James Borrelli, PhD
Assistant Professor

Contact Information

Business Address: Biomedical Engineering
Stevenson University
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Education

1998-2003 BS, Mechanical Engineering, University of Maryland at College Park
2003-2006 MS, Mechanical Engineering, University of Maryland at College Park
2006-2011 PhD, Mechanical Engineering, University of Maryland at College Park

Post Graduate Education and Training

2014-2016 Post-Doctoral Fellow, Toronto Rehabilitation Institute, Toronto, ON, Canada
2016-2017 Post-Doctoral Research Associate, University of West Florida, Pensacola, FL
2017-2021 Post-Doctoral Fellow, University of Maryland School of Medicine, Baltimore, MD

Peer-reviewed articles

1. **Borrelli J**, Haslach HW. Compensation for weak hip abductors in gait assisted by a novel crutch-like device. 26th Southern Biomedical Engineering Conference. College Park, MD. 2010:122-125.
2. **Borrelli J**, Haslach HW. Rationale for a modified crutch use methodology for individuals with weak or paralyzed hip abductor muscles. ASME 9th International Conference on Multibody Systems, Nonlinear Dynamics and Control. Portland, OR. 2013:1-11.
3. **Borrelli J**, Haslach HW. Experimental characterization of axillary/underarm interface pressure in swing-through crutch walking. Journal of Rehabilitation Research and Development. 2013; 50:423-436.
4. **Borrelli J**, Creath RA, Pizac D, Hsiao HY, Sanders OP, Rogers MW. Perturbation-evoked lateral steps in older adults: Why take two steps when one will do? Clinical Biomechanics. 2019, 63:41-47.
5. **Borrelli J**, Junod C, Inness EL, Jones S, Mansfield A, Maki BE. Clinical assessment of reactive balance control in acquired brain injury and stroke: A comparison of manual and cable release-from-lean perturbation methods. Physiotherapy Research International, 2019, 24: 1-10.
6. **Borrelli J**, Zabukovec J, Jones S, Junod C, Maki BE. Age-related changes in the capacity to select early-onset upper-limb reactions to either recover balance or protect against impact. Experimental Gerontology. 2019, 125:1-13
7. **Borrelli J,** Creath RA, Rogers, MW. Protective arm reactions are modulated with fall height. Journal of Biomechanics. 2020, 99: 1-10.
8. **Borrelli J**, Komisar V, Novak A, Maki BE, King E. The effect of handrail loads in calculation of the center of pressure location during anteroposterior perturbation. Journal of Biomechanics. 2020: 1-13.
9. Hsiao HY, Gray V, **Borrelli J**, Rogers MW. Biomechanical control of paretic lower limb during imposed weight transfer in individuals post-stroke. Journal of NeuroEngineering. 2020: 17: 1-11.

10. **Borrelli J**, Creath R, Pizac D, Gray V, Rogers MW. Untangling biomechanical differences in perturbation-induced stepping strategies for lateral balance stability in older adults. Journal of Biomechanics. 2021: 114: 1-14.
11. **Borrelli J**, Creath R, Westlake K, Rogers MW. Test-retest reliability of the FALL FIT system for assessing and training protective arm reactions in response to a forward fall. Methods X. 2022: 9: 1-13.
12. **Borrelli J**, Creath R, Westlake K, Rogers MW. Age-related changes in protective arm reaction kinematics, kinetics, and neuromuscular activation during evoked forward falls. Human Movement Science. 2022: 81: 1-13.
13. Shen KH, Prajapati SK, **Borrelli J**, Gray VL, Westlake KP, Rogers MW, Hsiao HY. Neuromechanical Control of Impact Absorption during Induced Lower Limb Loading in Individuals Post-Stroke. Scientific Reports. 2022: 12: 1-12.
14. **Borrelli J**, Creath R, Rogers MW. The timing and amplitude of muscular activity preceding impact, not arm kinematics, is modulated with fall velocity in protective arm reactions. Journal of Biomechanics. 2023: 150: 1-10.
15. Jeon W, **Borrelli J**, Hsiao HY. Effects of visual input absence on balance recovery responses to lateral standing surface perturbations in older and younger adults. Journal of Applied Biomechanics. 2023: 39 (3): 184-192
16. Bruce D, Raich A, Smith G, **Borrelli J**, Lerner. Commonality of failure modes in new program development. American Society for Engineering Education. Baltimore, MD. 2023
17. **Borrelli J**, Creath R, Rogers MW. A method for simulating forward falls and controlling impact velocity. Methods X. 2023: 11: 1-11.
18. Shen KH, **Borrelli J**, Gray VL, Rogers MW, Hsiao HY. Lower limb vertical stiffness and frontal plane angular impulse during perturbation-induced single limb support and their associations with gait in individuals post-stroke. Journal of Biomechanics. 2024: 163: 1-9.
19. Desikan SK, **Borrelli J**, Gray VL, Kankaria AA, Terrin M, Lal BK. Asymptomatic carotid stenosis is associated with mobility dysfunction. Vascular and Endovascular Surgery. Under Review

