

Bradley Steven Davidson

Curriculum Vitae
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CONTACT INFORMATION

Office: University of Denver
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EDUCATION and TRAINING

- Ph.D. Biomedical Engineering (2007)
Virginia Tech–Wake Forest University School of Biomedical Engineering and Sciences
Thesis Title: “Experimental and simulation-based assessment of the human postural response to sagittal plane perturbations with localized muscle fatigue and aging”
- M.S. Engineering Mechanics (2005)
Virginia Polytechnic Institute and State University
- B.S. Civil Engineering (2002)
Tennessee Technological University

PROFESSIONAL EXPERIENCE

- 2010–present Assistant Professor
University of Denver
Department of Mechanical and Material Engineering
- 2010–present Clinical Assistant Professor
University of Colorado School of Medicine
Department of Physical Medicine & Rehabilitation
- 2010–present Adjunct Professor
University of Colorado School of Medicine
Department of Orthopaedics
- 2008–2010 Postdoctoral Fellow
University of Colorado Denver
School of Medicine, Department of Orthopaedics
Bioengineering Division

PROFESSIONAL ASSOCIATIONS

American Society of Mechanical Engineers (2010-present)
American Society of Biomechanics (2003-present)
Tau Beta Pi, National Engineering Honor Society (2001-present)
IEEE Engineering in Medicine in Biology Society (2006-2013)
International Society of Electrophysiology and Kinesiology (2008-2011)
National Postdoctoral Association (2009-2010)
Biomedical Engineering Society (2003-2010)
Virginia Academy of Science (2006)
Phi Kappa Phi, National Multidisciplinary Honor Society (2002)
American Society of Civil Engineers (1998-2002)

SCHOLARLY ACTIVITIES

Publication Summary

Number of Published Journal Articles:	28	
Number of Conference Abstracts:	71	
	<u>Google Scholar</u>	<u>Web of Science</u>
Number of Citations:	448	220
h-Index:	11	9
i10-Index:	15	6

Refereed Journal Articles

†–Corresponding author, *–Student/Staff supervised by Dr. Davidson
[Times cited from Google Scholar, 2014 Impact Factor]

- Currie SJ*, Myers CA*, Enebo BA, Davidson BS[†]. The neuromuscular response to spinal manipulation in acute and chronic pain *Journal of Orthopaedic and Sports Physical Therapy* (in preparation)
- Murray AM, Gaffney BM*, Davidson BS, Christiansen CL[†]. Analysis of high-demand functional movements in patients with transtibial amputation. *Archives of Physical Medicine and Rehabilitation* (in preparation)
- Myers CA*, Laz PJ, Shelburne KB, Judd DL, Christiansen CL, Stevens-Lapsley JE, Davidson BS. Simulated hip abductor strengthening reduces peak joint contact forces during stair descent in patients with total hip arthroplasty *Journal of Biomechanics* (in preparation)
- Myers CA*, Laz PJ, Shelburne KB, Judd DL, Christiansen CL, Stevens-Lapsley JE, Davidson BS. Patient-specific strength validation and uncertainty assessment in musculoskeletal simulations of total hip arthroplasty patients. *Computer Methods in Biomechanics and Biomedical Engineering* (in preparation)
- Everitt AC*, Currie SJ*, Enebo BA, Davidson BS[†]. Cavitation and the neuromuscular response of the multifidus to spinal manipulation. *Manual Therapy* (in preparation)
- Gaffney BM*, Christiansen CL, Murray AM, Laz PJ, Davidson BS[†]. The effect of inertial uncertainties in transtibial prostheses on kinetic calculations during walking. *Journal of Biomechanics* (in preparation)

- Currie SJ*, Myers CA*, Enebo BA, Davidson BS[†]. Treatment and response factors in muscle activation during a spinal manipulation *Journal of Electromyography and Kinesiology* (in preparation)
- Gaffney BM*, Christiansen CL, Davidson BS[†]. Movement analysis based on the separation of angular momentum: Gait progression and segment rotation. *Human Movement Science* (in preparation; rewrite after rejection)
- Everitt AC*, Currie SJ*, Enebo BA, Davidson BS[†]. Cavitation and the neuromuscular response of the multifidus to spinal manipulation. *Manual Therapy* (submitted Nov 2015)
- Thompson KG*, Judd DL, Myers CA*, Stevens-Lapsley JE, Davidson BS[†]. Video-Based quantification of the Trendelenburg Test in candidates for total hip arthroplasty. *Clinical Biomechanics* (submitted Nov 2015)
- Judd DL, Dennis DA, Winters J, Miner TM, Dayton MR, Davidson BS, Stevens-Lapsley JE[†]. Multi-component rehabilitation following total hip arthroplasty: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* (submitted May 2015)
- Myers CA*, Decker MJ, Shelburne KB, Davidson BS[†]. Effects of External Core Support on Core Proprioception and Dynamic Stability. *Journal of Sports Science* (submitted June 2015, reviews returned: major revision)
- Davidson BS[†], Judd DL, Mizner RL, Eckhoff DG, Stevens-Lapsley JE. EMG normalization in patients with muscle activation deficits: Comparison and interpretation of two methods. *Journal of Applied Biomechanics* (submitted June 2015)
- Gaffney BM*, Murray AM, Christiansen CL, Davidson BS[†]. Identification of trunk and pelvis movement compensations in patients with transtibial amputation using angular momentum separation. *Gait and Posture* (1st revision submitted Nov 2015)
- 2015 Gaffney BM*, Maluf KS, Davidson BS[†]. High-density surface EMG biofeedback from the trapezius for real-time postural correction *Applied Psychophysiology and Biofeedback* (accepted Dec 2015)
- 2015 Gaffney BM*, Harris MD*, Davidson BS, Stevens-Lapsley JE, Christiansen CL, Shelburne KB[†]. Multi-joint compensatory effects of unilateral total knee arthroplasty during high-demand tasks. *Annals of Biomedical Engineering* (accepted Nov 2015)
- 2015 Currie SJ*, Myers CA*, Durso CS, Enebo BA, Davidson BS[†]. The neuromuscular response to spinal manipulation in the presence of pain. *Journal of Manipulative and Physiological Therapeutics* (accepted Nov 2015)
- 2015 Currie SJ*, Myers CA*, Krishnamurthy A, Enebo BA, Davidson BS[†]. A methodological comparison of muscle activation onset timing recorded during HVLA spinal manipulation *Journal of Manipulative and Physiological Therapeutics* (accepted Oct 2015)
- 2015 Christiansen CL[†], Bade MJ, Davidson BS, Dayton MR, Stevens-Lapsley JE. Effects of weight-bearing biofeedback training on functional movement patterns following TKA: A Pilot Study. *Journal of Orthopaedic and Sports Physical Therapy* 45(9) 647-655, 2015 [Citations: 0; 2014 Impact Factor: 3.011]

