# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **165** Abstract Title: | **Myonuclear number is decreased in aged diaphragm of satellite cell depleted mice** |
| Author(s): | L.S. Ghazala, Department of Biology, U of Kentucky<br>A.L. Confides, College of Health Sciences, U of Kentucky<br>E.E. Dupont-Versteegden, College of Health Sciences, U of Kentucky |

**Abstract:** Satellite cells (muscle stem cells) are required for skeletal muscle regeneration, but their role in muscle adaptation and maintenance, particularly in diaphragm muscle, is not clear. Since the diaphragm muscle is active throughout life, as opposed to hind limb muscles, the role of satellite cells needs to be explored, particularly under a stressor, such as exercise. Female Pax7-DTA mice were satellite cell depleted using tamoxifen at 4 months of age and were either provided with running wheels for 8 weeks or remained sedentary at 6 or 20-22 months age. Mice were sacrificed at 8 (young) or 22-24 months (aged) of age. Diaphragm muscle was dissected, digested into single muscle fibers, stained with DAPI, and analyzed for myonuclear number and fiber width. There were no age-related differences for either width or myonuclear number. In aged sedentary, but not running mice fiber width was decreased with tamoxifen, but no difference was observed in the young. Interestingly, myonuclear number was not different with satellite cell depletion in young mice in either sedentary mice or in runners, but in the aged mice there was a main effect for satellite cell depleted diaphragm muscle to have a lower myonuclear number which was more pronounced in the runners. We conclude that satellite cell depletion causes a decrease in myonuclear number in diaphragm muscle of aged, but not young mice independent of running activity.

Supported by: This work was funded through grant AG043721 from NIA

Primary Presenter / email: **Ghazala, L.S.** / lsgh222@g.uky.edu
**Student**
**Undergrad**
**Biology B.S.**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Dupont-Versteegden, E.E. / eedupo2@email.uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 166 Abstract Title: | **Depletion of Satellite Cells does not cause an Increase in Extracellular Matrix in Diaphragm Muscle of Running Mice** |
| Author(s): | E.J. Reister, Transylvania U, Lexington, KY<br>A.L. Confides, College of Health Sciences, U of Kentucky<br>E.E. Dupont-Versteegden, College of Health Sciences, U of Kentucky |

**Abstract:** Satellite cells are known to be required for skeletal muscle regeneration, but their role in muscle plasticity and adaptability has recently been questioned and their role in diaphragm is largely unexplored. The goal of this study was to discern the effect satellite cells have on the extracellular matrix (ECM) of diaphragm muscle in mice undergoing voluntary running activity. It was hypothesized that the depletion of satellite cells would result in an increase in the amount of ECM with running. In order to test this hypothesis, a Pax7-DTA mouse strain was utilized to ablate >90% of the satellite cells after tamoxifen treatment. Satellite cells were ablated at 4 months of age. At six months old, the mice were either given a running wheel or remained sedentary for eight weeks. Diaphragm muscle was collected and frozen. Muscle cross sections were stained with wheat germ agglutinin and amount of staining was quantified as an indicator of ECM using automated analysis software. Pax7+ positive cells were also counted. Two-way ANOVAs were used to test for statistical significance. Results show that running did not increase the number of satellite cells (Pax7+) in vehicle treated mice, but tamoxifen treated mice were >90% depleted of satellite cells. Furthermore, ECM was increased in runners and this effect was independent of satellite cell depletion. It is concluded that in diaphragm muscle a loss of satellite cells does not induce more ECM accumulation with running than in mice not depleted.

Supported by: Funding for this work was provided by grant AG043721 from NIA

Primary Presenter / email: **Reister, E.J.** / ejreister17@transy.edu
**Student**
**Undergrad**
**Neuroscience and Exercise Science**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Dupont-Versteegden, E.E. / eedupo2@email.uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **167** Abstract Title: | **Muscle Spindle Changes in Satellite (Stem) Cell Depleted Mice Alter Coordinative Balance** |
| Author(s): | A.L. Confides, Dept. of Rehabilitation Sciences, U of Kentucky<br>J.R. Jackson, Department of Rehabilitation Sciences, U of Kentucky<br>C.A. Peterson, Department of Rehabilitation Sciences, U of Kentucky<br>E.E. Dupont-Versteegden, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Satellite cells, better known as muscle stem cells, are known to play an essential role in muscle regeneration. However; they have also been associated with muscle plasticity and growth. By conditional depletion of satellite cells in genetically modified mice we were able to challenge the hypothesis that they are required for muscle growth. Depleting satellite cells by administering tamoxifen to a novel mouse strain (Pax7-DTA) showed that satellite cells were not necessary for muscle growth during hypertrophy or regrowth after atrophy. The requirement of satellite cells for running activity was investigated in the current study. Pax7-DTA mice, 2 months after tamoxifen or (control) administration, were provided with voluntary running wheels to track daily running activity. It was found that tamoxifen-treated mice run 27% less than the vehicle-treated mice and showed decreased coordination and balance. We hypothesized that the function of muscle spindles, the sensory organs of skeletal muscles which detect changes in length and stretch, has changed in response to satellite cell depletion. Muscle cross sections were stained with wheat germ agglutinin to visualize extra cellular matrix (ECM) and muscle spindles. ECM index (amount of ECM per spindle area) and size of intrafusal (spindle) fibers was measured. It was found that ECM index was increased in satellite cell depleted muscles while intrafusal muscle fiber size was decreased. Current studies have shown that declines in visual, proprioceptive, and motor systems accompany aging in adults. This hypothesis was observed in the slight 2.7% differential of average spindle lobe size of vehicle mice between young to aged ambulatory mice. Although a small differential, even the slightest changes in morphology of the spindle can lead to decreased sensibility and thus coordination. We conclude that changes in muscle spindles with satellite cell depletion are likely responsible for the decrease in running activity.

Supported by: This work was supported by UGSRF from APS, AG043721, AR060701, and Center for Muscle Biology at University of Kentucky.

Primary Presenter / email: **Robinson, T.** / tjro238@g.uky.edu
**Student**
**Undergrad**
**Chemical engineering**
**Division of Human Health Sciences**

Mentor / e-mail: Dupont-Versteegden, E.E. / eedupo2@email.uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **168** Abstract Title: | **Enzymatic evidence for a revised congocidine biosynthetic pathway** |
| Author(s): | A.H. Al-Mestarihi, Department of Chemistry, Georgia State U<br>A. Garzan, Department of Pharmaceutical Sciences, U of Kentucky<br>J.M. Kim, Division of Human Health Sciences, U of Kentucky<br>S. Garneau-Tsodikova, Department of Pharmaceutical Sciences, U of Kentucky |

**Abstract:** Nonribosomal peptides (NRP) are pharmaceutically valuable secondary metabolites that are processed in assembly-line fashion by enzymes called nonribosomal peptide synthetases (NRPS), which are typically composed of adenylation (A), thiolation (T), and condensation (C) units. Naturally produced pyrrolamides, such as congocidine, are nonribosomal peptides that bind to the minor groove of DNA in a sequence-specific manner, which confers anticancer activity. Considerable efforts have been made to increase this ability and overcome toxicity of pyrrolamide analogues. The majority of attempts to delineate the biosynthetic machinery, the order and method of protein function, during pyrrolamide assembly have been genetic methods. We discuss biochemical characterization of four essential proteins in congocidine formation: the adenylation-thiolation (A-T) di-domain Cgc18(1-610) and its MbtH-like partner SAMR0548, the AMP-binding enzyme Cgc3*, and the T domain Cgc19. Enzymes were expressed in E. coli and were NHis6-tagged to facilitate purification via Ni2+-NTA affinity chromatography. Further testing of substrate specificities was accomplished through ATP-[32P]PPi exchange assay and assays using pyrrole analogues. Reverse-phase HPLC was utilized to investigate the mechanisms of the pathway. We report revised substrate specificities of Cgc18(1-610) and Cgc3*, biochemical evidence of the AMP-binding activity of Cgc3*, and loading of 4-acetamidopyrrole-2-carboxylic acid onto Cgc19. Based on these biochemical studies, we suggest a revised congocidine biosynthetic pathway.

Supported by: University of Kentucky College of Pharmacy startup funds (SGT) NSF CAREER Award MCB- 1149427 (SGT) National Center for Advancing Translational Sciences (UL1TR000117) (SGT)

Primary Presenter / email: **Kim, J.M.** / jmki237@g.uky.edu
**Student**
**Undergrad**
**Human Health Sciences**
**Division of Human Health Sciences**

Mentor / e-mail: Garneau-Tsodikova, S. / sylviegtsodikova@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **169** Abstract Title: | **Long Term Effects of Anterior Cruciate Ligament Reconstruction on Quadriceps Strength and Function Abilities** |
| Author(s): | T. Bayers, Department of Biology, College of Arts and Sciences, U of Kentucky<br>J. Bell, College of Medicine, U of Kentucky<br>M. Lex, Division of Physical Therapy, College of Health Sciences, U of Kentucky<br>M.L. Ireland, Department of Orthopaedics and Sports Medicine, College of Medicine, U of Kentucky<br>D. Johnson, Department of Orthopaedics and Sports Medicine, College of Medicine, U of Kentucky<br>B. Noehren, Division of Physical Therapy, College of Health Sciences, U of Kentucky |

**Abstract:** Background/Hypothesis: Much of the research on outcomes after anterior cruciate ligament reconstruction (ACLR) has focused on the first 2 years after surgery. Little attention has been given to the potential effects of ACLR 5-20 years post-op. The purpose of this study is to compare the function of ACLR limbs 5-20 years post-op with healthy limbs. We hypothesize that ACLR limbs 5-20 years post-op will have deficits in Y-Balance anterior reach (YB-A), quadriceps strength, and single leg step down (SLSD) performance. Number of Subjects: 49 subjects (16 control, Height: 67±3.82 in Weight: 148.1±31.2 lbs. and 33 ACLR, Height: 65.3±12.2 in Weight: 161.2±26.8 lbs.) Methods: Subjects performed YB-A, isometric quadriceps strength testing, and SLSD. The results of the YB-A were normalized to limb length and strength values normalized to body mass. Statistical Analysis: Independent two-sample T-tests were used to compare YB-A performance, quadriceps strength, and SLSD performance between groups. Results: The mean values for the ACLR and control group for quadriceps strength were 2.36±.48 and 2.65±.65 Nm/kg respectively (p=.0865). The mean scores for YB-A for the ACLR and control group were 62.57±6.69 and 68.22±5.04 respectively (p=.0045). The mean scores for the ACLR and control subjects SLSD were 30.82±13.35 and 42.69±8.87 respectively (p=.0023). Conclusion: The ACLR group showed significantly poorer performance for the SLSD. While the results for quadriceps strength and YB-A are not statistically significant, there is a reduction. These results show a need to improve care for patients long term in order to maintain high functioning levels.

Supported by:

Primary Presenter / email: **Bayers, T.B.** / bayerstyler@gmail.com
**Student**
**Undergrad**
**Biology**
**Division of Human Health Sciences**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **170** Abstract Title: | **Magnetic Resonance T2 Measurements on the Vastus Lateralis in ALC-Injured and Uninjured Legs** |
| Author(s): | R.D. Lawless, College of Engineering, U of Kentucky<br>P.A. Hardy, Department of Radiology, U of Kentucky<br>M.L. Ireland, Department of Orthopaedic Surgery and Sports Medicine, U of Kentucky<br>D. L. Johnson, Department of Orthopaedic Surgery and Sports Medicine, U of Kentucky<br>A. H. Andersen, Department of Anatomy & Neurobiology, U of Kentucky<br>B. Noehren, Department of Physical Therapy, U of Kentucky |

**Abstract:** Hypothesis: In individuals who have had a torn ACL repaired the quadriceps muscles are persistently weaker even after extensive rehabilitation. We sought to use various MR imaging methods to detect differences in the amount of non-contractile volume and T2 values. We hypothesized that the injured limbs would have higher non-contractile volume and T2 values. Subjects: 5 ACL injured subjects (4M, 1F, 20 ±3.0 yrs old) Methods: We acquired proton density and T2-weighted MR images over the entire length of the vastus lateralis (VL) in both the injured and un-injured legs in individuals prior to ACL reconstruction surgery. From a subset of these images we estimated an approximation of the MR relaxation time T2 and the % of non-contractile material within the muscle. Between limb comparisons were made with a one way paired t-test and effect sizes were calculated. Results: We found a trend towards significant differences in % non-contractile volume (injured: 5.50± 8.09%, non-injured: 0.41±0.35, p=0.12 value, effect size=1.27) and T2 values (injured: 54.81+4.00, non-injured: 49.08±3.24, p=0.06, effect size=1.30) Conclusion: The T2 imaging technique appears to be sensitive to the presence of non-contractile tissue. Although not statistically significant the results had large effect sizes and we expect that additional subjects will further delineate differences associated with injury. These results suggest that potentially irreversible changes within quadriceps muscle occur as the result of an ACL tear.

