Deanna H. Gates, Ph.D.

Associate Professor, Movement Science and Biomedical Engineering, University of Michigan
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EDUCATION

2005-2009 **Ph.D., Biomedical Engineering**, The University of Texas at Austin
Dissertation: “Changes in the control of movement timing and stability with muscle fatigue”
Committee: Jonathan Dingwell (advisor), H. Grady Rylander, Lisa Griffin, Ronald Barr, and J. Steven Moore

2002-2004 **M.S., Biomedical Engineering**, Boston University
Thesis: “Characterization of ankle function during stair ascent, descent and level walking for ankle prosthetic and orthotic design”, Committee: Paolo Bonato (advisor), Hugh Herr, Jim Collins, Herbert Voigt

1998-2002 **B.S., Mechanical Engineering**, Minor in Biomedical Engineering, The University of Virginia
Thesis: “Porous Monolithic Sol-gel Columns for Capillary Electrochromatography”, Advisor: Pamela Norris

PROFESSIONAL EXPERIENCE

2018- Associate Professor, Dept. of Biomedical Engineering (0% appointment), U. Michigan
2018- Associate Professor, Movement Science, School of Kinesiology, University of Michigan
2017 - Core Faculty, Robotics Institute, University of Michigan
2013-2018 Assistant Professor, Dept. of Biomedical Engineering (0% appointment), U. Michigan
2012-2018 Assistant Professor, Movement Science, School of Kinesiology, University of Michigan
2011-2012 Site Supervisor, Henry M. Jackson Foundation for Military Medicine, Brooke Army Medical Center, Fort Sam Houston, TX
2010-2012 Research Biomechanist, Center for the Intrepid, Fort Sam Houston, TX
2009-2010 Associate, Exponent Failure Analysis Associates, Phoenix, AZ
2005-2009 Graduate Research Assistant, Nonlinear Biodynamics Laboratory, U. Texas at Austin
2003-2005 Research Assistant, Motion Analysis Laboratory, Spaulding Rehabilitation Hospital, Boston, MA

HONORS AND AWARDS

2018 Nominee, University of Michigan Golden Apple Award
2016 Finalist for Provost's Teaching Innovation Prize, “Scaling up engaged learning using flipped courses with shared learning goals", P. Bodary, S. Broglio, D. Gates, M. Gross, L. Robinson
2013-2015 Interdisciplinary Rehabilitation Engineering (IREK12) Scholar
2010 Best Presentation Award, Society of Automotive Engineers 2010 World Congress (Publication #J8, C18)
2008-2009 The University of Texas Continuing Doctoral Fellowship
2007-2008 George J. Heur, Jr. Ph.D. Endowed Graduate Fellowship
2007 Best Student Presentation Award, 2007 Meeting of the Gait and Clinical Movement Analysis Society (Publication # J1, C6)
2007 Graduate Engineering Council Student Travel Award
2007 Gait and Clinical Movement Analysis Society Travel Award
2006-2007 Student Grant-in-Aid from the American Society of Biomechanics
2006-2007 Temple Foundation Graduate Fellowship
2006 Professional Development Award from The University of Texas at Austin
2006 Women in Engineering Program Travel Scholarship
2005-2006 Agnes T. and Charles Wiebusch Fellowship
2002 Graduated with Distinction, University of Virginia, Charlottesville, VA
1998-2002 Robert C. Byrd Foundation Scholarship

PEER REVIEWED PUBLICATIONS (in reverse chronological order)
[a] Graduate student, [b] Postdoctoral fellow, [c] Undergraduate student
J: Journal Article, P: Peer-Reviewed Conference Paper, C: Conference Presentation

Available via Google Scholar: *https://scholar.google.com/citations?user=5pEJBM0AAAAJ&hl=en*

J40. Zheng, J., Davis, A. Kalpajikan, C., Larraga, M.[c], Chestek, C. and **Gates, D.H.** (In Press) "Priorities for the design and control of upper limb prostheses: A focus group study" *Disability and Health* (Accepted 3/22/19) https://doi.org/10.1016/j.dhjo.2019.03.009

J39. Nolasco, L.[a], Silverman, A.K., and **Gates, D.H.** (2019) "Whole body and segment angular momentum during 90-degree turns" *Gait & Posture.* 70: 12-19. https://doi.org/10.1016/j.gaitpost.2019.02.003

J38. Totah, D.[a], Menon, M.[c], Jones-Hershinow, C.[a], Barton, K., and **Gates, D.H.** (2019) "The impact of ankle-foot orthosis stiffness on gait: A systematic literature review" *Gait & Posture* 69: 101-111. https://doi.org/10.1016/j.gaitpost.2019.01.020

J37. Kang, J.[b], Gonzalez, M.[a], Gillespie, R.B., and **Gates, D.H.** (2019) "A haptic object to quantify the effect of feedback modality on prosthetic grasping" *IEEE Robotics and Automation Letters* 4(2): 1101-1108. https://doi.org/10.1109/LRA.2019.2894388

J36. Lapointe, A.[a], Nolasco, L.[a], Sosnowski, A.[c], Andrews, E.[c], Martini, D.N.[a], Palmieri-Smith, R., **Gates, D.H**., and Broglio, S.P. (2018) "Kinematic differences during a jump cut maneuver in people with and without a concussion history" *International Journal of Psychophysiology* 132 (Pt A): 93-98. https://doi.org/10.1016/j.ijpsycho.2017.08.003

J35. Ingraham, K.[a], Choi, H.[b], Gardinier, E.S.[b], Remy, C.D. and **Gates, D.H.** (2018) "Choosing appropriate prosthetic ankle power to reduce the energetic cost of individuals with transtibial amputation" *Scientific Reports* 8: 15303. http://doi.org/10.1038/s41598-018-33569-7

[Began Associate Professor Position at University of Michigan – Fall 2018]

J34. Cowley, J.C.[a] and **Gates, D.H.** (2018) "Influence of remote pain on movement control and muscle endurance during repetitive movements" *Experimental Brain Research* 236(8): 2309-2319. https://doi.org/10.1007/s00221-018-5303-6

J33. Actis, J.A.[a], Nolasco, L.[a], **Gates, D.H.,** and Silverman, A.K. (2018) "Lumbar loads and trunk kinematics in people with a transtibial amputation during sit-to-stand" *Journal of Biomechanics* 69(1): 1-9. http://dx.doi.org/10.1016/j.jbiomech.2017.12.030

J32. Actis, J.A.[a], Honegger, J.D.[a], **Gates, D.H.**, Petrella, A., Nolasco, L.[a] and Silverman, A.K. (2018) "Validation of lumbar spine loading from a musculoskeletal model including the lower limbs and spine" *Journal of* Biomechanics 68: 107-114. http://dx.doi.org/10.1016/j.jbiomech.2017.12.001

J31. Gardinier, E.S.[b], Wensman, J., Kelly, B.M. and **Gates, D.H.** (2018) "A controlled clinical trial of a clinically-tuned powered ankle prosthesis in people with transtibial amputation" *Clinical Rehabilitation* 32(3): 319-329. https://doi.org/10.1177/0269215517723054

J30. Totah, D.[a], Ojeda, L., Johnson, D.D., **Gates, D.H**., Mower Provost, E., and Barton, K. (2018) "Low – back electromyography (EMG) data-driven load classification for lifting tasks" *PloS ONE* 13(2): e0192938. https://doi.org/10.1371/journal.pone.0192938

J29. Engdahl, S.[a] and **Gates, D.H.** (2018) "Reliability of upper limb and trunk joint angles in healthy adults during activities of daily living" *Gait & Posture*. 60, 41-47. https://doi.org/10.1016/j.gaitpost.2017.11.001

J28. Cowley, J.C.[a] and **Gates, D.H.** (2017) "Inter-joint coordination changes during and after muscle fatigue" *Human Movement Science* 56 Part B, 109-118. https://doi.org/10.1016/j.humov.2017.10.015

J27. Engdahl, S.[a], Chestek, C., Kelly, B., Davis, A., and **Gates, D.H.** (2017) "Factors associated with interest in novel interfaces for upper limb prosthetic control" *PLoS ONE* 12(8): e0182482. https://doi.org/10.1371/journal.pone.0182482

J26. Cowley, J.C.[a], Leonardis, J.[a], Lipps, D., **Gates, D.H.** (2017) "The Influence of wrist posture, grip type and grip force on median nerve shape and cross-sectional area" *Clinical Anatomy* 30(4): 470-478. (PMID #28281294). https://doi.org/10.1002/ca.22871

J25. Cowley, J.C.[a] and **Gates, D.H.** (2017) "Proximal and distal muscle fatigue differentially affect coordination" *PLoS ONE.* 12(2): e0172835. https://doi.org/10.1371/journal.pone.0172835

J24. Koller, J.[a], **Gates, D.H.**, Ferris, D., Remy, C.D. (2017) "Confidence in the curve: establishing instantaneous cost mapping techniques using bilateral ankle exoskeletons" *Journal of Applied Physiology.* 122(2): 242-252. (PMID # 27856717). https://doi.org/10.1152/japplphysiol.00710.2016

J23. Cowley, J.C.[a], Resnik, L., Wilken, J.M., Smurr Walters, L, and **Gates, D.H.** (2017) "Movement quality of conventional prostheses and the DEKA arm during everyday tasks" *Prosthetics Orthotics International,* (Mar) 1-8. (PMID #26932980) https://doi.org/10.1177/0309364616631348

J22. Davidson, A.[c], Gardinier, E.S.[b], **Gates, D.H.** (2016) "Within and between day reliability of energetic cost measures during treadmill walking" *Cogent Engineering.* 3(1): 1251028. https://doi.org/10.1080/23311916.2016.1251028

J21. Martini, D.[a], Goulet, G.C., **Gates, D.H.**, Broglio, S.P. (2016) "Long-term effects of adolescent concussion history on gait, across age" *Gait & Posture*, 49: 264-270. (PMID# 27472823)

J20. Musselman, M.[a], **Gates, D.H**, and Djurdjanovic, D. (2016) "A system-based approach to monitoring the neuromusculoskeletal system" *International Journal of Prognostics and Health Management*, 7(2):1-14.