- 2015 Myers CA*, Laz PJ, Shelburne KB, Davidson BS[†]. A probabilistic approach to quantify the impact of uncertainty propagation in musculoskeletal simulations. *Annals of Biomedical Engineering* 43(5) 1098-1111, 2015 [Citations: 1; Impact Factor: 3.195]
- 2015 Dai X*, Zhou Z, Zhang J[†], Davidson BS. Ultrawideband radar based accurate motion measuring: Human body landmark detection and tracking with biomechanical constraints. *IET Radar, Sonar, & Navigation* 9(2):154–163, 2015 [Citations: 0; 2014 Impact Factor: 1.135]
- 2014 Thomas AC, Judd DL, Davidson BS, Eckhoff DG, Stevens-Lapsley JE[†]. Quadriceps/Hamstrings co-activation increases early after total knee arthroplasty. *The Knee* 21(6):1115-1119, 2014 [Citations: 1; Impact Factor: 1.936]
- 2014 Van Lieshout KG*, Anderson JG, Shelburne KB, Davidson BS[†]. Intensity rankings of plyometric exercises using joint power absorption *Clinical Biomechanics* 29:918-922, 2014 [Citations: 3; Impact Factor: 1.970]
- 2014 Gaffney BM*, Maluf KS, Davidson BS[†]. Associations between cervical and scapular posture and the spatial distribution of trapezius muscle activity *Journal of Electromyography and Kinesiology* 24:542-549, 2014 [Citations: 2; Impact Factor: 1.647]
- 2014 Simons CJ*, Cobb L, Davidson BS[†]. A fast, accurate, and reliable reconstruction method of the lumbar spine vertebrae using positional MRI. *Annals of Biomedical Engineering* 42(4):833-42, 2014 [Citations: 0; Impact Factor: 3.195]
- 2013 Davidson BS[†], Judd DL, Thomas AC, Mizner RL, Eckhoff DG, Stevens-Lapsley JE. Muscle activation and coactivation during five-time-sit-to-stand movement in patients undergoing total knee arthroplasty. *Journal of Electromyography and Kinesiology* 23(6):1485-1493, 2013 [Citations: 9; Impact Factor: 1.647]
- 2013 Hancock CW, Winston MJ*, Bach JM, Davidson BS, Baldini TH, Eckhoff DG[†]. Cylindrical axis, not epicondyles, approximates perpendicular to knee axes. *Clinical Orthopaedics and Related Research* 471(7):2278-2283, 2013 [Citations: 8; Impact Factor: 2.617]
- 2012 Myers CA*, Enebo BA, Davidson BS[†]. Optimized prediction of contact force application during side-lying lumbar manipulation. *Journal of Manipulative and Physiological Therapeutics* 35(9):669-677, 2012 [Citations: 1; Impact Factor: 1.480]
- 2011 Davidson BS[†], Madigan ML, Southward SC, Nussbaum MA. Neural control of posture during small magnitude perturbations: The effects of aging and localized muscle fatigue. *IEEE Transactions on Biomedical Engineering* 58(6):1546-1554, 2011 [Citations: 8; Impact Factor: 2.347]
- 2010 Pinski SE, King KB, Davidson BS, Zhou BH, Lu Y, Solomonow M[†]. High-frequency loading of lumbar ligaments increases proinflammatory cytokines expression in a feline model of repetitive musculoskeletal disorder. *The Spine Journal* 10:1078-1085, 2010 [Citations: 10; Impact Factor: 3.024]
- 2010 D'Ambrosia P, King KB, Davidson BS, Zhou BH, Lu Y, Solomonow M[†]. Pro-inflammatory cytokines expression increases following low- and high-magnitude cyclic loading of lumbar ligaments. *European Spine Journal* 19(8):1330-1339, 2010 [Citations: 11; Impact Factor: 2.066]

- 2009 King K[†], Davidson BS, Zhou BH, Lu Y, Solomonow M. High magnitude cyclic load triggers inflammatory response in lumbar ligaments. *Clinical Biomechanics* 24(10):792-798, 2009 [Citations: 16; Impact Factor: 1.970]
- 2009 Ben-Masaud A, Solomonow D, Davidson BS, Zhou BH, Lu Y, Patel V, Solomonow M[†]. Motor control of lumbar instability following exposure to various cyclic load magnitudes. *European Spine Journal* 18(7):1022-1034, 2009 [Citations: 11; Impact Factor: 2.066]
- 2009 Le B, Davidson BS, Solomonow D, Zhou BH, Lu Y, Patel V, Solomonow M[†]. Neuromuscular control of lumbar instability following static work of various loads. *Muscle and Nerve* 39(1):71-82, 2009 [Citations: 15; Impact Factor: 2.283]
- 2009 Davidson BS[†], Madigan ML, Nussbaum MA, Wojcik LA. Effects of localized muscle fatigue on recovery from a postural perturbation without stepping. *Gait and Posture* 29(4): 552-557, 2009 [Citations: 33; Impact Factor: 2.752]
- 2008 Solomonow D, Davidson BS, Zhou BH, Lu Y, Patel V, Solomonow M[†]. Neuromuscular neutral zones response to cyclic lumbar flexion. *Journal of Biomechanics* 41(13): 2821-2828, 2008 [Citations: 15; Impact Factor: 2.751]
- 2008 Youssef J, Davidson BS, Zhou BH, Lu Y, Patel V, Solomonow M[†]. Neuromuscular neutral zones response to static lumbar flexion: Muscular stability compensator. *Clinical Biomechanics* 23(7): 870-880, 2008 [Citations: 20; Impact Factor: 1.970]
- 2008 Lu D, Le P, Davidson BS, Zhou BH, Lu Y, Patel V, Solomonow M[†]. Frequency of cyclic lumbar loading is a risk factor for cumulative trauma disorder. *Muscle and Nerve* 38(1): 867-74, 2008 [Citations: 21; Impact Factor: 2.283]
- 2006 Madigan ML[†], Davidson BS, Nussbaum MA. Postural sway and joint kinematics during quiet stance are affected by lumbar extensor fatigue. *Human Movement Science* 25(6): 788-799, 2006 [Citations: 65; Impact Factor: 1.598]
- 2006 Herrmann CM, Madigan ML[†], Davidson BS, Granata KP. Effect of lumbar extensor fatigue on paraspinal muscle reflexes. *Journal of Electromyography and Kinesiology* 16(6): 637-641, 2006 [Citations: 26; Impact Factor: 1.647]
- 2006 Wilson EL, Madigan ML[†], Davidson BS, Nussbaum MA. Postural strategy changes with fatigue of the lumbar extensor muscles. *Gait and Posture* 23(3):348-354, 2006 [Citations: 49; Impact Factor: 2.752]
- 2004 Davidson BS, Madigan ML[†], Nussbaum MA. Effects of lumbar extensor fatigue and fatigue rate on postural sway. *European Journal of Applied Physiology* 93(1-2):183-189, 2004 [Citations: 91; Impact Factor: 2.187]

Book Chapters

- 2015 Decker MJ, Davidson BS[†]. “The Sensorimotor function of the Ligamentous-Fascial System”. In: *Fascia in the Osteopathic Field* Eds. Liem T, Tozzi P, Chila A. Handspring Publishing: Scotland, UK (in press)

Refereed Conference Proceedings

- 2016 Decker MJ, Shaw M, Madden C, Davidson BS. “A wearable neuromuscular device reduces ACL injury risk in female soccer athletes” *American Orthopaedic Society for Sports Medicine Annual Meeting*, Colorado Springs, CO, July 7–10, 2016 (in review)

- 2016 Rozelle B, Laz PL, Davidson BS, Gordon M. “Novel sophomore assessment modeled after the FE Exam” *American Society for Engineering Education Annual Conference & Exposition*, New Orleans, LA, June 26–29, 2016 (accepted)
- 2016 Simons CJ*, Seifert JG, Decker MJ, Shelburne KB, Sterett WI, Davidson BS. “Leg compression tights reduce muscle activation by altering ski turning technique” *American College of Sports Medicine Annual Meeting*, Boston, MA, May 31–Jun 4, 2016 (in review)
- 2016 Decker MJ, Simons CJ*, Seifert JG, Shelburne KB, Sterett WI, Davidson BS. “Leg Compression tights and turning direction influence alpine skiing mechanics and dynamic balance” *American College of Sports Medicine Annual Meeting*, Boston, MA, May 31–Jun 4, 2016 (in review)
- 2016 Murray AM, Gaffney BM, Davidson BS, Christiansen CL. “Stair climb performance and movement compensations in patients with diabetes and transtibial amputation” *2016 American Physical Therapy Association Combined Sections Meeting*, Anaheim, CA, Feb 17–20, 2016 (accepted)
- 2015 Davidson BS, Silfies SL. “Systems engineering approach to identifying core control strategies in individuals with and without low back pain during a novel unstable sitting task” *39th Annual Meeting of the American Society of Biomechanics*, Columbus, OH, Aug 5–8, 2015
- 2015 Gaffney BM*, Christiansen CL, Davidson BS. “Identification of compensatory moment patterns in patients with amputation using separation of angular momentum” *39th Annual Meeting of the American Society of Biomechanics*, Columbus, OH, Aug 5–8, 2015
- 2015 Thompson KG*, Judd DL, Stevens-Lapsley JE, Davidson BS. “Validation of a clinical test to assess hip abductor muscle control in patients with hip arthroplasty” *39th Annual Meeting of the American Society of Biomechanics*, Columbus, OH, Aug 5–8, 2015)
- 2015 Myers CA*, Laz PJ, Shelburne KB, Judd DL, Christiansen CL, Stevens-Lapsley JE, Davidson BS. “Simulated hip abductor strengthening reduces peak joint contact forces during stair descent in patients with total hip arthroplasty” *39th Annual Meeting of the American Society of Biomechanics*, Columbus, OH, Aug 5–8, 2015
- 2015 Donnermeyer BD*, Thompson KG*, Maydew TL*, Johnson A, Davidson BS. “BioView: A wearable sensor array for rehabilitation biofeedback” *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird Resort, UT June 17–20, 2015 **(Finalist in ASME Undergraduate Design Competition)**
- 2015 Simons CJ*, Christiansen CL, Stevens-Lapsley JE, Shelburne KB, Davidson BS. “A support vector machine based on vertical ground reaction force to supplement observational gait evaluation” *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird Resort, UT June 17–20, 2015
- 2015 Gaffney BM*, Johnston WM*, Christiansen CL, Stevens-Lapsley JE, Shelburne KB, Davidson BS. “Movement analysis based on the separation of angular momentum: Gait progression and segment rotation in patients with TKA” *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird Resort, UT June 17–20, 2015
- 2015 Gaffney BM*, Christiansen CL, Shelburne KB, Davidson BS. “A description of segmental angular momentum synergies using independent component analysis during gait” *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird Resort, UT June 17–20, 2015