Articles in final preparation

1. Go R, Bray A, Srour A, Raccioppi J, Nawej T, Jeon W, Hsiao H, Rogers MW, **Borrelli J.** Towards clinical assessment of fall-injury risk: push-off and handgrip strength are associated with the energy absorption capacity of the arms in older adults. To be submitted to Clinical Biomechanics

Podium Presentations

1. **Borrelli J,** Creath RA, Gray V, Westlake K, Rogers, MW. Reactive arm positioning in impact protection strategies. Submitted International Society of Biomechanics/American Society of Biomechanics, Calgary, Canada 2019.
2. Go R, Bray A, Srour A, Raccioppi J, Nawej T, Jeon W, Hsiao H, Rogers MW, **Borrelli J.** Towards clinical assessment of fall-injury risk: push-off and handgrip strength are associated with the energy absorption capacity of the arms in older adults, Posture, Smolenice, Slovakia 2023

Conference Abstracts

1. **Borrelli J**, Zabukovec J, Jones S, Maki BE. The role of the arms and hands in reacting to sudden loss of balance: A new perspective for preventing falls and injury in seniors. Toronto Rehabilitation Institute Research Day, Toronto, ON, 2014.
2. **Borrelli J**, Zabukovec J, Jones S, Maki BE. A new tool for assessing balance reactions. Toronto Rehabilitation Institute Research Day, Toronto, ON, 2014.

3. Duncan CA, Byrne JM, Mansfield A, Ingram TGJ, Jones S, **Borrelli J**, McIlroy W. Every step you take: Reviewing the influence of long-term previous experiences on balance control. National Fall Prevention Conference, Calgary, AB, 2016.
4. Brown C, **Borrelli J**, Inness EL, Mansfield A, Maki BE. Validity of a clinical assessment of reactive balance control in sub-acute acquired brain injury using manual and cable-controlled release-from-lean perturbations. Falls and Mobility Network Meeting, Toronto, ON, 2016.
5. **Borrelli J**, Zabukovec J, Jones S, Junod C, Maki BE. Reactions evoked by sudden loss of balance: Are arm reactions that protect the body during impact wit the ground strategies of last resort? International Society of Posture and Gait, Ft. Lauderdale, FL, 2017.
6. **Borrelli J**, Zabukovec J, Jones S, Junod C, Maki BE. The effect of age on reactions evoked by sudden balance loss: Are arm reactions that protect the body during ground impact strategies of last resort? International Society of Biomechanics, Brisbane, QLD, 2017.
7. **Borrelli J**, Junod C, Inness EL, Jones S, Mansfield A, Maki BE. Clinical assessment of reactive balance control in acquired brain injury and stroke: A comparison of manual and cable release-from-lean perturbation methods. International Society of Biomechanics, Brisbane, QLD, 2017.
8. **Borrelli J**, Katchky A, Maki BE, Wadey V, Gage W, Davey J, and Fernie G. Total knee arthroplasty does not have a clinically significant effect on reactive stepping biomechanics. American Academy of Orthopedic Surgeons Annual Meeting, New Orleans, USA 2018
9. **Borrelli J**, Katchky A, Maki B, Wadey V, Gage W, Davey J, and Fernie G. Total knee arthroplasty does not have a clinically significant effect on reactive stepping biomechanics. Orthopedic Research Society Annual Meeting, New Orleans, USA 2018.
10. **Borrelli J,** Creath RA, Pizac D, Hsiao HY, Sanders O, Inacio M, Savin, DN, Rogers, MW. Perturbation-evoked lateral steps in older adults: Why take two steps when one will do? American Society of Biomechanics, Rochester, USA 2018.
11. Hsiao HY, Gray V, **Borrelli J,** Rogers, MW. Control of lower limb loading individuals with chronic stroke. Submitted International Society of Biomechanics/American Society of Biomechanics, Calgary, Canada 2019.
12. King E, **Borrelli J**, Komisar V, Maki BE, Novak A. Extending the center of pressure to include handhold forces. International Society for Posture and Gait Research, Edinburgh, Scotland 2019.
13. **Borrelli J,** Creath RA, Pizac D, Hsiao HY, Sanders O, Inacio M, Savin, DN, Rogers, MW. Center of mass control differentiates single and multistep lateral protective stepping reactions in older adults. Aging Research Symposium, Baltimore, MD, 2019
14. **Borrelli J**, Straub J, Norton R, Greska E. Arm orientation prior to loss of balance affects fall velocity. University of Maryland Physical Therapy and Rehabilitation Science's Research Day, Baltimore, MD 2019
15. **Borrelli J**, Creath RA, Rogers MW. Neuromuscular responses of protective arm reactions are modulated with fall velocity prior to impact. International Society for Posture and Gait Research, Montreal, Canada 2022
16. Shen KH, Prajapati SK, **Borrelli J**, Gray VL, Westlake KP, Rogers MW, Hsiao HY. Leg Stiffness Regulation during Standing and Its Association with Walking Speed in People with Chronic Stroke. World Congress of Biomechanics, Taipei, Taiwan 2022.
17. Jean W, **Borrelli J**, Hsiao HY. Effects of visual input absence on balance recovery Responses to lateral standing surface perturbations in older and younger adults. American College of Sports Medicine, Denver, CO 2023
18. Bray A, Srour A, Raccioppi J, **Borrelli J**. Towards Clinical Assessment Of Fall-Injury Risk. American Society of Biomechanics East Coast, Reading, PA, USA