J19. **Gates, D.H.**, Smurr Walters, L., Cowley, J.C.[a], Wilken, J.M., and Resnik, L. (2016) "Motion requirements for upper limb activities of daily living," *American Journal of Occupational Therapy,* 70(1): 1-10. (PMCID # 4690598)

J18. Engdahl, S.[a], Christie, B.[c], Kelly, B., Davis, A., Chestek, C. and **Gates, D.H.** (2015) "Assessing patient interest in advanced prosthetic technology" *Journal of Neuroengineering and Rehabilitation,* 12:53. (PMCID # 4465617)

J17. Cowley, J.C.[a], Dingwell, J.B., and **Gates, D.H.** (2014) "Effects of local and widespread muscle fatigue on movement timing," *Experimental Brain Research*. 232: 3939-48 (PMCID: # 4241184)

J16. Sturdy, J., **Gates, D.H.**, Darter, B.J., Wilken, J.M. (2014) "Assessing preparative gait adaptations in persons with transtibial amputation in response to repeated medial-lateral perturbations," *Gait & Posture* 39:995-998. (PMCID # 4050440)

J15. **Gates, D.H.**, Aldridge, J.M., Wilken, J.M. (2013) "Kinematic comparison of walking on uneven ground using powered and unpowered prostheses." *Clinical Biomechanics* 28: 467-472.

J14. **Gates, D.H.**, Scott, S.J., Wilken, J.M., Dingwell, J.B. (2013) "Frontal plane dynamic margins of stability of individuals with and without transtibial amputation walking on a loose rock surface" *Gait & Posture.* 38: 570-575.

[Began Assistant Professor Position at University of Michigan – Fall 2012]

J13. **Gates, D.H.**, Wilken, J.M., Scott, S.J., Sinitski, E.H., Dingwell, J.B. (2012) "Kinematic strategies when walking across a destabilizing rock surface," *Gait & Posture,* 35(1): 36-42.

J12. **Gates, D.H.**, Dingwell, J.B., Scott, S.J., Sinitski, E.H., Wilken, J.M. (2012) "Gait characteristic of individuals with transtibial amputations walking on a destabilizing rock surface" *Gait & Posture,* 36: 33-39.

J11. **Gates, D.H.**, Darter, B.J., Dingwell, J.B., Wilken, J.M. (2012) "Comparison of walking overground and in Computer Assisted Rehabilitation Environment (CAREN) in individuals with and without transtibial amputations" *Journal of Neuroengineering and Rehabilitation* 9:81.

J10. **Gates, D.H.** and Dingwell, J.B. (2011) "The effects of muscle fatigue and movement height on movement stability and variability." *Experimental Brain Research.* 209(4): 525-36 (PMID # 21331526).

J9. Segala, D, **Gates, D.H.**, Dingwell, J.B., Chelidze, D (2011) "Nonlinear smooth orthogonal decomposition of kinematic features of sawing reconstructs muscle fatigue evolution as indicated by electromyography." *Journal of Biomechanical Engineering* 133(3): 031009 (PMID # 21303185).

J8. Lam, T., and **Gates, D.H.** (2010) "Repeated impacts on a motorcycle helmet: What happens after a significant impact?" Technical Paper # 2010-01-1016, *SAE Technical Papers*.

J7. **Gates, D.H.**, Bridges, A., Welch, T.D.J., Lam, T., Scher, I., Yamaguchi, G.T. (2010) "Lumbar loads in low to moderate speed rear impacts." Technical Paper #2010-01-0141, *SAE Technical Papers*.

J6. Welch, T., Bridges, A, **Gates, D**, Heller, M, Stillman D, Raasch, C, Carhart, M (2010) "An evaluation of the BioRID II and Hybrid III during low- and moderate-speed rear impact." *SAE International Journal on Passenger Cars – Mechanical Systems.* 3(1): 704-33.

J5. **Gates, D.H.** and Dingwell, J.B. (2010) "Muscle fatigue does not lead to increased instability of upper extremity repetitive movements." *Journal of Biomechanics*. 43(5): 913-919 (PMCID # 2834814).

J4. **Gates, D.H.** and Dingwell, J.B. (2009) "Comparison of different state space definitions for local dynamic stability analyses." *Journal of Biomechanics.* 42 (9): 1345-1349 (PMCID # 2718682).

J3. **Gates, D.H.** and Dingwell, J.B. (2008) "The effects of neuromuscular fatigue on task performance during repetitive goal-directed movements." *Experimental Brain Research*, 187 (4): 573-585 (PMCID # 2825378).

J2. **Gates, D.H.**, Su, J.L. and Dingwell, J.B. (2007) "Possible biomechanical origins of the long-range correlations in stride intervals of walking." *Physica A,* 380: 259-270 (PMCID # 2266876).

J1. **Gates, D.H.** and Dingwell, J.B. (2007) "Peripheral neuropathy does not alter the fractal dynamics of stride intervals of gait." *Journal of Applied Physiology*, 102 (3): 965-971 (PMCID # 2827357).

PEER REVIEWED FULL PAPERS PUBLISHED IN CONFERENCE PROCEEDINGS:

P4. Mussleman, M., **Gates, D.H.**, Djurdjanovic, D. (2017) "System based monitoring of neuromusculoskeletal system using divide and conquer type models" *2017 IEEE Aerospace Conference*, Big Sky, MT, Mar 4-11, 2017 (12 pgs.) doi: 10.1109/AERO.2017.7943769.

P3. Koller, J.[a], **Gates, D.H.**, Ferris, D., Remy, C.D. (2016) " 'Body-in-the-Loop' Optimization of Assistive Robotic Devices: A Validation Study" *Proceedings of Robotics: Science and Systems,* Ann Arbor, MI, June 18-22, 2016. (10 pgs.) doi: 10.15607/RSS.2016.XII.007.

P2. Segala, D.B., Chelidze, D., **Gates, D.H**., and Dingwell, J.B. (2010) "Linear and Nonlinear Smooth Orthogonal Decomposition to Reconstruct Local Fatigue Dynamics: A Comparison," Paper # DETC2010-28852, *Proceedings of the 2010 ASME International Design Engineering Technical Conferences (IDETC) and Computers and Information in Engineering Conference (CIE)*, Montréal, Canada, Aug. 15 – 18, 2010. (8 pgs.).

P1. Segala, D.B., Chelidze, D., **Gates, D.H.**, and Dingwell, J.B. (2009) "Dynamical Analysis of Sawing Motion Tracks Muscle Fatigue Evolution," Paper# DETC2009/VIB-87823, *Proceedings of the 23rd Biennial Conference on Mechanical Vibrations and Noise, 2009 ASME International Design Engineering Technical Conferences,* San Diego, CA, Aug. 30 – Sept. 2, 2009. (7 pgs.).

BRIEF (<4 PG) PEER REVIEWED REPORTS PUBLISHED IN CONFERENCE PROCEEDINGS

A3. O'Keeffe D.T., **Gates D.H.**, Bonato P, A wearable pelvic sensor design for drop foot treatment in post-stroke patients. *Conference Proceedings of the IEEE Engineering in Medicine and Biology Society*, 2007; 1820-3.

A2. Aiello E, **Gates D.H.**, Patritti B.L., Cairns K.D., Meister M, Clancy E.A., Bonato P, Visual EMG biofeedback to improve ankle function in hemiparetic gait. *Conference Proceedings of the IEEE Engineering in Medicine and Biology Society*, 2005; 7: 7703-6.

