Curriculum Vitae

Name: **Ross H. Miller**
Title: Associate Professor, Department of Kinesiology, University of Maryland
Office: 2134A School of Public Health Building, 4200 Valley Drive, College Park, MD 20742
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EDUCATION

2010 PhD, Kinesiology, University of Massachusetts (advisor: Graham Caldwell)
2006 MS, Exercise & Sport Science, Iowa State University (advisor: Jason Gillette)
2005 MS, Mechanical Engineering, Iowa State University (advisor: Francine Battaglia)
2003 BS, Mechanical Engineering, Iowa State University

EXPERIENCE

Academic Employment

2019-pres Associate Professor, Department of Kinesiology, University of Maryland
2012-2019 Assistant Professor, Department of Kinesiology, University of Maryland
2010-2012 Postdoctoral Fellow, Human Mobility Research Centre, Queen's University

Other Experience

2018-pres Biomechanics Interest Group Co-Chair, American College of Sports Medicine
2017-pres Associate Editor, Journal of Applied Biomechanics
2013-pres Faculty, Neuroscience & Cognitive Science Program, University of Maryland

AWARDS

2015 Promising Scientist Award, International Society of Biomechanics
2012 Top 25 Hottest Articles of the Year, Journal of Biomechanics (#22)
2010 Young Scientist Pre-Doctoral Award, American Society of Biomechanics
2005 Teaching Excellence Award, Iowa State University Graduate College
2003 Graduation with Distinction, Iowa State University

PUBLICATIONS

Working Papers

2020 Burnett JK, Choi YT, Li H, Wereley NM, Miller RH, Shim JK. Vibration suppression of a composite prosthetic foot using piezoelectric shunt damping: implication to vibration-induced cumulative trauma. *IEEE Transactions on Biomedical Engineering*, minor revision.
2020 Krupenevich RL, Miller RH. Habitual endurance running does not mitigate age-related differences in gait kinetics. *Experimental Gerontology*, major revision.

Original Research Articles

2020 Caminita M, Garcia GL, Kwon HJ, Miller RH, Shim JK. Sensory-to-motor overflow: cooling foot soles impedes squat jump performance. *Frontiers in Human Neuroscience* 14, article 549880.

2020 Hunter JG, Smith AMB, Sciarratta LM, Shim JK, Miller RH. Standardized lab shoes do not decrease loading rate variability in recreational runners. *Journal of Applied Biomechanics* 36(5), pp. 340-344.

2020 Miller RH, Krupenevich RL. Medial knee cartilage is unlikely to withstand a lifetime of running without positive adaptation: a theoretical biomechanical model of failure phenomena. *PeerJ* 8, article e9676.

2020 Wasser JG, Acasio JC, Hendershot BD, Miller RH. Single-leg forward hopping exposures adversely affect knee joint health among persons with unilateral lower limb loss: a predictive model. *Journal of Biomechanics* 109, article 109941.

2020 Krupenevich RL, Miller RH. Effects of self-selected step length and trunk position on joint kinetics in highly physically fit older adults. *Journal of Applied Biomechanics* 36(3), pp. 156-162.

2019 Baum BS, Hobara H, Koh K, Kwon HJ, Miller RH, Shim JK. Amputee locomotion: joint moment adaptations to running speed using running-specific prostheses after unilateral transtibial amputation. *American Journal of Physical Medicine & Rehabilitation* 98(3), pp. 182–190.

2019 Hunter JG, Garcia GL, Shim JK, Miller RH. Fast running does not have a greater contribution to cumulative load than slow running. *Medicine & Science in Sports & Exercise* 51(6), pp. 1178–1185.

2018 Koh K, Kwon HJ, Kiemel T, Miller RH, Park YS, Kim MJ, Kwon YH, Kim YH, Shim JK. Intra-auditory integration between pitch and loudness in humans: evidence of super-optimal integration at moderate uncertainty in auditory signals. *Scientific Reports* 8(1), article 13708.

