AACA Regional Meeting

Saturday, October 26, 2019

Oakland, CA

"Augmented Approaches for Incorporating Clinical Anatomy into Education, Research, and Informed Therapeutic Management"



SAMUEL MERRITT UNIVERSITY

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Welcome to the AACA Regional Conference

Dear Conference Attendees:

On behalf of Samuel Merritt University (SMU), It is with great pleasure and enthusiasm that we welcome you to the American Association of Clinical Anatomists' (AACA) 2019 Fall Regional Conference. We are honored to host the AACA's 6th regional conference, and have you visit our institution, while bringing together a variety of professionals who use clinical anatomy in their work, to share that knowledge, to network with one another, and to learn more about the AACA.

The goal of the conference is to inform the participant about, and to demonstrate, a collection of powerful tools that can be utilized to enrich and reinforce clinical anatomy, in many of the contexts for which it is foundational. Samuel Merritt University is an allied healthcare university that trains future healthcare clinicians in a diverse number of disciplines, including a spectrum of nursing degrees and certifications, physician's assistant, physical therapy, occupational therapy, and podiatric medicine. Additionally, we offer a number of basic and clinical science courses that are prerequisites for these types of programs. Clinical anatomy is foundational to all of these programs at SMU, though in different ways. This curricular diversity at SMU makes our institution an ideal one for demonstrating how clinical anatomy can be reinforced in many different contexts. We are proud to have the resources that we have to augment clinical anatomy and hope that you find the learning centers and facilities at SMU as models for demonstrating these goals. There are so many powerful tools that can be utilized for incorporating clinical anatomy into these arenas, and it is our hope that the curriculum of this meeting will expand your appreciation for these and provide you with some new tools and fresh inspiration for your professional work.

Thank you for taking the time during your weekend, away from your families and home institution, to come to the beautiful Bay Area and interact with your scientific peers. We hope your short time here will be fruitful and enjoyable. We are so pleased and proud to serve as the host institution and hope you will enjoy the hospitality of our university and the beauty of the Bay Area.

Sincerely,

Christina C. Lewis

Christina C. Lewis, Ph.D.

Samuel Merritt University

Barbara A Puder

Barb Puder, Ph.D.

Samuel Merritt University

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AACA Regional Conference

Schedule for Saturday, October 26

TIME	EVENT	LOCATION
7:30-8:15	Breakfast & Registration	Bechtel Room (HEC)
8:15-8:45 *8:15-8:20* *8:20-8:45*	Welcome Addresses *Robert Spinner, AACA President* *Fred Baldini (Vice President) & Celeste Villanueva (Assistant Vice President), Samuel Merritt University*	Bechtel Room (HEC)
8:45-9:25	Using 3D & Stereoscopic Tools for Imaging Clinical Anatomy *Greg Smith, St. Mary's College of California*	Bechtel Room (HEC)
9:25-10:05	How Simulation can be Used to Reinforce Clinical Anatomy *Ajitha Nair and Jeannette Wong, Samuel Merritt University*	Bechtel Room (HEC)
10:05-10:45	Biomechanics Technology can Enrich the Understanding of Clinical Anatomy *Drew Smith and Stephen Hill, Samuel Merritt University*	Bechtel Room (HEC)
10:45-11:00	**BREAK**	Atrium (HEC)
11:00-11:30	POSTER SLAM	Bechtel Room (HEC)
11:30-12:30 PM	LUNCH: Social/ Networking Hour/ Poster viewing	Bechtel Room (HEC)
12:30-12:45	**BREAK**	Atrium (HEC)
12:45-1:45	Workshop Hour 1 (concurrent sessions): 1) Using a Simulation Center* 2) Using a Motion Analysis Center* 3) 3D & Stereoscopic Imaging Tools Exhibits†	 ▪ HSSC (Peralta) ▪ MARC (HEC) ▪ Peralta Pavillion (L835)
1:45-2:05	**BREAK**	Atrium (HEC)
2:05-3:05	Workshop Hour 2 (concurrent sessions): 1) Using a Simulation Center* 2) Using a Motion Analysis Center* 3) 3D & Stereoscopic Imaging Tools Exhibits†	 ▪ HSSC (Peralta) ▪ MARC (HEC) ▪ Peralta Pavillion (L835)
3:05-3:25	**BREAK**	Atrium (HEC)
3:25-4:25	Workshop Hour 3 (concurrent sessions): 1) Using a Simulation Center* 2) Using a Motion Analysis Center* 3) 3D & Stereoscopic Imaging Tools Exhibits†	 ▪ HSSC (Peralta) ▪ MARC (HEC) ▪ Peralta Pavillion (L835)
4:25-4:45	**BREAK**	Atrium (HEC)
4:45-5:15	Design your own tools for incorporating clinical anatomy into education, research, or therapeutic management *(Round Table Discussion Activity)*	Bechtel Room (HEC)
5:15-5:30	Closing comments	Bechtel Room (HEC)
5:30-6:30	Wine & Cheese Social with AACA Council Members All attendees are invited! **Sponsored by Anatomage**	Atrium (HEC)