A1. **Gates D.H.**, Lelas J, Della Croce U, Herr H, Bonato P, Characterization of ankle function during stair ambulation. *Conference Proceedings of the IEEE Engineering in Medicine and Biology Society*, 2004; 6: 4248-51.

CONFERENCE PRESENTATIONS

C75. Engdahl, S.E.[a] and **Gates, D.H.** Limb length estimation in body-powered and myoelectric prosthesis users. Trent International Prosthetics Symposium (TIPS), Manchester, UK, Mar 20-22, 2019.

C74. Nolasco, L.A.[a], Silverman, A.K., **Gates, D.H.** Changes in prosthetic alignment affect ground reaction force symmetry and pain during sit-to-stand. 45th Academy Annual Meeting (AAOP), Orlando, FL, Mar 6-9, 2019

C73. Totah, D.[a], Barton, K., Menon, M.[c], Jones-Hershinow, C.[a], and **Gates, D.H.** The impact of ankle-foot orthosis stiffness on gait: A literature review. 45th Academy Annual Meeting (AAOP), Orlando, FL, Mar 6-9, 2019.

C72. **Gates, D.H.**, Vu, P.P [a], Irwin, Z.T. [a], Vaskov, A.K. [a], Henning, P.T., Lueders, D., Laidlaw, A.T., Nu, C.S.[a], Gillespie, R.B., Kemp, S.W., Kung, T.A., Chestek, C.A. and Cederna, P.S. Regenerative peripheral nerve interfaces enable dexterous hand control. 45th Academy Annual Meeting (AAOP), Orlando, FL, Mar 6-9, 2019.

C71. Ford, C.[c], Ingraham, K.[a], Gardinier, E.[b], Wensman, J., Remy, C.D., and **Gates, D.H.** Neuromuscular adaptations to varying prosthetic ankle power in people with a transtibial amputation. Regional Meeting of the American Society of Biomechanics, Dayton, OH, Feb 28-Mar 1, 2019.

C70. **Gates, D.H.**, Kim, J.[a] Colabianchi, N., Wensman, J., Assessing the impact of powered ankle prostheses on everyday activity. Military Health System Research Symposium, Orlando, FL, Aug 20-23, 2018.

C69. Menon, M.[c], Totah, D.[a], Chisena, R.[a], Shih, A., **Gates, D.H.**, and Barton, K. Reliability testing of the SMAPP device for characterizing ankle-foot orthosis stiffness. 42nd Annual Meeting of the American Society of Biomechanics, Rochester, MN, Aug 8-11, 2018.

C68. Nolasco, L.[a], Silverman, A.K. and **Gates, D.H.** Changes in prosthetic alignment affect ground reaction force symmetry and pain during sit-to-stand, 42nd Annual Meeting of the American Society of Biomechanics, Rochester, MN, Aug 8-11, 2018.

C67. Gonzalez, M.[a], Rosenblatt, N. and **Gates, D.H.** Impact of obesity on gait stability in older adults, 42nd Annual Meeting of the American Society of Biomechanics, Rochester, MN, Aug 8-11, 2018.

C66. Kim, J.,[a] Colabianchi, N., Wensman, J. and **Gates, D.H**. Quantifying the effects of powered ankle prostheses on everyday activity. 8th World Congress of Biomechanics, Dublin, Ireland, July 8-12, 2018.

C65. Totah, D.[a], Chisena, R.[a], Menon, M.[c], Shih, A., **Gates, D.H.**, and Barton, K. "Development of a representation of ankle-foot orthoses for haptic emulation. 8th World Congress of Biomechanics, Dublin, Ireland, July 8-12, 2018.

C64. Kubiak CA, Vu P, Irwin ZT, Nu C, Henning T, **Gates D,** Gillespie RB, Kung TA, Cederna PS, Chestek C, and Kemp SW. Successful Control of Virtual and Robotic Hands using Neuroprosthetic Signals

from Regenerative Peripheral Nerve Interfaces in a Human Subject. 63rd Annual Meeting of the Plastic Surgery Research Council, Birmingham, AL, May 17-20, 2018. ***Best Resident Clinical Research Paper Award**

C63. Honegger, J.D.[a], Actis, J.A.[a], Silverman, A.K. **Gates**, **D.H.**, and Petrella, A.J. Prediction of lumbar spine tissue mechanics for people with and without a transtibial amputation using multiscale modeling techniques. Orthopaedic Research Society 2018 Annual Meeting, New Orleans, LA, March 10-13, 2018.

C62. Kim, J.[a] Colabianchi, N., Wensman, J., **Gates, D.H.** Quantifying the effects of powered ankle prostheses on everyday activity levels. 44th Academy Annual Meeting (AAOP), New Orleans, LA, Feb 14-17, 2018.

C61. Engdahl, S.E.[a], Chestek, C.A., Kelly, B., Davis, A., **Gates, D.H.** Factors associated with interest in novel prosthetic interfaces. 44th Academy Annual Meeting (AAOP), New Orleans, LA, Feb 14-17, 2018.

C60. Actis, J.[a], Nolasco, L.[a], **Gates, D.H.,** and Silverman, A.K. Low back loading during sit-to-stand in people with a unilateral transtibial amputation, 41th Annual Meeting of the American Society of Biomechanics, Boulder, CO, Aug 8-11, 2017.

C59. Actis, J.[a], Honegger, J.D.[a], Nolasco, L.[a], Petrella, A.J. **Gates, D.H.,** and Silverman, A.K. Validation of a musculoskeletal model including the lower limbs and lumbar spine using intradiscal pressure measurements, 41th Annual Meeting of the American Society of Biomechanics, Boulder, CO, Aug 8-11, 2017.

C58. Choi, H.[b], Gardinier, E.S.[b], Remy, C.D., and **Gates, D.H.** Effects of different power of powered prosthesis on gait asymmetry and metabolic cost, 41th Annual Meeting of the American Society of Biomechanics, Boulder, CO, Aug 8-11, 2017.

C57. Nolasco, L.[a], Silverman, A.K. and **Gates, D.H.** Whole-body and segmental angular momentum during turning, 41th Annual Meeting of the American Society of Biomechanics, Boulder, CO, Aug 8-11, 2017.

C56. Kim, J.[a], Davidson, A.[c] and **Gates, D.H.** Characterizing ambulatory tendencies for lower limb amputees. 41th Annual Meeting of the American Society of Biomechanics, Boulder, CO, Aug 8-11, 2017.

C55. Cowley, J.C.[a] and **Gates, D.H.** Effects of remote pain on muscle fatigue during repetitive movements, 41th Annual Meeting of the American Society of Biomechanics, Boulder, CO, Aug 8-11, 2017.

C54. Engdahl, S.E.[a] and **Gates, D.H.** Minimum detectable change values for upper limb kinematics in healthy adults, 41th Annual Meeting of the American Society of Biomechanics, Boulder, CO, Aug 8-11, 2017.

C53. Lapointe, A.[a], Nolasco, L.[a], Sosnowski, A.[c], Andrews, E.[c], Martini, D.N.[a], **Gates, D.H**., and Broglio, S.P. Gender specific differences in knee kinematics between participants with and without a concussion history. American College of Sports Medicine. Denver, CO, May 30-June 3, 2017.

C52. Actis, J.[a], Honegger, J.D.[a], Nolasco, L.[a], Petrella, A.J. **Gates, D.H.,** and Silverman, A.K. Lumbar spine loading validation of a musculoskeletal model including the lower limbs and lumbar spine. Rocky Mountain ASB, Estes Park, CO, April 7-8, 2017. ***Best graduate student poster winner**

C51. Lapointe, A.[a], Nolasco, L.[a], Sosnowski, A.[c], Andrews, E.[c], Martini, D.N.[a], **Gates, D.H**., and Broglio, S.P. Biomechanical differences during a jump cut motion in those with and without a concussion history. 5th International Consensus Conference on Concussion in Sport. Berlin, Germany, Oct 22-23, 2016

C50. Koller, J.[a], **Gates, D.**, Ferris, D. and Remy, C.D. Confidence in the curve: validating instantaneous cost mapping with bilateral ankle exoskeletons. 40th Annual Meeting of the American Society of Biomechanics, Raleigh, NC, Aug 2-5, 2016.

C49. Cowley, J.[a], Leonardis, J.[a], Lipps, D. and **Gates, D.H.** Posture and grip force affect median nerve morphology. 40th Annual Meeting of the American Society of Biomechanics, Raleigh, NC, Aug 2-5, 2016.

C48. Engdahl, S.E. [a], Cowley, J.C.[a] and **Gates, D.H.** Between-trial variability of upper limb activities of daily living. 40th Annual Meeting of the American Society of Biomechanics, Raleigh, NC, Aug 2-5, 2016.

C47. Actis, J.A.[a], Nolasco, L.A.[a], **Gates, D.H.**, and Silverman, A.K. Trunk-pelvis kinematics and ground reaction forces during sit-to-stand in individuals with unilateral transtibial amputation. 40th Annual Meeting of the American Society of Biomechanics, Raleigh, NC, Aug 2-5, 2016.