19. Srour A, Bray A, Raccioppi J, **Borrelli J**. Characterizing Age-Related Changes In Muscle Activation And Energy Absorption/Development To Prevent Fall Injury Risk. American Society of Biomechanics East Coast, Reading, PA, USA
20. Borrelli J, Creath RA, Rogers MW. A method for simulating forward falls and controlling and predicting impact velocity. International Society for Posture and Gait Research, Brisbane, Australia 2023
21. Raccioppi J,Bray A, Srour A, **Borrelli J**. Association of Age-Related Changes in: Mobility, Balance, and Maximum Force with Fall Injury Risk. Biomedical Engineer Society, Seattle, WA, USA

Invited Talks

1. Slips, trips, falls, and crutches, Department of Mechanical Engineering, University of Maryland at College Park, MD Nov 2017.
2. Slips, trips, falls, and crutches, Physical Therapy and Rehabilitation Science, University of Maryland School of Medicine, Baltimore, MD, Oct 2017.
3. Center of mass control differentiates single and multistep lateral protective stepping reactions in older adults, University of Maryland School of Medicine Research Day, Baltimore, MD, May 2019.
4. Arm reactions when falling and the effect of age on strategy selection, Physical Therapy and Rehabilitation Science, University of Maryland School of Medicine, Baltimore, MD, October 2019.
5. The legs AND the arms play a role in recovering balance and preventing injury when falling, Department of Kinesiology, University of Maryland at College Park, Baltimore, MD, October 2019.
6. The functional role of the legs and the arms in recovering balance and preventing injury, Department of Kinesiology, Westmont College, Santa Barbara, CA, October 2020.

Workshops

1. Goodworth A, **Borrelli J,** Cuddeford T, Nashner L, Robins, B. Pursuing an industry position after graduate school, International Society for Posture and Gait, Edinburgh, Scotland 2019.

Grants

1. Bergbreiter S, **Borrelli J**, et al. Campus Student Technology Fee Proposal, University of Maryland at College Park Internal Grant ($33,000, 2013)
2. 2022 EMERGE In-Person Workshop Travel Grant award (~$1500)
3. Principle Investigator, Stevenson Summer Scholars Research Program ($14,000 in direct costs, 2023)
4. Principle Investigator, Stevenson Summer Scholars Research Program ($14,000 in direct costs, 2024)

Awards

1. Distinguished Teaching Assistant Award, University of Maryland at College Park (2006)

Research Support

1. Post-Doctoral Research Fellow, NIA/NIH: Hip Muscle Power, Lateral Balance Function, and Falls in Aging; 5R01AG060051-02 (50%, 2019-2021)
2. Post-Doctoral Research Fellow, NIA/NIH: Neuromuscular and Biomechanical Control of Lower Limb Loading in Individuals with Chronic Stroke; 5R21AG060034-02 (50%, 2019-2021)