Supported by: K23AR062069, VP Research for support of the MRISC.

Primary Presenter / email: **Lawless, R.D.** / rdla222@g.uky.edu
**Student**
**Undergrad**
**Biosystems Engineering**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 171 Abstract Title: | **The Long Term Effect of Quadriceps Strength on Function after an Anterior Cruciate Ligament Reconstruction** |
| Author(s): | M. Lex, Department of Rehabilitation Sciences, U of Kentucky<br>M.L. Ireland, Departments of Orthopaedic Surgery and Sports Medicine, U of Kentucky<br>D. Johnson, Departments of Orthopaedic Surgery and Sports Medicine, U of Kentucky<br>B. Noehren, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** HYPOTHESIS: Reductions in quadriceps strength following an anterior cruciate ligament (ACL) reconstruction have been hypothesized to reduce quality of life in as little as 5-20 years. However, this has never been formally tested and led us to assess the relationship between quadriceps strength and patient reported outcomes 5-20 years after surgery. We hypothesized that greater quadriceps strength would positively correlate to patient reported outcomes. NUMBER OF SUBJECTS: 31 (24 female, 7 male, 34 ±12 years old) PROCEDURES: Isometric quadriceps strength was measured and normalized to body weight. Subjects' function was reported on the International Knee Documentation Committee (IKDC), Lysholm Knee Questionnaire, Knee Injury and Osteoarthritis Outcome Score (KOOS), and Lower Extremity Functional Scale (LEFS) questionnaires. STATISTICAL ANALYSIS: Pearson's correlations were performed to assess the association between strength and patient reported outcomes. RESULTS: Mean values for the variables of interest were as follows, normalized knee extension strength 2.4 ± 0.50 N/kg, IKDC 81.7 ± 15.9, Lysholm 87.1 ± 11.4, KOOS subscale of activities of daily living (ADL) 95.0 ± 8.1, and LEFS 74.0 ± 7.2. Knee extension strength was significantly correlated to IKDC (r=0.60, p< 0.00), Lysholm (r=.41, p=0.02), KOOS ADL (r=0.45, p=0.01), and LEFS (r=0.52, p<0.00). CONCLUSIONS: Quadriceps strength was significantly correlated to long term outcomes and could be an important factor in preventing decline in function after an ACL reconstruction. Interventions are needed to maximize quadriceps strength during a critical time in individual's lives where they are at their peak productivity, as well as reduce long term risk of chronic disease in adulthood.

Supported by: NIH K23AR062069

Primary Presenter / email: **Lex, M.** / molly.lex@uky.edu
**Student**
**Undergrad**
**Kinesiology-Exercise Science**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 172 Abstract Title: | **Hip and knee angle asymmetries during the second landing of a drop vertical jump following an ACL reconstruction** |
| Author(s): | M. Marquez, Division of Human Health Sciences, College of Health Sciences, U of Kentucky<br>P. Kline, Department of Rehabilitation Sciences, College of Health Sciences, U of Kentucky<br>M. L. Ireland, Department of Orthopedic Surgery & Sports Medicine, College of Medicine, U of Kentucky<br>D. Johnson, Department of Orthopedic Surgery & Sports Medicine, College of Medicine, U of Kentucky<br>B. Noehren, Division of Physical Therapy, College of Health Sciences, U of Kentucky |

**Abstract:** Despite the high frequency of anterior cruciate ligament reconstructions (ACLR), little work has assessed between-limb kinematic asymmetries during a drop vertical jump (DVJ). The second landing from a DVJ simulates a rebound task in basketball and is a good simulation of how an athlete may land during competition, placing their knee at risk for reinjury. However, whether asymmetries exist during this task has never been assessed. Hypothesis: We hypothesize that there will be significant amounts of hip and knee asymmetry between ACL-reconstructed and non-reconstructed limbs during the second landing of a DVJ. Number of Subjects: Twenty subjects (12 F, age 19.7 ± 4 yrs, H 1.73 ± 0.1 m, M 69.1 ± 12.1 kg, Tegner 5.8 ± 1.4) were included in this study. Procedure: Individuals six months post ACLR performed three trials of a DVJ. Using 3-dimensional motion analysis, subjects were instructed to jump off a 30.5 cm box, land, perform a maximal jump, and land once more. Statistical Analysis: Visual 3D analyzed hip and knee kinematics at loading response (LR), defined as 20% of stance. Paired sample t-tests were used to compare limb asymmetries. Results: During LR, the reconstructed limb demonstrated significant asymmetries with great hip internal rotation (6.1±6.0°; p<.000) and the knee in greater external rotation (4.7±7.6°; p<.012), and flexion (2.6±4.2°; p<.014). There were no significant differences at initial contact. Conclusion: Greater asymmetry at LR suggests that the reconstructed limb is less able to control loading during the second landing, possibly increasing subsequent injury risk.

Supported by:

Primary Presenter / email: **Marquez, M.J.** / mjma237@g.uky.edu
**Student**
**Undergrad**
**Human Health Sciences**
**Division of Human Health Sciences**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **173** Abstract Title: | **Comparison in Muscle Extracellular Matrix Between Individuals With and Without Knee Osteoarthritis** |
| Author(s): | B. Noehren, Division of Physical Therapy, U of Kentucky<br>C. Peterson, Rehabilitation Sciences, U of Kentucky<br>K. Kosmac, College of Health Sciences, U of Kentucky<br>R.G. Walton, College of Health Sciences, U of Kentucky |

**Abstract:** HYPOTHESIS: Individuals with knee osteoarthritis (OA) are speculated to have reductions in muscle quality. However, to date few studies have investigated this potential contribution to reduced quadriceps function within subjects with OA. We hypothesized that subjects with OA will have significantly more extracellular matrix limiting the contractile function of the muscle. NUMBER OF SUBJECTS: 34 (OA: 9 females, 5 males; 60.5 ± 5.8 years old; 83.6 ± 16.0 kg; (Control: 9 females, 11 males; 63.6 ± 7.1 years old) METHODS: Muscle biopsies were taken from the Vastus Lateralis muscle. Seven µm serial sections were cut in a cryostat and the Wheat Germ Agglutinin (WGA) Staining Protocol was then followed. Images were captured using the Zeiss upright microscope and then analyzed using Axiovision software to determine the fibrosis relative to the total cross sectional area (CSA) of the section. STATISTICAL ANALYSIS: A two-tailed t-test was used to determine between groups differences. RESULTS: Significant differences (p=0.002) were found between the control group 4.8 ± 2.0 µm2, and the OA group 7.3 ± 7.8 µm2. CONCLUSIONS: The OA subjects had significantly greater extra cellular matrix, limiting the contractile function for muscle fibers and potentially affecting the muscle ability to produce force. These could represent irreversible changes within the muscle and future studies are needed to assess the functional and clinical implications of these findings.

Supported by: Grants present for the project in the College of Health Sciences under the supervision of the senior scientist Dr. C. Peterson

Primary Presenter / email: **Benish, C.** / Cnbe227@g.uky.edu
**Student**
**Undergrad**
**Human Health Sciences**
**Division of Human Health Sciences**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 174 Abstract Title: | **Trunk Muscle Adaptations Responsible for Altered Gait Mechanics in Individuals with ACL Reconstruction** |
| Author(s): | G.F. Boggess, Depts of Mechanical Engineering & Chemical & Materials Engineering, U of Kentucky<br>K.D. Morgan, Department of Physical Therapy, U of Kentucky<br>B.N. Noehren, Department of Physical Therapy, U of Kentucky<br>M.L. Ireland, Department of Orthopaedic Surgery, U of Kentucky<br>D.L. Johnson, Department of Orthopaedic Surgery, U of Kentucky<br>J.A. Reinbolt, Department of Mechanical Engineering, U of Tennessee |

**Abstract:** HYPOTHESIS: Excessive trunk lean over the injured leg is a risk factor for Anterior Cruciate Ligament reconstruction (ACLR) re-tear. Thus, the objective of this study is to identify the muscles responsible for excessive trunk lean in ACLR individuals. NUMBER OF SUBJECTS: 11 control (22.7±3.5 years, 60.56±8.51 kg, 1.68±0.08 m); 11 ACLR (19.7±3.7 years, 64.22±12.04 kg, 1.67±0.06 m) METHODS: Three dimensional kinematics and ground reaction forces were recorded during a running protocol at a self-selected speed (control 2.76±0.26 m/s; ACLR 2.80±0.29 m/s). Muscle-tendon actuated simulations were developed for each participant in OpenSim, a musculoskeletal modeling software program. Trunk (internal and external obliques; rectus abdominis; erector spinae) muscle forces were assessed at impact peak. STATISTICAL ANALYSIS: A two-tailed t-test compared the ratio of injured side/non-injured side trunk muscle forces between the two groups (α=0.05). RESULTS: At impact peak control subjects had a greater erector spinae ratio (3.438±1.58) than ACLR subjects (1.561±1.66) (p =.03). There was no difference between the groups for the rectus abdominis (Control: 3.62±4.23, ACLR 2.15±1.46, p=0.32) and the obliques were not significantly active at impact peak. CONCLUSIONS: The significantly different injured to non-injured side erector spinae force production in the ACL group indicates that abnormal injured side force production may be responsible for excessive trunk lean at impact. The lack of differences for the rectus abdominis and internal and external obliques not being significant further supports the aforementioned finding. These results indicate that post ACLR rehabilitation should also focus on strengthen and motor control of the erector spinae muscles.

Supported by: This research was supported by the National Institute of Arthritis And Musculoskeletal And Skin Diseases of the National Institutes of Health under Award Number K23AR062069

Primary Presenter / email: **Boggess, G.F.** / grant.boggess@gmail.com
**Student**
**Undergrad**
**Mechanical Engineering/Materials Engineering**
**Division of Physical Therapy**

Mentor / e-mail: Noehren, B.N. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **175** Abstract Title: | **The Effect of Blood Flow Restriction Training on Improving Quadriceps Strength and Function** |
| Author(s): | M.A. MacDonald, College of Arts & Sciences, U of Kentucky<br>A.J. Hickey, College of Health Sciences, U of Kentucky<br>B.W. Noehren, Division of Physical Therapy, U of Kentucky |

**Abstract:** HYPOTHESIS: Traditional strength training requires high load resistance exercise that are not practical for patients with orthopedic injuries. Blood flow restricted training (BFRT) is emerging as we way to increase strength using low loads. However, whether this training affects function as well is unknown. We hypothesized that BFRT would significantly improve muscle strength and hop test performance in healthy subjects. NUMBER OF SUBJECTS: 6 (2 male, 4 female, 26.6 ± 9.5 years old) PROCEDURES: Kaatsu BFRT bands were placed on the subjects' thighs while they performed leg extension, leg press, and calf raises exercises at 30% of their 1 RM max 3 times per week for 6 weeks. Isometric quadriceps strength, rate of torque development (RTD), single leg hop, and triple jump, were measured before and after the study. STATISTICAL ANALYSIS: Paired t-tests were used to compare pre-post data. RESULTS: Significant improvements were found in peak strength (pre: 151.2 ± 6.8° N, post: 189.4 ± 6.6° N, p=.05, 25.32% change), single leg hop (pre: 117.8± 20.4cm, post: 136.7± 28.4cm, p=.05), and triple jump (pre: 340.4± 77.6cm, post: 374.1 ± 92.2cm, p=.035. Insignificant results were observed for RTD. RTD (pre: 572.8 ± 67.2° N post: 659.2 ± 73.4° N, p=.10, 15. 077% change). CONCLUSIONS: BFRT training improved jump distances and peak strength in the quadriceps. This type of training may serve as alternative to traditional strength training for patients recovering from orthopedic injuries.

