

SHANNON LEIGH MATHIS

The University of Alabama in Huntsville

College of Education
Department of Kinesiology: Exercise Science
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Education and Training

05/1998 BS (Mathematics) Mississippi College, Clinton
12/1999 MS (Mathematics) Mississippi College, Clinton
05/2007 MS (Mathematics) University of Tennessee, Knoxville
12/2011 Ph.D. (Health and Human Performance) Middle Tennessee State University,
Murfreesboro

Postdoctoral Training

2011-2013 Vanderbilt University Medical Center, Department of Orthopaedic Surgery and
Rehabilitation (Staff Scientist), Nashville, TN

Academic Appointments

2015-present Assistant Professor, Department of Kinesiology, The University of Alabama in
Huntsville (UAH)
2014-2015 Lecturer, Department of Mathematics, Belmont University, Nashville, TN
2013-2014 Lecturer, Department of Mathematics and Statistics, University of TN at Martin

Honors and Awards

- The 2019 Howard R. Thranhardt Lecture Series Award of the American Academy of Orthotists & Prosthetists
- The 2018 University of Alabama in Huntsville Research and Creative Activity Mentor Award
- Best Paper Award. May 2017. International Conference on Virtual, Augmented and Mixed Reality. Dispelling the gorilla arm syndrome: The viability of prolonged gesture interactions.

Grants

Present and Active

- “Feasibility of the Guidelines for Exercise Training in Underactive Parkinson’s Disease (GET UP) Program,” Rehabilitation Research Resource to Enhance Clinical Trials C-Tech Pilot Program. 6/2020-6/2021. Total costs: \$39,958. Role: PI.
- “Gait Analysis Using Video: Defining K-Level in Lower-Limb Prosthesis Users,” American Orthotic & Prosthetic Association’s Small Grant Pilot Program from Center for

Orthotic and Prosthetic Learning and Outcomes/Evidence-Based Practice. 6/2018 – 6/2020. Total costs: \$5,145. Role: PI.

- “Data-based Clinical Decision Making: Using Motion Capture and Video Analysis to Define Mobility in Adults with Lower-limb Amputation,” UAH Individual Investigator Distinguished Research Program (IIDR) from UAH Office of the Vice-President for Research and Economic Development (OVPRED) 6/2018-6/2021. Total costs: \$44,000. Role: PI.

Past Funding

- “From Aeronautics to Biomechanics: Enhancing and Broadening the Research Capabilities of the ATOM Lab,” UAH Research Infrastructure Fund from OVPRED. 3/2018-3/2019. Total costs: \$15,575. Role: Co-I.
- “Improving Outcomes in Lower-Limb Amputees: Reducing Fall Risk and Improving Mobility,” UAH New Faculty Research Program from OVPRED. 11/2017-4/2019. Total cost: \$10,000. Role: PI.
- “Feasibility of Underwater Treadmill Training to Improve Mobility and Disability in Unilateral, Transtibial Amputees,” Orthotic and Prosthetic Education and Research Foundation, Inc. Small Grant Program. 6/2017-6/2019. Total costs: \$25,000. Role: PI.
- “Dual-Energy X-Ray Absorptiometry (DXA): Investigation of Bone Health, Body Composition, and Cardiovascular Health,” UAH Research Infrastructure Fund from OVPRED. 3/2017-3/2018. Total costs: \$95,000. Role: PI.
- “Improving Outcomes in Amputees: Feasibility of Underwater Treadmill Training and Definition of Lower Limb Kinematics,” UAH Cross-College Faculty Research grant from OVPRED. 1/2017-1/2018. Total costs: \$5,000. Role: PI.
- “Materials Working Group,” UAH Cross-College Faculty Research grant from OVPRED. 1/2017-1/2018. Total costs: \$5,000. Role: Co-I.
- “Calcium loss in sweat: An unrecognized risk factor for bone fracture and osteoporosis.” \$5,000,” UAH Cross-College Faculty Research grant from OVPRED. 1/2017-1/2018. Total costs: \$5,000. Role: PI.