C46. Gardinier, E.[b], Pennito, A.[a], Wensman, J., Kelly, B., and **Gates, D.H.** Improvements in walking performance when using a powered ankle prosthesis. American Academy of Orthotists and Prosthetists, Orlando, FL, Mar 9-12, 2016.

C45. Engdahl, S.M.[a], Christie, B.[c], Kelly, B., Davis, A., Chestek, C. and **Gates, D.H.** Surveying the interest of individuals with upper limb loss in novel prosthetic control techniques. American Orthotics and Prosthetics Association National Assembly, San Antonio, TX, October 7-10, 2015.

C44. Totah, D.[a], Odeja, L. Johnson, D. **Gates, D.**, Provost, E. and Barton, K. Modeling of human intent for classification of a weight lifting task. 39th Annual Meeting of the American Society of Biomechanics, Columbus, OH, Aug 5-8, 2015.

C43. Engdahl, S.M.[a], Christie, B.[c], Kelly, B., Davis, A., Chestek, C. and **Gates, D.H.** Surveying the interest of individuals with upper limb loss in novel prosthetic control techniques. 39th Annual Meeting of the American Society of Biomechanics, Columbus, OH, Aug 5-8, 2015.

C42. Felt, W. [a], Gardinier, E. [b], Wensman, J., **Gates, D.**, and Remy, C., Body-in-the-Loop optimization for the selection of prosthetic control parameters – A pilot study. 39th Annual Meeting of the American Society of Biomechanics, Columbus, OH, Aug 5-8, 2015.

C41. Johnson, A. [a], Mirdamadi, J. [c], Gervasi, N. [c], and **Gates, D.H.** Muscle activation strategies of stepping onto a compliant surface in healthy adults. 39th Annual Meeting of the American Society of Biomechanics, Columbus, OH, Aug 5-8, 2015.

C40. Sriram, H. [a], Cowley, J.C. [a], and **Gates, D.H.** Movement quality during unimanual and bimanual functional reaching movements. 39th Annual Meeting of the American Society of Biomechanics, Columbus, OH, Aug 5-8, 2015.

C39. Davidson, A. [c], Felt, W. [a], Wensman, J., Gardinier, E., Remy, C., and **Gates, D.H.** Metabolic cost changes with the amount of prosthetic ankle power provided. 39th Annual Meeting of the American Society of Biomechanics, Columbus, OH, Aug 5-8, 2015.

C38. Cowley, J.C. [a], Saunders, R. [c], and **Gates, D.H.** Effects of proximal and distal muscle fatigue on repetitive movements. 39th Annual Meeting of the American Society of Biomechanics, Columbus, OH, Aug 5-8, 2015.

C37. Martini, D.[a], Goulet, G., Meehan, S., **Gates, D.H.** and Broglio, S. A Preliminary investigation: long-term effects of concussion on obstacle crossing. Annual Meeting of the American College of Sports Medicine, San Diego, CA. May 26-30, 2015.

C36. Gardinier, E.S.[b] and **Gates, D.H.** Neuromuscular adaptations to assistive ankle power during gait in individuals with transtibial amputations. 20th Annual Meeting of the Gait and Clinical Movement Analysis Society. Portland, OR. March 18-21, 2015.

C35. Engdahl, S.M.[a], Christie, B., Kelly, B., Davis, A., Chestek, C. and **Gates, D.H.** Assessing interest in novel control modalities for upper limb prostheses. 3rd ASU Workshop on Rehabilitation Robotics. Tempe, AZ. Feb 13 – 14, 2015.

C34. Gordon, D.[c] Gardinier, E.S.[b] and **Gates, D.H.** The Reliability of Energetic Cost Measurements. MICHR 2014 Research Symposium. Ann Arbor, MI. October 1, 2014. ***Second Place Scholars Poster Award**

C33. Gardinier, E.S.[b], Wensman, J., Kelly, B.M., and **Gates, D.H.** Improving walking performance and reducing knee loads in below-knee amputees. MICHR 2014 Research Symposium. Ann Arbor, MI. October 1, 2014.

C32. **Gates, D.H.**, Wilken, J.M., Smurr Walters, L., Resnik, L. Comparing movement time with upper extremity prostheses during activities of daily living. 19th Annual Meeting of the Gait and Clinical Movement Analysis Society. Newark, DE. June 24-27, 2014.

C31. Cowley, J.C., Smurr, L., Resnik, L., **Gates, D.H.** Reach trajectories of the dominant and non-dominant hands. 19th Annual Meeting of the Gait and Clinical Movement Analysis Society. Newark, DE. Jun 24-27, 2014.

C30. Engdahl, S.M.[a], **Gates, D.H.**, Wilken, J.M., Smurr, L., Resnik, L. The effect of wrist motion on reduction compensatory trunk motion in transradial prosthesis users. 19th Annual Meeting of the Gait and Clinical Movement Analysis Society. Newark, DE. June 24-27, 2014.

C29. Cowley, J.C.[a], Smurr, L., Resnik, L., **Gates, D.H.** Reach trajectories of the dominant and non-dominant hands. Midwest American Society of Biomechanics Regional Meeting. Akron, OH. Mar 4-5, 2014.

C28. Engdahl, S.M.[a], **Gates, D.H.**, Wilken, J.M., Smurr, L., Resnik, L. The effect of wrist motion on reduction compensatory trunk motion in transradial prosthesis users. Midwest American Society of Biomechanics Regional Meeting. Akron, OH. Mar 4-5, 2014.

C27. **Gates, D.H.**, Wilken, J.M., Smurr Walters, L., Resnik, L. Comparison of performance using upper extremity prostheses with and without active wrist motion. 2nd ASU Workshop on Rehabilitation Robotics. Tempe, AZ. Feb 28 - Mar 1, 2014.

C26. Cowley, J., Dingwell, J.B., and **Gates, D.H.** Effects of localized and widespread fatigue on a repetitive sawing task. 37th Annual Meeting of the American Society of Biomechanics, Omaha, NE. Sept. 4-7, 2013.

C25. **Gates, D.H.**, Scott, S.J., Wilken, J.M., Dingwell, J.B., The effect of walking surface on lateral stability of individuals with and without transtibial amputations. Annual Meeting of the Gait and Clinical Movement Analysis Society. Cincinnati, OH. May 14-17, 2013.

C24. **Gates, D.H.**, Aldridge, J.M., Wilken, J.M. Comparison of powered and unpowered prostheses in patients with transtibial amputation walking on a rock surface. University of Michigan Orthotics and Prosthetics Center: Centennial Celebration and Education Seminar. Ann Arbor, MI. Oct. 18-19, 2012.

C23. **Gates, D.H.**, Aldridge, J.M., Wilken, J.M. Kinematic comparison of walking on uneven ground using powered and unpowered prostheses. 36th Annual Meeting of the American Society of Biomechanics. Gainesville, FL. Aug 15-18, 2012.

C22. **Gates, D.H.**, Dingwell, J.B., Scott, S.J., Sinitski, E.H., Wilken, J.M. Gait adaptations when walking on a destabilizing rock surface. 35th Annual Meeting of the American Society of Biomechanics. Long Beach, CA. Aug 10-13, 2011.

C21. **Gates, D.H.**, Dingwell, J.B., Scott, S.J., Sinitski, E.H., Wilken, J.M. Gait characteristic of individuals with transtibial amputations walking on a destabilizing rock surface. George E. Omer Jr. Research and Alumni Lectureship. San Antonio, TX. May 6, 2011.

C20. Welch, T., Bridges, A., **Gates D.**, Heller, M., Stillman D., Raasch, C., Carhart, M. An evaluation of the BioRID II and Hybrid III during low- and moderate-speed rear impact. SAE 2010 World Congress. Detroit, MI. April 13-15, 2010.

C19. **Gates, D.H.**, Bridges, A., Welch, T.D.J., Lam, T., Scher, I., Yamaguchi, G.T. Lumbar loads in low to moderate speed rear impacts. SAE 2010 World Congress. Detroit, MI. April 13-15, 2010.

C18. **Gates, D.H.**, and Lam, T. Repeated impacts on a motorcycle helmet: What happens after a significant impact? SAE 2010 World Congress. Detroit, MI. April 13-15, 2010. ***Best presentation winner**

C17. **Gates, D.H.** and Dingwell, J.B. Upper Extremity Muscle Fatigue That Induces Muscle Imbalances Does Not Increase Movement Instability. 33rd Annual Meeting of the American Society of Biomechanics. State College, PA. Aug 26-29, 2009.

C16. **Gates, D.H.**, Smallwood, R., and Dingwell, J.B. Muscle Fatigue Affects Task Performance during Repetitive Upper Extremity Movements. 33rd Annual Meeting of the American Society of Biomechanics. State College, PA. Aug 26-29, 2009.