Supported by: UK Division of Physical Therapy

Primary Presenter / email: **MacDonald, M.A.** / mia.macdonald@uky.edu
**Student**
**Undergrad**
**Biology**
**Division of Physical Therapy**

Mentor / e-mail: Noehren, B.W. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 176 Abstract Title: | **A study of vocal function in adults irradiated for larynx cancers** |
| Author(s): | V. Angadi, Rehabilitation Sciences, U of Kentucky<br>R. Gower, Division of Communication Sciences and Disorders, U of Kentucky<br>J. Mercado, Division of Communication Sciences and Disorders, U of Kentucky<br>J. Stemple, Division of Communication Sciences and Disorders, U of Kentucky |

**Abstract:** Background: Kentucky shows one of the highest incidence rates for larynx cancers in the Unites States. Larynx cancers, both early and advanced, can be treated with radiation therapy alone, surgery alone or a combination of these treatment modalities. Advanced laryngeal cancers are often treated with a combination of chemoradiation therapy. Though curative in nature, radiotherapy itself causes significant damage to the vocal fold structures and surrounding tissues. There are a number of studies that have documented the adverse effects of radiation on vocal fold structures and subsequently voice quality. Objective: The objective of this study is to describe vocal function in subjects who have previously received radiation therapy for larynx cancers using the five domains of voice assessment. Methods: This is a cohort study that focuses on the data collection and analysis of a radiation therapy group and a control group. Data was analyzed from 17 subjects. Results: The groups were matched in terms of age and smoking habits. Statistically significant differences were observed in terms of VHI, mean peak air pressure, vital capacity, and pitch range. Greater number of participants in the radiation therapy group showed abnormal stroboscopic and high-speed measures as compared to the control group. Discussion: Patients who have undergone radiation therapy for laryngeal cancers show long-term voice changes across the five domains of voice assessment. The majority of the patients in the radiation therapy group continued to show abnormal voice measures across the five domains of voice assessment, months after completion of radiation treatment.

Supported by:

Primary Presenter / email: **Gower, R.; Mercado, J.** / rebecca.gower@uky.edu
**Student**
**Undergrad**
**Communication Sciences and Disorders**
**Division of Communication Sciences & Disorders**

Mentor / e-mail: Stemple, J. / jcstem2@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 177 Abstract Title: | **Can Chest Width Be Used as a Surrogate for Weight for Selection of Contrast Injection Rate for Computed Tomographic Angiography?** |
| Author(s): | A.B. Pittman, Medical Laboratory Science, College of Health Sciences, U of Kentucky<br>K.P. Landwehr, Computer Science, College of Engineering, U of Kentucky<br>C. Malekera, Epidemiology, College of Public Health, U of Kentucky<br>F. Appiah, Statistics, College of Arts & Sciences, U of Kentucky<br>M.A. Winkler, Department of Radiology, Gill Heart Institute, University of Kentucky |

**Abstract:** Introduction: Contrast media (CM) injection rate for computed tomographic angiography (CTA) is typically determined by patient weight. Noise increases with increasing patient weight and attenuation increases with injection rate. Consequently, as patient weight increases injection rate must be increased in order to maintain a contrast to noise ratio (CNR) within the vessel of interest sufficient enough for diagnosis. However, in the care of trauma patients it is seldom feasible to obtain a patient's weight before performing CTA. It has been observed that chest width has a positive relationship to image noise. As body weight is also known to be a predictor of image noise, it is possible that chest width might be used as a surrogate for body weight to determine the optimal contrast injection rate for CTA. Methods: A CTA quality assurance database containing information on 2822 inpatient and emergent thoracic CTA examinations were queried from records that contained complete data on body weight, injection rate, chest width, CTDI, noise, and aortic attenuation. Pearson correlation coefficient was used to examine the correlation significance and to determine the potential of multicollinearity. Results: A strong correlation existed between weight and chest width. Chest width had a stronger main effect than weight on CNR. In the adjusted models, the effect of chest width on CNR increased and that of weight attenuated.
Conclusion: Chest width is highly correlated with weight. Chest width is a stronger predictor of CNR than weight, thus chest width may be a better metric to use than weight when determining injection rate for CTA to aid in diagnosis.

Supported by: This project was supported by the National Center for Advancing Translational Sciences, through Grant UL1TR000117. The content is solely the responsibility of the authors and does not necessarily represent the official views of Teleflex or the National Institutes of Health.

Primary Presenter / email: **Pittman, A.B.** / ashley.pittman@uky.edu
**Student**
**Undergrad**
**Medical Laboratory Science**
**Medical Laboratory Science Program**

Mentor / e-mail: Winkler, M. / michael.winkler@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **178** Abstract Title: | **The Effectiveness of Augmentative and Alternative Communication on Social Interactions for a Child with Cerebral Palsy** |
| Author(s): | E.R. Grisell, College of Health Sciences, U of Kentucky<br>S.A. Davis, College of Health Sciences, U of Kentucky |

**Abstract:** Problem: Cerebral Palsy is "defined as a disorder of movement, muscle tone or posture that is caused by an insult to the immature, developing brain, most often before birth" (Mayo Clinic, 2016). Cerebral Palsy can affect a variety of abilities including the development of speech. (Mayo Clinic, 2016). Luckily, over the past 30 years, the development and use of augmentative and alternative communication (AAC) has increased dramatically. The American Speech-Language and Hearing Association explains that individuals who present severe speech/language deficits can now "rely on AAC to supplement existing speech or replace speech that is not functional" (ASHA, 2016.) Extensive evidence indicates the effectiveness of AAC, however recent research by Kearns et al (2011) indicates that 50% or less of students with significant disabilities in the U.S. public schools that need AAC actually have AAC in place. Indeed even when students are provided with AAC in an inclusive classroom they "may remain socially isolated from their classmates …" (Chung & Carter, 2013, p. 94). Emerging AAC strategies to combat these problems include the use of aided language modeling in the classroom and CORE vocabulary designs to improve communication interactions of students who use AAC. Purpose of the project: The purpose of this project was to evaluate the effectiveness of AAC and aided language modeling on the social interactions of a child with Cerebral Palsy and minimal oral speech. Strategies employed included: the use of AAC and aided modeling of AAC, by both adults and peers, within an inclusive classroom setting.

Supported by: Mayo Clinic, 2016 ASHA, 2016 Chung and Carter, 2013 Kearns et al, 2011

Primary Presenter / email: **Davis, S.A.** / s.amalia@uky.edu

Mentor / e-mail: Kleinert, J. / jklei2@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 179 Abstract Title: | **The Effects of a Hip Flexor Stretching Program on Running Kinematics in Individuals with Limited Passive Hip Extension** |
| Author(s): | J.H. Mettler, Department of Kinesiology and Health Promotion, U of Kentucky<br>B. Noehren, Division of Physical Therapy, U of Kentucky<br>R. Shapiro, Department of Kinesiology and Health Promotion, U of Kentucky<br>M.B. Pohl, Department of Kinesiology and Health Promotion, U of Kentucky |

**Abstract:** While the underlying cause of low back pain in runners is currently unknown, research suggests that improving flexibility of the hip flexor muscle group may be a useful intervention in terms of reducing low back pain. Therefore, the purpose of this study is to analyze the effects of a three-week home-based stretching program on passive hip extension flexibility in healthy individuals who demonstrate limited passive hip extension flexibility. In addition, the sagittal plane kinematics of the hip, pelvis, and spine will be analyzed when running at a self-selected speed. Methods: To date, five healthy subjects have completed the protocol (age: 24.8±4.76 yrs; height: 1.72±0.08 m; mass: 70.64±14.88 kg). Following a screening to assess passive hip extension flexibility, subjects underwent a 3D gait analysis both prior to (PRE) and following (POST) a three-week static hip flexor stretching program. Results: Following the three-week stretching program, peak passive hip extension flexibility increased significantly (PRE=3.2 ± 2.6, POST=-7.6 ± 2.4*, p< 0.05). In contrast to the hypotheses, preliminary results demonstrate no significant improvements in hip extension flexibility during running (PRE=0.1 ± 3.7, POST=-1.7 ± 1.9, p=0.12). There were also no significant reductions in anterior pelvic tilt (PRE=22.8 ± 4.4, POST=20.5 ± 3.5, p=0.12) or lumbar spine extension (PRE=-22.6 ± 8.3, POST=-21.8 ± 8.5, p=0.36) during running. Conclusion: Although statistical differences in running kinematics were not observed following the stretching program, slight alternations in hip extension and pelvic drop were observed in the expected direction. Given the small sample size it is possible that the changes will reach statistical significance as more subjects complete this ongoing study.

Supported by:

Primary Presenter / email: **Mettler, J.H.** / jeff.mettler@uky.edu

Mentor / e-mail: Pohl, M.B. / mbpo223@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 180 Abstract Title: | **Application of an Optimal Cyclic Compressive Load as a Massage-Mimetic Does Not Induce Damage to Young and Aged Rat Skeletal Muscle** |
| Author(s): | E. Hunt, College of Health Sciecnes, U of Kentucky<br>S. Abshire, College of Health Sciences, U of Kentucky<br>A. Confides, College of Health Sciences, U of Kentucky<br>E. Dupont-Versteegden, College of Health Sciences, U of Kentucky<br>T.A. Butterfield, College of Health Sciences, U of Kentucky |

**Abstract:** Introduction: Massage in the form of cyclic compressive loading (CCL) is effective in modulating inflammatory processes, thereby accelerating muscle recovery and restoring function in young animals. Mechanical properties of aged skeletal muscle are different, such that it is stiffer, and therefore the inflammatory response to CCL may be compromised and even detrimental in the aged. Objective: Determine if massage at a load which shows positive immunomodulatory effects in young muscle, will result in damage in aged muscle. Methods: Male Brown Norway/F344 rats, 10 and 30 months of age were each divided into two groups: control, non-massaged (CON, n=8) and massaged (CCL, n=8). The right gastrocnemius muscle received CCL for 30 min at 4.5N. Rats were euthanized 24h post-massage and gastrocnemius muscles were frozen in liquid nitrogen. Muscle sections were cut and stained with FITC- conjugated mouse anti-IgG. Densitometric analysis of IgG inside the muscle fiber was performed. Results: No differences were observed between young and aged (p=0.377), or between CON and CCL (p=0.227). There were no interactions of group and age (p=0.459). Conclusion: Results indicate that massage at a beneficial immunomodulatory load does not cause damage in aged muscle and therefore similar loads can be used in young and aged.

Supported by: NIA grant number: AG042699

Primary Presenter / email: **Hunt, E.** / emily.hunt@uky.edu
**Student**
**MS**
**Division of Athletic Training**

Mentor / e-mail: Butterfield, T.A. / tim.butterfield@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **181** Abstract Title: | **Muscle phenotype and functional performance in Peripheral Artery Disease** |
| Author(s): | A.W. Bugg, Department of Rehabilitation Sciences, U of Kentucky<br>S.H. White, Department of Rehabilitation Sciences, U of Kentucky<br>K. Kosmac, Department of Rehabilitation Sciences, U of Kentucky<br>R.G. Walton, Department of Rehabilitation Sciences, U of Kentucky<br>C.A. Peterson, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Peripheral arterial disease (PAD) causes impairment of blood supply to lower limbs, resulting in decreased mobility and increased mortality in affected patients. Though PAD has been associated with diminished walking capacity, changes in muscle morphology contributing to loss in function are largely unexplored. In order to determine if changes to lower limb muscle contribute to mobility deficits in PAD, we analyzed fiber types in tissue samples from patients using immunohistochemical analyses. Three distinct distributions of fiber types were observed in PAD patients, while non-PAD patients showed an even mix of fiber types. This observation caused us to question if fiber type differences contributed to the decreased functional performance seen in PAD patients. However, fiber type did not correlate to walking performance . We then hypothesized diminished oxidative capacity in muscle fibers from PAD patients. In order to test this, we measured mitochondrial activity using Succinate Dehydrogenase (SDH) staining. SDH staining correlated with fiber type in both PAD and non-PAD groups, however, many muscle fibers showed a lack of SDH in their cores in PAD. This finding was surprising, and was indicative of mitochondrial impairment in muscle fibers from PAD patients. These results suggest that decreased blood flow in lower limbs may lead to mitochondrial dysfunction within muscle fibers in PAD, contributing to loss of endurance.

Supported by: NIH awards R01HL088589, R01HL083064, R01HL089619, R01HL107510, R01HL109244, and R01AR60701-S1.

Primary Presenter / email: **Bugg, A.W.** / awbu223@uky.edu
**Student**
**MS**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Peterson, C.A. / cpete4@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **182** Abstract Title: | **Vocal Function Exercises for Normal Voice: The Effects of Varying Dosage** |
| Author(s): | M. Bane, Department of Communication Sciences and Disorders, U of Kentucky<br>V. Angadi, Department of Communication Sciences and Disorders, U of Kentucky<br>R. Andreatta, Department of Communication Sciences and Disorders, U of Kentucky<br>J. Stemple, Department of Communication Sciences and Disorders, U of Kentucky |

**Abstract:** Many phase I clinical trials demonstrate positive treatment effects for various interventions in speech-language pathology. However, most treatments currently employed have little to no information from phase II trials providing guidance on dose-response relationships. This issue is especially salient in the area of voice therapy, where dosing can mean the difference between no effect, the ideal effect, and toxic or adverse effects on voice production. One voice therapy program, Vocal Function Exercises (VFEs), is designed to strengthen and balance the laryngeal musculature and improve the relationship among the three subsystems of voice production: respiration, phonation, and resonance. Coordination of these three subsystems results in efficient vocal fold vibration, which is determined by maximum phonation time. While a variety of studies have demonstrated VFEs to be effective in enhancing both normal and pathological voices, little is known about the ideal dose, or the dose that yields the greatest benefit without causing harm. Establishing the ideal dosage has implications for increasing efficiency of intervention, thereby sparing client and clinician resources, including time, costs, and effort. The purpose of the study was to investigate the effects of varying doses of Vocal Function Exercises on attainment of pre-established maximum phonation time goals in individuals with normal voice production.