3. Post-Doctoral Research Fellow, University of Maryland Advanced Neuromotor Rehabilitation Research Training, National Institute on Disability, Independent Living, and Rehabilitation Research (100%, 2017- 2019)
4. Post-Doctoral Research Associate, University of West Florida, Exercise Science and Community Health, Center for Research and Opportunity (100%, 2016-2017)
5. Post-doctoral fellow, Canadian Institutes of Health Research, CIHR Team for the Development, Testing and Knowledge Translation of Innovative approaches to Optimize Gait and Balance of Older Adults (100%, 2013-2015)
6. Co-investigator, Maryland industrial partnership with Orthotic Mobility Systems, MIPS Orthotic Mobility #2804, Improved Mobility System for Children with Neurological Disorder (100%, 2003-2006)

Patents

1. Tiltable underarm support mechanism and crutch-like mobility assist device using same. US 20070144567 A1
2. Crutch-like mobility assist device with rotatable footer assembly. US 20070144568 A1

Professional Society Membership

2009-present	Member, Sigma Xi
2011-present	Member, Phi Kappa Phi
2013-present	Member, American Society of Mechanical Engineers
2016-present	Member, International Society of Posture and Gait
2016-present	Member, International Society of Biomechanics
2018-present	Member, American Society of Biomechanics

National Service

2010	Ad Hoc Reviewer, Experimental Mechanics (1x/yr), Biomedical Engineering Conference (1x/yr)
2010	Co-Chair Kinematics Session, Southern Biomedical Engineering Conference
2013	Ad Hoc Reviewer, ASME IDETC/CIE Conference (1x/yr)
2013	Co-Chair Biomechanics-Human Motion Session, ASME IDETC/CIE Conference
2014	Ad Hoc Reviewer, Physical Therapy in Sport (1x/yr)
2017	Ad Hoc Reviewer, Public Library of Science (PLOS One) (1x/yr)
2017	Ad Hoc Reviewer, Journal of Neurophysiology (1x/yr)
2018	Ad Hoc Reviewer, Physiotherapy Research International (1x/yr)
2018	Ad Hoc Reviewer, PLOS One (2x/yr)
2018	Ad Hoc Reviewer, Physiotherapy Research International (1x/yr)
2018	Ad Hoc Reviewer, Journal of Biomechanics(1x/yr)
2019	Ad Hoc Reviewer, Journal of Biomechanics(2x/yr)
2020	Ad Hoc Reviewer, Archives of Physical Medicine and Rehabilitation (1x/yr)
2020	Ad Hoc Reviewer, Journal of Biomechanics (2x/yr)
2020	Ad Hoc Reviewer, Frontiers (1x/yr)
2021	Ad Hoc Reviewer, Wearable Technologies (1x/yr)
2021	Ad Hoc Reviewer, Journal of Biomechanics (5x/yr)
2021	Ad Hoc Reviewer, Gait & Posture (1x/yr)
2021	Ad Hoc Reviewer, Frontiers (4x/yr)
2022	Ad Hoc Reviewer, Frontiers (2x/yr)
2022	Ad Hoc Reviewer, Journal of Electromyography and Kinesiology (1x/yr)
2022	Ad Hoc Reviewer, Journal of Neurophysiology (1x/yr)
2023	Ad Hoc Reviewer, Experimental Brain Research (2x/yr)

2023 Ad Hoc Reviewer, Journal of Biomechanics (3x/yr)
2023 Ad Hoc Reviewer, Journal of Motor Control (1x/yr)
2023 Ad Hoc Reviewer, Methods X (2x/yr)

Institutional Service

2012-2013 Chair, Electronics and Instrumentation Course Suite Redesign Committee, University of Maryland at College Park
2015 PhD Poster Judge, Toronto Rehabilitation Institute Research Day
2017 Host, Student Scholars Symposium and Faculty Research Showcase at UWF
2023 Member, Intercultural Knowledge and Competency Committee
2023 Member, Academic Affairs Committee