C15. **Gates, D.H.** and Dingwell, J.B. Upper Extremity Muscle Fatigue that Induces Muscle Imbalances does not Increase Movement Instability. 14th Annual Meeting of the Gait and Clinical Movement Analysis Society. Denver, CO. March 10-13, 2009

C14. **Gates, D.H.**, and Dingwell, J.B. The Effect of Muscle Fatigue on Task Performance during Repetitive Goal Directed Movements. 13th Annual Meeting of the Gait and Clinical Movement Analysis Society. Richmond, VA. April 2-5, 2008.

C13. **Gates, D.H.**, and Dingwell, J.B. Movement Stability Is Affected By Muscle Fatigue. 13th Annual Meeting of the Gait and Clinical Movement Analysis Society. Richmond, VA. April 2-5, 2008.

C12. O'Keefe, D.T., **Gates, D.H.**, Bonato, P. A Wearable Pelvic Sensor Design for Drop Foot Treatment in Post-Stroke Patients. IEEE Engineering in Medicine and Biology Society. Aug 23-27, 2007.

C11. **Gates, D.H.**, and Dingwell, J.B. The Effect of Muscle Fatigue on Correlations in Timing Errors. 31st Annual Meeting of the American Society of Biomechanics. Stanford, CA. August 23-25, 2007.

C10. **Gates, D.H.**, and Dingwell, J.B. Movement Height Affects Kinematic Variability during Fatigue. 31st Annual Meeting of the American Society of Biomechanics. Stanford, CA. August 23-25, 2007.

C9. **Gates, D.H.**, Su, J.L and Dingwell, J.B. Origins of the Long-range Correlations in Stride Times. 31st Annual Meeting of the American Society of Biomechanics. Stanford, CA. August 23-25, 2007.

C8. **Gates, D.H.**, and Dingwell, J.B. Movement Stability is Affected by Muscle Fatigue. 31st Annual Meeting of the American Society of Biomechanics. Stanford, CA. August 23-25, 2007.

C7. **Gates, D.H.,** Su, J.L and Dingwell, J.B. Possible Biomechanical Origins of the Long-range Correlations in Stride Times. 12th Annual Meeting of the Gait and Clinical Movement Analysis Society. Springfield, MA. April 11-14, 2007.

C6. **Gates, D.H.,** and Dingwell, J.B. Does Peripheral Neuropathy Alter the Fractal Dynamics of Gait Stride Intervals? 12th Annual Meeting of the Gait and Clinical Movement Analysis Society. Springfield, MA. April 11-14, 2007. *** Best Student Presentation Award Winner**

C5. **Gates, D.H.** and Dingwell, J.B. Peripheral Neuropathy Does Not Alter the Fractal Dynamics of Gait Stride Intervals. American Society of Biomechanics, Blacksburg, VA, September 6-9, 2006.

C4. **Gates, D.H.** and Dingwell, J.B. Are long-range correlations in stride intervals centrally mediated? World Congress of Biomechanics, Munich, Germany, July 29-August 4, 2006.

C3. Aiello, E., **Gates, D.H.**; Patritti, B.L., Cairns, K.D., Meister, M., Clancy, E.A., Bonato, P. Visual EMG Biofeedback to Improve Ankle Function in Hemiparetic Gait, 26th Annual Meeting of IEEE Engineering in Medicine and Biology Society. Shanghai, China. Sept 1-4, 2005.

C2. Bishop, S., Lelas, J., Hoerner, J., **Gates, D.**, Della Croce, U., Nimec, D., Bonato, P. Use of minimal bracing to treat toe walking**.** American Academy of Physical Medicine and Rehabilitation Annual Assembly**,** Phoenix, AZ. October 7-10, 2004.

C1. **Gates, D.H.**, Lelas, J., Croce, U.D., Herr, H., Bonato, P., Characterization of ankle function during stair ambulation. 25th Annual Meeting of IEEE Engineering in Medicine and Biology Society. San Francisco, CA. Sept 1-5, 2004.

Invited Conference Talks

1) *"Powered ankle prostheses: Who benefits and why?"* Symposium Title: Refreshing Perspectives on Assistive Technology, XXVII Congress of the International Society of Biomechanics (ISB), Calgary, BC, July 31-Aug 4, 2019.

2) *"The influence of muscle fatigue and pain on multi-joint movements"* Symposium Title: Motor Control in Biomechanics, 66th Annual Meeting of the American College of Sports Medicine (ACSM), Orlando, Florida, May 28, 2019.

3) *"Prosthetic intervention: translating short-term studies to long-term benefits"* Symposium Title: Assessing Outcomes in O&P, Orthotic & Prosthetic Innovative Technologies Conference, May 16-19, 2019.

4) *"Patient interest in surgical approaches for prosthetic control"* Symposium Title: Abandonment Issues in Upper Limb Prosthetics: Addressing the Problems, 45th meeting of the American Academy of Orthotists and Prosthetists (AAOP), Orlando, FL, Mar 6-9, 2019.

5) *"Regenerative peripheral nerve interfaces enable dexterous hand control"* Symposium Title: Future Possibilities in Amputation Surgery, American Orthotics and Prosthetics Association (AOPA) National Assembly, Vancouver, BC, Sept 26-29, 2018.

6) *"Powered ankle prostheses: who can benefit and how do we maximize improvements?"* Workshop Title: Assistive Robotic Devices for Dynamic Locomotion, Robotics Signals and Systems, Ann Arbor, MI, June 19, 2016.

7) *"Quantifying performance with upper extremity prostheses"* Symposium at the 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society. Chicago, IL, August 26-30, 2014.

Invited Talks

8) *"Optimizing prostheses to enhance individual performance"* Louisiana Tech University, 2017-2018 New Frontiers in Biomedical Research Seminar Series, Ruston, LA, January 22, 2018.

9) *"Optimizing individual performance with powered ankle prostheses"* Carnegie Mellon University, Robotics Institute Seminar Series, Pittsburgh, PA, November 17, 2017.

10) *"Outcomes with upper limb prostheses"* Functional Restoration Seminar, University of Michigan, Ann Arbor, MI, October, 31, 2017.

11) *"Optimizing individual performance with powered ankle prostheses"* Midwest Robotics Workshop, Toyota Technological Institute at Chicago, Chicago, IL, May 19, 2017.

12) *"Leveraging ankle power to improve walking in people with transtibial amputation"* Center for Exercise Research (CXR), University of Michigan, March 10, 2017.

13) *"Leveraging ankle power to improve walking in people with transtibial amputation"* Biomechanics Colloquium, Dept. of Mechanical Engineering, Colorado School of Mines, September 15, 2016

14) *"Advances in Prosthetic Technology"* Colorado School of Mines, Golden, CO, Sept.18, 2014.

15) *"Quantifying performance with upper extremity prostheses."* 4th Annual Musculoskeletal Rehabilitation Sciences (MRS) Training Day, Chicago, IL, August 22, 2014

16) *"Robotics to Enhance Rehabilitation"* Musculoskeletal Research in Progress, University of Michigan, Ann Arbor, MI, February 12, 2014.

17) *"Research Careers in Prosthetics and Orthotics"* Pre-Physical Therapy Club Prosthetics and Orthotics Seminar, Ann Arbor, MI, November 20, 2013.

18) *"History and Future of Prosthetics: Moving Toward Intelligent Technology"* BME 500 Seminar Series, University of Michigan, Ann Arbor, MI, February 27, 2013.

Media

Fablab TV https://youtu.be/DaohjhTViOs

Big 10 *"Michigan lab displays prosthetic prowess: LiveBIG 2016-17"* https://www.youtube.com/watch?v=inG3w3Oh4n4&feature=youtu.be

UM News http://michigantoday.umich.edu/biomechanics-and-bionics/ http://ns.umich.edu/new/releases/24118-motorized-prosthetics-improves-lives-of-amputees

GRANT FUNDING

Current – Extramural

W81XWH-17-C-0084 (Johansson, PI) 02/11/2019 – 02/10/2021
Department of Defense STTR Phase II, *"No Power Bionic Lower Extremity Prostheses";* This project will assess the benefits of a non-powered ankle with increased energy storage and return and range of motion on performance during a variety of daily ambulatory tasks.
Role: Co-I and University Partner to Liberating Technologies, Inc; Total Award Amount (to UM): $299,989

OP170086 (Gates, PI) 09/30/2018 – 09/29/2022
Department of Defense, Congressionally Directed Medical Research Program (CDMRP),
Orthotics and Prosthetics Outcomes Research Program (OPORP)
"A Comparative Assessment of Conventional and Adjustable Transfemoral Prosthetic Sockets"; This clinical trial will compare patient outcomes between various adjustable prosthetic sockets.
Role: PI; Total Award Amount: $2,398,239