Supported by:

Primary Presenter / email: **Bane, M.** / maria.bane@uky.edu
**Student**
**MS**
**Division of Communication Sciences & Disorders**

Mentor / e-mail: Stemple, J. / jcstem2@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 183 Abstract Title: | **Effect of Pre-Operative Quadriceps Strength on 3-month Outcomes in Articular Cartilage Repair and Restoration Patients** |
| Author(s): | C.E. Whale Conley, Department of Rehabilitation Science, U of Kentucky<br>J.S. Howard, Appalachian State U, Boone, NC<br>C. Lattermann, Department of Medicine, U of Kentucky<br>C.G.Mattacola, Department of Rehabilitation Science, U of Kentucky |

**Abstract:** Background: Articular cartilage post-operative rehabilitation requires a long non-weightbearing period contributing to post-operative quadriceps atrophy. Limited research has focused on quadriceps strength in these patients. Our purpose was to evaluate if preoperative isometric quadriceps strength affects 3-month post-operative outcomes. Hypothesis: We hypothesized that patients with high-strength would have better post-operative outcomes. Patients/Participants: 15 participants(6=M,9=F,Age 27+10yrs,BMI 28.94+6.12) undergoing articular cartilage repair or restoration procedures participated. Procedures: Three 5-second isometric MVICs of the quadriceps were performed bilaterally. Pre-operative limb symmetry index(LSI=involved peak torque/uninvolved peak torque) was calculated. Patients were categorized as low-strength(<80% LSI)(n=9) or high-strength(>80% LSI)(n=6). Pre-operative and 3-months post-operative patients completed patient reported outcomes (KOOS,IKDC) and the Y-Balance Test(YBT). Participants performed 3-repetitions on the YBT bilaterally. Three trials were averaged. A Mann-Whitney-U test was used to compare dependent variables (YBT,KOOS,IKDC) between low-strength and high-strength groups. Change scores (post-operative–pre-operative) were calculated for each PRO to determine minimal detectable change(MDC) and minimally clinically important difference(MCID). Results: No statistical differences (p>0.05) were found for any dependent variable. Median(IQR) are listed as LSI>80%, LSI<80%, respectively. KOOSpain 72(52-87),75(53-96), KOOSsymptoms 43(35-69),64(49-84), KOOSADL 78(58-93),91(51-99), KOOSSportRec 18(10-51),18(0-81), KOOSQOL 35(18-40),50(25-60), IKDC 39(28-58),46(29-70), YBT-anteriorsurgical 55.37(51.55-60.52),52.64(36.6-62.48), YBT-posteriomedialsurgical 85.43(80.78-95.77),93.81(69.95-101.46), YBT-posteriorlateralsurgical 81.33(71.68-87.84),79.96(68.49-93.62). The IKDC difference between groups(7 points) exceeded the MCID(6 points), but not the MDC(15.6 points). The group differences for KOOSsymptoms(21 points), KOOSADL(13 points), KOOSQOL(15 points) exceeded both the MDC(pain6, symptoms5, ADL7, SportRec12, QOL7 points) and the MCID(8-10 points). Conclusion: There was no statistical difference between groups for PROs or YBT measures. However, the low-strength group KOOSsymptoms, KOOSADL, KOOSQOL, and IKDC medians were elevated when compared to the high-strength group at 3-months post-operative. Furthermore, the median group difference for KOOSsymptoms, KOOSADL, KOOSQOL, and IKDC exceeded the MCID. These differences suggest that clinical differences between the groups may exist. This is evident by function in the high-strength groups' PRO being influenced more than the low-strength group. This may be due to those patients with greater quadriceps strength being more adversely affected by the extended non-weight bearing period than the weaker group.

Supported by: The project described was supported by the Center for Clinical and Translational Sciences through the Graduate Student Seed Grant.

Primary Presenter / email: **Whale Conley, C.E.** / caitlin.whale@uky.edu

Mentor / e-mail: Mattacola, C.G. / CarlMattacola@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 184 Abstract Title: | **Knee Extension Torque Deficits Exist Bilaterally in Patients Following Unilateral Anterior Cruciate Ligament Reconstruction** |
| Author(s): | C.M. Gabler, Department of Rehabilitation Sciences, U of Kentucky<br>C.A. Jacobs, Department of Orthopaedic Surgery & Sports Medicine, U of Kentucky<br>T.A. Butterfield, Department of Rehabilitation Sciences, U of Kentucky<br>B.G. Pietrosimone, Department of Exercise and Sport Science, U of North Carolina-Chapel Hill<br>C.G. Mattacola, Department of Rehabilitation Sciences, U of Kentucky<br>D.L. Johnson, Department of Orthopaedic Surgery & Sports Medicine, U of Kentucky |

**Abstract:** BACKGROUND: Quadriceps weakness limits lower-extremity function, and is linked to the development of knee-osteoarthritis. Furthermore, evidence shows that quadriceps strength can be affected in the uninvolved limb after ACLR. While peak knee-extension torque(PKET) is a valuable measure of quadriceps strength, it does not assess rapid force production. Rate of torque development(RTD) can determine the force generated in the early phase of muscle contraction. PURPOSE: To assess bilateral changes in PKET and RTD in patients before and after ACLR, and compare these changes between limbs.METHODS: PKET and RTD were measured bilaterally in 25 patients(11 males,14 females; age=19.4±4.5 yrs) before and 6 months post-ACLR. PKET(Nm) was assessed via max voluntary isometric contraction(MVIC), and RTD(Nm/s) was calculated within the first 200ms(all normalized to bodyweight). The RTD curve was further divided into the first(RTD1) and last(RTD2) 100ms to examine differences in contractile and neural components, respectively. Time and limb comparisons were made using repeated-measures ANOVA($\alpha$=0.05). RESULTS: PKET was lower in the involved versus uninvolved limbs of patients before(2.9±0.9 vs. 3.4±0.7 Nm/kg) and after ACLR(2.0±0.8 vs. 3.1±0.7 Nm/kg). PKET decreased over time in both limbs($p<0.05$). RTD was lower in the involved limb versus uninvolved limbs only after ACLR(5.5±2.7 vs. 7.2±3.5 Nm*s-1/kg). RTD1 and RTD 2 were lower in the involved limb versus uninvolved limb before(RTD1=7.9±4.7 vs. 9.7±4.4 Nm*s-1/kg; RTD2=6.0±3.2 vs. 8.2±3.1 Nm*s-1/kg) and after ACLR(RTD1=7.0±3.9 vs. 8.8±5.0 Nm*s-1/kg; RTD2=4.3±2.4 vs. 6.5±2.9 Nm*s-1/kg). Neither RTD nor RTD1 changed over time in either limb, but RTD2 was decreased in bilaterally ($p<0.001$). CONCLUSION: Although PKET and RTD are lower in the involved limbs of patients after ACLR, both limbs exhibit temporal deficits. Intensive quadriceps strengthening should be performed bilaterally after ACLR to restore function and prevent subsequent injury.

Supported by: Seed Grant via the UK Center for Clinical and Translational Science Scholar Certificate. The project described was supported by the National Center for Advancing Translational Sciences, National Institutes of Health, through grant number UL1000117 (NCATS). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Primary Presenter / email: **Gabler, C.M.** / gabler.cm@uky.edu

Mentor / e-mail: Mattacola, C G. / CarlMattacola@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 185 Abstract Title: | **The Amount of Moderate to Vigorous Physical Activity Needed to Induce Weight Loss in Children Age 8-12: A Critical Appraisal Topic** |
| Author(s): | N.E. Kearns, Rehabilitation Sciences, U of Kentucky<br>E.E. Dupont-Versteegden, Rehabilitation Sciences, U of Kentucky |

**Abstract:** In order to combat the pediatric obesity epidemic in the United States, many intervention programs targeted at improving physical activity levels have been developed. The American College of Sports Medicine currently recommends 60 minutes of physical activity per day for children in order to achieve health-related fitness benefits; however, it does not specify how many minutes are recommended for weight loss in children. A literature search was conducted for level 2 evidence in order to answer the question: Is there evidence to support how much moderate-to-vigorous physical activity (MVPA) is needed in order to induce weight loss in children age 8-12? Two level 2 studies were identified from the literature search which fit the criteria. The study selected for this appraisal was conducted in an inpatient setting vs ambulatory to examine the effect on BMI z-score. The results of this study indicate that a favorable weight loss and subsequent reduction in BMI z-score can be obtained with 30-60 minutes of high-intensity physical activity per day in obese children with more significant results among children whose physical activity is supervised by an exercise professional. With decreased minutes allocated to physical activity within the public school system, this study provides a framework for optimizing the minutes available in order to produce a change in weight in the overweight or obese child. We propose to identify how many minutes of physical activity students in Kentucky public schools are receiving per day as well as the potential barriers or facilitators to implementing the recommended minutes of physical activity.

Supported by:

| | |
|---|---|
| Primary Presenter / email: | **Kearns, N.E.** / elise.kearns@uky.edu<br>**Student**<br>**PhD**<br>**Rehabilitation Sciences Doctoral Program** |
| Mentor / e-mail: | Dupont-Versteegden, E.E. / eedupo2@uky.edu |

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 186 Abstract Title: | **Development of a Volume-Based Stroke Interval Training Program in Elite Level Tennis Players** |
| Author(s): | N. L. Myers, Department of Rehabilitation Sciences, U of Kentucky<br>A. D. Sciascia, Lexington Clinic: Shoulder Center of Kentucky<br>W. B. Kibler, Lexington Clinic: Shoulder Center of Kentucky<br>T.L. Uhl, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Background: The only known metric specific to the volume of tennis serves is that male professional players serve approximately 8 times during a game. This leaves a knowledge gap regarding typical serve volume to train a player for sport specific demands. Objective: To determine the average serve volume in professional and elite junior players in order to create a data based interval-training program. Participants: 135 male and 122 female professional players, and 134 male and 136 female junior players. Procedures: Game day scorecards were provided to the research team from the 2013&2014 United States Open and the 2014 Metropolia Orange Bowl. Serve data for all players were extracted from the scorecards. These data were then used to construct an interval stroke program. Data included serves per set and match. Results: Professional male players served 62 more total serves per match than junior male players (P<0.001). Professional female players served 10 more total serves per match than junior females (P=0.01). All male players hit 2 more total serves per set than all female players (P=0.005). Regardless of sex, professional players served 4 more total serves per set than junior players (P<0.001). The typical amount of serves per set was 40, resulting in a 3-to-1 ratio of first to second serves. With these variables a 21-step stroke progression was devised to prepare athletes for 120 serves per match. Conclusion: Tennis professionals may use these data in estimating loads per season on the player's body. The volume-based program can be initiated at different phases depending on the training and injurious factors contributing to each player.

Supported by:

Primary Presenter / email: **Myers, N.L.** / natalie.myers@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Uhl, T.L. / tim.uhl@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 187 Abstract Title: | **Athletic Trainers Spend Most Time on Maintenance and Preventative Care to Keep Athletes on the Field** |
| Author(s): | A. Whitson, Department of Rehabilitation Sciences, U of Kentucky<br>A. D. Sciascia, Department of Rehabilitation Sciences, U of Kentucky<br>J. Light, Department of Rehabilitation Sciences, U of Kentucky<br>T. L. Uhl, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Context: Non-time loss (NTL) injuries have shown to account for a larger number of injuries as compared to time-loss (TL) injuries that athletic trainers regularly manage. There is limited literature on the amount of effort athletic trainers spend on managing athletes with both types of injuries as well as those receiving preventative care/maintenance treatments. Objective: To investigate the number of treatments provided to athletes categorized as full, limited or out during off-season baseball. Design: Descriptive Epidemiology Setting: Collegiate Athletic Training Room. Participants: 44 NAIA Collegiate Baseball Players (Age=20±2) Interventions: Athlete exposures were recorded over a 55 day off-season training period during fall baseball. Participation status of all participants was recorded using one of three categories. Full participation without limitations received preventative care/maintenance treatments. Limited participation (NTL) indicated partial participation in practice. Out (TL) indicated the athlete was completely out of practice due to illness or an injury. Main Outcome Measures: Athlete exposures and total number of treatments provided per participation status. Descriptive analysis of data was performed to determine the frequency of treatment and participation status. Results: Over the 55 day period, a total of 2,162 potential exposures were possible. The participation status identified 1,934(89%) full athlete exposures, 38(2%) limited athlete exposures and 190(9%) out athlete exposures. A total of 301 treatments were applied with 176 (59%) provided to athletes categorized as full, 28(9%) to athletes categorized as limited, and 97 (32%) categorized as out. Conclusions: Preventative care/maintenance and NTL injuries account for 68% of the treatments performed by an athletic trainer during out of season practice. These results agree with the literature and indicate athletic trainers provide a large amount of treatment in order to keep athletes participating.