** Sessions with rotating stations of hands-on activities.*

† NOTE: While various products will be on display, the selection is based upon specific experience and context of presenters. The AACA supports all meeting exhibitors and their products equally, and does not specifically endorse any one product or vendor.

University Map



Samuel Merritt University Classrooms & Offices

1. **Health Education Center (HEC)**
   400 Hawthorne Ave
2. **South Pavilion**
   3100 Summit St
3. **3012 Summit**
   3012 Summit St
4. **Peralta Pavilion**
   450 30th St
5. **Peralta Medical Office Building**
   3100 Telegraph Ave

Legend

- Shuttle
- Parking
- Street View
- Main Entrance
- Mailbox
- Eatery

2019 AACA Fall Regional Conference

Exhibitors

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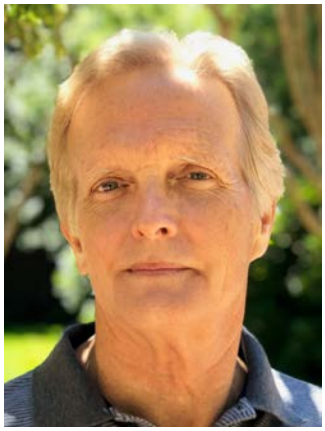
Speakers

Saturday, October 26

8:45 – 9:25 AM
Bechtel Room (HEC)
"Using Stereoscopic 3D Tools for Imaging Clinical Anatomy"



Dr. Greg Smith
Professor
Saint Mary's College of California

Objectives:

- Distinguish virtual 3D versus stereoscopic 3D
- Incorporate 3D imaging into anatomy lab
- Learn about clinical anatomy (variation, pathology and anomalies) through DICOM 3D viewing

Greg Smith is a Professor of Human Anatomy at Saint Mary's College of California in Moraga. He is the director of two Human Anatomy courses, one for the Allied Health Sciences and, the other, an upper division course for Health Professions students (Advanced Human Anatomy) at Saint Mary's. Both courses are cadaver based with the Advanced Human Anatomy involving full dissection. For much of his career, Professor Smith has worked with developers that create resources for supplemental learning in the anatomy lab. In the 1990s, he collaborated with A.D.A.M. (Animated Dissection of Anatomy for Medicine) which was the first real digital dissector. The program's initial success led some medical schools to claim that this product could serve as a substitute for cadaver use. Professor Smith has also worked with VisibleBody and 3D4Medical incorporating their apps as iPad adjuncts to assist student dissections. The previously listed programs display anatomy in virtual 3D, that is, the perception of 3D occurs by the manipulation of the images.

Recently, he has worked on projects that display anatomy in true stereoscopic 3D. As a part of a sabbatical project, Professor Smith worked with the anatomists at the Warwick University School of Medicine to learn how to produce 3D videos of anatomical specimens. While in England, he was introduced to the developers of the Alioscopy 3D Display Monitor. This monitor displays images in stereoscopic 3D without the need of glasses. Professor Smith will present a history of 3D anatomy including stereoscopic 3D from the early 1900s to the present time. Many of the products that have been created have come and gone. There are several technologies in development now that are next in line for 3D anatomy application. So, the question that begs to be asked is why is there a seemingly eternal but fleeting quest for 3D anatomy? Professor Smith will try to convince the attendees that the ability to render DICOM (MRI and CT Scan) files for display in stereoscopic 3D could be the holy grail in human anatomy education.

Greg Smith has been a member of the AACA since 1989. He hosted the 2004 AACA Annual Meeting in Moraga and was a Co-Host of the 2016 Annual Meeting in Oakland.