2018 Krupenevich RL, Miller RH, Hendershot BD, Schnall BL, Pruziner AL. Knee adduction moment peak and impulse do not change during the first six months of walking with a prosthesis. *Gait & Posture* 63: pp. 89–90.

2018 Karimpour R, Krupenevich RL, Miller RH, Shim JK. Evaluation of gait asymmetry using force plates vs. accelerometer. *Journal of Mechanics in Medicine & Biology* 18(2), 1850015.

2018 Russell Esposito E, Miller RH. Maintenance of muscle strength retains a normal metabolic cost in simulated walking after transtibial limb loss. *PLoS One* 13(1), article e0191310.

2017 Kiernan D, Miller RH, Baum BS, Kwon HJ, Shim JK. Amputee locomotion: frequency content of prosthetic vs. intact limb vertical ground reaction forces during running and the effects of filter cutoff frequency. *Journal of Biomechanics* 60, pp. 248–252.

2017 Miller RH, Krupenevich RL, Pruziner AL, Wolf EJ, Schnall BL. Medial knee joint contact force in the intact limb during walking in recently ambulatory service members with unilateral limb loss: a cross-sectional study. *PeerJ* 5, article e2960.

2017 Krupenevich RL, Pruziner AL, Miller RH. Knee joint loading during single-leg forward hopping. *Medicine & Science in Sports & Exercise* 49(2), pp. 327–332.

2016 Koh K, Kwon HJ, Park SY, Kiemel T, Miller RH, Kim YH, Shin JH, Shim JK. Intra-auditory integration improves motor performance and synergy in an accurate multi-finger pressing task. *Frontiers in Human Neuroscience* 10, 260.

2016 Edwards WB, Miller RH, Derrick TR. Femoral strain during walking predicted with muscle forces from static and dynamic optimization. *Journal of Biomechanics* 49(7), pp. 1206–1213.

2015 Miller RH, Esterson AY, Shim JK. Joint contact forces when minimizing the external knee adduction moment by gait modification: a computer simulation study. *The Knee* 22(6), pp. 481–489.

2015 Koh K, Kwon HJ, Yoon BC, Cho Y, Shin JH, Hahn JO, Miller RH, Kim YH, Shim JK. The role of tactile sensation in online and offline hierarchical control of multi-finger force synergy. *Experimental Brain Research* 233(9), pp. 2539–2548.

2015 Miller RH, Hamill J. Optimal footfall patterns for cost minimization in running. *Journal of Biomechanics* 48(11), pp. 2858–2864.

2015 Gentili RJ, Oh H, Huang DW, Katz GE, Miller RH, Reggia JA. A neural architecture for performing actual and mentally simulated movements during self-intended and observed bimanual arm reaching movements. *International Journal of Social Robotics* 7(3), pp. 371–392.

2015 Graham RB, Smallman CLW, Miller RH, Stevenson JM. A dynamical systems analysis of assisted and unassisted anterior and posterior hand-held load carriage. *Ergonomics* 58(3), pp. 480–491.

2015 Miller RH, Edwards WB, Deluzio KJ. Energy expended and knee joint load accumulated when walking, running, or standing for the same amount of time. *Gait & Posture* 41(1), pp. 326–328.

2014 Brandon SCE, Miller RH, Thelen DG, Deluzio KJ. Selective lateral muscle activation in subjects with moderate medial knee osteoarthritis does not unload medial knee condyle. *Journal of Biomechanics* 47(6), pp. 1409–1415.

2014 Miller RH. A comparison of muscle energy models for simulating human walking in three dimensions. *Journal of Biomechanics* 47(6), pp. 1373–1381.

2014 Miller RH, Edwards WB, Brandon SCE, Morton AM, Deluzio KJ. Why don't most runners get knee osteoarthritis? A case for per-unit-distance loads. *Medicine & Science in Sports & Exercise* 46(3), pp. 572–579.

