**Nathaniel H. Hunt, PhD**

Associate Professor

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**Research Interests**

Biomechanics, Motor Control, Motor Learning, Balance Recovery, Bioinspired Robotics

**Professional Preparation**

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| --- | --- | --- |
| 2012.7-2017. 5 | University of California, Berkeley  Poly-PEDAL Lab  Center for Interdisciplinary Bio-Inspiration in Education and Research  Dissertation: *Cognitive Biomechanics of Arboreal Locomotion* | PhD  Integrative Biology  NSF CiBER-IGERT Fellow  UC Berkeley Chancellor’s Fellow  Advisor: Robert J. Full |
| 2010.5-2012.5 | University of Nebraska, Omaha  Nebraska Biomechanics Core Facility  Thesis: *Manipulating Gait Variability with Fur Elise: Chaotic and Fractal Variations* | MS Exercise Science  Advisor: Nicholas Stergiou |
| 2002.5-2010.5 | University of Nebraska, Lincoln | B.S. Physics  Track: Computational Methods  Minor Mathematics |
| 2006.8 | Henry H Lind Non-Commissioned Officer Academy | Rank: Sergeant  Honor Graduate |
| 2004.5-2005.8 | Deployed in Operation Iraqi Freedom | Iraq Campaign Medal  Global War on Terrorism Service Medal |

**Funded Awards**

2019-2025 NIH Centers of Biomedical Research Excellence – P20GM109090-08, 5786

Sub-project: *Variability and Specificity in Reactive Stabilization Movements to Diverse Slip Perturbations*

Total Awarded: $10,990,584

Award Attributable to N. Hunt: $636,610

Primary Investigator: Nicholas Stergiou

Research Lead: **Nathaniel Hunt**

2019-2021 NU Collaboration Initiative, Seed Grant

*Performance Tradeoffs in Agile Arboreal Locomotion*

Total Awarded: $149,500

Principal Investigator: **Nathaniel Hunt**

2019-2022 NIH R15 - R15AG063106

*Mechanisms of Fall Resistance to Diverse Slipping Conditions*

Total Awarded: $420,108

Principal Investigator: **Nathaniel Hunt**

2012-2017 Chancellor’s Fellowship, University of California, Berkeley

2012-2015 Center for Interdisciplinary Bio-Inspiration in Research and Education Fellowship, National Science Foundation

2015 Fellowship of Graduate Student Travel, Society for Integrative and Comparative Biology

2014 Mentoring Summer Undergraduate Research Fellowship

2012 NASA Nebraska Travel Grant

2011-2012 NASA Nebraska Fellowship

2011 NASA Nebraska Travel Grant

2010-2011 NASA Nebraska Fellowship

**Publications**

(\* indicates students in by lab)

**Book Chapters**

Published

1. **Hunt, NH**. (2018). Autocorrelation, Mutual Information, and Correlation Dimension. In N. Stergiou (Ed.), *Nonlinear Analysis for Human Movement Variability* (pp. 301-342), Boca Raton, LA: CRC Press.