1R01NS105132 (Chestek, PI) 07/01/2018 – 06/29/2022
NIH/NINDS, *"Regenerative Peripheral Nerve Interfaces for Restoring Individual Finger Movement in People with Upper Limb Amputations";* This study will investigate use regenerative peripheral nerve interfaces to control dexterous prosthetic hands in three people with upper limb loss.
Role: Co-I; Total Award Amount: $2,116,227

1R03HD092639 (Gates, PI) 04/01/2018 – 03/31/2020
NIH/NICH, "*Evaluating and Improving Assistive Robotic Devices Continuously and in Real-time"*
The goal of this project is to develop methodology to measure metabolic costs through small unobtrusive sensors and use this information to tune prostheses and exoskeletons in real-time.
Role: PI; Total Award Amount: $155,959

OP150078 (Gates, PI) 09/15/2016 – 09/14/2019
Department of Defense, Congressionally Directed Medical Research Program (CDMRP),
Orthotics and Prosthetics Outcomes Research Program (OPORP)
"Characterizing Limits of Performance Imposed by Upper-Limb Prostheses"; This study will quantify the quality and accuracy of movements made by individuals using body-powered and myoelectric prostheses and individuals without upper limb loss.
Role: PI, Total Award Amount: $492,416; *Products: J37, C54*

N66001-16-1-4006 (Chestek, Cederna co-PIs) 01/04/2016 – 07/24/2019

DARPA HAPTIX
"Providing intuitive prosthetic movement and sensation using residual nerve endings to neurotize regenerative muscle grafts"; The goal of this project is to surgically connect pieces of muscle to free nerve endings in an amputated limb and use this signal to control a prosthetic arm. As part of this project, we will perform a stakeholder analysis to determine patient interest in surgical options.
Role: Co-I; Total Award Amount: $1,218,822; *Products: J27*

W81XWH-15-1-0548 (Gates, PI) 09/30/2015 – 09/29/2018 (no cost through 7/29/19)
Department of Defense, Congressionally Directed Medical Research Program (CDMRP)
Orthotics and Prosthetics Outcomes Research Program (OPORP)
"Determining the potential benefit of powered prostheses"; The goal of the project is to determine the impact of powered prosthetic devices on compensatory muscle activity and the onset of muscle fatigue during an extended bout of walking, overall physical activity level, and quality of life.
Role: PI, Total Award Amount: $494,885; *Products: C56; C62, C66, C70*

NSF1536188 (Gates / Remy, PI) 09/01/2015 – 08/31/2018 (no cost through 8/31/19)
Sponsor: Civil, Mechanical and Manufacturing Innovation (CMMI) / General and Age-Related Disabilities Engineering (GARDE), National Science Foundation (NSF)
"Optimizing the Controllers of Powered Prostheses with the Human Body in the Loop"; The goal of the project is to improve the performance and benefits of powered prosthetic devices by enabling an automated subject-specific adaptation of controller parameters.
Role: PI, Total Award Amount: $358,245; *Products: J24, J35, P3, C50, C58*

Prior Support - Extramural

W81XWH-17-C-0084 (Johansson, PI) 09/01/2017 – 03/28/2018
Department of Defense STTR Phase I, *"No Power Bionic Lower Extremity Prostheses"*
Role: Co-I and University Partner to Liberating Technologies, Inc.
Total Award Amount: $150,000
Products: Phase II Award

K12HD073945 (Gates, PI) 10/01/2013 – 09/30/2015
NIH / NICHD, *"K12 Career Development in Movement and Rehabilitation Sciences"*
This grant supports the development of research areas linking engineering to clinical sciences.
Total Award Amount: $266,120
Products: J19, J20, J23, J25, J26, C27, C28, C29, C30, C31, C32, C36, C39, C42

VA A9226-R (Resnik, PI) 07/01/2012 – 12/30/2016
Department of Veterans Affairs
"Home Study of an Advanced Upper Limb Prosthesis Project Modification"
This supplemental funding supports a new aim is to describe normative active range of motion during everyday tasks, and then describe movement patterns utilized by subjects using both their conventional prostheses and the DEKA Arm. Role: Co-Investigator
Products: J19, J23, C27, C28, C29, C30, C31, C32

1R03HD058942 (Dingwell, PI) 09/01/2008 – 08/31/2010
NIH / NICHD, *"Changes in Control of Movement Timing and Stability with Muscle Fatigue"*
This project determined how widespread muscle fatigue vs. localized muscle fatigue affected the control of movement timing, stability, and the trial-to-trial variability in a repetitive upper arm sawing-like task.
Role: Co-I, Total Award Amount: $141,749
Products: J3, J4, J5, J17, C9, C10, C11, C13, C14, C15, C16, C17

Student Grant-in-Aid (Gates, PI) 09/01/2006 – 09/01/2007
American Society of Biomechanics, *"Tracking Fatigue-Related Changes in Motor Coordination"*

This study quantified how the variability of kinematic, kinetic, and EMG patterns in the upper extremity change over time during the course of a work-like task similar to sawing when the upper body is in both kinematically constrained and unconstrained. Total Award Amount: $5,000
Products: J9, J10

Prior Support – Intramural

MCUBED (Barton, PI) 01/01/2017 – 12/31/2017
University of Michigan, *"Advancements in 3D Printing for the Fabrication of Customized Orthoses and Prostheses",* Role: Co-Investigator, $60,000

UL1TR00043 (Gardinier, PI) 06/01/2014 – 08/31/2016
NIH, National Center for Advancing Translational Sciences, Postdoctoral Translational Scholars Program (PTSP), University of Michigan (MICHR), *"Improving performance and reducing knee loads in transtibial amputees",* Role: Postdoctoral Advisor; Total Award Amount: $100,000
Products: J31, C33, C42

MCUBED Program (Gates, PI) 09/01/2013 – 12/31/2014
University of Michigan, *"Reducing effort through an augmented lower limb prosthesis"*
This pilot study used a novel optimization process to determine the appropriate amount and timing of ankle power to supply a lower limb prostheses user during gait.
Role: PI, Total Award Amount: $60,000
Products: J23, C36, C39, C42; Grant: NSF1536188

Office of Research (Gates, PI) 09/01/2013 – 09/01/2014
University of Michigan, *"Assessing patient satisfaction and design priorities for upper extremity prosthetic technology"* This pilot study surveyed upper extremity prostheses users to determine current limitations of their devices and what features of new prostheses they would be most interested in adapting.
Role: PI, Total Award Amount: $18,000
Products: J18, C34, C35, C43, C45; Grant: DARPA N66001-16-1-4006

Continuing Doctoral Fellowship (Gates, PI) 09/01/2008 – 05/28/2009
University of Texas at Austin, *"Changes in Control of Movement Timing and Stability with Muscle Fatigue"*
This project determined how widespread muscle fatigue vs. localized muscle fatigue affected the control of movement timing, stability, and the trial-to-trial variability in a repetitive upper arm sawing-like task.
Role: PI, Total Award Amount: $30,000
Products: J3, J4, J5, J17, C9, C10, C11, C13, C14, C15, C16, C17

Student Fellowships (for which I am primary mentor) ~$480,000 total

Christina Lee	2018, Biomedical Engineering Fellowship, University of Michigan, $22,000
Michael Gonzalez	2018, Rackham Conference Travel Award, University of Michigan, $800 2017-2018, Rackham Merit Fellowship, University of Michigan, $67,000
Luis Nolasco	2018, Rackham Conference Travel Award, University of Michigan, $800 2017-2018, Rackham Merit Fellowship, University of Michigan, $67,000 2017, Rackham Conference Travel Award, University of Michigan, $800 2016, Diversity Travel Award, American Society of Biomechanics, $500 2014, Kinesiology Merit Fellowship, University of Michigan, $10,000
Jaywoo Kim	2018, School of Kinesiology Travel Grant, University of Michigan, $600 2018, Rackham Conference Travel Award, University of Michigan, $1050

2016-2020, School of Kinesiology Fellowship, University of Michigan, $17,567
2017, Rackham Conference Travel Award, University of Michigan, $800

Susannah Engdahl
2017, Rackham Conference Travel Award, University of Michigan, $800
2016, Rackham Conference Travel Award, University of Michigan, $800
2015, Rackham Pre-doctoral Research Grant, University of Michigan, $1500
2015, Rackham Conference Travel Award, University of Michigan, $800
2014, Rackham Conference Travel Award, University of Michigan, $458
2014, Student Travel Grant, Gait and Clinical Movement Analysis Society, $342
2014-2017, Graduate Research Fellowship, National Science Foundation, $132,000
2013-2018, Rackham Merit Fellowship, University of Michigan, $112,479