2014 Hobara H, Baum BS, Kwon HJ, Linberg A, Wolf EJ, Miller RH, Shim JK. Amputee locomotion: lower extremity loading using running-specific prostheses. *Gait & Posture* 39(1), pp. 386–390.

2013 Hobara H, Baum BS, Kwon HJ, Miller RH, Ogata T, Shim JK. Amputee locomotion: spring-like leg behavior and stiffness regulation using running-specific prostheses. *Journal of Biomechanics* 46(14), pp. 2483–2489.

2013 Russell EM, Miller RH, Umberger BR, Hamill J. Lateral wedges alter mediolateral load distribution at the knee in obese individuals. *Journal of Orthopaedic Research* 31(5), pp. 665–671.

2013 Miller RH, Brandon SCE, Deluzio KJ. Predicting sagittal plane biomechanics that minimize the axial knee joint contact force during walking. *Journal of Biomechanical Engineering* 135(1), article 011007.

2012 Gillette JC, Stevermer CA, Miller RH, Edwards WB, Schwab CV. Lower extremity joint moments during carrying tasks in children. *Journal of Applied Biomechanics* 28(2), pp. 156–164.

2012 Miller RH, Umberger BR, Caldwell GE. Sensitivity of maximum sprinting speed to characteristic parameters of the muscle force-velocity relationship. *Journal of Biomechanics* 45(8), pp. 1406–1413.

2012 Miller RH, Umberger BR, Caldwell GE. Limitations to maximum sprinting speed imposed by muscle mechanical properties. *Journal of Biomechanics* 45(6), pp. 1092–1097.

2012 Miller RH, Umberger BR, Hamill J, Caldwell GE. Evaluation of the minimum energy hypothesis and other potential optimality criteria for human running. *Proceedings of the Royal Society of London B* 279(1733), pp. 1498–1505.

2012 John D, Miller RH, Kozey-Keadle SL, Caldwell GE, Freedson PS. Biomechanical examination of the plateau phenomenon in ActiGraph vertical activity counts. *Physiological Measurement* 33(2), pp. 219–230.

2011 Hasson CJ, Miller RH, Caldwell GE. Contractile and elastic ankle joint muscular properties in young and older adults. *PLoS One* 6(1), article e15953.

2011 Hamill J, Russell EM, Gruber AH, Miller RH. Impact characteristics in shod and barefoot running. *Footwear Science* 3(1), pp. 33–40.

2010 Miller RH, Chang R, Baird JL, Van Emmerik REA, Hamill J. Variability in kinematic coupling assessed by vector coding and continuous relative phase. *Journal of Biomechanics* 43(13), pp. 2554–2560.

2010 Gillette JC, Stevermer CA, Miller RH, Meardon SA, Schwab CV. The effects of age and type of carrying task on lower extremity kinematics. *Ergonomics* 53(3), pp. 355–364.

2009 Hamill J, Russell EM, Gruber AH, Miller RH, O'Connor KM. Extrinsic foot muscle forces when running in varus, valgus and neutral shoes. *Footwear Science* 1(3), pp. 153–161.

2009 Miller RH, Caldwell GE, Van Emmerik REA, Umberger BR, Hamill J. Ground reaction forces and lower extremity kinematics when running with suppressed arm swing. *Journal of Biomechanical Engineering* 131(12): article 124502.

2009 Miller RH, Hamill J. Computer simulation of the effects of shoe cushioning on internal and external loading during running impacts. *Computer Methods in Biomechanics & Biomedical Engineering* 12(4), pp. 481–490.

2009 Miller RH, Gillette JC, Derrick TR, Caldwell GE. Muscle forces during running predicted by gradient-based and random search static optimisation algorithms. *Computer Methods in Biomechanics & Biomedical Engineering* 12(2), pp. 217–225.