- 2015 Gordon M, Chaoi B, Lengsfeld CL, Davidson BS. “Providing ME students opportunities to enroll in law school courses” *American Society for Engineering Education Annual Conference & Exposition*, Seattle, WA, Jun 14–17, 2015
- 2015 Myers CA*, Laz PJ, Shelburne KB, Davidson BS. “Patient-specific strength validation and uncertainty assessment in musculoskeletal simulations of total hip arthroplasty patients.” *ASME Verification and Validation Symposium*, Las Vegas, NV, May 13–15, 2015
- 2015 Dammann O, Nuzhdin S, Barhak J, Hailegiorgis A, Bansal S, Leff HS, Behr JG, Hunt CA, Feenstra T, Marathe M, Butler M, Davidson BS, Marjoram P, Scholz S, Karnon J, Garrett A, Chrosny W, Swarup S, Ramakrishnan N, Lanzas C, Ilany A, Rice J “Population modeling by examples” *The Society for Modeling & Simulation International*, Alexandria, VA, April 12–15, 2015
- 2015 Harris MD*, Houston T*, Decker MJ, Davidson BS, Shelburne KB. “Influence of ACL brace and orthopaedic tights on hip and knee mechanics during cutting maneuvers” *American College of Sports Medicine Annual Meeting*, San Diego, California, May 27–30, 2015
- 2015 Gaffney BM*, Johnston WM*, Bade MJ, Stevens-Lapsley JE, Christiansen CL, Davidson BS. “Whole-body angular momentum differences following unilateral TKA” *American College of Sports Medicine Annual Meeting*, San Diego, California, May 27–30, 2015
- 2015 Everitt AC*, Currie SJ*, Enebo BA, Davidson BS. “Cavitation and the neuromuscular response to spinal manipulation” *Association of Chiropractic Colleges – Research Agenda Conference*, Las Vegas, NV, Mar 19–21, 2015
- 2015 Currie SJ*, Everitt AC*, Enebo BA, Davidson BS. “The neuromuscular response to spinal manipulation in the presence of pain” *Association of Chiropractic Colleges – Research Agenda Conference*, Las Vegas, NV, Mar 19–21, 2015 (**ACC-RAC Research Award**)
- 2015 Gaffney BM*, Harris MD*, Davidson BS, Stevens-Lapsley JE, Christiansen CL, Shelburne KB. “Multi-joint effects of TKA during high-demand tasks ” *Gait & Clinical Movement Analysis Society Annual Conference*, Portland, OR, Mar 17–20, 2015
- 2014 Hao J, Dai X, Stroder AE, Zhang J, Davidson BS, Mahoor MH, McClure N. “Prediction of a bed-exit motion: Multi-modal sensing approach and incorporation of biomechanical knowledge” *Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, Nov 2–5, 2014
- 2014 Simons CJ*, Davidson BS. “In vivo variability of lumbar intervertebral axes of rotation” *7th World Congress of Biomechanics*, Boston, MA, July 6–11, 2014
- 2014 Cyr AJ*, Harris MD*, Kefala V*, Gordon MH, Rullkoetter PJ, Davidson BS, Shelburne KB. “Implant tracking using a high-speed stereo radiography system” *7th World Congress of Biomechanics*, Boston, MA, July 6–11, 2014
- 2014 Decker MJ, Myers CA*, Shelburne KB, Davidson BS. “The Influence of a novel pelvis support garment on frontal-plane hip biomechanics during gait” *7th World Congress of Biomechanics*, Boston, MA, July 6–11, 2014

- 2014 Gaffney, BM*, Davidson BS, Harris MD*, Stevens-Lapsley JE, Christiansen CL, Shelburne KB. “Quadriceps force and movement strategies during high-demand activities after unilateral total knee arthroplasty” *7th World Congress of Biomechanics*, Boston, MA, July 6–11, 2014
- 2014 Davidson BS, Myers CA*, Shelburne KB, Curran-Everett, D. “Should we normalize biomechanical data by subject-specific mass?” *7th World Congress of Biomechanics*, Boston, MA, July 6–11, 2014
- 2014 Myers CA*, Laz PJ, Shelburne KB, Davidson BS. “Probabilistic evaluation of measurement and parameter uncertainty on hip joint kinematics and kinetics” *7th World Congress of Biomechanics*, Boston, MA, July 6–11, 2014
- 2014 Gordon M, Lengsfeld CL, Davidson BS. “Adding flexibility and hands-on experiences while minimizing sequential gaps in the ME curriculum” *American Society for Engineering Education Annual Conference & Exposition*, Indianapolis, IN, Jun 15–18, 2014
- 2014 Stroder AE*, McClure NL, Wagner LM, Richards JD*, Davidson BS. “Comparative analysis of segment movements to predict bed exits and bed rolls in older adults” *American College of Sports Medicine Annual Meeting*, Orlando, Florida, May 27–31, 2014
- 2014 Decker MJ, Harris MD*, Myers CA*, Shelburne KB, Davidson BS. “The effects of sex and knee support level on quasi-stiffness of the knee and dynamic stability during landing” *2014 Annual Meeting of the Orthopaedic Research Society*, New Orleans, LA, Mar 15–18, 2014
- 2014 Gaffney, BM*, Davidson BS, Harris MD*, Stevens-Lapsley JE, Christiansen CL, Shelburne KB. “Limb asymmetry during high-demand tasks after unilateral total knee arthroplasty” *2014 Annual Meeting of the Orthopaedic Research Society*, New Orleans, LA, Mar 15–18, 2014
- 2014 Gaffney BM*, Maluf KS, Davidson BS. “Correlation between cervicospinal position and the spatial distribution of trapezius muscle activity” *2014 American Physical Therapy Association Combined Sections Meeting*, Las Vegas, NV, Jan 20–23, 2014
- 2013 Wu M*, Dai X*, Zhang YD, Davidson BS, Zhang J, Amin MG. “Fall detection based on sequential radar signal time-frequency features” *IEEE International Conference on Healthcare Informatics*, Philadelphia, PA, Sept 9–11, 2013
- 2013 Dai X*, Wu M*, Davidson BS, Mahoor MM, Zhang J. “Image-based fall detection with human posture sequence modeling” *IEEE International Conference on Healthcare Informatics*, Philadelphia, PA, Sept 9–11, 2013
- 2013 Simons CJ*, Cobb L, Davidson BS. “A description of lumbar intervertebral configuration using principal component-based manifolds” *35th Annual Meeting of the American Society of Biomechanics*, Omaha, NE, Sept 4–7, 2013
- 2013 Myers CA*, Shelburne KB, Silfies SP, Davidson BS. “Inverse dynamics of unstable sitting: The relationship between COP and moment control for increasing task difficulty” *35th, Annual Meeting of the American Society of Biomechanics*, Omaha, NE, Sept 4–7, 2013