Academic Appointments

2003 Research Assistant, Mechanical Engineering, University of Maryland College Park
2003-2005 Research Assistant, Mechanical Engineering, University of Maryland College Park
2005-2011 Teaching Assistant, Mechanical Engineering, University of Maryland College Park
2011 Lecturer, Mechanical Engineering, University of Maryland at College Park
2012-2013 Research Associate, Mechanical Engineering, University of Maryland College Park
2014-2016 Post-Doctoral Fellow, Toronto Rehabilitation Institute
2016-2017 Post-Doctoral Research Associate, University of West Florida
2017-2021 Post-Doctoral Fellow, University of Maryland School of Medicine
2020 Adjunct Professor, University of Maryland, College Park
2021-Current Assistant Professor, Stevenson University

Teaching

2005 Teaching (student) Assistant, Electronics and Instrumentation I
30 2nd/3rd year Mechanical Engineering Students, 1 contact hour/week x 2 sections
2006 Teaching (student) Assistant, Statics (Fall), Statistics (Spring),
30 2nd year Mechanical Engineering Students, 1 contact hour/week x 3 sections
2007-2009 Teaching (student) Assistant, Electronics and Instrumentation I
30 2nd/3rd year Mechanical Engineering Students, 1 contact hour/week x 2-3 sections
2009-2011 Teaching (student) Assistant, Electronics and Instrumentation II
30 3rd year Mechanical Engineering Students, 1 contact hour/week x 2-3 sections
2011 Lecturer, Electronics and Instrumentation II Summer Session
8 3rd year Mechanical Engineering Students, 4 contact hours/week
2011 Lab Manager, Electronics and Instrumentation I and II, >300 3rd year undergraduate Mechanical Engineering Students, 30 contact hours/week
2018 Lab Assistant, Neuromuscular I, 30 Doctor of Physical Therapy Students,
3 contact hours/semester
2018 Lab Assistant, Neuromuscular II, 30 Doctor of Physical Therapy Students,
3 contact hours/semester
2019 Lab Assistant, Basic Sciences III, 30 Doctor of Physical Therapy Students,
9 contact hours/semester
2019 Seminar Facilitator, Medical Issues, 15 Doctor of Physical Therapy Students,
5 contact hours/semester
2020 Seminar Facilitator, Neuromuscular II, 15 Doctor of Physical Therapy Students,
4 contact hours/semester

2020 Seminar Facilitator, Basic Science III, 15 Doctor of Physical Therapy Students, 1 contact hour/semester
2020 Adjunct Professor, Mechanical Engineering, Assistive Robotics, 30 3rd/4th year undergraduate Mechanical Engineering Students, 3 contact hours/week
2021 Assistant Professor, Biomedical Engineering, Biomechanics, 2 3rd year undergraduate Biomedical Engineering Students, 6 contact hours/week
2021 Assistant Professor, Biomedical Engineering, Introduction to Mathematical Reasoning, 23 1st year undergraduate students, 3 contact hours/week
2021 Assistant Professor, Biomedical Engineering, Introduction to Biology, 23 1st year undergraduate students, 3 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Biofluids, 5 3rd year undergraduate Biomedical Engineering Students, 6 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Introduction to Mathematical Reasoning, 13 1st year undergraduate students, 3 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Biomaterials, 1 3rd year undergraduate Biomedical Engineering Students, 6 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Internship, 1 3rd year undergraduate Biomedical Engineering Students, 6 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Biomechanics, 4 3rd year undergraduate Biomedical Engineering Students, 6 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Bioinstrumentation, 3 4th year undergraduate students, 3 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Independent Research, 4 3rd/4th year undergraduate Biomedical Engineering Students, 6 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Biofluids, 5 3rd year undergraduate Biomedical Engineering Students, 6 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Independent Research, 1 4th year undergraduate students, 3 contact hours/week
2022 Assistant Professor, Biomedical Engineering, Biomaterials, 5 3rd/4th year undergraduate Biomedical Engineering Students, 6 contact hours/week
2023 Assistant Professor, Biomedical Engineering, Biomechanics, 4 3rd year undergraduate Biomedical Engineering Students, 6 contact hours/week
2023 Assistant Professor, Biomedical Engineering, Bioinstrumentation, 5 3rd/4th year undergraduate students, 6 contact hours/week
2023 Assistant Professor, Biomedical Engineering, Independent Research, 2 4th year undergraduate Biomedical Engineering Students, 6 contact hours/week

Employment History

2004 Consultant, Engineering Design, Orthotic Mobility Systems
2013 Associate, Expert Legal Witness, Robson Forensic