Supported by:

Primary Presenter / email: **Whitson, A.** / autumn.whitson@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Uhl, T.L. / tim.uhl@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **188** Abstract Title: | **Strength Training Progression Effectiveness with Use of the Smart Handle** |
| Author(s): | K.J. Picha, Department of Rehabilitation Sciences, U of Kentucky<br>M.R. Almaddah, Department of Rehabilitation Sciences, U of Kentucky<br>T.L. Uhl, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Context: Elastic resistance(ER) training is commonly used to improve strength during rehabilitation. One major disadvantage of ER during training is that the participant is unaware of the load being lifted throughout the exercise. Applying a load cell to the ER during training may help to elicit greater strength gains. Objective: We hypothesize that the knowledge of load during ER exercise increases the strength gains during exercises of the hip. Design: Randomized clinical trial. Setting: Musculoskeletal laboratory. Interventions: 34 healthy participants underwent an 8-week ER hip training program. Participants were randomized into either a non-load cell(n=14) or load cell(n=20) group. The load cell group was given a target load to obtain, while the non-load cell group used perceived exertion. Exercises were completed 3xs/week and progressed. Main Outcome Measures: Isometric hip abduction and extension strength were evaluated at baseline and after eight weeks of training using a dynamometer. Average torque was generated from isometric contractions for each test position bilaterally, normalized to bodyweight and change scores calculated. Changes in strength for each group were compared using ANOVA. Results: The load cell group increased strength by an average of 4% more than the non-load cell group overall. Only left hip abduction strength increased significantly more in the load cell group (11.7±6%) compared non-load cell group (6.5±7%, P=.03). Conclusions: Providing targeted loads during training more effectively increases strength than perceived exertion alone. Continually setting load expectations during training with ER appears to motivate participants resulting in greater strength gains.

Supported by: Patterson Medical

Primary Presenter / email: **Picha, K.J.** / kelsey.picha@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Uhl, T.L. / tim.uhl@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **189** Abstract Title: | **The Effect of Load Carriage and Recovery on Axillary Nerve Function** |
| Author(s): | M.R. Almaddah, Department of Rehabilitation Sciences, U of Kentucky<br>T.L. Uhl, Department of Athletic Training, U of Kentucky<br>A.J. Nitz, Department of Physical Therapy, U of Kentucky |

**Abstract:** Background –Military personnel often develop shoulder injuries. A potential contributing factor is believed to be caused by the 45-pound rucksack that is frequently carried on the shoulders. A true nerve palsy rarely occurs, however, a subclinical insult to nerve could be occurring placing the shoulder musculature at risk for injury. It is currently unknown what acute neurophysiological insult is occurring due to carrying a rucksack. Objectives –We hypothesize that carrying a rucksack weighting 45-pounds for 120-minutes will lead to a reduction in axillary nerve amplitude and diminished shoulder endurance. Methods –Axillary nerve latency and amplitude will be measured from the middle deltoid prior to, during and following a treadmill walking task with a 45-pound rucksack on their shoulder. Repeated measures will occur at 6 times points. 1) pre-walking task, 2) after 1-hour of walking, 3) after 2-hours of walking, 4) 10-minutes, 5) 20-minutes, and 6) 30-minutes following treadmill walking. Shoulder function will be evaluated by having participants hold a 10-pound load for 60-seconds at 90° abduction or until they are no longer able to hold the weight at the prescribed load. Results – This is currently only been piloted on 3 subjects. The preliminary results suggest that nerve function is diminished as well as shoulder function following the treadmill walking task. Deltoid muscle amplitude decreases from an average of (6.7±2.6mV) to (2.80±1.8mV) following the treadmill task the change in amplitude (3.92±3mV). Conclusion – We plan to extend our recovery measurements to have 3 post-walking assessments to determine recovery of nerve function and shoulder function. The acute results suggest that nerve function is dramatically impaired following a two-hour treadmill walk carrying a 45-pound rucksack which likely contributed to the significant prevalence of shoulder pain in military personal.

Supported by:

| | |
|---|---|
| Primary Presenter / email: | **Almaddah, M.R.** / m.almaddah@uky.edu<br>**Student**<br>**PhD**<br>**Rehabilitation Sciences Doctoral Program** |
| Mentor / e-mail: | Uhl, T.L. / tim.uhl@uky.edu |

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **190** Abstract Title: | **An Electromyography Study of Fatigability in Multiple Endurance Tests** |
| Author(s): | N.A. Evans, Department of Rehabilitation Sciences, U of Kentucky<br>T. Uhl, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Background: The posterior shoulder endurance test (PSET) has been used clinically to measure shoulder endurance but the specific muscles that are fatiguing are unknown. Purpose: To determine which shoulder muscles are fatiguing to the greatest degree during the PSET at $90^0$ and $135^0$. Participants: Thirty healthy female subjects (age= 20±2 years) without any shoulder pathology were recruited using a sample of convenience. Methods: Seven muscles were instrumented with surface electrodes to measure median frequency during fatiguing isometric contractions. An external torque of 20Nm remained consistent between subjects, and the subjects were tested while lying prone with the arm abducted to 90° and 135°. There was a 15 minute rest between test position and the order was randomized. The first 20 seconds of each position was used for analyzing the median frequency slopes. Results: The median frequency shifted significantly less in the lower trapezius compared to the posterior deltoid (p=0.0031) Conclusion: The PSET primarily fatigues the posterior deltoid during the first 20 seconds of the PSET. It is important to focus intervention on improving muscular endurance of the posterior deltoid muscle.

Supported by:

| | |
|---|---|
| Primary Presenter / email: | **Evans, N.A.** / evansn@marshall.edu<br>**Student**<br>**PhD**<br>**Rehabilitation Sciences Doctoral Program** |
| Mentor / e-mail: | Uhl, T. / tim.uhl@uky.edu |

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 191 Abstract Title: | **Unsaturated to Saturated Fatty Acid Intake Ratio is Inversely Associated with Intramyocellular Lipid in Healthy, Aged Individuals** |
| Author(s): | M. Redzic, Department of Pharmacology and Nutritional Sciences, U of Kentucky<br>L.V. Mitchell, Department of Pharmacology and Nutritional Sciences, U of Kentucky<br>D.T. Thomas, Department of Clinical Sciences, U of Kentucky |

**Abstract:** Exercise, BMI, and age are known to influence the quantity of intramyocellular (IMCL) and extramyocellular lipid (EMCL) in humans. Increased EMCL has been associated with impaired physical function, while IMCL is associated with insulin resistance. Animal studies suggest that higher intakes of saturated fatty acids (SFA) are associated with higher IMCL and lower lipid turnover, while polyunsaturated (PUFA) and monounsaturated (MUFA) fatty acids are associated with increased turnover and improved metabolic health. The purpose of this 13-wk trial was to examine the contribution of dietary fat and daily physical activity (PA) to muscle lipid in healthy, aged humans. At baseline (BL), midpoint (MP), and endpoint (EP), dietary recalls and PA were measured using Nutrition Data System for Research software and accelerometry. IMCL and EMCL were measured with magnetic resonance spectroscopy and fat segmentation, respectively. Fifteen participants (age 68.6±6YO; BMI 25.2±4kg/m2) completed all study measures. PA was not associated with EMCL or IMCL. Dietary energy intake from fat was 33.5±5% and was positively associated with IMCL (p=0.002) and EMCL (p=0.04). Unsaturated to SFA ratio, [(PUFA + MUFA)/SFA] was not associated with EMCL but was negatively correlated with IMCL (p=0.005) and was a better predictor of IMCL (p=0.06) than age (p=0.52), BMI (p=0.36), and PA (p=0.41). Along with exercise and maintaining a healthy weight, these data suggest increased consumption of MUFA and PUFA may have favorable effects on muscle lipid profiles and contribute to enhanced metabolic health.

Supported by: Supported by NIH grants: R21AG046762-01A1 and T32DK007778-16. The project described was supported by the National Center for Advancing Translational Sciences, UL1TR000117. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Primary Presenter / email: **Redzic, M.** / mre226@g.uky.edu
**Student**
**PhD**
**Division of Clinical Nutrition**

Mentor / e-mail: Thomas, D.T. / david.t.thomas@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 192 Abstract Title: | **Vocal Function Exercises for the Treatment of Presbyphonia: A Case Study** |
| Author(s): | J.E. Sloggy, Rehabilitation Sciences, U of Kentucky<br>J.C. Stemple, Rehabilitation Sciences, U of Kentucky |

**Abstract:** Voice changes in the elderly (presbyphonia) are common with aging of the subsystems of voice production, respiration, phonation, and resonance. This deterioration of voice is recognized as part of the normal aging process but may significantly affect quality of life. Vocal Function Exercises (VFEs) comprise a series of exercises designed to strengthen and balance the laryngeal muscles, thus improving vocal fold vibration and voice quality. Several studies have focused on the efficacy of VFEs as a treatment modality for presbyphonia, however these studies are limited by the lack of an experimental control and limited outcome measures. The current study is the first to use a randomized, placebo-controlled design while comparing pre and post-treatment measures involving all five domains of voice assessment (audio-perceptual, acoustic, aerodynamic, self-assessment, visual-perceptual). The treatment group receives six weeks of VFEs and the control group receives six weeks of placebo therapy with both pre and post-treatment assessments and a one-month follow-up assessment. It is hypothesized that the experimental group will show significant improvement in all five domains of voice assessment post-treatment while there will be no significant difference in the pre and post-treatment measures for the control group. This case study presents the results from the initial participant of this study who was in the treatment (VFE) group.

Supported by:

Primary Presenter / email: **Sloggy, J.E.** / joanna.sloggy@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Stemple, J.C. / joseph.stemple@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 193 Abstract Title: | **Vocalization Subsystem Responses to Temporarily Induced Unilateral Vocal Fold Paralysis** |
| Author(s): | D.J. Croake, Department of Rehabilitation Sciences, U of Kentucky<br>J. C. Stemple, Department of Rehabilitation Sciences, U of Kentucky<br>R.D. Andreatta, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Healthy voicing is thought to be dependent on a dynamic balance of three interactive subsystems: respiration, phonation, and resonance. Despite this widely held assumption, the most basic details necessary to characterize individuals' vocalization patterns across all three subsystems are unknown. Understanding the dynamic tradeoffs of subsystem interactions is fundamental to drive treatment for voice disorders. We hypothesize that characteristic symptoms of voice disorders stem from subsystem alterations that destabilize and disturb the balance of normal patterns of subsystem behavior. Unfortunately, this fund of knowledge is absent, therefore conclusions are purely speculative. The objective of this study is to precisely quantify the interactions of the vocalization subsystems in both non-perturbed and perturbed vocalization conditions in 10 participants. Perturbation will be accomplished by a temporarily induced unilateral vocal fold paralysis (UVFP) serving to disrupt laryngeal closure during voicing resulting in hoarseness. Simultaneous measures of respiration, phonation, and resonance will be used to quantify key performance variables before, during, and after the temporary UVFP. We hypothesize that individuals will demonstrate characteristic and distinctive patterns of vocal subsystem adaptations, resulting in reliably identifiable vocalization profiles. This study will support future development of a clinical diagnostic profiling method to more accurately assess functional aspects of voice disorders and enhance therapeutic interventions.