9:25 – 10:05 AM
Bechtel Room (HEC)
"How Simulation can be Used to Reinforce Clinical Anatomy"

Dr. Ajitha Nair
Simulation Educator
Samuel Merritt University



Objectives:

- Describe the use of simulation in undergraduate and graduate medical education
- Review of simulation modalities and the concept of fidelity in simulation
- Describe the use of simulation at Samuel Merritt University

- Give examples of how simulation at Samuel Merritt University incorporates clinical anatomy into education and informed therapeutic management

Ajitha Nair, DPM, MPH is a simulation educator at Samuel Merritt University's Health Science and Simulation Center where she offers support to faculty around the use of simulation in curriculum. Ajitha has been using simulation in her teaching since 2013. Prior to joining faculty at Samuel Merritt University (SMU) in 2013, Ajitha Nair completed her residency in reconstructive rearfoot and ankle surgery. She received her Doctor of Podiatric Medicine degree in 2010 from the California School of Podiatric Medicine at SMU.

Jeanette Wong

Director of the Health Sciences Simulation Center
Samuel Merritt University



Jeanette Wong is the Director of the Health Sciences Simulation Center (HSSC) at Samuel Merritt University (SMU). As the Director, she is responsible for leading a highly qualified interprofessional team to promote immersive learning experiences for SMU students and clinical partners. Jeanette is committed to ensuring the simulation experiences are purposeful and follow best practice standards allowing learners a successful learning opportunity.

Ms. Wong received her Bachelors in Nursing from the University of San Francisco and her Maters in Public Administration/Health Service Administration from the University of Southern California.

10:05 – 10:45 AM
Bechtel Room (HEC)
"Biomechanics Technology can Enrich the Understanding of Clinical Anatomy"

Dr. Drew Smith
MARC Director
Samuel Merritt University



Objectives:

- To become aware of the wide range of currently available human motion analysis technologies
- To understand the relationships between knowledge of clinical anatomy and objective quantitative anatomical measurement
- To appreciate how these insights may impact future clinical practice

Andrew (Drew) Smith, Ph.D., MARC director, has more than 35 years of experience in the field of movement analysis and kinesiology and has worked internationally in academic settings, clinical settings, and research labs. His primary area of research is in gait and balance in particular neuromuscular control of motion across a wide spectrum of movements. Before coming to Samuel Merritt University, Professor Smith was an associate professor and associate head of the Department of Health and Physical Education at The Education University of Hong Kong.

Dr. Stephen Hill

Assistant Professor
Samuel Merritt University



Dr. Stephen Hill received his Bachelor of Science degree in Kinesiology at the University of Waterloo (Canada) and then performed clinical service with foot orthotics, specialized footwear, and back injury rehabilitation before being recruited as director of the Motion Analysis Lab at Southern Illinois University School of Medicine. He completed his Master of Science degree, and PhD in Kinesiology (Biomechanics) at the University of Waterloo Gait and Posture Laboratory, followed by a Post-Doctoral Fellowship in Mobility at Toronto Rehab Institute / Sunnybrook Hospital / University of Toronto.

Before becoming Assistant Professor, Laboratory Manager of the Samuel Merritt University Motion Analysis Research Center (MARC), Steve collaborated in, developed, and managed multidisciplinary clinical and research motion analysis labs in Canada and the US, and has taught several biomechanics courses. At SMU, he teaches with Occupational Therapy: Scholarly Writing, Guided Research, and Research Synthesis Project; Podiatry: second- and third-year biomechanics rotations; Physical Therapy: Functional Anatomy, Biomechanics and Kinesiology I&II: group motion analysis projects; and the MARC: Neuro Bases of Posture Balance Gait.

His clinical and research work has included orthotics & prosthetics, footwear, back injury, and neurological disorders (cerebral palsy, myelomeningocele, stroke, multiple sclerosis, incomplete spinal cord injury, post-polio). His primary research focus is on clinical and occupational applications of biomechanics.

Steve is the co-Primary investigator with Dr. Timothy Dutra, DPM in SMU Faculty Research Seed Grant funded study “The Efficacy of Custom Foot Orthosis in the Protection from Non-Contact Anterior Cruciate Ligament Injuries at the Knee”. He is the co-Primary Investigator with Dr. Donna Breger-

Stanton, OTD, OTR/L, FAOTA in SMU Seed Grant study "Within Sessions Effects of Selected Physical Rehabilitation Interventions for a Dysfunctional Upper Extremity Using Electromyography". He is also co-investigator with Dr. Timothy Dutra, DPM, Professor Drew Smith, PhD and primary Investigator Dr. Cherri S. Choate, DPM on the Faculty Scholarship Grant Program funded study, "The impact of maximalist running shoes on lower extremity kinematics and kinetics during walking and running compared to neutral running shoes".