2008 Hamill J, Miller RH, Noehren B, Davis IS. A prospective study of iliotibial band strain in runners. *Clinical Biomechanics* 23(8), pp. 1018-1025.

2008 Miller RH, Meardon SA, Derrick TR, Gillette JC. Continuous relative phase variability during an exhaustive run in runners with a history of iliotibial band syndrome. *Journal of Applied Biomechanics* 24(3), pp. 262-270.

2007 Miller RH, Lowry JL, Meardon SA, Gillette JC. Lower extremity mechanics of iliotibial band syndrome during an exhaustive run. *Gait & Posture* 26(3), pp. 407-413.

Narrative Reviews and Commentaries

2018 Paquette MR, Miller RH. Reconciling new with old injury paradigms and the need to dig deeper – comment on Nigg *et al*. *Current Issues in Sport Science* 3, article 105.

2017 Miller RH. Joint loading in runners does not initiate knee osteoarthritis. *Exercise & Sport Sciences Reviews* 45(2), pp. 87–95.

2017 Miller RH, Brandon SCE, Selbie WS, Deluzio KJ. Commentary on "Modelling knee flexion effects on joint power absorption and adduction moment". *The Knee* 24(5), pp. 1256–1257.

Book Chapters

2018 Miller RH. Hill-based muscle modeling. In: Müller B, Wolf SI (eds.), *Handbook of Human Motion* pp. 373–394. Berlin: Springer.

2018 Umberger BR, Miller RH. Optimal control modeling of human movement. In: Müller B, Wolf SI (eds.), *Handbook of Human Motion* pp. 327–348. Berlin: Springer.

2017 Andrews DL, Miller RH, Cork S. Weaponizing kinesiology: illuminating the militarization of the sport sciences. In: Butterworth ML (ed.), *Sport & Militarism: Contemporary Global Perspectives* pp. 31–47. London: Routledge.

2014 Van Emmerik REA, Miller RH, Hamill J. Dynamical systems methods for the analysis of movement coordination. In: Robertson DGE, Caldwell GE, Hamill J, Kamen G, Whittlesey SN (eds.), *Research Methods in Biomechanics* 2nd ed. pp. 291–316. Champaign: Human Kinetics.

2012 Hamill J, Gruber AH, Miller RH. Footwear effects on running kinematics. In: Goonetilleke RS (ed.), *The Science of Footwear* pp. 457–474. Boca Raton: CRC Press.

FUNDING[1]

Proposals Funded as Principal Investigator

2021-2023 A predictive musculoskeletal modeling and simulation framework for individuals with above knee amputation. Henry M. Jackson Foundation, $85,507.

2020-2021 Enhance student learning in virtual biomechanics laboratories. University of Maryland Office of the Provost, $5,670.

2019-2021 An advanced biomechanical model to guide prosthetic prescription and rehabilitation after amputation. Henry M. Jackson Foundation, $53,407.

2018-2019 Optimizing shoe midsole longitudinal bending stiffness based on runner's body mass. New Balance Athletics, $5,960 in kind.

2016-2017 Muscular properties and gait mechanics in older adults. National Center for Simulation in Rehabilitation Research, $4,000.

[1] Amounts shown are direct costs in USD received by Miller's institution unless otherwise indicated.

2016-2017 Biomechanical evaluation and refinement of the Milestone Pod for running. Maryland Technology Enterprise Institute, $60,645.
2015-2016 The elite athlete as a model for the impact of mechanical loading on human knee joint health. University of Maryland Division of Research, $50,000.
2015-2019 Evaluation of knee joint health in Service Members with unilateral lower extremity trauma. Henry M. Jackson Foundation, $182,226.
2014-2015 Joint loading and knee osteoarthritis risk in lower limb amputees. University of Maryland Division of Research, $9,000.
2012-2013 Integrating OpenSim with high-performance computing to predict optimal walking gaits. National Center for Simulation in Rehabilitation Research, $1,500.
2007-2008 A subject-specific musculoskeletal model of the iliotibial tract. American Society of Biomechanics, $863.