Supported by: CTS Seed Grant

Primary Presenter / email: **Croake, D.J.** / djcroa2@uky.edu
**Student**
**PhD**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Stemple, J.C. / joseph.stemple@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 194 Abstract Title: | **Student Veteran Occupational Transitions in Postsecondary Education: A Grounded Theory** |
| Author(s): | B. T. Gregg, Department of Rehabilitation Science, U of Kentucky<br>A. Shordike, Dept. of Occupational Therapy & Occupational Science, Eastern Kentucky U, Richmond, KY<br>D.M. Howell, Dept. of Occupational Therapy and Occupational Science, Eastern Kentucky U, Richmond, KY<br>P.H. Kitzman, Department of Rehabilitation Science, U of Kentucky<br>M.K. Iwama, Department of Occupational Therapy, Augusta U, Augusta, GA |

**Abstract:** Introduction: Over 1.5 million veterans will transition to academic institutions following systematic down-sizing of the military. However, 44% report difficulty transitioning to civilian environments due to psychosocial challenges from combat exposure. Theoretical investigations have attributed difficult veteran transitions to a readjustment in cultural differences described as reverse culture shock. The influence of military culture has not been explicitly studied in veteran transitions to student environments, therefore, this constructivist grounded theory study investigated the influence of culture in veteran transition experiences to postsecondary education. Method: The Kawa model, a culturally-relevant framework using a river metaphor to contextualize client narratives as life flow, was employed in twelve veterans transitioning as students. Intensive interviews were used to discuss the meaning of Kawa river diagrams. Data were analyzed with the constant comparison technique until theoretical saturation was achieved. Results: An emergent theory of veteran transitions to student culture involved two theoretical concepts: 'seeking understanding' and 'gaining stability to shape life flow.' The concept of seeking understanding of transition experiences was supported by actions of other individuals reaching out and connecting with veterans. Veterans gained stability in transition by using personal skills, pinpointing useful resources, and cultivating personal skills. Discussion: Transition challenges were specific to cultural contexts veterans transitioned. Understanding veterans' experiences in military culture facilitate client-centered care by explicating meaning shared between military personnel and institutions. This study provides insights into the cultural context student veterans transition to and how rehabilitation practitioners and educators can address veterans' needs from a culturally-relevant lens.

Supported by: The project described was supported by the Department of Rehabilitation Sciences doctoral program. The content is solely the responsibility of the authors.

Primary Presenter / email: **Gregg, B.T.** / btgr223@uky.edu
**Student**
**PhD**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Shordike, A. / anne.shordike@eku.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 195 Abstract Title: | **Calcitriol treatment increases oxygen consumption and blunts lipid accumulation in human myotubes** |
| Author(s): | D.M. Schnell, Department of Pharmacology & Nutritional Sciences, U of Kentucky<br>D.T. Thomas, Department of Clinical Sciences, U of Kentucky |

**Abstract:** Cancer cachexia is characterized by significant weight loss, anabolic resistance, mitochondrial dysfunction, and ectopic fat infiltration in muscle. This wasting syndrome is a significant clinical concern for many cancer types. Current nonpharmacological treatment focuses on mitigating muscle loss with resistance exercise and protein supplementation. Vitamin D supplementation may augment this treatment by improving mitochondrial function and substrate availability, however specific metabolic responses to vitamin D are not well understood. This project aims to determine basic metabolic benefits of vitamin D supplementation in vitro. To address this question, primary human myoblasts were differentiated into myotubes for seven days. We investigated lipid accumulation by incubating myotubes with 100 nM calcitriol, 100 μM palmitate, or both for 24 hours. Staining with oil red O showed that calcitriol decreases lipid accumulation when cells are challenged with palmitate. Differentiated myotubes were treated with 100 nM calcitriol for 24 hours then trypsonized and replated for Seahorse XF96 oxygen consumption rate (OCR) analysis. Data revealed a 57% increase in OCR at rest ($p = 0.01$), specifically associated with a 52% increase of OCR driven by complex IV (ATP linked OCR) ($p = 0.03$). These data suggest that calcitriol treatment increases mitochondria-driven metabolism and improves metabolic response to pathological lipid concentrations in myotubes. This may be mediated by improved lipid packaging via coatomer proteins. Findings of the current study will serve as a foundation for future research investigating vitamin D supplementation as an intervention to muscle wasting in cancer cachexia patients.

Supported by: This project was made possible with the assistance of the Redox Metabolism Shared Resource Facility NIH Award: R21AG046762

Primary Presenter / email: **Schnell, D.M.** / dave.schnell@uky.edu
**Student**
**PhD**
**Division of Clinical Nutrition**

Mentor / e-mail: Schnell, D.M. / david.t.thomas@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **196** Abstract Title: | **The Effects of Trunk Fatigue on Proximal Joint Kinematics and Coupling During Running** |
| Author(s): | P. Kline, Department of Rehabilitation Sciences, U of Kentucky<br>K. Morgan, Division of Physical Therapy, U of Kentucky<br>K. Grim, Division of Physical Therapy, U of Kentucky<br>K. Ackerman, Division of Physical Therapy, U of Kentucky<br>B. Noehren, Division of Physical Therapy, U of Kentucky |

**Abstract:** Hypothesis: Fatigue is an injury risk factor and may alter neuromuscular coordination. The trunk relies on local musculature to control the body's center of mass (COM). With trunk fatigue, we hypothesized reduced ability to control the COM as measured by increased joint mechanics and altered coordination. Number of Subjects: 32 (16 M, age 21±3 years, H: 1.7±0.1 m, M: 65.3±12.5 kg). Procedures: Subjects underwent instrumented gait analysis at a self-selected running speed (3.1±0.5 m/s) until reporting a 14 on the Borg scale. Next, the subjects performed a trunk fatiguing circuit. Once fatigued, the subjects ran at their previous speed for a 2nd gait analysis. Visual3D and MATLAB were used to calculate joint excursion and angle-angle plots for trunk and pelvic motions. Statistical Analysis: A line of best fit was applied to all angle-angle plots to assess joint coupling. Paired t-tests were used to test differences between the conditions. Results: There was a significant reduction in pelvic excursion when fatigued in all planes (Sagittal: 6.8±1.8° vs 6.2±1.7° ($p<0.01$), Frontal: 13±3.5° vs 11.7±3 .4° ($p<0.01$), Transverse: 8.2±3.2° vs 7.4±2.9° ($p<0.01$)). There were no significant differences in trunk or hip excursion or joint coupling between the conditions. Conclusions: Reduced pelvic excursion may be an adaptation to reduce the work the trunk muscles perform. However, no changes in joint coupling were found suggesting that coordination patterns are maintained. Potentially, trunk fatigue may affect conditions like anterior knee pain which have been linked to altered pelvic mechanics.

Supported by: CCTS: TL1TR000115

Primary Presenter / email: **Kline, P.** / paul.kline@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 197 Abstract Title: | **Effects of Post-Traumatic Stress Disorder (PTSD) Symptoms on Disability, Function, and Pain-Related Beliefs and Outcomes in Veterans with PTSD and Pain Compared to Veterans with Pain Only: A Systematic Review with Meta-Analysis.** |
| Author(s): | T.M. Benedict, Department of Rehabilitation Science, U of Kentucky<br>T. Uhl, Department of Rehabilitation Science, U of Kentucky<br>A. Nitz, Department of Rehabilitation Science, U of Kentucky<br>J. Stemple, Department of Rehabilitation Science, U of Kentucky |

**Abstract:** Introduction: Post traumatic stress disorder (PTSD) and chronic pain are frequently co-morbid conditions in the US Veteran population. Several theories about the cause of increased pain prevalence in individuals with PTSD have been presented. The purpose of this study was to systematically review the literature and quantify disability, function, and pain-related beliefs and outcomes in Veterans with PTSD and pain compared to Veterans with pain only. Methods: A systematic search of 4 electronic databases was conducted. Inclusion criteria required comparison of patients with pain and PTSD to those with pain only or contribution of PTSD symptomology on outcomes. Primary outcome measures and standardized mean differences were assessed for pain, function, disability, pain beliefs, and healthcare utilization. Results: 14 original research studies met inclusion criteria and were assessed for quality and outcomes of interest. The majority of studies were cross-sectional with moderate to high quality given their design. Veterans with PTSD and co-morbid pain demonstrated higher pain (d=.42), disability (d=.62), depression, catastrophizing beliefs (d=.93), sleep impairments, and health utilization; they have lower function (d=.4) and coping (d=.7) compared to Veterans with pain only. Discussion: In Veterans with chronic pain, PTSD symptomology has a large effect for a number of negative health related outcomes. This review supports the need for clinicians to screen and understand the effects of PTSD symptoms on patients with pain. Clinicians should recognize that a Veteran with PTSD and pain likely have elevated catastrophic beliefs and decreased coping abilities that should be targeted for intervention.

Supported by:

Primary Presenter / email: **Benedict, T.M.** / timothy.benedict@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Nitz, A. / arthur.nitz@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| **198** Abstract Title: | **Acute ACL Injury and Early Posttraumatic Osteoarthritis Biomarker Variability** |
| Author(s): | K.N. Jochimsen, Department of Rehabilitation Science, U of Kentucky<br>C. Jacobs, Dept. Orthopaedic Surgery and Sports Medicine, U of Kentucky<br>C.G. Mattacola, Department of Rehabilitation Science, U of Kentucky<br>C.E. Whale Conley, Department of Rehabilitation Science, U of Kentucky<br>M. Proffitt, Department of Physical Therapy, Edinburg, Scotland<br>L. Gammon, Department of Orthopaedic Surgery and Sports Medicine, U of Kentucky<br>V.B. Kraus, Division of Rheumatology, Duke U<br>J. Abt, Department of Rehabilitation Science, U of Kentucky<br>E.K. Reinke, Department Orthopaedic Surgery, Vanderbilt U<br>J. Huebner, Department of Rehabilitation Science, U of Kentucky<br>K.P. Spindler, Department of Orthopaedic Surgery, Cleveland Clinic<br>C. Lattermann, Department of Orthopaedic Surgery and Sports Medicine, U of Kentucky |

**Abstract:** Purpose: Biomarker analysis following anterior cruciate ligament (ACL) injury may be a novel approach to evaluating early changes associated with the development of posttraumatic osteoarthritis (PTOA). However, studies evaluating biomarkers immediately after ACL injury face challenges due to both the inter-subject variability of inflammatory and/or chondrodegenerative biomarkers and the different time-course response patterns demonstrated by the different biomarkers. The purpose of this study was to analyze the variability and time-course response patterns of commonly used biomarkers immediately following ACL injury. Subjects: Ten ACL-injured patients were included in this longitudinal analysis (6F, 4M; age=17.9±2.2 years; BMI=22.1±1.9kg/m2). Procedures: All subjects underwent repeated knee aspiration at a mean of 5, 13, and 28 days after ACL injury. Chondrodegenerative (COMP, sGAG, CTX-II, NTx, MMP-3, and MMP-9) and synovial inflammatory (IL-1α, IL-1β, and IL-1ra) biomarkers were assessed at all 3 time points. Statistical Analysis: Repeated measures ANOVAs were used to compare chondrodegenerative and inflammatory biomarkers over the 3 time points(T1-T3). Cohen's d effect sizes were calculated to determine the magnitude of change for all biomarkers over the course of the first 4 weeks after injury. Results: Moderate to large effects were seen in the majority of chondrodegenerative and inflammatory biomarkers following injury. Chondrodegenerative markers (COMP and CTX-II) steadily changed over the first 4 weeks, and were significantly different between T1 and T3. Inflammatory markers demonstrated a more variable response. Despite 10-fold greater values, initial IL-1ra measures(7906 ±9177) did not statistically differ from later time points(T2,T3) due to marked inter-subject variability. Conclusion: Acute ACL injury offers a viable model of early posttraumatic arthritis due to the longitudinal changes of chondrodegenerative biomarkers; however, the response pattern of inflammatory biomarkers vary greatly between patients.

| | |
|---|---|
| Supported by: | This study received funding from The Arthritis Foundation of America. Dr. Lattermann was supported by a K-23 career development award from the NIH-NIAMS (5K23AR060275). Data collection and study administration was supported by the University of Kentucky CTSA award (UL1TR000117). |

| | |
|---|---|
| Primary Presenter / email: | **Jochimsen, K.N.** / kate.jochimsen@uky.edu<br>**Student**<br>**PhD**<br>**Department of Rehabilitation Sciences** |
| Mentor / e-mail: | Lattermann, C. / Christian.Lattermann@uky.edu |

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 199 Abstract Title: | **Preparing for Discharge After Total Knee Replacement: Being Supported, Having Confidence, and Persevering** |
| Author(s): | R. Causey-Upton, Dept of Occupational Science & Occupational Therapy, Eastern Kentucky U; Dept. of Rehabilitation Sciences, U of Kentucky<br>D.M. Howell, Dept. of Occupational Science & Occupational Therapy, Eastern Kentucky U; Dept. of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Patients experience shorter lengths of stay following total knee replacement (TKR), with less time to prepare for discharge home. Most research available in the literature has studied readiness for discharge from a quantitative perspective, such as examining length of stay or post-operative pain levels. Some qualitative research has examined the experience of preparing for discharge home after total hip replacement and other orthopedic conditions, but no published research had examined the lived experience of preparing for discharge home after TKR prior to this current study. The purpose of this transcendental phenomenology study was to explore patients' experiences of preparing for discharge home after elective TKR and to identify factors that impacted readiness for discharge. Four participants completed semi-structured interviews prior to discharge home. Interviews were recorded and transcribed verbatim. Data analysis and data collection were concurrent, permitting subsequent interviews to be altered as needed based on results from previous participants. Thematic analysis of the interview transcriptions was conducted to identify significant meaning statements through a process of horizontalization. Significant statements were organized into shared themes among participants. Three themes emerged: being supported for discharge home; having confidence in self, family and health care staff; and persevering: it's no bed of roses. Implications include a need to assess patients for appropriate social support, educate patients on safety and modifications for functional tasks, and develop rapport with clients through the use of open, clear communication. This study was approved by a University IRB and the Scientific Review Committee at the study setting.