AACA Regional Meeting Workshops

Workshop Hours:

Round 1: 12:45 – 1:45 PM

Round 2: 2:05 – 3:05 PM

Round 3: 3:25 – 4:25 PM

Workshop Options*(concurrent sessions offered during each workshop hour):*

Option 1: Using a Health Sciences Simulation Center to Reinforce Clinical Anatomy

(Health Sciences Simulation Center, Peralta Pavilion)

Station 1: Overview of Simulation Center Tools

- A variety of simulation tools will be showcased and available for participant engagement, including maternity suit, geriatric suit, stroke simulating mobility suit, use of ventriloscope, joint aspiration demonstration, as well as a mannequin that emits abnormal heart and breath sounds.
- Facilitators will describe how the health sciences simulation center at SMU is currently being used to incorporate clinical anatomy into its different programs. Additionally, discussion opportunities will explore possibilities for participants to incorporate simulation tools at their home institution or in their professional activities.

Station 2: Parturition Scenario

- Participants will observe a child birthing scenario being played out by students and standardized patients. Participants will observe the "*realness*" that can be experienced in simulation during the progression of the surrounding events.

Station 3: Advanced Cardiopulmonary Intervention Scenario

- Participants will observe an advanced cardiopulmonary intervention scenario being played out by a team of students and faculty from the Program of Nurse Anesthesia. Participants will also be able to observe the debriefing discussions that follow simulated scenarios, which is where a great deal of student learning occurs.

Option 2: Using a Motion Analysis Research Center to Enrich the Understanding of Clinical Anatomy

(Motion Analysis Research Center, HEC)

The Motion Analysis Research Center at Samuel Merritt University (SMU) is among the best-equipped healthcare sciences teaching and research laboratories in northern California. It is a 2,100 ft^2 state-of-the-art laboratory designed to advance the study of human movement in education, research, and patient care. The Motion Analysis Research Center serves as a teaching venue for motion analysis for faculty and students from SMU's California School of Podiatric Medicine (CSPM), Department of Occupational Therapy, and Department of Physical Therapy. Some of the capabilities of the MARC will be demonstrated today via three stations that focus on balance, muscle function, plantar pressure mapping, and gait

Station 1: Balance

Successful balance involves both sensory inputs from vision, somatosensory proprioception, and vestibular function and motor control of postural muscles. The Natus Smart Equitest Balance Manager is a sophisticated balance testing, training, and rehabilitation device that offers more than half a dozen different tests of balance and dynamic balance control. Today's demonstration will involve the Sensory Organization Test.

Station 2: Muscle Function and Plantar Pressure Mapping

One important tool for podiatrists is measuring plantar pressures during standing and gait, particularly for their diabetic patients. We are also often interested in the muscle function during these activities. This station will demonstrate the Novel Emed Pressure Platform and Delsys Trigno Electromyography System.

Station 3: Gait Analysis

Until recently, gait analysis was mostly conducted either observationally or using cameras. Within the past 10 years or so, and particularly in the last 3-5 years, new technology is available that does not rely on cameras to deliver comprehensive data on gait. This station features our new Xsens MTw Awinda Wireless Motion Trackers which utilize inertial monitoring units to capture three-dimensional motion without the use of cameras.

Option 3: Using 3D (Virtual and Stereoscopic) Tools for Imaging Clinical Anatomy

(Peralta Pavilion, L835)

Demonstrations on Display

- Stereoscopic Studies - Edinburgh Anatomy *(Greg's team)*
- David Bassett's Stereoscopic Atlas of Human Anatomy *(Greg's team)*

- A.D.A.M. *(Greg's team)*
- Alioscopy *(Greg's team)*
- Warwick University Stereoscopic Videos *(Greg's team)*
- BodyViz *(Greg's team)*
- Anatomage *(Soo Kim)*

Poster Presentations & Viewing

(Bechtel Room, HEC)