Not Funded

- “Feasibility of the Guidelines for Exercise Training in Underactive Parkinson’s Disease (GET UP) Program,” Rehabilitation Research Resource to Enhance Clinical Trials Pilot Program. 3/2019. Total costs: \$40,000. Role: PI

Membership in Professional Societies

2008-present	Member, American College of Sports Medicine
2016-present	Member, American Academy of Orthotics and Prosthetics
2017-2019	Member, American Orthotist and Prosthetist Association

Boards and Peer-Review Service

2018-present	Chair, Alabama Pre-professional Academic Committee for Kinesiology and Exercise Science
2019-2021	Member, ACSM Strategic Health Initiative on Aging
2018-2021	Co-Chair, ACSM BONE Interest Group

2018-2020 Member, the University of North Alabama's Advisory Committee for the
Doctorate in Exercise Science

2018-present Co-Director, Exercise Science program, UAH

2016-2018 Coordinator, Department of Kinesiology, UAH

2018 Chair, ACSM-BONE Interest Group Awards Committee

Manuscript Reviewer: Journal of Prosthetics and Orthotics
International Journal of Sports Medicine
British Journal of Medicine and Medical Research
BAOJ Orthopedics
European Journal of Sports Science

Bibliography

Peer-reviewed Journal Publications

1. Alrefai H, **Mathis SL**, Hicks SM, Pivovarova AI, MacGregor GG. Salt and water balance after sweat loss: A study of Bikram yoga. *Physiological Reports*. Accepted October 10, 2020. In press. October 27, 2020.
2. **Mathis SL**, Pivovarova AI, Hicks SM, Alrefai H, MacGregor G. Calcium loss in sweat does not stimulate PTH release: A study of Bikram hot yoga. *Complementary Therapies in Medicine*. 2020; 51:102417. Impact factor: 1.979
3. Coronado RA, Ehde DM, Pennings JS, Vanston SW, Koyama T, Phillips SE, **Mathis SL**, McGirt MJ, Spengler DM, Aaronson OS, Cheng JS, Devin CJ, Wegener ST, Archer KR. Psychosocial mechanisms of cognitive-behavioral-based physical therapy outcomes after spine surgery: preliminary findings from mediation analyses. *Physical Therapy*. In Press. April 22, 2020. Impact factor: 3.043
4. **Mathis SL**. Factors associated with mobility apprehension in persons with lower-limb amputation. *Journal of Prosthetics and Orthotics International*. First published April 27, 2020. <https://doi.org/10.1177/0309364620915017>. Impact factor: 1.482
5. **Mathis SL** & Welch MW. A novel model to identify factors associated with mobility apprehension in persons with lower-limb amputation. *Journal of Prosthetics and Orthotics*. In press. March 2, 2020.
6. Singh, H, Carter SJ, **Mathis SL**, Hunter GR. Combined Aerobic and Resistance Training Increases Stretch-Shortening Cycle Potentiation and Walking Economy in Postmenopausal Women. *Frontiers in Physiology (Exercise Physiology section)*. November 28, 2019. <https://doi.org/10.3389/fphys.2019.01472>
7. Hunter GR, Moellering DR, Windham ST, **Mathis SL**, Bamman MM, Fisher G. Relationship between VO_{2max} , cycle economy & mitochondrial respiration in untrained/trained. *Journal of Applied Physiology*. 2019; 127(6): 1562-1568. <https://doi.org/10.1152/jappphysiol.00223.2019>
8. Singh H, Lein DH, **Mathis SL**, Davis RD. Interplay of factors affecting vibration transmission to skeleton during standing: a narrative review. *International Journal of Applied Sports Science*. 2018 June; 30(1).
9. Mesko NW, Wilson, RJ, Lawrenz JM, Mathieu JL, Ghiam MK, **Mathis SL**, Halpern JL, Schwartz HS, Holt GE. Pre-operative evaluation prior to soft tissue sarcoma excision – Why can't we get it right? *European Journal of Surgical Oncology*. 2018 Feb; 44(2):243-250. Impact factor: 3.522