Jeffrey Cowley
2017, Rackham Conference Travel Grant, University of Michigan, $800
2017, Rackham One-Term Dissertation Fellowship, University of Michigan, $15,401
2016, Rackham Conference Travel Grant, University of Michigan, $800
2015, Rackham Graduate Student Research Grant, University of Michigan, $3000
2015, School of Kinesiology Travel Grant, University of Michigan, $500
2014, Student Travel Grant, Gait and Clinical Movement Analysis Society, $342
2014, School of Kinesiology Travel Grant, University of Michigan, $400
2013, Rackham Conference Travel Grant, University of Michigan, $700
2012-2016, School of Kinesiology Fellowship, University of Michigan, $16,881

Summer Programs

Lydia Mason	2019, Summer Research Opportunities Program (SROP), U. Michigan, $7000
Sean Mori Carroll	2019, MICHR Summer Research Program, funded by NIH UL1TR00043, $6800
Diego Fernando Morales	2018, Summer Research Opportunities Program (SROP), U. Michigan, $7000
María Larrága-Martinez	2017, Summer Research Opportunities Program (SROP), U. Michigan, $7000
Luis Nolasco	2016, MICHR Summer Research Program, funded by NIH UL1TR00043, $6800
Darren Gordon	2014, MICHR Clinical Research Scholars Program, NIH UL1TR00043, $6800

TEACHING

University of Michigan – Instructor

MOVESCI 330 Biomechanics of Human Movement, Movement Science
Undergraduate lecture and laboratory course on musculoskeletal biomechanics.
Enrollments: W'13: 60, F'13: 73, W'16: 74, F'18*:* 55

MOVESCI 431 Clinical Gait Analysis, Movement Science
Undergraduate lecture course on gait biomechanics.
Enrollments: F'15: 17, F'16*:* 16, F'17: 22, F'18*:* 25

KINESLGY 531 Analysis of Biologic Data using MATLAB, School of Kinesiology
Graduate lecture and laboratory course in Matlab programming.
Enrollments: F'12: 17, F'14*:* 15, F'15: 10, F'17: 10

Lectures / Workshop Presentations

- "Blended Course Design for Active Learning: Starting from Scratch", 20th Annual Enriching Scholarship Conference, May 2, 2017
- Teaching and Learning in Kinesiology Spring Symposium Presenter, May 15, 2017.

Teaching Grants

Victors for Michigan (Gates, PI) 01/01/2018– 12/01/2018
University of Michigan, *"Kinesiology Makerspace,"* Supports converting an old machine shop into a makerspace that can be used for undergraduate/graduate education. Total Award Amount: $5,000.

Transforming Learning for the Third Century (TLTC) (Kuo, PI) 03/01/2015 – 08/31/2016
University of Michigan, *"The Flipped Engineering Laboratory"* Supports the development of a lending laboratory of inexpensive, miniature sensor technology to be utilized in several engineering design courses.
Role: Co-PI**;** Total Award Amount: $50,000

Transforming Learning for the Third Century (TLTC) (Gross, PI) 03/01/2015 – 08/31/2016
University of Michigan, *"Using Hybrid Modular Courses to Scale up Engaged Learning",* Supports the development of courses focused on active learning experiences with associated online content,
Role: Co-PI; Total Award Amount: $50,000

University of Texas at Austin – Teaching Assistant

BME 365S Quantitative Engineering Physiology II, Department of Biomedical Engineering, Spring 2008
Undergraduate lecture course in quantitative physiology for biomedical engineers

BME 334 Biomechanics, Department of Biomedical Engineering, Fall 2007
Undergraduate lecture and lab course in biomechanics for biomedical and mechanical engineering students

Boston University – Teaching Assistant

ENG EK 424 Thermodynamics and Statistical Mechanics, School of Engineering, Spring 2003
Undergraduate lecture course in thermodynamics for engineering students

BME 515 Introduction to Medical Imaging, Department of Biomedical Engineering, Fall 2002, Fall 2004
Undergraduate/graduate lecture and lab course using MathCad to analyze medical images

SERVICE

Journal Editorial Service

2018 Associate Editor, *IEEE BioRob 2018*
2017 – Associate Editor, *IEEE Transactions on Neural Systems & Rehabilitation Engineering*

2010-pres Ad hoc Reviewer,

Brain and Behavior Functions
Clinical Biomechanics
Ergonomics
Exercise and Sport Sciences Reviews
Experimental Brain Research
Expert Review of Medical Devices
Gait and Posture
Human Movement Science
IEEE Transactions on Occupational Ergonomics & Human Factors
IEEE Transactions on Neural Systems & Rehabilitation Engineering
Journal of Applied Biomechanics
Journal of Applied Physiology
Journal of Biomechanical Engineering
Journal of Biomechanics
Journal of Electromyography and Kinesiology
Journal of Motor Behavior
Journal of Neuroengineering and Rehabilitation
Journal of Pain Research
Journal of Rehabilitation Research & Development
Journal of the Royal Society Interface
Journal of Science and Medicine in Sport
Medical Engineering & Physics
Military Medical Research
Neuroscience Letters
Nonlinear Dynamics
Novel Physiotherapies
PLoS One
Prosthetics Orthotics International
RESEARCH
Scientific Reports

Grant Review Service

2019 DoD Congressionally Directed Medical Research Programs (CDMRP), Tele-reviewer **(x2)**
2019 Orthotics and Prosthetics Education and Research Foundation (OPERF), Mail-in Review
2019 Natural Sciences and Engineering Research Council of Canada (NSERC), Mail-in Review
2018 DoD Congressionally Directed Medical Research Programs (CDMRP), Tele-reviewer
2018 DoD Defense Medical Research and Development Program (DMRDP), Tele-reviewer
2017 DoD Congressionally Directed Medical Research Programs (CDMRP), Panel Reviewer **(x2)**
2016 Royal British Legion, Mail-in Review
2016 National Science Foundation (NSF), Panel Reviewer
2015 Food and Drug Administration (FDA), Mail-in Review
2015 The Henry Smith Charity, London, UK, Mail-in Review
2014 DoD Congressionally Directed Medical Research Programs (CDMRP), Panel Reviewer
2013 DoD Congressionally Directed Medical Research Programs (CDMRP), Tele-reviewer

Abstract / Award Review Service

2018 Judge, Applied Collegiate Exoskeleton (ACE) Competition 2018
2018 Judge, Engineering Graduate Symposium, Richard and Eleanor Towner Prize for Outstanding Ph.D. Research
2018 American Society of Biomechanics, J. Biomechanics and Clinical Biomechanics Awards
2018 American Society of Biomechanics (ASB) Meeting Abstracts
2016 International Society of Electrophysiology and Kinesiology (ISEK) Conference Abstracts
2016 EMBS Conference Papers
2015, 2016 American Society of Biomechanics (ASB) Meeting Abstracts
2015 Gait and Clinical Movement Analysis Society (GCMAS) Conference Award Papers
2014 Gait and Clinical Movement Analysis Society (GCMAS) Conference Presentation Awards
2014 MICHR Symposium Undergraduate Scholars Poster Awards

Leadership Positions

2019 Scientific Program Co-Chair, Orthotic and Prosthetic Innovative Technologies Conference
2018 – 2019 Member, Executive Committee, School of Kinesiology, University of Michigan
2017 – 2019 Member, Graduate Committee, Robotics Program, University of Michigan
2017 Member, ASB Program Committee
2016 Member, ISEK Program Committee
2014 – 2019 Education Committee, Gait and Clinical Movement Analysis Society

Professional Organizations

2016 Member, International Society of Electromyography and Kinesiology (ISEK)
2015- Member, American Academy of Orthotists and Prosthetists (AAOP)
2015- Member, International Society of Biomechanics (ISB)
2014- Member, Institute of Electrical and Electronics Engineers (IEEE)
2007- Member, Gait and Clinical Movement Analysis Society (GCMAS)
2006- Member, American Society of Biomechanics (ASB)
2000-2002 Member, Pi Tau Sigma Mechanical Engineering Honor Fraternity
2000-2002 Member, Tau Beta Pi, Engineering Honor Society

School of Kinesiology, University of Michigan, Service

2018 – Member, Executive Committee
2018 Speaker, Detroit Prospective Students Day
2017 Member, Biomechanics Faculty Search Committee
2016 Reviewer, Kinesiology Undergraduate Scholarships
2016 Co-Chair, Biomechanics Faculty Search Committee
2016-2017 Member, Building Committee, Kraus Renovations
2014 Member, Biomechanics Faculty Search Committee
2013 Reviewer, Kinesiology Undergraduate Scholarships

University of Michigan Seminar Organization

Carrie Peterson, Ph.D. *Special Seminar,* 3/21/2019
Stephen Piazza, Ph.D. *Kinesiology Seminar Series,* 11/11/2016
Anne Silverman, Ph.D. *Special Seminar,* 11/13/2015
Elizabeth Hsiao-Wecksler, Ph.D. *Rehabilitation Robotics Seminar Series*, 3/24/2015
Todd Kuiken, M.D., Ph.D. *Rehabilitation Robotics Seminar Series,* 10/14/2014
Anne Simon, Ph.D., *Rehabilitation Robotics Seminar Series* 11/20/2013