Poster Slams: 11:00 – 11:30 AM

*(*presenting author provides 1-2 minute synopsis of work)*

Poster Viewing: 11:00 AM-12:25 PM

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1. BORDES[1] JR. Stephen J., Katrina E. Bang[1,2], Robert Spinner[3], Joe Iwanaga[4], Marios Loukas[1], and R. Shane Tubbs[4]. [1]Department of Anatomical Sciences, St. George's University School of Medicine, Grenada. [2]Department of Orthopedics and Rehabilitation, Iowa Carver School of Medicine, Iowa City, IA. [3]Department of Neurosurgery, Mayo Clinic, Rochester, MN. [4]Department of Neurosurgery, Tulane University School of Medicine, New Orleans, LA.
Anatomical Study of Ulnar Nerve Subluxation.

INTRODUCTION: Ulnar nerve subluxation is a cause of acute and chronic pain radiating from the elbow distally in an ulnar distribution. It may cause neuritis or further damage to the nerve. In this cadaveric study, we found that various degrees of flexion were required for nerve subluxation based on the anatomical position of the arm. This study was conducted to gain a further understanding of ulnar nerve subluxation and its diagnosis within a clinical setting. METHODS: 20 adult, fresh-frozen cadavers underwent dissection of the ulnar nerve at the elbow. Palpation of the medial elbow was performed in the neutral and flexed positions to observe for ulnar nerve subluxation, skin over the elbow was removed, and the position of the ulnar nerve was documented for each elbow. Each elbow was slowly flexed and the point of any ulnar nerve subluxation was documented. A goniometer measured degrees of elbow flexion in full supination and pronation. Fluoroscopy was performed on all elbows to observe for anatomical variants of the bones of the elbow e.g., anconeus epitrochlearis, medial epicondyle hypoplasia, or signs of previous trauma to the medial epicondyle of the humerus. SUMMARY: Ulnar nerve subluxation occurred in 3 out of 40 elbows (7.5%) (one left side and one bilateral) with elbow flexion. Elbow extension returned all subluxed ulnar nerves to the cubital tunnel. In neutral position, the ulnar nerve dislocated from the cubital tunnel with

approximately 50 degrees of elbow flexion (range, 45-55 degrees). In full supination, subluxation occurred at an average of 70 degrees of flexion (range, 60-75 degrees). In the fully pronated forearm, the ulnar nerve subluxed at an average of 40 degrees of flexion (range, 30-55 degrees). No regional anatomical variation, prior trauma, or gross injury was identified. Causes of ulnar nerve subluxation are likely linked to structural or developmental abnormalities of the postcondylar groove and adjacent structures or congenital weakness of supporting ligaments. CONCLUSION: Ulnar nerve subluxation required different degrees of flexion based on the anatomical position of the forearm and elbow. This understanding may enable physicians to increase the accuracy of a preliminary diagnosis of ulnar nerve subluxation, differentiating this pathology from others such as snapping triceps syndrome.

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2. GEST, Thomas R., Ph.D., Ryan T. Davis, Ashley L. Dean. CMU College of Medicine
Using the Intertragic Notch to Localize the Greater Occipital Nerve for Analgesic Injection

INTRODUCTION. Chronic daily headache (CDH) is defined as headaches that occur at least 15 days a month, for longer than three months. In evaluation of chronic daily headaches, compression of the greater occipital nerve (GON) is commonly targeted for analgesic administration. A common compression site of the GON is found at the exit from the semispinalis capitis muscle and entrance into the trapezius muscle. Although extra-cranial nerve blocks of the GON have recently seen clinical success, standardized approaches and methods to locating the GON have yet to be established. RESOURCES. With a goal to pinpoint the location of GON in patients for treatment, posterior neck dissections were done on 10 cadavers, revealing 20 GONs exiting the semispinalis capitis muscles bilaterally. Distances were measured using a metric ruler. DESCRIPTION. The distance was measured from left intertragic notch to right intertragic notch (ITN-ITN) across the occipital bone in a horizontal plane. The nuchal ligament was pinned in the same horizontal plane and defined as the “Intertragic-Nuchal Zero." This pin dictated a reference point for GON localization, with horizontal (x) and vertical (y) measurements taken from this point. SIGNIFICANCE. Using the ITN-ITN distance and dividing by two should place the nuchal ligament within 1.9 mm of the measurement. With this small reference range, the nuchal ligament can be identified on a patient and used as a universal reference point for the GON location. With the discussed ITN-ITN method, the proposed area for all penetration points of the GON on the left for both sexes was 17.1 mm^2, and for the right was 18.9 mm^2. Decreasing the area of the GON penetration point provides many benefits, including decreased drug administration costs, more

accurate and localized administration of analgesics, and subsequent decreased symptoms for the patient with minimized health care costs.