10. **Mathis SL** & Caputo JL. Resistance Training is Associated with Higher Lumbar Spine and Hip Bone Mineral Density in Competitive Male Cyclists. *Journal of Strength and Conditioning Research*. 2018 Jan; 32(1):274-279. Impact factor: 2.060
11. Hansberger JT, Peng C, **Mathis SL**, Shanthakumar VA, Meacham SC, Lizhou C, Blakely VR. Dispelling the gorilla arm syndrome: The viability of prolonged gesture interactions. *International Conference on Virtual, Augmented and Mixed Reality*, May 2017: pp. 505-520. Impact factor: 3.700
12. Archer KR, Devin CJ, Vanston SW, Koyama T, Phillips SE, **Mathis SL**, George SZ, McGirt MJ, Spengler DM, Aaronson OS, Cheng JS, Wegener ST. Cognitive-behavioral-based self-management approach to physical therapy: improving surgical spine outcomes. *The Journal of Pain*. 2016;17(1):76-89. Impact factor: 4.759
13. **Mathis SL**, Farley RS, Fuller DK, Jetton A, Caputo JL, & Ishikawa S. Effects of a calcium supplement across a competitive season on bone mineral density in male cyclists. *Journal of Sports Medicine and Physical Fitness*. September 2015; 55(9): 940-945. Impact factor: 1.215
14. Archer KR, **Mathis SL**, Vanston S, Devin C, Spengler D, McGirt M, Cheng J, Aaronson O, Wegener S. A cognitive-behavioral based self-management approach to physical therapy: improving surgical spine outcomes. *The Journal of Pain*. 2014;15(4):S110. Impact factor: 4.759
15. Archer KR, Seebach CL, **Mathis SL**, Riley LH, Wegener ST. Early postoperative fear of movement predicts pain, disability, and physical health 6 months after spinal surgery for degenerative conditions. *The Spine Journal*. 2014; 14(5):759-67. PMID: 24211099 Impact factor: 3.024
16. Kay H, Sathiyakumar V, Archer KR, **Mathis SL**, Apfeld JC, Lee YM, Jahangir AA, Ehrenfeld J, Obremskey WT, Sethi MK. The homeless orthopaedic trauma patient: Follow-up, emergency room usage, and complications. *Journal of Orthopaedic Trauma*. 2014; 28(6):e128-32.
17. **Mathis SL**, Farley RS, Fuller DK, Jetton A, & Caputo JL. Cortisol and Bone Mineral Density in Male Competitive Cyclists. *Journal of Sports Medicine*. May, 2013. <http://dx.doi.org/10.1155/2013/896821>
18. Alamanda VK, Delisca GO, **Mathis SL**, Archer KR, Ehrenfeld JM, Halpern JL, Schwartz HS, Holt GE. The financial burden of re-excising incompletely excised soft tissue sarcomas: A cost analysis. *Annals of Surgical Oncology*. September 2013; 20(9):2808-14
19. Alamanda VK, Crosby S, **Mathis SL**, Archer KR, Terhune K, Holt GE. Influence of resident education in correctly diagnosing extremity soft tissue sarcoma. *Sarcoma*. Epub April 18, 2013. DOI: 10.1155/2013/679323
20. Morris BJ, Unger RZ, Archer KR, **Mathis SL**, Perdue AM, Obremskey WT. Risk factors of infection after ORIF of bicondylar tibial plateau fractures. *Journal of Orthopaedic Trauma*. 2013;27(9):e196-200. DOI: 10.1097/BOT.0b013e318284704e

Research Articles Accepted with Revisions

- Madhu S, Kang CK, Landrum DB, Aono H, Mathis SL, Lee T. Effects of flight altitude on the lift generation of monarch butterflies: from sea level to overwintering mountain. *Bioinspiration & Biomimetics*. Accepted October 2, 2020. Revisions in progress

Research Articles in Review

- Kang C, Sridhar M, Landrum DB, **Mathis SL**, and Aono H. Enhanced Aerodynamic Performance of Monarch Butterflies at High Altitudes. Submitted to *Physical Review Journals E – American Physical Society*, July 2020. In review.