Outreach

2019 GradSWE Networking Mixer, Discussion Leader
2016 Keynote Speaker, FIRST Robotics Kick-off, University of Michigan
2016 Amazin' Blue Preview, University of Michigan
2015 Seminar Leader, Robotics Day, April 10, 2015
2013- Mentor, American Society of Biomechanics (ASB) Student Mentor Program
2013-2015 Instructor, Females Excelling More in Math Science and Engineering (FEMMES) Program
2006-2007 Mentor, Graduates Linked to Undergraduates in Engineering Program, Women in Engineering Program
2005-2009 Student instructor, Introduce a Girl to Engineering Day, Women in Engineering Program

MENTORING EXPERIENCE

Postdoctoral Fellows

1. Emily Gardinier, Ph.D. 2014-2016
2. Hwan Choi, Ph.D., 2017-2018, *Placement: Assistant Professor, Mechanical Engineering, University of Central Florida
3. Jiyeon Kang, Ph.D., 2018, *Placement: Assistant Professor, Mechanical Engineering, SUNY Buffalo

Dissertation Committees

Chair / Co-Chair

1. Christina Lee (expected 2023), Biomedical Engineering, University of Michigan
2. Michael Gonzalez (expected 2022), Robotics, University of Michigan
3. Luis Nolasco (expected 2021), Movement Science, University of Michigan
4. Jaywoo Kim (expected 2020), Movement Science and Mechanical Engineering, University of Michigan
5. Deema Totah (expected 2019), Mechanical Engineering (co-chair: K. Barton), University of Michigan
6. Susannah Engdahl (2019), Biomedical Engineering, University of Michigan *Placement: Postdoctoral Fellow: George Mason University
7. Jeffrey Cowley (2017) Motor adaptations to muscle fatigue: moderating factors and implications, Kinesiology, University of Michigan, *Placement: Assistant Professor, Kinesiology, University of Wisconsin-Platteville

Member

1. Jeff Koller (2017) Adaptive controllers for assistive robotic devices, Mechanical Engineering, University of Michigan.
2. Gu Eon Kang (2017) A pilot longitudinal study of motor behavior in Bipolar Disorder, Kinesiology, University of Michigan.
3. Zachary Irwin (2016) Restoring fine motor skills through neural interface technology, Biomedical Engineering, University of Michigan.
4. Richelle Williams (2016) The effects of concussive and sub-concussive head impacts on brain activity, Kinesiology, University of Michigan.
5. Douglas Martini (2015) Long-term effects of concussion on motor performance across the lifespan, Kinesiology, University of Michigan.

Master's Thesis Students

Chair

1. Sean Mori Carroll (expected 2020) Kinesiology, University of Michigan
2. Vibha Vempala (expected 2020) Biomedical Engineering, University of Michigan
3. Riley Doherty (expected 2019) Biomedical Engineering, University of Michigan, *co-chair*
4. Luis Nolasco (2017) Kinematics and dynamic balance during straight-line walking and turning in people with transtibial amputation, Movement Science, University of Michigan.

Member

1. Katherine Wagner (2019) The effect of prosthetic alignment on muscle activity for people with a unilateral transtibial amputation during sit-to-stand, Mechanical Engineering, Colorado School of Mines.
2. Jason Actis (2017) Low-back biomechanics during sit-to-stand with transtibial amputation, Mechanical Engineering, Colorado School of Mines.
3. Alexa Johnson (2016) Neural and morphological factors regulate torque development after anterior cruciate ligament reconstruction at the time of return to activity, Kinesiology, University of Michigan.

Undergraduate Thesis Students

1. Claire Ford (2019) Neuromuscular adaptations to varying prosthetic ankle power in people with a transtibial amputation, University of Michigan.
2. Audra Davidson (2016) Assessing community integration post lower limb amputation, Movement Science Honors Thesis, University of Michigan.
3. Jeremy Ross (2015) Upper-limb reaching device for quantification of arm movement, Mechanical Engineering Honors Project, University of Michigan.

MICHR Clinical Research Scholars Program / MICHR Summer Research Program
Sean Mori Carroll, Summer 2019
Luis Nolasco, Summer 2016
Darren Gordon, Summer 2014

Summer Research Opportunities Program (SROP)
Lydia Mason, Taylor University, Summer 2019
Diego Fernando Perez Morales, Delaware State University, Summer 2018
Maria Fernanda Larraga Martinez, University of Iowa, Summer 2017

Research Staff / Volunteers

Kelsey White	Clinical Research Coordinator	2016 –
Jasmine Mirdamadi	Research Coordinator	2014 – 2015
Andrew Moseley-Gholl	Research Assistant	2013 – 2014

Master's Students – Research Rotations

John Verros	Kinesiology	Winter 2014
Alexa Johnson	Kinesiology	Winter 2015
Josh Leonardis	Kinesiology	Fall 2015
Leelai Abraha	Kinesiology	2014-2016
Hari Sriram	Biomedical Engineering	2014-2015
Anthony Pennito	Biomedical Engineering	2015-2016
Pravin Ullagadi	Biomedical Engineering	Winter 2016
Jillian Kirby	Biomedical Engineering	Fall 2017, Winter 2018
Robert Oswald	Movement Science	Fall 2017, Winter 2018
Carlie Jones-Hershinow	Movement Science	Winter 2018, Summer 2018
Bryce LeBar	Movement Science	Summer 2018, Fall 2018
Vibha Vempala	Biomedical Engineering	Fall 2018, Winter 2019
Riley Doherty	Biomedical Engineering	Fall 2018 – Winter 2019
Sean Mori Carroll	Movement Science	Winter 2019 –

Undergraduate Student Researchers

Breanne Christie	Biomedical Engineering	Summer 2013
Trevor Plizga	Movement Science	Summer 2013
Hari Sriram	Mechanical Engineering	Summer 2013 – Summer 2014
Jessica Ford	Movement Science	Fall 2013 – Summer 2014
Shannon Pomeroy	Movement Science	Fall 2013
Jessica Axelrod	Movement Science	Fall 2013 – Winter 2015
Daphne Chou	Biomedical Engineering	Fall 2013 – Winter 2014
Jasmine Wisely	Movement Science	Winter 2014
Amanda Chamberlain	Mechanical Engineering	Summer 2014 – Winter 2015, Summer 2017
Nicole Gervasi	Movement Science	Fall 2014, Winter 2015
Rebecca Saunders	Movement Science	Winter 2015
Maggie Armstrong	Movement Science	Winter 2015
Devin Nelson	Movement Science	Summer 2015
Daniel Kim	Mechanical Engineering	Summer 2015
Zachary Conley	Movement Science	Fall 2015, Winter 2016
Lauren Peterson	Electrical Engineering	Fall 2015, Winter 2016
Jaqueline Katz	Movement Science	Winter 2016, Summer 2016, Fall 2016
Alexander Lopez	Mechanical Engineering	Winter 2016
Erika Elliot	Health Science at Purdue	Summer 2016
Jacob Lynn	Movement Science	Summer 2016 – Summer 2017
Kristin Roberts	Movement Science	Summer 2016
Nicholas Dolnicek	Movement Science	Summer 2016
Nicole Johns	Biomedical Engineering	Summer 2016, Fall 2016

Danny Tian	Movement Science	Summer 2016 – Summer 2017
Yoonjoo Kim	Biomedical Engineering	Summer 2016, Fall 2016
Sarah Chen	Electrical Engineering	Summer 2016 – Summer 2017
Sean McLoughlin	Movement Science	Fall 2016
Alondra Lopez	Electrical Engineering	Winter 2017
Ann Starling	Movement Science	Fall 2016, Winter 2017
Erin Shy	Movement Science	Winter 2017
Elizabeth Lusk	Movement Science	Winter 2017, Fall 2017
Samantha Levin	Movement Science	Winter 2017
Maya Kohavi	Athletic Training	Winter 2017, Fall 2017
Samantha Darmon	Movement Science	Winter 2017
Sarah Thompson	Movement Science	Winter 2017
Amaanat Gill	Movement Science	Winter 2017
Kelley Burger	Movement Science	Winter 2017
Sandyvel Lopez-Zeledon	Movement Science	Summer 2017, Fall 2017, Winter 2018
Claire Ford	Movement Science	Summer 2017 – Winter 2019
Hannah Landman	Movement Science	Summer 2017, Fall 2017
Max Adamo	Movement Science	Summer 2017 – Winter 2019
Kyle Lacroix	Movement Science	Fall 2017
Alexandra Kalabat	Movement Science	Fall 2017
Amanda Shah	Movement Science	Winter 2018
Natalie Bullock	Movement Science	Winter 2018 –
Loriann Hom	Movement Science	Winter 2018
Orion Siu	Movement Science	Winter 2018 –
Mykel Dolinski	Movement Science	Fall 2018