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3. HARMON, Derek J., Stacey J. Yu, Barbie A. Klein, Gary J. Farkas.
University of California, San Francisco, California.
The influence of virtual reality on exam performance in a physical therapy anatomy course.

INTRODUCTION: For doctor of physical therapy students (DPT), anatomy is a critical component of clinical practice; however, students often struggle due to the complex spatial processing required. Virtual reality (VR) applications allow students to deconstruct and reconstruct anatomy in 3D, aiding in knowledge acquisition. The aim of this study was to investigate the impact of VR on exam performance among first-year DPT students. METHODS: Study details were provided to all students during class where they completed informed consent in this IRB-exempt study. Students determined if they wanted to complete the VR session, remain in the control group (CG), or completely opt out of the study prior to the third exam, which included a lab practical and written component worth 35 points each. Anatomy VR software (3D Organon, Gold Coast, Queensland) was available on the VR system (HTC Vive, Taiwan) over a single day for groups of 4 students using 2 VR headsets for 1 hour, for a total of 6 hours. During the VR session, students completed a self-directed learning activity. Following the session, the students completed a Likert-based questionnaire about their experience. Normality was assessed and differences were evaluated with the Mann–Whitney U-test. Alpha<0.05. SUMMARY: 20 students completed the VR session, 28 remained in the CG, and 3 opted out. On the practical exam (VR: 28.1±3.9, CG: 27.8±4.3), written exam (VR: 32.1±3.8, CG: 30.9 ± 4.6), and the sum of the exams (VR: 60.7±7.2, CG: 58.3±8.2), the VR group scored higher than the CG; however, these differences were not significant ($p \geq 0.33$). Questionnaire data showed the 70% of students thought the VR session helped them understand spatial relationships, 93% enjoyed participating in the session, and 93% were likely to recommend VR. CONCLUSION: Results from the present study show a non-significant improvement with the use of VR, and evidence that students valued VR. Future studies should use a larger sample size and more VR sessions.

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4. HARRIS[1], A., R. Shapiro[1], and C. Lewis[2]
[1]Program of Occupational Therapy, Samuel Merritt University, Oakland, CA 94609, USA; [2]Department of Basic Sciences, Samuel Merritt University, Oakland, CA 94609, USA

Use of 3D Modeling to Characterize and Quantify Osteoarthritis in Cadaveric Elbow and Wrist Joints

INTRODUCTION: Osteoarthritis (OA) is the most common chronic disorder of the joints, affecting 10-13% of the U.S. population. OA can significantly disrupt activities of daily living (ADLs) by causing dysfunction and disability via reduced mobility and significant acute and chronic pain. Much of the current OA research has focused on the weight-bearing joints of the lower limb, but OA involving joints of the upper limb (UL), including those of the elbow and wrist, can also significantly impact the quality of life, yet are underdeveloped. The purpose of the current study is to gain insight regarding the prevalence and patterns of OA in the distal joints of the UL, and to determine if there are relationships among frequency, location, and severity of occurrence, as well as an individual's sex, age, and prior occupations. METHODS: The ULs were harvested bilaterally from 36 embalmed cadavers (16F, 29M; ages 52-100, with mean of 80.8 yo ± 12.0), the elbow and wrist joints dissected, and the articulations examined. The articulating surfaces for the distal humerus, proximal and distal radius and ulna, and the scaphoid, lunate, and triquetrum carpal bones were each examined. Pitting and degeneration of both cartilage and bone of the articulating surfaces were digitized using the Microscribe 3D Digitizer, and 3D models were created and subsequently analyzed via Rhinoceros 5 software. Quantitative analyses of the OA at each articulating surface was used to construct a descriptive comparison of the severity of degeneration on a 4-point scale (i.e., 0 to 3) ranging from no arthritis to severe arthritis. Ongoing studies seek to generate 3D models using an alternative approach in order to better define the negative space created by bone and cartilage pitting and degeneration and to quantitatively analyze and compare OA in these joints. Additional 3D modeling is being captured via HDI Advance R1X 3D Scanner (*GoMeasure 3D, Amherst, VA*) and analyzed via Geomagic FreeForm software (3D Systems; *Rock Hill, South Carolina*). SUMMARY of findings and their clinical implications: The present study demonstrates that OA can significantly affect the elbow and wrist joints of the UL, which are important in performing numerous ADLs. Our data indicate that the presence and severity of OA typically affected multiple articulation sites, rather than single surfaces, suggesting that the pathogenesis of OA in any given individual may be more complex than is currently appreciated. OA of the elbow joint was found on multiple articulating

