Mark Leeper

Meghan Leary

Title: A Comprehensive Analysis of an Addiction Recovery Program and Client Response in Northeast Nebraska

Instructor: Dr. Karen Walker

Jacob Mathieson

Title: You Can Get There From Here: Paths and Trails in Wayne, America

Instructor: Dr. Randy Bertolas

Tamara Nash

Title: Between Identities: Multiracial Identity and Substance Abuse

Instructor: Dr. Karen Walker

Rachel Schmitz

Title: Living Latino/a in the Midwest: An Analysis of Cultural Perspectives Through the Lens of Latino-Owned Businesses

Instructor: Dr. Monica Snowden

Presentations for 2010

Nebraska Chapter of the Wildlife Society ~ Norfolk, NE February 2010

Allison Freedman

Title: A Comparison of Bird, Invertebrate and Small Mammal Granivory at an Iowa prairie.

Abstract: Prairie grasses and forbs produce abundant seed each year, yet the fate of that seed is unclear. Certain rodents, birds, and invertebrates are seed eaters and can serve as granivores associated with prairies. Research was conducted to determine the extent granivorous animals remove native plant seeds in a prairie system. The study site was located at the Nature Conservancy's Sioux City (Iowa) Prairie. Native grass and forb seed (wild-bergamot, lead plant, purple prairie clover, switch grass, big bluestem, and purple coneflower) were placed in cages and/or seed barriers such that only invertebrates, rodents, or birds individually could access the seed. Rodents and birds removed the greatest amount of seeds in comparison to invertebrates. On average, more forb seeds were removed from the study site than grass seeds. In general there were no differences in seed removal across microsites at a given sampling time. Our results indicate granivorous animals do have an influence on the amount of seeds available for future reproduction, and thus may impact relative abundance of prairie species over time.

Advisor: Dr. Mark Hammer

Lisa Rech

Title: Small Mammal Diversity in Areas of Restored Prairie

Abstract: Habitat disturbance can have a direct effect on small mammal population structure. We conducted a comparison of small mammal species richness, abundance, and diversity using live trapping to evaluate the impact of varying levels of disturbance in prairie habitat. We conducted small mammal trapping surveys between May and August 2009 in a recently disturbed prairie, restored prairie, and undisturbed prairie in Wayne County, Nebraska. Small mammal species richness did not differ among sites. The abundance of small mammals was higher at the restored and undisturbed prairie sites than at the recently disturbed site. Diversity was highest at the restored and undisturbed prairie sites, however the dominant species differed at each site; deer mice (*Peromyscus maniculatus*) and meadow jumping mouse (*Zapus hudsonius*) respectively. These results suggest that of the small mammal species present, some prefer areas with little to no disturbance while others may be tolerant of some level of disturbance.

Project Advisor: Dr. Ron Loggins

NACSM ~ St. Cloud, MN March 2010

L. K. Grim, T.S. Johnson and K.G. Suing

Title: Acute Cryotherapy or Prolonged Seated Rest Decreases Vertical Jump Performance in Female Collegiate Volleyball Athletes

Abstract: Recent research has shown that acute hamstring cryotherapy applied for 10 min, but not 3 min results in significantly lower average single-leg vertical jump performance immediately post and 20 min post ice application in a heterogeneous group of male and female recreational and collegiate athletes (Fischer J. et al., *J. Strength Cond. Res.* 23:44-50, 2009). However, it is unclear whether vertical jump performance is adversely affected following quadriceps cryotherapy or prolonged seated rest in a homogenous group of female collegiate volleyball athletes.

Purpose: To compare the effects of no ice (NI), 3 min ice (3I) and 10 min ice (10I) on counter movement vertical jump performance from pre (PRE) to immediately post (IP) and 20 min post (20P) ice application in National Collegiate Athletic Association Division II female volleyball athletes.