- 2013 Gaffney BM*, Maluf KS, Davidson BS. “Evaluation of novel biofeedback in changes of activation of the trapezius” *35th, Annual Meeting of the American Society of Biomechanics*, Omaha, NE, Sept 4–7, 2013
- 2013 Wanamaker AB*, Davidson BS, Christiansen CL, Saint-Phard D. “Comparison of load reduction abilities of camwalker and corset-style ankle foot orthoses” *35th, Annual Meeting of the American Society of Biomechanics*, Omaha, NE, Sept 4–7, 2013
- 2013 Gaffney BM*, Maluf KS, Davidson BS. “High-density surface EMG biofeedback from the trapezius for real-time postural correction” *ASME Summer Bioengineering Conference*, Sunriver, OR, June 26–29, 2013
- 2013 Van Lieshout KG*, Dennis OW*, Anderson JG, Shelburne KB, Davidson BS. “Intensity rankings of plyometric exercises using joint power absorption” *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28–June 1, 2013
- 2013 Davidson BS, Judd DL, Thomas AC, Mizner RL, Eckhoff DG, Stevens-Lapsley JE. “Change in hamstring activation during stand-to-sit movement following total knee arthroplasty” *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28–June 1, 2013
- 2013 Decker MJ, Myers CA*, Shelburne KB, Davidson BS. “Effects of external pelvis support on core proprioception and dynamic landing” *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28–June 1, 2013
- 2013 Myers CA*, Decker MJ, Shelburne KB, Davidson BS. “The relationship between hip function and core proprioception” *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28–June 1, 2013
- 2013 Christiansen CL, Bade MJ, Stuart PS*, Stevens-Lapsley JE, Davidson BS. “Weight-bearing biofeedback improves asymmetry during bilateral stance after total knee arthroplasty” *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28–June 1, 2013
- 2013 Currie SJ*, Myers CA*, Enebo BA, Davidson BS. “Muscle activation onset timing recorded during HVLA spinal manipulation - A methodological comparison” *Association of Chiropractic Colleges – Research Agenda Conference*, Washington D.C., Mar 14–16, 2013
- 2013 Shelburne K, Fitzpatrick C, Davidson BS, Laz P, Christiansen C, Stevens-Lapsley J, Rullkoetter P. “A lower extremity model for muscle-driven simulation of activity using explicit finite element modeling” *2013 Annual Meeting of the Orthopaedic Research Society*, San Antonio, TX, Jan 26–29, 2013
- 2013 Bade MJ, Reynolds M, Davidson BS, Stevens-Lapsley JE, Christiansen CL. “Weight bearing biofeedback training following total knee arthroplasty: a randomized controlled trial” *2013 American Physical Therapy Association Combined Sections Meeting*, San Diego, CA, Jan 21–24, 2013
- 2013 Wanamaker AB*, Davidson BS, Christiansen CL. “Kinematic asymmetries while using a common ankle foot orthosis” *BMES 2012 Annual Meeting*, Atlanta, GA, Oct 24–27, 2012

- 2013 Currie SJ*, Myers CA*, Davidson BS, Enebo BA. “Anticipatory activation of the erector spinae and multifidus in patients with and without low back pain” *34th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL, Aug 15–18, 2012
- 2012 Simons CJ*, Davidson BS, Cobb L. “Reliability of lumbar vertebra position and orientation measurement using weight-bearing MRI” *34th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL, Aug 15–18, 2012
- 2012 Davidson BS, Judd DL, Thomas AC, Stevens-Lapsley JE. “Eccentric muscle activation patterns during a five-time-sit-to-stand movement” *American College of Sports Medicine Annual Meeting*, San Francisco, CA, May 29–June 2, 2012
- 2012 Myers CA*, Davidson BS, Enebo BA, Wanamaker AB*. “Optimized estimation of contact force application during a side-lying lumbar manipulation” *Association of Chiropractic Colleges – Research Agenda Conference*, Las Vegas, NV, Mar 15–17, 2012 (**ACC-RAC Research Award**)
- 2012 Christiansen CL, Davidson BS, Schenkman ML, Khort WM. “Factors related to walking economy in people with Parkinson’s disease” *2012 American Physical Therapy Association Combined Sections Meeting*, Chicago, IL, Feb 8–12, 2012
- 2012 Judd DL, Davidson BS, Thomas AC, Stevens-Lapsley JE. “Muscle coactivation during gait before and after unilateral total knee arthroplasty” *2012 American Physical Therapy Association Combined Sections Meeting*, Chicago, IL, Feb 8–12, 2012
- 2011 Shoemaker EM, Davidson BS, Christiansen CL, Saint-Phard D. “Biomechanical assessment of unloading capacity in ankle foot orthoses” *American Academy of Physical Medicine and Rehabilitation Annual Assembly*, Orlando, FL, Nov 17–20, 2011
- 2011 Bakhshi S*, Mahoor MH, Davidson BS. “Development of a body joint angle measurement system using IMU sensors” *33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Boston, MA, Aug 30–Sept 3, 2011
- 2011 Christiansen CL, Davidson BS, Schenkman ML, Khort WM. “Muscle co-activation and stride variability: implications for walking economy in people with Parkinson’s disease” *33rd Annual Meeting of the American Society of Biomechanics*, Long Beach, CA, Aug 10–13, 2011
- 2011 Judd DL, Thomas AC, Davidson BS, Eckhoff DG, Mizner RL, Stevens-Lapsley JE. “Lower extremity muscle activity in end-stage knee osteoarthritis during a five-time-sit-to-stand Task” *American College of Sports Medicine Annual Meeting*, Denver, CO, May 31–June 4, 2011
- 2010 Davidson BS, Enebo B, Solomonow M. “Activation timing of the erector spinae and multifidus during flexion-relaxation of the spine” *The XVII Congress of the International Society of Electrophysiology and Kinesiology*, Aalborg, Denmark, June 16–19, 2010
- 2009 Davidson BS, Madigan ML, Nussbaum MA, Wojcik LA. “Recovery from postural perturbations without stepping following localized muscle fatigue” *33rd Annual Meeting of the American Society of Biomechanics*, State College, PA, Aug 26–29, 2009

- 2009 Winston MJ*, Hancock C, Bach JM, Davidson BS, Baldini T, Eckhoff DG. “Difference between the transepicondylar axis and cylindrical axis of the the knee relative to the femoral and tibial mechanical axes” *55th Annual Meeting of the Orthopaedic Research Society*, Las Vegas, NV, Feb 22–25, 2009
- 2008 Matrangola SL, Madigan ML, Davidson BS, Nussbaum MA. “Correlation between postural sway during quiet standing and balance recovery after small perturbations” *2008 North American Congress on Biomechanics*, Ann Arbor, MI, Aug 5–9, 2008
- 2008 Bieryla KA, Davidson BS, Madigan ML. “Repeated exposure to small perturbations leads to improvements in balance recovery” *2008 North American Congress on Biomechanics*, Ann Arbor, MI, Aug 5–9, 2008
- 2008 Davidson BS, Madigan ML, Southward SC, Nussbaum MA. “Identification and stability analysis of the postural control system during small magnitude perturbations” *ASME Summer Bioengineering Conference*, Marco Island, FL, June 25–29, 2008
- 2007 Davidson BS, Madigan ML, Nussbaum MA. “Changes in the postural control system following localized muscle fatigue: A time-delayed stability analysis” *31st Annual Meeting of the American Society of Biomechanics*, Palo Alto, CA, Aug 22–25, 2007
- 2006 Davidson BS, Madigan ML, Nussbaum MA. “Analysis of joint kinematics during quiet standing following localized lumbar extensor fatigue” *30th Annual Meeting of the American Society of Biomechanics*, Blacksburg, VA, Sept 6–9, 2006
- 2006 Davidson BS, Madigan ML, Nussbaum MA. “Changes in balance with low back fatigue” *84th Annual Meeting of The Virginia Academy of Science*, Blacksburg, VA, May 24–26, 2006 (**Best Student Paper Award**)
- 2005 Wilson EL, Madigan ML, Davidson BS, Nussbaum MA. “Lumbar extensor fatigue changes postural recovery strategy” *XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics*, Cleveland, OH, July 31–Aug 5, 2005 (**Finalist for Clinical Biomechanics Research Paper Award**)
- 2005 Herrmann CM, Madigan ML, Davidson BS, Granata KP. “Increase in amplitude in paraspinal muscle reflexes following lumbar extensor fatigue” *XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics*, Cleveland, OH, July 31–Aug 5, 2005
- 2005 Davidson BS, Madigan ML, Nussbaum MA. “Lumbar extensor fatigue affects postural control by increasing ankle stiffness” *ASME Summer Bioengineering Conference*, Vail, CO, June 22–26, 2005 (**3rd place, ASME Student Paper Competition**)
- 2003 Davidson BS, Madigan ML. “Balance degradation and recovery following low back fatigue” *BMES 2003 Annual Meeting*, Nashville, TN, Oct 1–4, 2003