surfaces between the distal humerus and ulna, whereas OA of the wrist joint was largely confined to the triquetrum. Ad hoc analyses are currently underway and seek to determine if there are patterns of observed OA in the UL in relationship to sex, age, and prior occupations. CONCLUSIONS: The current study indicates that OA is present in significant degrees and on multiple surfaces of the elbow joints, and this region is not well explored in the current literature. Future analyses using robust 3D analysis will help clarify relationships between OA observed in these joints.Our data provides additional characterization and description of OA affecting the UL, and this information may guide therapeutic approaches to occupational therapy regimes.

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5. KIM, Soo Y., Brent Burbridge[2], Stacey Lovo Grona[1], Katie Crockett[1].
[1]University of Saskatchewan, College of Medicine, School of Rehabilitation Science, Saskatoon, Saskatchewan. [2]University of Saskatchewan, College of Medicine, Department of Medical Imaging.

Does the Use of 3D Images Reformatted from an Anatomage Table Enhance Learning of Anatomy?

INTRODUCTION: Biomechanical assessment and treatment skills taught in the musculoskeletal courses for physical therapy (PT) students require an in-depth understanding of human anatomy. Traditionally, instructors have used images from anatomy textbooks to review the relevant body region of focus. The Anatomage Table is a fully segmented, real human, anatomy teaching system that many programs use to teach anatomy. Individual anatomic structures can be reconstructed in 3D. To date, use of the Anatomage Table to review the relevant anatomy within our PT courses has not been explored. PURPOSES: To explore an innovative use of the Anatomage Table outside of the anatomy course in the PT program and to investigate whether students' use of 2D anatomy images translated to both 2D and 3D anatomical knowledge. METHODS: Thirty-nine PT students participated. Four separate anatomy tests, focusing on different body regions, were given (shoulder, elbow, cervical spine, and wrist and hand). Prior to each test, images from an anatomy textbook relevant to the body region to be studied were posted. Each student was asked to take two versions of the test: traditional paper test with10-12 labelled structures to be identified and a 3D video test where 10-12 short (20 sec) dynamic, labelled, video clips were presented to the class with students asked to identify labelled anatomy. The 3D test was always administered first. RESULTS: Scores on the 3D tests were significantly lower than the traditional 2D test. For particular body region tests, statistically significant differences were found for the

elbow and cervical spine. CONCLUSIONS: Findings suggests learning from static images may not carry over to being able to identify the same anatomic structures in 3D. Providing more 3D resources and integrating more 3D dynamic anatomy into courses where a strong appreciation for spatial relationships is needed may be an effective teaching practice.

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6. KIMPO PhD. Rhea, and Barb Puder, PhD. Dept. of Basic Sciences, Samuel Merritt University, Oakland, CA 94707.

Impact of Neuroanatomy Lab Practical Exam Format on Medical Students' Preference and Performance.

ABSTRACT BODY: The traditional format for a neuroanatomy lab practical exam has a time limit for each station, requires walking to and keeping track of the next station, and does not allow students to go back to a previous station ('Timed Stations'). To determine whether lab practical exam formats influence the test performance and format preference of medical students, we designed and administered two additional formats using digital images of human brains and brain slices:

• 'Timed PowerPoint (PPT) Slides' -- A digitized, anatomical image is projected onto a screen. Students view each image with a time limit while sitting, without the ability to go back to previous images.

• 'Untimed Paper' -- Anatomical images are printed on paper. Students take the exam sitting down with no time limit for viewing each image, but with a time limit for the entire exam, and can view previous images.

The three formats were randomized across three modules within a neuroscience course for two cohorts of medical students. Data were analyzed double blind to the identity of the students.