Methods: Seven healthy trained female collegiate volleyball athletes (mean \pm SD, age=19.6 \pm 0.8 y, height=176.9 \pm 6.4 cm, mass=71.56 \pm 6.35 kg, body fat=18.9 \pm 4.0 %) volunteered to participate in the study. Following a 5-min jog, subjects completed 3 randomly assigned cryotherapy protocols to include: NI (control), 3I, and 10I. The cryotherapy protocols consisted of applying ice bags to the quadriceps muscle group on both legs for the designated time interval. For the NI protocol, subjects sat in a chair with back support for 10 min with both feet on the ground. Similarly, subjects sat in a chair for 20 min post treatment prior to the 20P vertical jump assessment. The highest of 3 vertical jumps with 30 sec rest between attempts was used to compute maximal vertical jump performance for each protocol.

Results: Two-way (time x protocol) repeated measures ANOVA was used to determine differences. Follow-up analyses included one-way ANOVA with Tukey post-hoc tests. The data indicated that average vertical jump height across the NI condition was not different ($p>0.05$) from PRE (52.80 \pm 3.54 cm) to IP (51.53 \pm 3.59 cm) but was significantly greater ($p<0.05$) versus 20P (50.62 \pm 3.07 cm). For the 3I condition, PRE (52.25 \pm 3.36 cm) was greater than IP (51.88 \pm 3.54 cm) and 20P (49.71 \pm 3.13 cm). Similarly, for the 10I condition, PRE (53.52 \pm 2.87 cm) was greater than IP (51.89 \pm 3.42 cm) and 20P (49.17 \pm 2.77 cm).

Conclusion: We conclude that 20P following the NI treatment but not IP, has a similar negative effect on vertical jump performance to 3I and 10I both IP and 20P ice application. The data from this project suggests that acute cryotherapy or prolonged seated rest decreases vertical jump performance in female collegiate volleyball athletes.

Project Advisors: D.S. Conley, FACSM, T.K. Evetovich, FACSM, B.J. Engebretsen, and K.R. Hinnerichs

A.B. Donner, M.J. Stander and C. Cerda

Title: Acute Strengthening Followed by Varied Rest has Similar Effects on Upper and Lower Body Strength

Abstract: Recent research has shown that rest intervals of 5 min or longer may mitigate the effects of acute stretching on performance in collegiate track athletes and further, it is unclear whether stretching has the same effect on upper versus lower body muscular strength (Torres, E.M. et al., *J. Strength Cond. Res.* 22:1279-1285, 2008).

Purpose: To compare the acute effects of static stretching with varied rest intervals on one repetition maximum (1RM) bench and leg press performance in recreationally trained college-aged males.

Methods: Eleven healthy resistance trained males (mean \pm SD, age=20.4 \pm 1.3 y, height=178.0 \pm 7.2 cm, mass=79.76 \pm 15.23 kg, body fat=12.8 \pm 5.7 %) involved in a regular weight training program for 4 consecutive months immediately prior to the study and, with a minimum of 1 y of weight training experience volunteered to participate in the study. Subjects completed 4 randomly assigned protocols to include: 1) static stretch with no rest followed by 1RM bench press (SSNRBP), 2) static stretch with no rest followed by 1RM leg press (SSNRLP) 3) static stretch with 5 min rest followed by 1RM bench press (SSWRBP) and 4) static stretch with 5 min rest followed by 1RM leg press (SSWRLP). Four upper body stretches were performed prior to 1RM bench press protocols that targeted the chest, shoulders, triceps and upper back. Similarly, 4 lower body stretches were performed prior to 1RM leg press protocols that targeted the quadriceps, hamstrings, gastrocnemius and hip flexors. The stretching interventions included 3 sets of each exercise passively held to a point of moderate tension by the same technician for 30 sec. The stretching protocols were substituted for the stretching recommendations outlined in the ACSM 1RM resistance training guidelines (2000). A minimum of 48 h was required between testing sessions and all testing was completed within 3 wk.

Results: Paired t-tests were used to determine mean differences across the 2 stretching treatments for both bench and leg press. The data indicated that average SSNRBP (104.7 \pm 6.1 kg) was not significantly different ($p>0.05$) versus SSWRBP (104.0 \pm 5.6 kg). Similarly, the data showed that average SSNRLP (235.41 \pm 21.0 kg) was not different versus SSWRLP (229.2 \pm 20.0 kg).