Works in Preparation

- **Mathis SL**. Fear-Avoidance Behavior among Persons with Lower-Limb Amputation. *Archives of Physical Medicine and Rehabilitation*.
- **Mathis SL**, Anderson J, Vazquez JA. Underwater treadmill training for lower-limb amputees: A pilot study. In progress: *Journal of Prosthetics and Orthotics International*.
- **Mathis SL**, Lawson SK, Singh H, Hunter GR, MacGregor G. Attention-Deficit Hyperactivity Disorder Medication Use and Bone Mineral Density in Young Adults
- Sridhar MK, Kang CK, Landrum DB, Mathis SL. Beneficial effect of the coupled wing-body dynamics on power consumption in butterflies. *AIAA Journal of Aircraft*.

Seminars and Presentations

Speaking Presentations

- The Institute of Electrical and Electronics Engineers (IEEE) International Conference on Bioinformatics and Biomedicine, virtual conference. December 16-19, 2020. *Lower-Gait Tracking Mobile Application: A Case Study of Lower body Motion Capture Comparison Between Vicon T40 System and Apple Augmented Reality*.
- American Academy of Orthotists and Prosthetists 46th Annual Meeting and Scientific Symposium, Chicago, IL. March 4-7, 2020. *Underwater Treadmill Training in Persons with Transtibial Amputation*.
- American Orthotic and Prosthetic Association National Assembly, San Diego, CA. September 26, 2019. *A Theoretical Model to Understand Psychological and Physical Limitations in Lower-Limb Amputees*.
- American College of Sports Medicine Annual Meeting, Orlando, FL. May 29, 2019. *A Spring in Your Step: Exercise Training Increases Stretch-Shortening Cycle Potentiation and Walking Economy*.
- American Academy of Orthotists and Prosthetists 45th Annual Meeting and Scientific Symposium, Orlando, FL. March 7, 2019. *Fear-Avoidance Behavior among Persons with Lower-Limb Amputation*.
- *Winner of the Howard R. Thranhardt Lecture Series Award.
- American Orthotic and Prosthetic Association National Assembly, Vancouver, BC, Canada. September 27, 2018. *Factors Associated with Mobility Apprehension in Amputees*.
- American College of Sports Medicine Annual Meeting, Orlando, Florida. May 28, 2014. *Factors Associated with Bone Mineral Density in Competitive Male Cyclists*.
- American College of Sports Medicine Annual Meeting, Indianapolis, IN. May 29, 2013. *Effects of a Calcium Supplement on Bone Mineral Density in Male Cyclists*.

Poster Presentations (selected)

- American College of Sports Medicine Annual Meeting, San Francisco, CA. May 31, 2020. *Bone Density is Lower and Differentially Related to Body Composition in Adults using ADHD Medications*. (Meeting canceled due to COVID-19 Pandemic.)

American College of Sports Medicine Annual Meeting, Minneapolis, MN. May 31, 2018. *Feasibility of Underwater Treadmill Training to Improve Mobility: A Case Study of a Transtibial Amputee.*

American Academy of Orthotists and Prosthetists Annual Meeting, New Orleans, LA. February 15, 2018. *Mobility Apprehension in Amputees.*

American College of Sports Medicine Annual Meeting, Denver, CO. June 1, 2017. *Calcium Lost Through Sweat: Is There Evidence of Bone Remodeling due to Cutaneous Calcium Loss during Bikram Hot Yoga?*

American College of Sports Medicine Annual Meeting, Boston, MA. May 31, 2016. *Cortisol Response during a Bicycling Competition.*

American College of Sports Medicine Annual Meeting, San Francisco, CA. May 30, 2012. *Cortisol and Bone Mineral Density in Male Competitive Cyclists.*

World Congress on Exercise is Medicine, Denver, CO. May 28, 2011. *Muscle Strengthening Exercise and Obesity among U.S. Adults.*

American College of Sports Medicine Annual Meeting; Denver, CO. May 31, 2011. *Effect of Strength Training on Cycling Endurance Performance: A Meta-Analysis.*