Here, we show that, indeed, the format of the lab practical exam significantly affected medical students' test performance and preference. This effect depended on how well they performed in the control format ('Timed Stations'). Students who did not receive an 'A' in the 'Timed Stations' format performed better in the untimed, digital format that allowed viewing of previous images ('Untimed Paper'). In contrast, students who received an 'A' in the 'Timed Stations' format performed significantly worse in the timed, digital format that did not allow viewing of previous images ('Timed PPT Slides'). We also show that the students' most preferred format significantly changed after experiencing all 3 formats, from preferring 'Timed Stations' to the 'Untimed Paper'. We conclude that a time limit, moving from station-to-station, and the inability to view previous images, all of which can increase test anxiety, can significantly influence the performance of students. This may be

especially true for students who may be more sensitive to the testing environment. Further research is required to measure students' test anxiety during lab practical exams, and how the testing environment may contribute to this anxiety. SMU IRB approval no. 18-003.

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7. WISCO[1,2], J.J. and Kevin S. Steed[3]. [1]Department of Anatomy and Neurobiology, Boston University School of Medicine, Boston, MA 02118; [2]Physician Assistant Program, Northeastern University, Boston, MA 02115; [3]College of Osteopathic Medicine, California Health Sciences University, Clovis, CA 93612.

Significant service-learning experiences through Anatomy Academy.

INTRODUCTION. The Liaison Committee on Medical Education (LCME) requires service-learning to be a part of the medical curriculum. According to accreditation guidelines, service-learning is defined as: "Educational experiences that involve all of the following components: 1) medical students' service to the community in activities that respond to community-identified concerns; 2) student preparation; and 3) student reflection on the relationships among their participation in the activity, their medical school curriculum, and their roles as citizens and medical professionals. (Element 6.6)." INNOVATION. We introduce Anatomy Academy, a service-learning program established in 2012 to teach anatomy, physiology and nutrition concepts to elementary school children as an effort to combat the obesity epidemic through educational intervention. Based on the conceptual framework of Fink's Taxonomy of Significant Learning (2003, 2013), we asked Mentors to complete a series of weekly reflections during the seven-week program that ascertained their professional growth in the areas of Foundational Knowledge, Application, Integration, Human Dimension, Caring, and Learning How to Learn. SUMMARY. A grounded theory, thematic analysis of responses showed that Mentors learned the following lessons: 1) Development of a stronger desire and responsibility to teach accurate information; 2) Communicating simplified information for the children facilitated their own deeper learning and integration of the content in the context of other classes; 3) Creating and facilitating student-mentor connections, incorporating engaging activities, and providing feedback through questions resulted in engaging learning; 4) Self-reflection in the educational process was a valuable activity; 5) Teaching improved interpersonal skills in general; 6) Being engaged in a teaching role was surprisingly helpful for their own learning experience; 7) "Love" for the students they were teaching drove their own desire to learn. DISCUSSION. Anatomy Academy Mentors learn how to communicate complex

medical information to a level appropriate for elementary school children that results in an immediate, quantifiable, professional behavioral change.

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Tissue Engineering of Artificial Urethra.

INTRODUCTION. The urethra belongs to lower urinary system. Its complex histological structure makes urethral tissue prone to various injuries with complicated healing processes. Urethral stricture disease can affect individuals of both genders. The occurrence of this pathology is more common in men and thus are previous research has been mainly oriented on male urethra reconstruction. However, commonly used surgical approaches provide weak results because of complications. The new developing field of tissue engineering applying different biomaterials, cells and growth factors may offer promising solutions, which could be applied in the urethral tissue regeneration. RESOURCES. Data collection was based on the key articles published in English language in years between 2010 and 2019 using the searching terms of urethral stricture, tissue engineering and regeneration on PubMed database. DESCRIPTION. Various types of stem cells were used in many experimental studies, but only autologous urothelial cells, fibroblasts, and keratinocytes were applied in clinical trials. Natural and synthetic scaffolds were studied in the context of urethral tissue engineering. The main advantage of synthetic ones is the fact that they can be obtained in unlimited amount and modified by different techniques, but scaffolds of natural origin normally contain chemical groups and bioactive proteins which increase the cell attachment and may promote the cell proliferation and differentiation. The most promising are smart scaffolds delivering different bioactive molecules or those that can be tubularized. The technique such as bioprinting and electrospinning seem to be very promising in the mentioned context. SIGNIFICANCE. Tissue engineering of urethra may provide not only new treatment approaches for pathologies of urethra but also provide artificial urethral tissue suitable for various experimental studies as well as for educational purposes in the field of clinical anatomy.