**Journal Publications**

Published in Peer-Reviewed Scientific Journals

1. Yentes J, **Hunt NH**, Schmidt K, Kaipust J, McGrath D, Stergiou N. The appropriate use of approximate entropy and sample entropy with short data sets. *Annals of Biomedical Engineering*, 41(2): 349-365, 2013.
2. **Hunt NH**, McGrath D, Stergiou N. The influence of auditory motor coupling on fractal dynamics in human gait. *Scientific Reports*, 4: 5879, 2014.
3. Decker LM, Cignetti F, **Hunt NH**, Potter JF, Stergiou N, Studenski SA. Effects of aging on the relationship between cognitive demand and step variability during dual-task walking. *Age*, 38(4): 363-375, 2016.
4. Full RJ, Jayaram K, Li C, Naik S, **Hunt NH**, Lee C. Bio-Inspired principles of extended terrain mobility, *Micro Autonomous Systems and Technology*, 2017.
5. Ouattas A\*, Wellsandt E, **Hunt NH**, Boese CK, Knarr BA. Comparing single and multi-joint methods to detect knee joint proprioception deficits post primary unilateral total knee arthroplasty. *Clinical Biomechanics*, 68: 197-204, 2019.
6. Rasmussen CM\*, **Hunt NH**. A novel wearable device to deliver unconstrained, unpredictable slip perturbations during gait. *Journal of NeuroEngineering and Rehabilitation*, 16(1): 118, 2019.
7. Rasmussen CM\*, **Hunt NH**. Unconstrained slip mechanics and stepping reactions depend on slip onset timing. *Journal of Biomechanics*, 110572, 2021.
8. **Hunt NH**, Jinn J, Jacobs LF, Full RJ. Acrobatics squirrels learn to leap and land on tree branches without falling. *Science*, 373(6555): 697-700, 2021.
9. Parker SM, Crenshaw J, **Hunt NH**, Burcal C, Knarr BA. Outdoor walking exhibits peak ankle and knee flexion differences compared to fixed and adaptive-speed treadmills in older adults. *Biomedical Engineering Online*, 20 (1): 1-15, 2021.
10. Salazar DA, Cramer J, Markin NW, **Hunt NH**, Linke G, Siebler J, Zuniga J. Comparison of 3d printed anatomical model qualities in acetabular fracture representation. *Annals of Translational Medicine*, 10 (7), 2022.
11. Ouattas A\*, Rasmussen CM\*, **Hunt NH**. Severity of unconstrained simultaneous double-limb slips: The impact of frontal plane feet velocities relative to the center of mass to classify slip-related falls and recoveries. *Frontiers in Public Health*, 2022.
12. Rasmussen CM\*, Curtze C, Mukherjee M, **Hunt NH**. Slipping mechanics during walking along curved paths depend on the biomechanical context at slip onset. *Scientific Reports*, 12 (1), 2022.
13. Rasmussen CM, Mun S, Ouattas A, Walski A, Curtze C, **Hunt NH**. Curvilinear walking elevates fall risk and modulates slip and compensatory step attributes after unconstrained human slips. *Journal of Experimental Biology*, 227 (6), 2024.
14. Engsberg CP, **Hunt NH**, Barlow S, Mukherjee M. Effect of Vibro-Tactile Stimulation Sequence and Support Surface Inclination on Gait and Balance Measures. *Brain Sciences*, 15 (2), 138, 2025.
15. Lee S, Wang S, Kuang D, Wang E, Yim J, **Hunt NH**, Stuart H, Fearing R, Full RJ. Free-ranging squirrels perform stable, above-branch landings by balancing using leg force and nonprehensile foot torque. *Journal of Experimental Biology,* 228 (7), 2025.
16. Yim JK, Wang EK, Lee SD, **Hunt NH**, Full RJ, Fearing RS. Monopedal robot branch-to-branch leaping and landing inspired by squirrel balance control. Science Robotics, 10 (100), 2025.

Published in Non-Peer-Reviewed Scholarly Journals

1. Jacobs L, **Hunt NH**, Full RJ. We used peanuts and a climbing wall to learn how squirrels judged their leaps so successfully – and how their skills could inspire more nimble robots. *The Conversation*, 2021.

**Published Conference Abstracts**

1. **Hunt NH**, Hammond A, Burnett NP, Pritchard-Berman M, Full R.J., Stability of Cockroaches Running Rapidly on Rigid Rods. *Integrative and Comparative Biology*, 54, E97-E97, 2014.
2. **Hunt NH**, Jinn J, Libby T, Jacobs LF, Full RJ, Learning to launch: targeted leaping from a dynamic obstacle in squirrels, *Integrative and Comparative Biology*, 55, E85-E85, 2014.
3. **Hunt NH**, Frendberg-Mates E, Jinn J, Robin A, Jacobs LF, Full RJ, Squirrels Running on Compliant Branches, *Integrative and Comparative Biology*, 57, E299-E299, 2017.
4. Lee CY, **Hunt NH**, Full RJ, Rod Running Performance and Inter-Leg Coordination is Unchanged by Inversion, *Integrative and Comparative Biology*, 57, E299-E299, 2017.
5. **Hunt NH**, Jinn J, Robin A, Lee CY, Fajardo I, Huang J, Jacobs LF, Full RJ, Squirrel Parkour: wall-jump maneuver adds intermediate control point to ballistic trajectories, *Integrative and Comparative Biology*, 56, E305-E305, 2017.
6. Wang LK, Ruopp R, **Hunt NH**, Nguyen A, Full RJ. Effect of motivation on sequential jump strategy in fox squirrels. *Integrative and Comparative Biology*, 61, E959-E960, 2021.
7. Lee S, Wang S, Kuang D, Yim J, Wang E, **Hunt NH**, Stuart H, Full RF. Free-ranging squirrels stabilize branch landing using nonprehensile, palmar foot grasps. *Integrative and Comparative Biology*, 64, S295-S295, 2024.
8. Engsberg C, **Hunt NH**, Mukherjee M. Gait kinematics dependent plantar stimulation. *Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. 2024.