Non-Refereed Abstracts

- 2015 Davidson BS, Stroder AE*, McClure NL. “Comparative analysis of segment movements to predict bed exits and bed rolls in older adults” *2015 CCTSI Community Engagement Research Exchange Forum*, Golden, CO, Sept 25, 2015
- 2015 Decker MJ, Myers CA*, Shelburne KB, Davidson BS. “Directional compression tights reduce the knee adductor moment during gait” *2015 Rocky Mtn ASB Meeting*, Estes Park, CO, April 17–18, 2015
- 2015 Simons CJ*, Christiansen CL, Stevens-Lapsley JE, Shelburne KB, Davidson BS. “A support vector machine based on vertical ground reaction force to supplement observational gait evaluation” *2015 Rocky Mtn ASB Meeting*, Estes Park, CO, April 17–18, 2015
- 2015 Thompson KG*, Judd DL, Stevens-Lapsley JE, Davidson BS. “Validation of a clinical test to assess hip abductor muscle control in patients with THA” *2015 Rocky Mtn ASB Meeting*, Estes Park, CO, April 17–18, 2015
- 2015 Gaffney BM*, Christiansen CL, Davidson BS. “Identification of movement strategies using angular momentum separation” *2015 Rocky Mtn ASB Meeting*, Estes Park, CO, April 17–18, 2015
- 2015 Everitt AC*, Currie SJ*, Enebo BA, Davidson BS. “Cavitation and the neuromuscular response to spinal manipulation” *2015 Rocky Mtn ASB Meeting*, Estes Park, CO, April 17–18, 2015
- 2015 Kim DJ*, Simons CJ*, Shelburne KB, Decker MJ, Davidson BS. “Multi-System Fusion for Field-Based Quantitative Measurement of Human Motion” *2015 Rocky Mtn ASB Meeting*, Estes Park, CO, April 17–18, 2015
- 2014 Simons CJ*, Davidson BS. “In-vivo variability of lumbar intervertebral axes of rotation during sagittal postures” *2014 Rocky Mtn ASB Meeting*, Estes Park, CO, April 11–12, 2014
- 2014 Myers CA*, Laz PJ, Shelburne KB, Davidson BS. “The effects of measurement error and body segment parameter uncertainty on muscle force estimation” *2014 Rocky Mtn ASB Meeting*, Estes Park, CO, April 11–12, 2014
- 2014 Gaffney BM*, Davidson BS, Harris MD*, Stevens-Lapsley JE, Christiansen CL, Shelburne KB. “Unique movement strategies during high-demand activities after unilateral TKA” *2014 Rocky Mtn ASB Meeting*, Estes Park, CO, April 11–12, 2014
- 2014 Stroder AE*, McClure NL, Davidson BS. “Segmental movement analysis to distinguish bed exits and bed rolls in healthy older adults” *2014 Rocky Mtn ASB Meeting*, Estes Park, CO, April 11–12, 2014
- 2013 Wanamaker AB*, Davidson BS, Christiansen CL, Saint-Phard D. “Comparison of load reduction abilities of camwalker and corset-style ankle foot orthoses” *Orthotics and Prosthetics World Congress*, Orlando, FL, Sept 18–21, 2013
- 2013 Simons CJ*, Cobb L, Davidson BS. “A principal component-based description of lumbar intervertebral configuration” *2013 Rocky Mtn ASB Meeting*, Estes Park, CO, April 12–13, 2013

- 2013 Myers CA*, Shelburne KB, Silfies SP Davidson BS. “Inverse dynamics of unstable sitting: Relating center of pressure to functional lumbar moment control” *2013 Rocky Mtn ASB Meeting*, Estes Park, CO, April 12–13, 2013
- 2013 Gaffney BM*, Maluf KS, Davidson BS. “Effects of novel EMG biofeedback on trapezius muscle activation” *2013 Rocky Mtn ASB Meeting*, Estes Park, CO, April 12–13, 2013
- 2013 Ivester J, Rullkoetter P, Davidson BS, Shelburne KB. “Design of a reconfigurable biplane fluoroscopy system” *2013 Rocky Mtn ASB Meeting*, Estes Park, CO, April 12–13, 2013
- 2013 Wanamaker AB*, Davidson BS, Christiansen CL, Saint-Phard D. “Load reduction abilities of camwalker and corset-style ankle foot orthoses” *2013 Rocky Mtn ASB Meeting*, Estes Park, CO, April 12–13, 2013
- 2012 Shelburne KB, Fitzpatrick C, Davidson BS, Laz PJ, Rullkoetter P. “Single-framework models for muscle-driven simulation using finite element modeling” *National Institutes of Health Multiscale Modeling (MSM) Consortium Meeting*, Bethesda, MD, Oct 22–23, 2012
- 2012 Wanamaker AB*, Davidson BS, Christiansen CL. “Kinematic asymmetries while using a common ankle foot orthosis” *University of Denver Undergraduate Research Symposium*, Denver, CO, May 8, 2012
- 2011 Bakhshi S*, Davidson BS, Mahoor MH. “Measuring body joint angle using wearable IMU sensors” *Covidien 2011 Research and Design Summit*, Westminster, CO, Oct 6, 2011
- 2010 Saint-Phard D, Davidson BS, Christiansen CL. “Biomechanical assessment of unloading capacity in ankle foot orthoses” *2nd Musculoskeletal Research Symposium*, University of Colorado, Denver, April 10, 2010
- 2010 Davidson BS, Enebo BA, Solomonow M. “Analysis of surficial and fine wire EMG recordings during flexion-relaxation of the lumbar spine” *2nd Musculoskeletal Research Symposium*, University of Colorado, Denver, April 10, 2010
- 2010 Solomonow M, Zhou BH, Lu Y, King K, Davidson BS. “Biomechanics, motor control, tissue biology & stability of repetitive lumbar injury” *2nd Musculoskeletal Research Symposium*, University of Colorado, Denver, April 10, 2010
- 2009 Davidson BS, Enebo BA, Solomonow M. “In vivo characterization of spine stability using neuromuscular neutral zones” *NIOSH Mountains & Plains Education and Research Center 1st Annual Research Symposium at the Rocky Mountain Academy of Occupational & Environmental Medicine Conference*, Highlands Ranch, CO, Jan 16–17, 2009
- 2007 Davidson BS, Madigan ML, Nussbaum MA. “Identification and stability analysis of the postural control system during small magnitude perturbations: The effects of aging and muscle fatigue”, *VT-WFU SBES 6th Annual Graduate Student Research Symposium*, Blacksburg, VA, May 10, 2007
- 2006 Davidson BS, Madigan ML, Nussbaum MA. “Localized changes in joint kinematics during quiet standing following lumbar extensor fatigue” *VT-WFU SBES 5th Annual Graduate Student Research Symposium*, Winston-Salem, NC, May 11, 2006
- 2004 Davidson BS, Madigan ML, Nussbaum MA. “Effects of fatigue rate on balance degradation” *VT-WFU SBES 3rd Annual Graduate Student Research Symposium*, Winston-Salem, NC, April 24, 2004

- 2003 Davidson BS, Madigan ML, Nussbaum MA. "Effects of low back fatigue on balance" *VT-WFU SBES 2nd Annual Graduate Student Research Symposium*, Blacksburg, VA, May 1, 2003