Seminars

American Academy of Orthotists and Prosthetists Paul E. Leimkuehler Online Learning Center Webinar. March 27, 2019. *Fear-Avoidance Behavior among Persons with Lower-Limb Amputation - 2019 Thranhardt Winner.*

Health Occupation Students of America International Leadership Conference. Nashville, TN. June 16, 2016. *Exercise and Medicine.*

Alabama State Association for Health, Physical Education, Recreation, and Dance. Hoover, AL, November 16, 2015. *Mountain Biking: A School Sport Promoting Lifetime Health and Fitness.*

Belmont University Mathematical Musing & Munching (MM&M) Convocation Lecture. Nashville, TN, March 19, 2015. *The Pathway to Drug Therapy.*

Tennessee Association for Health, Physical Education, Recreation, and Dance. Murfreesboro, TN October 27, 2013. *Starting and Managing a High School Mountain Bike Team.*

Vanderbilt Center for Bone Biology, Nashville, TN January 11, 2013. *Clinical Research: From Enrollment to Statistics.*

Vanderbilt University School of Medicine, Department of Orthopaedics, Surgical Resident Education, Nashville, TN. October 12, 2012. *Stata 101: ANOVA and Regression.*

Vanderbilt University School of Medicine, Department of Orthopaedics, Surgical Resident Education, Nashville, TN September 28, 2012. *Stata 101: Introduction to Stata: A Focus on Resident Projects.*

Vanderbilt University School of Medicine, Department of Orthopaedics, Surgical Resident Education, Nashville, TN. September 14, 2012. *Research Methods: A Focus on Resident Projects.*

Vanderbilt University School of Medicine, Department of Orthopaedics, Surgical Resident Education Research Symposium. May 25, 2012. *Osteogenic Effect of Endurance Cycling.*

Graduate and Undergraduate Research Activities

Graduate Student Mentor Activities

- Dissertation committee member: Madhu Sridhar is pursuing a Ph.D. in Mechanical Engineering at UAH. Role: advise and oversee statistical analyses of data from measurements of the variation of body and wing kinematics in butterflies during flight at

high altitude. December 2020 graduation

- Master's thesis committee and advisor: Sims Kirkland Lawson is pursuing an MS in Biological Sciences at UAH. Thesis: Effect of Attention Deficit-Hyperactivity Disorder medication on the bone mineral density in young adults. May 2019 graduation

Undergraduate Student Research Mentor Activities (selected)

- Maggi R. Welch. A Novel Model to Identify Factors Associated with Mobility Apprehension in Persons with Lower-Limb Amputation. Presented at National Conference on Undergraduate Research, April 2019; UAH Research Horizon's Day, March 2019; College of Education Research Day (Honorable Mention) November 2018. Published in *Perpetua* Fall 2019.
- Kristina Y. Shearod, Alexa V. Convers, Tjahane Holmes. Effects of Boxing Training on Cognitive and Physical Function in Patients with Parkinson's disease. ACSM Annual Meeting in Minneapolis, MN, June 2018. UAH Research Horizon's Day, Huntsville, AL, April 2018. Posters at the Capitol, Montgomery, AL, February 2018.
- Rebecca Frederick. Measuring the effects of the Alexander Technique on posture and tension in student violinists and violists. *Perpetua*, Volume 2, Issue 2. April, 2018. UAH Research Horizon's Day, Huntsville, AL, April 2018
- D. Eli Walls, Brittany Carter, Brittany Taylor, Tyler Harrison, Kristina Shearod. Factors Associated with a High HbA1c Level among U.S. Adults. Southeastern ACSM Annual Meeting Presentation. February, 2017.