Conclusion: We conclude that varying rest intervals up to 5 min following static stretching has the same effect on 1RM bench and leg press in college-aged recreationally trained males. The data from this project suggests that acute static stretching followed by varied rest intervals up to 5 min has similar effects on upper and lower body muscular strength.

Project Advisors: D.S. Conley, FASCM, T.K. Evetovich, FASCM, B.J. Engebretsen, and K.R. Hinnerichs.

Jessica Wimmer

Title: A Stream Assessment of Macroinvertebrates in Nebraska's Pine Ridge.

Abstract: This is a survey of aquatic macroinvertebrates from the Nebraska Pine Ridge area since the fall of 2008. This study has a total of 9 sites using 6 sites which were sampled since 2008 and 3 sites from historical data. The goal of this study is to determine the macroinvertebrate diversity as well as determine the community structure of the macroinvertebrates according to their site. The streams were sampled in 2008 using a modified rapid bioassessment protocol from the USEPA. The data from this study was combined with the historical data which was collected by the Nebraska Department of Environmental Quality and the Central Plains Center for Bioassessment for an increase in seasons and years sampled. The results of this study contained 60 different families. With a total of 35 families collected and counted. At East Ash Creek, the Upper White River, and Trunk Butte Creek Trichoptera had the greatest percent family richness. Big Bordeaux Creek was dominated mainly by percent Ephemeropteran richness. At Chadron Creek at the Wildlife Management Area, Monroe Creek, and the Lower White River the highest percent richness was Diptera. While Squaw Creek was most dominant in percent Trichoptera and Diptera richness and Chadron State Park was richest in Trichoptera, Diptera, and Ephemeroptera. The overall analysis of all the sites concluded that the highest percent richness went to Diptera, Trichoptera, and then Ephemeroptera with the other families following shortly behind. This is an ongoing study, with new sites collected and are currently being sorted and analyzed to increase our understanding of the macroinvertebrate communities in Nebraska's Pine Ridge.

Advisor: Dr. Barbara Hayford

Midwest Sociological Symposium ~
Chicago, IL March 2010

Eva Rosberg

Title: Black and White Wealth Gap: Race Through a White Lens

Rachel Schmitz

Title: Living Latino/a in the Midwest: An Analysis of Cultural Perspectives Through the Lens of Latino-Owned Businesses

Advisor: Dr. Monica Snowden

A.C. McIntyre, T.E. Cinfel, C.D. Miller and K.R. Meyer

Title: Warm-Up Following Acute Cryotherapy Does Not Alter Wingate Cycle Ergometer Test Performance

Abstract: Research examining the acute effects of cryotherapy on functional performance has shown that a warm-up following ice application to the anterior thigh can negate the effects of cryotherapy (Richendollar, M.L., et al., *J. Strength Cond. Res.* 41:364-370, 2006). However, the acute effects of cryotherapy followed by a warm-up on Wingate cycle ergometer test (WCET) performance has not been reported.

Purpose: To compare the effects of no ice with a warm-up (NIWU), 10 min of ice followed by no warm-up (10INW), and 10 min of ice followed by a warm-up (10IWU) on WCET in National Collegiate Athletic Association Division II football players.

Methods: Thirteen healthy trained collegiate football athletes (mean \pm SD, age=20.5 \pm 1.6 y, height=181.4 \pm 6.5 cm, mass=91.05 \pm 11.76 kg, body fat=14.2 \pm 4.5 %) volunteered to participate in the study. Subjects completed 3 randomly assigned warm-up protocols to include: NIWU, 10INW, and 10IWU prior to WCET. The NIWU warm-up protocol consisted of pedaling a calibrated Monarch cycle ergometer at 25W for 5 min interspersed with 5-sec sprints every 60 sec. The 10INW protocol included applying ice to the quadriceps muscle group on both legs for 10 min followed by 5 min of rest. The 10IWU protocol involved applying ice to the quadriceps muscle group on both legs for 10 min followed by a 5 min cycle warm-up identical to the NIWU protocol. All WCET were performed on a calibrated Monarch Peak Bike, and indices of peak power (PP) and mean power (MP) were calculated for each test and have been described elsewhere (Powers, S.K. & Howley, E.T. *Exercise Physiology Theory and Application to Fitness and Performance* 7th Edition, p. 442, 2010). A minimum of 48 h was required between each WCET and all tests were completed within 2 wk.