Professional Presentations

Invited Presentations

- 2015 "Challenges in translating quantitative human movement biomechanics to orthopaedic rehabilitation", *University of Colorado Department of Mechanical Engineering*, Boulder, CO, Oct 20, 2015
- 2015 "Strategies for a Successful Postdoctoral Experience", Summer Biomechanics, Bioengineering and Biotransport Conference, Snowbird Resort, UT, June 19, 2015
- 2014 "A probabilistic tool to quantify the effects of population variability & model uncertainty", OpenSim webinar, Dec 4, 2014 (presented with Casey Myers)
- 2014 "Uncertainty in musculoskeletal modeling: What's in your toolbox?", 7th World Congress of Biomechanics, Boston, MA, July 7, 2014 (presented with Casey Myers)
- 2013 "Complexity and uncertainty in biomechanics of low back pain and regional interdependence", Colorado State University, Fort Collins, CO, Dec 13, 2013
- 2013 "Using EMG data to map feedback pathways and validate passive muscle responses in the lumbar spine", Noraxon 2013 Spring Research Symposium, Movement Performance Institute, Los Angeles, CA April 27-28, 2013
- 2010 "Biomechanics of Human Movement: Applications in orthopaedics", Orthopaedics Core Curriculum Conference, University of Colorado Denver, Apr 28, 2010
- 2010 "Identification of neural mechanisms of musculoskeletal stability: Addressing occupational risks through basic science research", Colorado School of Mines, Feb 19, 2010
- 2010 "Developing methods to address cumulative trauma disorder of the lumbar spine in humans", University of Denver, Feb 16, 2010
- 2009 "Identification of neural mechanisms of musculoskeletal stability: Addressing occupational risks through basic science research", University of Missouri Kansas City Seminar Series, Oct 2, 2009
- 2009 "Musculoskeletal Tissues: Basic science of muscles, tendons, and ligaments", *Orthopaedics Core Curriculum Conference*, University of Colorado Denver, Apr 22, 2009
- 2008 "From preventing falls to preventing injury: Identification of neural mechanisms of musculoskeletal stability", University of Denver Seminar Series, Nov 6, 2008
- 2007 "Experimental and simulation-based approach to understanding the effects of localized muscle fatigue on the postural control system", *Neurological Sciences Institute*, Portland, OR, March 2, 2007
- 2007 "Experimental and simulation-based approach to understanding the effects of localized muscle fatigue on the postural control system", *Temple University Department of Physical Therapy*, Philadelphia, PA, Feb 26, 2007

Papers Presented at Conferences

- 2015 “Simulated hip abductor strengthening reduces peak joint contact forces during stair descent in patients with total hip arthroplasty” *39th Annual Meeting of the American Society of Biomechanics*, Columbus, OH, Aug 5–8, 2015 (Podium)
- 2015 “Systems engineering approach to identifying core control strategies in individuals with and without low back pain during a novel unstable sitting task” *39th Annual Meeting of the American Society of Biomechanics*, Columbus, OH, Aug 5–8, 2015 (Podium)
- 2014 “Should we normalize biomechanical data by subject-specific mass?” *7th World Congress of Biomechanics*, Boston, MA, July 6–11, 2014 (Poster)
- 2013 “High-density surface EMG biofeedback from the trapezius for real-time postural correction” *ASME Summer Bioengineering Conference*, Sunriver, OR, June 26–29, 2013 (Podium)
- 2013 “Change in hamstring activation during stand-to-sit movement following total knee arthroplasty” *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28–June 1, 2013 (Poster)
- 2013 “Weight-bearing biofeedback improves asymmetry during bilateral stance after total knee arthroplasty” *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28–June 1, 2013 (Poster)
- 2013 “Eccentric muscle activation patterns during a five-time-sit-to-stand movement” *American College of Sports Medicine Annual Meeting*, San Francisco, CA, May 29–June 2, 2012 (Poster)
- 2010 “Activation timing of the erector spinae and multifidus during flexion-relaxation of the spine” *The XVII Congress of the International Society of Electrophysiology and Kinesiology*, Aalborg, Denmark, June 16–19, 2010 (Poster)
- 2009 “Recovery from postural perturbations without stepping following localized muscle fatigue” *33rd Annual Meeting of the American Society of Biomechanics*, State College, PA, Aug 26–29, 2009 (Poster)
- 2009 “In vivo characterization of spine stability using neuromuscular neutral zones” *NIOSH Mountains & Plains Education and Research Center 1st Annual Research Symposium at the Rocky Mountain Academy of Occupational & Environmental Medicine Conference*, Highlands Ranch, CO, Jan 16–17, 2009 (Poster)
- 2008 “Identification and stability analysis of the postural control system during small magnitude perturbations” *ASME Summer Bioengineering Conference*, Marco Island, FL, June 25–29, 2008 (Podium)
- 2006 “Analysis of joint kinematics during quiet standing following localized lumbar extensor fatigue” *30th Annual Meeting of the American Society of Biomechanics*, Blacksburg, VA, Sept 6–9, 2006 (Poster)
- 2006 “Changes in balance with low back fatigue” *84th Annual Meeting of The Virginia Academy of Science*, Blacksburg, VA, May 24–26, 2006 (Podium)

- 2005 “Lumbar extensor fatigue changes postural recovery strategy” *XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics*, Cleveland, OH, July 31–Aug 5, 2005 (Podium)
- 2005 “Lumbar extensor fatigue affects postural control by increasing ankle stiffness” *ASME Summer Bioengineering Conference*, Vail, CO, June 22–26, 2005 (Poster)
- 2003 “Balance degradation and recovery following low back fatigue” *BMES 2003 Annual Meeting*, Nashville, TN, Oct 1–4, 2003 (Podium)

Other Professional Contributions

Editorial Board/Panel Membership

- Associate Editor, *Gait and Posture* [5-year Impact Factor: 3.185] (2015–present)
- Canadian Natural Sciences and Engineering Research Council Discovery Grant (2015)
- NSF CAREER Award panelist (2014)
- NSF Graduate Research Fellowship panelist (2011)

Professional Society Positions

- American Society of Biomechanics, Education Committee (2012–2013)

Session Moderator

- 2015 Non-Level Gait, *34th Annual Meeting of the American Society of Biomechanics*, Columbus, OH Aug 5–8, 2015
- 2015 Mechanics and Rehabilitation, *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird Resort, UT June 17–20, 2015
- 2015 Joint Motion and Rehabilitation, *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird Resort, UT June 17–20, 2015
- 2013 Joints and Muscles in Clinical Assessment, *2013 ASME Summer Bioengineering Conference*, Sunriver, OR, June 26–29, 2013
- 2012 Occupational Biomechanics, *34th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL, Aug 15–18, 2012
- 2009 Human Dynamics and Rehabilitation, *2009 ASME Summer Bioengineering Conference*
- 2006 Falls, *30th Annual Meeting of the American Society of Biomechanics*, Blacksburg, VA, September 6–9, 2006

Reviewer

- 2014 Regular Abstracts, *6th World Congress on Biomechanics*
- 2013 Graduate Student Grant-In-Aid Awards, *35th Annual Meeting of the American Society of Biomechanics*
- 2012 Regular Abstracts, *34th Annual Meeting of the American Society of Biomechanics*
- 2012 Undergraduate Rehabilitation Design Competition, *ASME Summer Bioengineering Conference*
- 2009 M.S. and Ph.D. Student Paper Competition, *ASME Summer Bioengineering Conference*

Manuscript Reviewer

Muscle and Nerve (2015), Annals of Biomedical Engineering (2013–2015), ASME Journal of Biomechanical Engineering (2013–2015), Gait and Posture (2007–2015), Journal of Electromyography and Kinesiology (2007–2015) Ergonomics (2014), Journal of Applied Biomechanics (2006, 2009, 2013–2014), Journal of Dynamic Systems, Measurement, and Control (2012), Physical Medicine and Rehabilitation Journal (2012–2013), Experimental Brain Research (2012), Journal of Neurophysiology (2011), Gerontology (2011), Journal of Sports Science and Medicine (2010), IEEE Transactions on Biomedical Engineering (2009)

Research Proposals, Grants, and Contracts

Summary of Direct Costs

External Research:	\$2,429,595	as PI: \$623,990
External Equipment:	\$ 550,000	\$50,000
Internal Research:	\$177,352	\$118,602
Internal Equipment:	\$355,6000	\$110,000
Total Direct Costs:	\$3,512,547	\$902,592

External Research Funding

- *Advancing rehabilitation after total hip arthroplasty*
National Institutes of Health, NIA (R01). 9/1/2016 – 8/31/2021 (Pending)
The objective of this project is to advance post-surgical THA rehabilitation by applying functional strengthening integration, and investigate the mechanisms through musculoskeletal modeling.
Role: Co-Investigatior, Univ Colorado PI: J. Stevens-Lapsley, Univ Colorado Co-Is: C. Christiansen, D. Judd
Direct Costs: \$213,171 (DU Subaward)
- *Interpreting Neuromuscular Mechanisms Underlying Recurrent Back Pain: A Novel Systems Engineering and Motor Control Approach.* National Institutes of Health, NCMRR (R21). 7/1/2016 – 6/30/2018 (Pending)
The objective of this project is to develop a testing and treatment paradigm for recurrent LBP based on unstable sitting performance and systems engineering.
Role: Principal Investigator, Drexel Co-I: S. Silfies
Direct Costs: \$275,000
- *STTR: Mobile Kinetics Diagnostic System - Quantitative movement analysis for the clinic.* National Institutes of Health, NIBIB (R43). 4/1/2016 – 3/31/2017 (Pending)
The objective of this project is to support translational research and development for creation of a device to measure quantitative movement biomechanics in a clinical setting.
Role: Principal Investigator, Opedix Co-Is: D. Gustafson, M. Decker, DU Co-I: K. Shelburne.
Direct Costs: \$60,143 (DU Subaward)