Supported by:

Primary Presenter / email: **Causey-Upton, R.** / renee.causey-upton@eku.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Howell, D.M. / dana.howell@eku.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 200 Abstract Title: | **The Clinical Transition Process for Adolescents with Lifelong Disabilities from the Perspective of Pediatric Physical Therapists: A Delphi Study** |
| Author(s): | C.L. Gohrband, Division of Physical Therapy, U of Kentucky<br>K.A.Sheppard-Jones, Human Development Institute, U of Kentucky<br>D. Howell, Department of Occupational Therapy, Eastern Kentucky U |

**Abstract:** Background, Hypothesis & Purpose: As individuals with lifelong disabilities (LLD) age out of pediatric physical therapy services they often have difficulty accessing therapy services in adult-oriented settings. There is projected to be over 500,000 adolescents with disabilities transitioning from general pediatric to adult services annually in the United States alone. It is hypothesized that there is a gap in knowledge and resources on the part of physical therapists in the clinical transition of individuals with LLD. The purpose of this study is to explore and seek out information to generate a consensus for the appropriate process for clinical transitions from pediatric to adult physical therapy services for adolescents with LLD. Number of Subjects: There will be 10-20 pediatric physical therapists recruited for this study. Proposed Methods and Procedures: This Delphi study will seek the perspectives of pediatric physical therapists on the clinical transition of their adolescent patients through information obtained from successive survey responses from this sample of pediatric therapists. Statistical Analysis: Data obtained from this study will be analyzed by using measures of central tendency, level of dispersion and percentages of responses to represent the input of all subjects. Expected Results and Future Direction: The results of this study will be used to create a model for clinical transitions from pediatric to adult services and to potentially educate the adult-oriented physical therapists for the provision of physical therapy services to this population as they age into adulthood.

Supported by: UK RHB program for advising and funding support for poster development.

Primary Presenter / email: **Gohrband, C.L.** / catherine.gohrband@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Howell, D. / Dana.Howell@eky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 201 Abstract Title: | **Meditation after Stroke: An Ongoing Phenomenological Study** |
| Author(s): | C.L. Carrico, Department of Rehabilitation Science, U of Kentucky |

**Abstract:** Meditation can be defined as a mental training of attention to elicit mindfulness, stress reduction, and/or enhanced health and well-being. Research on meditation has rapidly proliferated in recent years to show associated health-related benefits over a range of conditions. However, systematic review evidence indicates that further research is needed to establish whether and how meditation may support stroke recovery. Furthermore, phenomenology has been identified as a particular need area for meditation research in general. Phenomenology is a form of qualitative inquiry designed to reveal meanings that may influence mechanisms or outcomes related to a phenomenon. To this end, the present phenomenological study is currently being conducted with people who have meditated after stroke. The grand questions guiding the research inquire 1) what stroke survivors experience in association with their participation in meditation, and 2) what contexts, situations, or factors have typically played a part in their experience of meditation. Data collection (1 to 3 interviews per subject) and analysis (coding and thematic categorization of data) remains in progress. Four of a targeted maximum of 15 subjects have completed interviews. Future steps include further recruitment, data collection, and analysis until saturation is reached (i.e., no new themes emerge). Integration of all themes will constitute the final, descriptive essence of the phenomenon of meditation after stroke. Understanding the meaning that subjects associate with meditation will contribute to an understanding of why they meditate as well as their perception of ascribed benefits. Such information could help inform development of meditation interventions following stroke.

Supported by: U of Kentucky Department of Rehabilitation Sciences

Primary Presenter / email: **Carrico, C.L.** / cheryl.carrico@uky.edu
**Student**
**PhD**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Howell, D. / dana.howell@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 202 Abstract Title: | **Exercise as a Treatment for Cervicogenic Headache: Interpretation of Findings from Systematic Review.** |
| Author(s): | G.S. Naze, Dept. of Rehabilitation Sciences, College of Health Sciences; Orofacial Pain Clinic, College of Dentistry, U of Kentucky<br>A.L. Harrison, Dept. of Rehabilitation Sciences & Div. of Physical Therapy, College of Health Sciences; Orofacial Pain Clinic, College of Dentistry, U of Kentucky |

**Abstract:** INTRODUCTION. The diagnosis of cervicogenic headache encompasses the structures of the cervical spine, both bony and soft tissue, which can generate pain into the head and face. This can occur through direct innervation of the head by the upper cervical nerves or through convergence of the upper cervical nerves with the trigeminal nerve at the trigeminocervical nucleus. RESOURCES. The authors performed a systematic search of the peer reviewed literature using specific search terms to identify studies that included a clinical trial of a cohort of subjects with orofacial pain receiving interventions of aerobic or strengthening exercises. DESCRIPTION. While multiple articles were identified that assessed exercise as an intervention for other types of headache, three articles specifically addressed cervicogenic headache. All three of these articles used resistance training as the mode of exercise and improvements were found in headache intensity and frequency. SIGNIFICANCE. The potential effects of resistance exercise in improving symptoms of cervicogenic headache include biomechanical contributions, activation of opioid pathways, and activation of non-opioid pathways, including anti-inflammatory mechanisms and alteration of neurotransmitters responsible for transmission of nociception to the sensory cortex of the brain. While improvement with resistance exercise was noted, not all subjects responded. Further research is needed to better define the mechanisms and diagnosis of cervicogenic headache to allow for better subgrouping of patients for more targeted interventions.

Supported by:

Primary Presenter / email: **Naze, G.N.** / garrett.naze@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Harrison, A.L. / anne.harrison@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 203 Abstract Title: | **An Examination of Corticomotor Plasticity in Individuals With and Without Chronic Ankle Instability** |
| Author(s): | K.B. Kosik, Department of Rehabilitation Sciences, U of Kentucky<br>M. Terada, Department of Rehabilitation Sciences, U of Kentucky<br>R.S. McCann, Department of Rehabilitation Sciences, U of Kentucky<br>C.P. Drinkard, Department of Rehabilitation Sciences, U of Kentucky<br>P.A. Gribble, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Context: Previous literature has found decreased excitability within the corticospinal pathway of the fibularis longus(FL) muscle using Transcranial Magnetic Stimulation(TMS) assessment in patients with chronic ankle instability(CAI), indicating a potential reorganization in the supraspinal sensorimotor system. Mapping of the motor cortex may further quantify this potential reorganization by identifying shifting and/or expansion of the area of the motor cortex associated with selected muscle. Objective: Compare differences of the corticomotor map output for the FL muscle in patients with and without CAI. Design: Single-blinded case control study. Setting: Research laboratory. Patient or Other Participants: Seventeen CAI patients (23.5±3.7years,179.17±7.3cm,73.19±11.5kg) and 16 Healthy-controls(HC) (21.1±2.2years,168.6±10.4cm,66.5±10.2kg) volunteered. Interventions: Peripheral nerve stimulation was applied over the superficial peroneal nerve to determine the average of three maximum muscle response (Mmax) of the FL. The average of three motor evoked potentials(MEP) at Active Motor Threshold(AMT) intensity was recorded for each scalp site and was then normalized to Mmax. Main Outcome Measures: Corticomotor plasticity was determined through 1) size of the corticomotor map area and 2) volume of the corticomotor map. The map area is expressed as the mean number of sites from which normalized MEPs were evoked. The map volume was calculated as the sum of normalized MEP amplitude across scalp sites. Independent T-tests were used to assess group differences and Cohen's d effect sizes along with 95% confidence intervals(CI) were calculated. Results: CAI patients exhibited less map volume (P=0.018,CAI:8.3±3.3vs.HC:11.3±3.8,d=0.85,CI:0.12,1.54) and map area (P=0.046, CAI:12.8±6.0vs.HC:17.37±6.8, d=0.70,CI:0.02,1.38) compared to HC Conclusions: The smaller map area and volume suggest a more concentrated area of motor cortical cells associated with the FL muscle in patients with CAI. This may explain altered movement strategies that lead to ankle re-injury.

Supported by: 2015 South East Athletic Trainers Association (SEATA) Research Grant.

Primary Presenter / email: **Kosik, K.B.** / kyle.kosik@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Gribble, P.A. / phillip.gribble@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| 204 Abstract Title: | **Prediction of Lower Extremity Injury in Collegiate Women's Soccer Players** |
|---|---|
| Author(s): | R.S. McCann, Department of Rehabilitation Sciences, U of Kentucky<br>K.B. Kosik, Department of Rehabilitation Sciences, U of Kentucky<br>M. Terada, Department of Rehabilitation Sciences, U of Kentucky<br>M.Q. Beard, Department of Health and Sports Sciences, Capital U, Columbus, OH<br>G.E. Buskirk, Department of Athletics, U of Toledo, Toledo, OH<br>P.A. Gribble, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** HYPOTHESIS: Decreased dynamic postural control and isometric hip extension strength in collegiate women's soccer players will be associated with increased odds of sustaining an acute lower extremity injury. NUMBER OF SUBJECTS: Twenty-eight NCAA Division I women's soccer players (19.6±1.2yrs; 167.7±3.7cm; 60.3±4.8kg). PROCEDURES: All participants were tested bilaterally in the Star Excursion Balance Test anterior reach (SEBT-ANT) and isometric hip extension strength (HEXT). Subsequent lower extremity injuries were tracked through the competitive season by an athletic trainer. STATISTICAL ANALYSIS: Independent t-tests and Cohen's d effect sizes analyzed SEBT-ANT and HEXT differences between injured (n=13) and uninjured (n=30) participants. Logistic regression assessed the ability of SEBT-ANT and HEXT to predict injury risk. Sensitivity, specificity, diagnostic odds ratio (DOR), and area under the curve (AUC) from receiver operating characteristic (ROC) curve analysis further assessed predictive value. RESULTS: No significant group differences were identified for SEBT-ANT (injured: 67.0±7.8%, uninjured: 69.3±5.8%; P=0.26; d=-0.36) and HEXT (injured: 42.2±7.3%, uninjured: 44.9±7.6%; P=0.28, d=-0.37). Logistic regression failed to produce a significant injury prediction model ($\chi 2 = 3.229$, P=0.26). Perfect model specificity (1.00) indicated low SEBT-ANT and HEXT effectively predicted True Negative cases, however low sensitivity (0.23) indicated poor identification of True Positive cases. The DOR (29.87) and AUC (0.664, P=0.09) indicated SEBT-ANT and HEXT could potentially predict injury status. CONCLUSION: SEBT-ANT and HEXT may identify collegiate women's soccer players at low risk of acute lower extremity injury. Continued work is needed to confirm the positive predictive value of SEBT-ANT, HEXT, and other clinical measures in this population.

Supported by:

Primary Presenter / email: **McCann, R.S.** / rsmc223@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Gribble, P.A. / phillip.gribble@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 205 Abstract Title: | **Music Therapy Intern Supervision Inventory** |
| Author(s): | J. Rushing, Department of Rehabilitation Sciences, U of Kentucky<br>L. Gooding, College of Music, The Florida State U, Tallahassee, FL<br>P. Westgate, Department of Biostatistics, U of Kentucky |

**Abstract:** Background: All pre-professional music therapy students must complete a clinical internship prior to sitting for the board certification exam. During internship, interns are supervised and evaluated on their ability to demonstrate professional competencies by their internship directors and supervisors. Approaches utilized for supervision are site and supervisor dependent. Objective: The purpose of the current study is to investigate approaches of supervision utilized by internship directors and supervisors. This study examines the use of models, influences on supervision style, and competency alignment within stages of internship. Participants reported on demographics, education and professional items, supervision and internship site, supervision influences, and stages of internship in which they spend the most time and would ideally spend the most time addressing each competency. Methods: Respondents completed a 75 item online survey. Descriptive statistics, Wilcoxon, Fisher's exact test, and Bowker's test for symmetry were used for data analysis. Comparisons were drawn between respondents who reported using a specific model of supervision (n=13) and those who did not (n=59). Results: Seventy-two complete responses were collected. Taking a non-music therapy course with a focus on supervision, satisfaction with supervision style, and years of intern supervision were significantly associated with use of a model. Differences were found between when ideal and actual competency focus occurs across the internship training experience. Conclusion: Overall results indicate that factors in training and experience among internship directors and supervisors may lead to use of a specific model of supervision. A suggested outline of competency focus across stages of internship is provided.