Results: Two separate repeated measures one-way ANOVA's indicated that PP was not different ($p>0.05$) across all 3 treatments to include NIWU (919.5 \pm 44.5W), 10INW (938.4 \pm 52.3W), and 10IWU (991.3 \pm 50.6W). Similarly, the data showed that MP was not different across all 3 treatments to include NIWU (669.3 \pm 22.3W), 10INW (663.4 \pm 25.2W), and 10IWU (695.7 \pm 19.7W).

Conclusion: We conclude that acute cryotherapy followed with or without a 5 min warm-up has no significant effect on PP or MP assessed during the WCET in collegiate football players. The data from this project suggests that performing a warm-up following acute cryotherapy does not alter Wingate cycle ergometer test performance in collegiate football players.

Project Advisors: D.S. Conley, FACSM, T.K. Evetovich, FACSM, B.J. Engebretsen, and K.R. Hinnerichs.

A.A. Bachman, G.J. Kopecky and J.E. Pickinpaugh

Title: Acute Fluid Consumption Improves Hydration Status Without Altering Body Fat in Collegiate Wrestlers

Abstract: Leg-to-leg bioelectrical impedance analysis (LBIA) has been reported to have acceptable accuracy in estimating percent body fat compared to hydrostatic weighing in collegiate wrestlers (Dixon, C.B. et al., *J. Strength Cond. Res.* 19:85-91, 2005) and is commonly used to assess body composition in competitive wrestlers. However, the effects of acute fluid consumption on hydration status, body weight, and estimation of body fat using LBIA in collegiate wrestlers is unclear.

Purpose: To examine the effects of acute hydration on urine specific gravity, body weight, and body fat in collegiate wrestlers.

Methods: Ten healthy trained National Collegiate Athletic Association Division II club wrestlers (mean \pm SD, age=19.6 \pm 1.3 y, height=177.2 \pm 6.9 cm, mass=77.54 \pm 2.26 kg, body fat=12.6 \pm 5.1 %) volunteered to participate in the study. Following a 12 hr fast, baseline urine specific gravity (USG), body weight (BW), and percent body fat (BF) using LBIA were assessed. Subjects then consumed 591 ml of water within 5 min after which, USG, BW, and BF were assessed every 20 min for 1 hr. USG was assessed using a hand-held Mannix REF312ATC optical protein/urine refractometer, BW was measured using a Balfour digital scale, and BF was assessed using a TANITA BF-522 LBIA analyzer.

Results: Repeated measures one-way ANOVA analysis with Tukey post-hoc tests indicated that USG decreased significantly ($p<0.05$) from baseline (1.026 \pm 0.018) across 20 (1.022 \pm 0.002), 40 (1.017 \pm 0.003) and 60 min (1.013 \pm 0.003) time intervals. BW increased significantly from baseline (77.54 \pm 2.26 kg) to 20 min (77.73 \pm 2.26 kg) but was not different ($p>0.05$) at 40 (77.62 \pm 2.26 kg) and 60 (77.54 \pm 2.26 kg) min time intervals. BF was not different from baseline (12.58 \pm 1.47 %), across all time intervals to include 20 (12.45 \pm 1.42 %), 40 (12.70 \pm 1.42 %), and 60 min (12.64 \pm 1.38 %).

Conclusion: We conclude that acute fluid consumption significantly changes USG from dehydrated to euhydrated levels without altering body weight and body fat within 60 min. The data from this project suggests that acute fluid consumption significantly improves hydration status without altering body fat in collegiate wrestlers.

Project Advisors: D.S. Conley, FACSM, T.K. Evetovich, FACSM, B.J. Engebretsen, and K.R. Hinnerichs.