- *SPIRE: Development of a novel device to measure socket pistoning*
 US Dept of Veterans Affairs. 4/1/2016 – 3/31/2018 (Pending)
 The objective of this project is to develop a device that accurately measures socket pistoning in transtibial and transfemoral amputees during walking and running.
 Role: Co-Investigator, Univ Colorado PI: A. Grabowski
 Direct Costs: \$37,114 (DU Subaward)

- 2015 *Age-related Changes in thoracic spine biomechanics*
 National Institutes of Health, NIA (R00AG042458), 10/1/2015 – 9/30/2018
 The objective of this project is to develop novel in-vivo measurements of thoracic spine motion in young, older, and hyperkyphotic older adults toward realistic evaluation of thoracic spinal loading.
 Role: PI on Subaward, Harvard Med School PI: D. Anderson, DU Co-I: K. Shelburne
 Direct Costs: \$42,000 (DU Subaward)

- 2015 *A Wearable Sensory System for Hazardous Source Locating and Exposure Level Warning.*
 Bonneville Power Administration (BPA-0003274), 10/1/2015 – 9/30/2018
 The objective of this project is to develop an array of wearable sensors to detect and map electromagnetic exposure for maintenance workers in power plants and other facilities.
 Role: Co-Investigator, DU PI: J. Zhang, DU Co-I: W. Gao, NREL Co-I: Y. Zhang
 Direct Costs: \$298,605

- 2015 *DU-DePuy Research in Total Hip Arthroplasty*
 DePuy Synthes, a Johnson & Johnson Company, 5/1/2015 – 4/30/2018
 The objective of this project is to use stereo radiography and computational models to support the initial design phase of a new generation of total hip implants.
 Role: Co-Investigator, DU PI: P. Rullkoetter, DU Co-Is: P. Laz, C. Fitzpatrick, K. Shelburne
 Direct Costs: \$633,000

- 2015 *Integration of miniature sensors for fusion motion capture during alpine skiing*
 Gustafson Family Foundation, 1/1/2015 – 7/31/2015
 The objective of this project was to implement measurement of quantitative biomechanics into an alpine skiing environment.
 Role: Principal Investigator, DU Co-Is: M. Decker, K. Shelburne
 Direct Costs: \$57,990

- 2012 *A finite element platform for multi-scale muscle-driven simulation of human physical activity.* National Institutes of Health, NIBIB (R01EB015497), 9/01/2012 – 8/31/2015
 This objective of this project was to develop and validate a multi-scale finite element modeling framework to evaluate natural and implanted knee mechanics.
 Role: Co-Investigator, DU PI: K. Shelburne, DU Co-Is: P. Rullkoetter, P. Laz, C. Fitzpatrick
 Direct Costs: \$874,000

- 2010 *Neuromuscular neutral zones in humans: A new method to assess spinal stability*
National Institutes of Health, NCCAM (R00AT0044983), 8/01/2010 – 7/31/2013
Role: Principal Investigator, Univ Colorado Co-I: B. Enebo
The objective of this project was to measure the neuromuscular response in healthy and people with LBP during HVLA spinal manipulation.
Direct Costs: \$524,000
- 2009 *Neuromuscular neutral zones in humans: A new method to assess spinal stability*
National Institutes of Health, NCCAM (K99AT004983), 8/01/09 – 7/31/10
The objective of this project was to measure the neuromuscular neutral zones of the multifidus during passive flexion-distraction in healthy participants.
Role: Principal Investigator, Univ Colorado Mentor: M. Solomonow
Direct Costs: \$65,750
- 2008 *In vivo assessment of spinal neuromuscular neutral zones in humans*
NIOSH Mountains and Plains ERC Pilot Award, 6/1/08 – 5/31/09
The objective of this project was to pilot in-vivo measurement of neuromuscular neutral zones of the multifidus in healthy participants.
Role: Principal Investigator, Univ Colorado Mentor: M. Solomonow
Direct Costs: \$9,860

External Equipment Funding

- 2012 *MRI: Acquisition of a biplane fluoroscopy system for dynamic imaging of in-vivo human motion.* National Science Foundation, CISE (CNS-1229148), 10/1/2012 – 9/30/2014
The objective of this project was to develop a state-of-the art high-speed stereo radiography system for directly measuring of joint motion with sub-mm level of precision.
Role: Co-Investigator, PI: P. Rullkoetter, Co-Is: K.Shelburne, P. Laz, C. Fitzpatrick
Direct Costs: \$500,000
- 2011 *Development of the bioengineering laboratory at the University of Denver*
Gustafson Family Foundation, 1/1/11 – 12/31/11
The objective of this project was to support equipment acquisition and laboratory personnel during the initial development of the DU Human Dynamics Laboratory.
Role: Principal Investigator, Co-I: K.Shelburne
Direct Costs: \$50,000

Internal Research Funding

- 2014 *Improving rehabilitation after lower-extremity joint replacement surgery by considering regional interdependence in the musculoskeletal system*
The Knoebel Center for the Study of Aging Pilot Award, 4/1/2014 – 3/31/2016
The objective of this project is to develop two hypotheses on regional interdependence of the knee, hip, and spine into measurable outcomes applied too patients following TKA surgery.
Role: Principal Investigator, Co-I: K.Shelburne
Direct Costs: \$64,000

- 2012 *A motion capture based surveillance system for elderly fall recognition, detection, and early warning*
 The Knoebel Center for the Study of Aging Pilot Award, 4/1/2014 – 3/31/2016
 The objective of this project was to methods of camera-based detection of falls in the elderly to be applied to assisted living facilities.
 Role: Co-Investigator, PI: J. Zhang
 Direct Costs: \$58,750
- 2013 *Development of an evidence-based knee brace design and evaluation framework for the prevention of ligament injury*
 Interdisciplinary Research Pilot Award, 1/23/2012 – 1/22/2014
 The objective of this project was to assess the effects of bracing treatment used in rehabilitation following an ACL reconstruction surgery.
 Role: Principal Investigator, Co-Is: K. Shelburne, P. Rullkoetter, M. Decker
 Direct Costs: \$54,102
- 2006 *A measurement and simulation based investigation of the effects of neuromuscular fatigue on dynamic balance*
 Virginia Tech Graduate Research Development Award, 6/1/06 – 12/31/06
 The objective of this project was to investigate the effects of localized muscle fatigue on balance recovery through experimental measurement and simulation.
 Role: Principal Investigator, Virginia Tech Mentor: M. Madigan
 Direct Costs: \$500

Internal Equipment Funding

- 2010 *Shared instrumentation for motion capture of human movement*
 University of Denver Equipment RFP, 1/1/11 – 7/31/11
 The objective of this grant was to purchase an optical motion capture system for the DU Human Dynamics Laboratory.
 Role: Principal Investigator, Co-Is: K. Shelburne, P. Rullkoetter, P. Laz
 Direct Costs: \$110,000
- 2008 *Interdisciplinary movement science laboratory*
 UCDHSC Academic Enrichment Foundation, 8/1/08 – 7/31/11
 The objective of this grant was to purchase motion capture, force measurement, and electromyographic equipment while creating the Interdisciplinary Movement Science Laboratory on the Anschutz Medical Campus.
 Role: Co-Investigator, PI: M. Schenkman, Co-Is: J. Stevens-Lapsley, C. Christiansen, K. Maluf, J. Carollo, M. Solomonow
 Direct Costs: \$245,600

Honors and Awards

- 2015 ACCRAC Award Winning Paper (see Currie et al. 2015)
- 2014 Scholar of the Year; DU Ritchie School of Engineering and Computer Science
- 2014 Early Career Reviewer (ECR) Program; National Institutes of Health
- 2013 Most Innovative Research Discovery; OpenSim Advanced User's Workshop
- 2012 Outstanding Researcher Award; NIH National Center for Simulation in Rehab Research
- 2012 ACCRAC Award Winning Paper (see Myers et al. 2012)
- 2012 Teacher of the Year; DU Ritchie School of Engineering and Computer Science
- 2009 K99 NIH Pathway to Independence Award
- 2006 Best Student Paper – *84th Annual Meeting of The Virginia Academy of Science*
- 2005 Finalist for Clinical Biomechanics Research Paper Award – *XXth Congress of the ISB and 29th Annual Meeting of the ASB*
- 2005 3rd place in M.S. Student Paper Competition (Solids, Modeling, and Rehabilitation Category) – *ASME Summer Bioengineering Conference*
- 2004 Outstanding Student Researcher Award – *VT-WFU SBES Student Research Symposium*