Proposals Funded as Co-Investigator

2016-2017 Soccer periodization. National Collegiate Athletic Association, $89,123.
2013-2014 Effects of a chocolate milk product on mild traumatic brain injury in youth and collegiate athletes. Maryland Technology Enterprise Institute, $69,373.
2013-2014 Statistical models for establishing a control data set for biomechanical gait analysis. Natural Sciences & Engineering Research Council, $25,000 CAD.
2011-2012 Neuromuscular contribution to contact forces in knee osteoarthritis subjects. National Center for Simulation in Rehabilitation Research, $5,000.

MENTORING

Doctoral Students Graduated

2015-2020 Jessica Hunter. *The effect of training habits on cumulative load and tibial stress fracture injury risk in runners*. Postdoctoral Fellow, Harvard University.
2014-2019 Rebecca Krupenevich. *Investigating sources of the age-related distal to proximal shift of kinetics*. Postdoctoral Fellow, University of North Carolina.

Masters Students Graduated

2015-2018 Elizabeth Bell. *Muscular fatigue influences motor synergies during push-ups*. Doctoral Student, University of Maryland.
2013-2016 Edward Chu. *Neural modulation of leg stiffness in response to neuromuscular fatigue*. Doctoral Student, University of Maryland.

Undergraduate Honors Students Graduated

2018-2019 Daniel Gross. *A biomechanical perspective of osteoarthritis with lower limb amputation*.
2017-2018 Claudia Damico. *Interactions of fatigue indicators in highly trained endurance runners*.
2016-2017 Rachel Knobel. *Mechanisms of increasing running speed with different footstrike patterns*.
2014-2015 Aryeh Esterson. *An in-depth analysis of human walking*.

TEACHING

Undergraduate Courses Taught

2019-pres Biomechanical Forces and Musculoskeletal Health (taught 2x)
2014-pres The Cybernetic Human (taught 4x)
2013-pres Biomechanics of Sport (taught 7x)
2013-pres Biomechanics of Human Movement (taught 10x)

Graduate Courses Taught

2019-pres Modeling and Simulation of Human Movement (taught 2x)
2015-pres Mechanical Analysis of Human Movement (taught 2x)
2014-pres Skeletal Muscle Mechanics (taught 3x)

SERVICE

Memberships

2010-pres Member, International Society of Biomechanics
2007-pres Member, American Society of Biomechanics
2005-pres Member, American College of Sports Medicine
2004-2011 Member, American Society of Mechanical Engineers

Service to Profession

Program Committee, ASB Annual Meeting, 2017
Award committee, ASB Annual Meeting, 2015, 2017
Session chair, ASB Annual Meeting, 2015, 2017
Mentor, ASB Graduate Student Mentoring Program, 2013–pres
Abstract reviewer, ASB Annual Meeting, 2012–pres
Organizing committee, National Biomechanics Day, 2017
Grant reviewer, Dutch Technology Foundation, 2016, 2019
Grant reviewer, National Aeronautics & Space Administration, 2016
Abstract reviewer, ACSM Annual Meeting, 2014–2016
Grant reviewer, Mitacs, 2020

Service to University of Maryland

2020-pres Member, Dissertation Fellowship Committee
2019-pres Chair, Undergraduate Program Committee, Department of Kinesiology
2019-pres Member, Undergraduate Degree Program Task Force, School of Public Health
2016-2018 Member, Programs, Curricula, & Courses Committee, School of Public Health
2015-pres Member, Undergraduate Program Committee, Department of Kinesiology
2014-2015 Member, Innovation & Technology Advisory Committee, School of Public Health
2013-pres Member, Human Performance Committee, Department of Kinesiology

2013-pres Member, Admissions Committee, Neuroscience & Cognitive Science Program
2013-2014 Member, Graduate Program & Admissions Committee, Department of Kinesiology