Research Experience

Staff Scientist

Vanderbilt University Medical Center (VUMC), Department of Orthopaedic Surgery and Rehabilitation, Nashville, TN

- Taught and mentored medical students, residents and fellows during development of research projects
- Performed statistical analyses using Stata for orthopaedic resident research projects serving as co-author on manuscripts and posters
- Developed reports of results in tables and graphs of research findings
- Performed statistical analyses for research projects with psychosocial outcomes
- Assisted PI in manuscript preparation for scientific journals
- Wrote grant for PI funded by the National Institute on Disability and Rehabilitation Research. *Improving Trauma Outcomes: A Goal Management Approach*; \$384,000

Project Coordinator

Vanderbilt University Medical Center; Funded by the National Institutes of Health (R21)

Cognitive Behavioral Based Physical Therapy: Improving Surgical Spine Outcomes

- Developed and maintained Vanderbilt Institutional Review Board documentation, Investigator Binder, Manual of Operations, and RedCap database
- Developed RedCap user interface for participants to answer questionnaires using an iPad
- Recruited participants, supervised and assisted research assistants in recruitment efforts ($n = 130$), scheduling, testing, and follow-up with participants' visits (3 return visits)
- Maintained database of all patients who had spine surgery from five surgeons recording information provided in Starpanel, VUMC's electronic medical record
- Performed a physiologic measurement of pain on 3 anatomical areas using a pain

- algometer (Wagner Instruments)
- Prepared midterm progress report for the NIH

Database Manager

Vanderbilt University Medical Center. *The effect of psychosocial risk factors on outcomes following ACL reconstruction*

- Developed and maintained Vanderbilt Institutional Review Board documentation
- Developed and maintained Investigator Binder and Manual of Operations
- Designed SurveyMonkey survey of psychosocial questionnaires including Tampa Scale for Kinesiophobia, Pain Catastrophizing Scale, Brief Pain Inventory, SF-12 Health Survey, Return to Sport
- Performed data quality checks

Teaching Experience

Kinesiology/Exercise Science

- Research Methods (MS and BS)
- Statistics for the Behavioral Sciences
- Physiology of Exercise
- Applied Research in Exercise Science
- Measurement and Evaluation
- Exercise Prescription and Assessment for Healthy and Special Populations (MS and BS)
- Sport Nutrition
- Internship in Exercise Science

Mathematics

- Elementary Statistics
- Statistics in Nursing (online RN to BSN degree program)
- Calculus I
- College Algebra
- Intermediate Algebra
- Mathematics for the Liberal Arts

Other Work Experience

2015	Adjunct Instructor, Lipscomb University, MS in Exercise and Nutrition Science
2014	Adjunct Instructor, Cumberland University, MS in Sport and Exercise Science
2011	Research Specialist, Vanderbilt University Medical Center
2010	Adjunct Instructor, Middle Tennessee State University, BS in Exercise Science
2009	Bio-Medical Technology Instructor, Tennessee Technology Center
2007	Adjunct Instructor, University of Tennessee, Chattanooga, TN, BS Mathematics
2002-2004	Instructor, Belmont University, BS Mathematics
2001-2002	Adjunct Instructor, Nashville State Community College, Nashville, TN
2001-2002	Database Marketing Analyst, LifeWay Christian Stores, Nashville, TN
2000	Software Test Engineer, SkyTel, a WorldCom Company, Advanced Technology Center, Jackson, MS
1998-1999	Graduate Teaching Assistant, Mississippi College Mathematics Department

1999 Mathematical Consultant, Corps of Engineers, Waterways Experiment Station,
Vicksburg, MS.

Community Partnerships and Volunteer Service

- A-Team Mountain Bike Development Racing Program: Cross-Country Coach
- Tennessee Chapter of National Interscholastic Cycling Association, Coaching Education and Skills Coordinator, 2013 – 2015
- Endeavor Performance Cycling Development Camp, Co-coordinator and Coach, 2013
- USA Cycling Junior Development Camp, Coach, 2007 – 2010
- Scenic City Velo Cycling Club, Cycling Development Camp, Coach, 2011

Other Memberships and Activities

- Team Belladium – Elite women’s road cycling racing team, 2013 – 2016
- Team Vantaggio-Trek – Elite women’s mountain bike racing team, 2005 – 2012
- National Series Champion, National Off-Road Mountain Bike Association, 2006
- 5th place, Master’s World Mountain Bike Championship, Kamloops, BC, 2006
- Team DeFeat – Elite women’s road cycling racing team, 2004
- USA Cycling Certified Level II Cycling Coach, 2004-2013