Supported by:

Primary Presenter / email: **Rushing, J.** / jessy.rushing@uky.edu
**Student**
**PhD**
**Department of Rehabilitation Sciences**

Mentor / e-mail: Gooding, L. / lgooding@fsu.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 206 Abstract Title: | **Context Focused Intervention Versus Child Focus Intervention in Improving Performance of Functional Tasks in Young Children with Cerebral Palsy** |
| Author(s): | A.S. Gmmash, Department of Rehabilitation Sciences, U of Kentucky |

**Abstract:** Objective: To find if there is evidence to suggest that context focused interventions are more effective than child focused interventions in improving performance of functional tasks in young children with cerebral palsy Methods: The following databases were searched for level B and higher evidence according to the Oxford Centre for Evidence-Based Medicine Levels of Evidence for the use of interventions that were context focused versus those that were child focused: Medline, PubMed, CINHAL with full text, ERIC and hand search. Results: Only one randomized control trial met the inclusion criteria. The RCT examined the efficacy of child focused intervention versus context focused intervention in improving performance of functional tasks in young children with cerebral palsy. This RCT showed a significant difference in the Gross Motor Function Classification System (GMFCS) and Pediatric Evaluation of Disability Inventory (PEDI) scores for all children from baseline to 6 months and a significant increase in the PEDI scores in children younger than 3 years of age. Also, there was no significance difference in-between group at baseline, in the PEDI scores or GMFCS, the range of motion and in all outcome measures from 6 to 9 months for all children. Conclusion: Three to four times a month of either context focused or child focused approaches can significantly improve mobility functions in young children with CP. This study suggests that rehabilitation for the children with CP that are frequent, functional activity-based, goal-directed with the addition of family education and home exercises, will likely promote functional skills.

Supported by:

Primary Presenter / email: **Gmmash, A.S.** / a.gmmash@yahoo.com
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Effgen, S.K. / seffgen@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 207 Abstract Title: | **A Retrospective Investigation of Cardiovascular Intensive Care Unit Physical Therapy Practice** |
| Author(s): | A. Johnson, Dept. of Rehabilitation Sciences, College of Health Sciences, U of Kentucky<br>A. Henning, Inpatient Rehabilitation Dept., UK HealthCare<br>A. McLaughlin, Center for Clinical and Translational Science, U of Kentucky<br>P. Morris, Div. of Pulmonary, Critical Care & Sleep Medicine, College of Medicine, U of Kentucky<br>E. Dupont-Versteegden, Dept. of Rehabilitation Sciences, College of Health Sciences, U of Kentucky |

**Abstract:** Background: Early mobilization in a medical ICU has been shown to decrease hospital length of stay (LOS). Our goal was to examine early mobilization using physical therapy (PT) practice in patients with cardiac and respiratory problems requiring intervention in a cardiovascular (CV) ICU. Our independent variables include time to first PT in the ICU, mean days of PT, mean days of mechanical ventilation, comorbidity score and age. Our dependent variables were hospital and CV ICU LOS. Methods: We performed a retrospective, cross-sectional study of patients in the CV ICU at the University of Kentucky. Our population (n=2,568) was based on individual patient encounters for all patients >18 years of age. Patients received physical therapy based on consultation from the primary physician service line providing care for the patient. Any date with a physical therapy current procedural terminology (CPT) code entered for a patient was considered a day of physical therapy. Results: Semi-logarithmic multivariate regression analysis of hospital LOS revealed time to first PT in the CV ICU, mean days of PT, mean days of mechanical ventilation, comorbidity score and age explains 56% of the variation in hospital LOS. All independent variables were significant (p=0.00). The same independent variables explain 48% of the variation in CV ICU LOS; all independent variables were statistically significant (p=0.00) except for age. There were no omitted variables in the model and no evidence of multicollinearity. Conclusions: Mean days of mechanical ventilation showed clinical significance. For each day increase in mechanical ventilation, hospital LOS increased 0.20days and CV ICU LOS increased 0.28days. We conclude that time to first PT in ICU, mean days of PT, mean days of mechanical ventilation, comorbidity score and age are associated with hospital and CV ICU LOS.

Supported by: 'The project described was supported by the National Center for Advancing Translational Sciences, UL1TR000117. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Primary Presenter / email: **Johnson, A.** / audreyjohnson4@uky.edu
**Student**
**PhD**
**Rehabilitation Sciences Doctoral Program**

Mentor / e-mail: Dupont-Versteegden, E. / eedupo2@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 208 Abstract Title: | **The accuracy of one repetition maximum prediction equations for quadriceps strength in healthy adults: a critically appraised topic** |
| Author(s): | B. Barney, Department of Rehabilitation Science, Division of Physical Therapy, U of Kentucky<br>B. Noehren, Department of Rehabilitation Science, Division of Physical Therapy, U of Kentucky |

**Abstract:** Clinical scenario: The one repetition maximum (1RM) test is commonly used to assess maximal strength for accurate exercise intensity prescription. 1RM prediction equations have also been developed to estimate 1RM from submaximal exercise tests. However, the relative accuracy of these equations has rarely been tested for the leg extension (LE) exercise at higher (>10) repetition ranges. The development of these equations may be useful for estimating maximal quadriceps strength for persons recovering from a knee injury. Focused Clinical Question: In healthy adults, what is the best evidence that a submaximal estimate can accurately predict maximal quadriceps strength? Best Evidence: After performing a literature search, 28 relevant articles were found. After further review, 2 articles were identified that fit all inclusion criteria – a 2002 study by Wood et al and 2012 study by Julio et al. Results: Wood et al – mean correlation coefficient value of r = 0.88 ($p \leq 0.05$) and average error = 29.0 lbs for seven prediction equations for LE. Julio et al – r = 0.973 (p = 0.664), adjR2 = 0.76, percent error = 7% for LE. Summary of Key Findings: Although the equations in both studies yielded high r values, neither study developed an equation specifically work for a higher repetition test. Also, neither study gave adequate details on subject recruitment, which makes it more difficult to generalize their results to the overall population. Further research on the development of an equation from a high repetition LE exercise test is necessary.

Supported by:

Primary Presenter / email: **Barney, B.** / bba248@uky.edu
**Student**
**DPT**
**Division of Physical Therapy**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 209 Abstract Title: | **Efficacy of a Home Training Program in Army National Guard Soldiers to Improve Performance and Reduce Injuries: A Pilot Study** |
| Author(s): | Z.T. Holtkamp, Division of Physical Therapy, U of Kentucky<br>B.W. Noehren, Division of Physical Therapy, U of Kentucky<br>P.W. Kline, Division of Physical Therapy, U of Kentucky<br>W.S. Black, Division of Physician Assistant Studies, U of Kentucky |

**Abstract:** Hypothesis: The purpose of the study was to evaluate the effectiveness of an unsupervised, structured training program on injury rate and 2-mile run performance in Army National Guard soldiers. It was expected that the soldiers' fitness levels would increase with minimal injuries when completing the program. Subjects: Eleven subjects participated in the study (3 females, 27±8.7 years, BMI26.29±3.1 kg/m2). Procedures: Subjects completed a 10-week training program that included 3 weekly runs and an interval workout. Exercises to improve hip and core strength and running drills were also included. The subjects ran two miles at maximum effort before and after the training program. Number of days missed due to injury were recorded. Statistical Analysis: A paired sample t-test was used to compare pre-test and post-test. Running times were converted to VO2 max values and percent change in VO2 max was calculated. Results: Significant improvements were seen in two mile times (16.79 vs 16.40 minutes, p=.033). There was a 2.36% decrease in two mile times and a 2.57% increase in VO2 max. One runner was not able to run the post-test because of an injury. None of the subjects that completed the study missed any training days due to injury. Conclusions: National Guard Soldiers have a capacity to improve fitness levels given this specific training program. Pairing a running program with strength and gait training may help minimize injury rate.

Supported by:

Primary Presenter / email: **Holtkamp, Z.T.** / ztho225@uky.edu
**Student**
**DPT**
**Division of Physical Therapy**

Mentor / e-mail: Noehren, B.W. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 210 Abstract Title: | **Waveform parameter estimation techniques for evaluating knee stiffness and control during gait following an anterior cruciate ligament reconstruction** |
| Author(s): | K.D. Morgan, Department of Physical Therapy, U of Kentucky<br>B. Noehren, Department of Physical Therapy, U of Kentucky |

**Abstract:** HYPOTHESIS: Increased knee stiffness in gait following an anterior cruciate ligament reconstruction (ACLR) may be associated with debilitating knee pain and early on-set knee osteoarthritis. Damping ratios are used to quantify the oscillatory behavior of a system from which one can elucidate the systems' stiffness. Thus we will use damping ratios to assess knee stiffness during walking. We hypothesize that the ACLR individuals will exhibit greater knee stiffness than the control group. NUMBER OF SUBJECTS: Ten control (19.4 ± 5.6 years, 66.0±12.0kg, 1.7±0.1m) and 6-month post ACLR (22.2±2.3yrs, 59.9±7.2kg, 1.7±0.1m) individuals. METHODS: Participants performed a walking protocol during which 3D kinematic data was collected. Individuals walked at 1.5m/s on an instrumented treadmill. A second order polynomial was fit to the sagittal plane knee kinematics. The polynomial coefficients served as inputs for the damping ratio (ζ) calculation. A damping ratio less than 1 ($\zeta < 1$) represented a knee exhibiting diminished joint stiffness, $\zeta = 1$ was a knee with the appropriate stiffness, and $\zeta > 1$ represented excessive stiffness. STATISTICAL ANALYSIS: A two sample t-test assessed differences in damping ratio between the two groups. RESULTS: The ACLR group had significantly larger damping ratios (1.22 ± 0.07) than the control group (0.99 ± 0.07) (p=0.02). CONCLUSIONS: We found that the ACLR individuals exhibited excessive knee stiffness compared to the control individuals. These results support the use of damping ratios as a tool that clinicians can use to assess changes in knee stiffness during rehabilitation.

Supported by: This project described was supported by the University of Kentucky Lyman T Johnson Postdoctoral Fellowship Award. The content is solely the responsibility of the authors and does not necessarily represent the official view of the University of Kentucky.

Primary Presenter / email: **Morgan, K.D.** / kmo242@uky.edu
**Postdoc**
**Division of Physical Therapy**

Mentor / e-mail: Noehren, B. / b.noehren@uky.edu

# College of Health Sciences Research Day
# Poster Presentation Abstracts

| | |
|---|---|
| 211 Abstract Title: | **Critical Appraisal Topic and Future Research: Frailty pre-surgery predicts functional outcome post-surgery in patients with aortic valve implantation** |
| Author(s): | A. Henning, Department of Rehab Sciences, Department of In-patient Rehab, U of Kentucky<br>A. Johnson, Department of Rehab Sciences, U of Kentucky<br>E.E. Dupont-Versteegden, Department of Rehab Sciences, U of Kentucky |

**Abstract:** Background: Frail patients demonstrate increased risk for poor post-surgical outcomes. Frailty measures have been shown to predict post-operative outcomes in a variety of surgical populations. No gold-standard has been identified for assessing frailty. Multiple composite models have been proposed. Research shows a high degree of variability of post-surgical course in cardiothoracic populations specifically those in need of aortic valve intervention. Methods: Literature search for best evidence was performed to answer the following PICO question: Is there evidence to suggest that frailty assessment is predictive of post-surgical outcomes in adults over the age of 65 in need of transcatheter aortic valve implantation (TAVI)? One cohort study was found as the best (level 2) evidence for this topic: "Predictors of functional decline in elderly patients undergoing transcatheter aortic valve implantation (TAVI)" by Schoenenberger et al, 2013. Results: The authors found a significant relationship between the pre-surgical measures of high frailty index as well as individual components of index and functional decline, death, or the combination of decline and death. These results showed stronger predictive value of frailty measures than traditional surgical risk stratification tools. Application: We propose to utilize and refine a frailty index including validation in patients in need of aortic valve intervention. The validated frailty index could be used to aid in assignment of patient procedure as well as identification of those in need of "prehabilitation" or aggressive rehabilitation. Mitigation of risk in this population will improve outcomes and provide cost-saving to institutions.

Supported by:

| | |
|---|---|
| Primary Presenter / email: | **Henning, A.** / angela.henning@uky.edu<br>**Postdoc**<br>**Rehabilitation Sciences Doctoral Program** |
| Mentor / e-mail: | Dupont-Versteegden, E.E. / eedupo2@email.uky.edu |