SERVICE ACTIVITIES

Dept of Mechanical Engineering

- Chair Search Committee (2011)
- Faculty Search Committee (2012)

Ritchie School of Engineering and Computer Science

- Dean's Faculty Committee (2012-2015)
- Engineering Club Advisor (2010-2013)

University of Denver

- Institute for Healthy Aging Working Group (2015–present)
- Institutional Review Board Member (2013-present)
- Faculty Senate Member (2014–present)
- IRB Subcommittee on Procedures/Efficiency (2014)
- DU Alumni Seminar Presentation, University of Denver (2013)

TEACHING EXPERIENCE

Courses Taught

<u>Undergraduate Courses</u>	<u>Year</u>
ENME 2510 Mechanics I (Statics)	2011, 2013
ENME 2520 Mechanics II (Dynamics)	2011–2013
ENEE 2015 Engineering Foundations I (Statics Lab)	2012
ENEE 2016 Engineering Foundations II (Dynamics Lab)	2013
ENME 2510 Statics with Lab	2014
ENME 2520 Particle Dynamics with Lab	2014–2015
ENME 2530 Rigid Body Dynamics	2014–2015
ENGR 3721 Controls	2011–2012
<u>Graduate and Dual Level Courses</u>	<u>Year</u>
ENME 4510 Biomechanics of Human Movement	2011, 2013
ENME 4800 Intermediate Dynamics	2013

In 2014, Statics and Dynamics curricula were updated from 3 to 4 credit hours with embedded laboratories; each also underwent a name change.

Course Evaluations

Instructor Evaluation 5.3/6.0 (Departmental Average 5.3/6.0)

Course Evaluation 4.9/6.0 (Departmental Average 5.0/6.0)

Educational Funding

2014 *Engineering Dynamics: A pedagogic transformation through hybrid learning*

DU Office of Teaching and Learning, 1/1/2014 – 6/30/2014

The objective of this project was to implement a flipped classroom approach through video content generation and textbook change, and laboratory development.

Direct Costs: \$3,000

Postdoctoral Supervision

2014-2015 Michael Harris (co-supervised with K. Shelburne)

Employment: Assistant Professor, Washington University (St. Louis, MO)

Ph.D. Thesis Directed

– Craig Simons, DU, MechE (anticipated May 2017)

– Brecca Gaffney, DU, MechE (anticipated May 2017)

2015 Stuart Currie, DU, BioE “The neuromuscular response to spinal manipulation: Quantifying the effect of pain with electromyography”

Employment: Owner of Mojo Feet, LLC (Denver, CO)

2015 Casey Myers, DU, MechE “Probabilistic musculoskeletal simulation methods to address intersegmental dependencies of the knee, hip, and spine”

Employment: Postdoctoral Fellow, University of Denver (Denver, CO)

M.S. Thesis Directed

- 2013 Andrea Wanamaker, DU, MechE “Biomechanical comparison of lower limb unloading between common modalities of ankle foot orthoses”
Employment: PhD Student, Ohio State University (Columbus, OH)
- 2013 Brecca Gaffney, DU, MechE “Evaluation of novel high-density EMG feedback parameters on the spatial distribution of trapezius muscle activity”
Employment: PhD Student, University of Denver (Denver, CO)
- 2013 Craig Simons, DU, MechE “Generalizable methods for modeling lumbar spine kinematics”
Employment: PhD Student, University of Denver (Denver, CO)

Ph.D. Thesis Committee Member

- Matthew Miller, CU-AMC, PhysMed&Rehab (anticipated May 2018)
 - Dana Coombs, DU, MechE (anticipated May 2016)
- 2015 Ryan Marker, CU-AMC, PhysMed&Rehab “Cortical and subcortical contributions to stress-induced muscle activity in the upper trapezius and relationships to chronic neck pain”
- 2014 Bahar Shahidi, CU-AMC, PhysMed&Rehab “Psychological, neurophysiological, and physical risk factors for development of chronic neck pain”
- 2014 Dana Judd, CU-AMC, PhysMed&Rehab “Improving rehabilitation outcomes after total hip arthroplasty”
- 2103 Xiaobo Guo, DU, MechE “Multi-physical study of MEMS resonators and oscillators”
- 2011 Christopher Aastad, DU, MechE “Hybrid sensing and adaptive control for direct brain actuation of artificial limbs”
- 2011 Sara Matrangola VT-WFU, BiomedEng “An experimental and simulation based approach toward understanding the effects of obesity on balance recovery from a postural perturbation”

M.S. Thesis Committee Member

- 2015 Soroush Niketeghad, DU, ECE “Towards closed-loop deep brain stimulation: Behavior recognition from human STN”
- 2015 Vasiliki Kefala, DU, BioE “Assessment of Normal Knee Kinematics using High-Speed Stereo-Radiography System”
- 2014 John Ivester, DU, MechE “Design of the high-speed stereo radiography system”
- 2012 Jonathan Girwar-Nath, DU, ElecCompE “An efficient navigation-control system for small unmanned aircraft”
- 2012 John Giarratano, DU, BioE, “Protein aggregation through ultrasonic nebulization”
- 2011 Matthew Davidson, UCD, MechE “Biomechanical characterization of the limb kinetics during the fencing lunge”
- 2011 Lisa Weber, DU, MechE “Particle deposition as a function of age and species”
- 2011 Saba Bakhshi, DU, ElecCompE “Development of wearable sensors for body joint angle measurement”
- 2008 Kelly Desens, CSM, MechE “In vivo prediction of modular component sizing, orientation, and range of motion for total hip arthroplasty”

Undergraduate Research Projects Supervised

- 2015 “Residual hamstring weakness in deep flexion after anterior cruciate ligament reconstruction”, K. Falkenstine, DU Summer Research Grant
- 2014 “Identification of compensatory movement strategies in patients with transtibial amputation”, W. Johnston, DU Summer Research Grant
- 2014 “Multi-system fusion for non laboratory-based quantitative measurement of human motion”, D. Kim, DU Summer Research Grant
- 2014 “Developing a clinically reliable and relevant test to measure hip abductor muscle weakness in patients with total hip arthroplasty”, K. Thompson, DU Summer Research Grant
- 2014 “Association of audible release and muscle activation timing during spinal manipulation”, A. Everitt, DU Summer Research Grant
- 2013 “Development of an unstable sitting paradigm”, N. Foster, DU Summer Research Grant
- 2012 “Biomechanical classification of plyometric movements for injury rehabilitation and prevention”, K. Van Lieshout, DU Summer Research Grant
- 2012 “Improving function with weight-bearing biofeedback in patients with total knee arthroplasty”, P. Stuart, DU Summer Research Grant
- 2011 “Biomechanical investigation of HVLA spinal manipulative therapy”, A. Wanamaker, DU Summer Research Grant
- 2011 “Biomechanical comparison of lower-limb unloading between common modalities of ankle foot orthosis”, A. Wanamaker, DU Fall PINS

Senior Design Projects Supervised

- 2016 “Designing a wearable sensory system and its test bench for power system electromagnetic hazard detection and prevention”. (team: Diaz, Rahm, Niel), co-advisor: Jun Zhang
- 2015 “A wearable sensor array for rehabilitation biofeedback” for Livity, LLC. (team: Donnermeyer, Maydew, Thompson)
- 2014 “Design of a prosthesis system for thumb amputees” for Orthotransmission, (team: Davenport, Hollenbeck, Tripp), co-advisor: Peter Laz
- 2014 “A wheelchair sensor system for posture detection” for Assisted Technology Partners (team: Agha, Bower, Currie), co-advisor: Jun Zhang
- 2013 “Design process for the intraosseous transcutaneous prosthesis system” for Orthotransmission, (team: Hills, Parkinson, VanLieshout), co-advisor: Peter Laz
- 2013 “Design of a mechanical system for muscle strength measurement” for CU Physical Therapy, (team: AlQanaee, Bohannon, Mattice), co-advisor: Peter Laz