**Invited Lectures**

1. **Hunt NH**. Dynamic Balance in Humans, Squirrels and Cockroaches. *UNMC Physiology Seminar*. Omaha, Nebraska. 2019.

**Conference Oral Presentations**

1. **Hunt NH**, Stergiou N, Effects of Chaotic Music on Movement Patterns. *Proceedings of the 121st Nebraska Academy of Sciences Annual Meeting*. Lincoln, Nebraska. 2011.
2. **Hunt NH**, Stergiou N, Investigating the Effects of Various Kinds of Chaotic Auditory Stimulus on the Walking Patterns of Both Human Subjects and a Computer Model. *Proceedings of the 121st Nebraska Academy of Sciences Annual Meeting*. Lincoln, Nebraska. 2012.
3. **Hunt, NH**, Haworth, J., McGrath, D., Myers, S., Stergiou, N., Manipulation of the Structure of Gait Variability with Rhythmic Auditory Stimulus. *Proceedings of the American Society of Biomechanics*. 2012 Meeting. Gainesville, Florida, August 2012.
4. Schieber M, Decker L, **Hunt NH**, Myers SA, Aging Impacts Structure of Gait Variability While Dual-Tasking, *The Gerontological Society of America*. Orlando, Florida, November 2015.
5. Liu X, Decker L, **Hunt NH**, Myers SA, The variability of minimum toe clearance decreases in both healthy young and healthy older adults during dual-task treadmill walking, *The Gerontological Society of America*. Orlando, Florida, November 2015.
6. Rasmussen CM\*, **Hunt NH**. Slip Onset Phase Influences Slipping Mechanics and Stepping Responses. *American Society of Biomechanics & International Society of Biomechanics*, Calgary 2019.
7. Rasmussen CM\*, Walski A\*, Sanwick C\*, **Hunt NH**. Slip Context Influences Experienced Slip Mechanics During Turning. *Human Movement Variability*, Omaha, Nebraska, 2020.
8. Rasmussen CM\*, Ouattas A\*, **Hunt NH**. Slip-and-fall risk posed by sloped walking surfaces. *North American Conference on Biomechanics*. Ottawa, Ontario, Canada, 2022.
9. Ouattas A\*, Rasmussen CM\*, **Hunt NH**. Kinematic factors that best discriminate falls from recoveries following unconstrained slips. *North American Conference on Biomechanics*. Ottawa, Ontario, Canada, 2022.
10. Niemeyer KL, **Hunt NH**. One Step At A Time: Recovering balance with real-time auditory biofeedback. *Great Plains Biomechanics*. Omaha, Nebraska, 2023.

**Conference Posters**

1. **Hunt NH**, Decker L, Stergiou N, Phonological dual-task interference affects walking regularity. University of Nebraska Centennial Celebration of Student Research and Creative Activity. Omaha, Nebraska, April 2011.
2. McGrath, D., Wurdeman, S., Yentes, J., **Hunt NH**, Myers, S., Stergiou, N. Metabolic Cost of Postural Control During a Perturbed Gait Task is Related to Gait Variability. Proceedings of the American Society of Biomechanics 2012 Meeting. Gainesville, Florida, August 2012.
3. Renz J, Vallabhajosula S, **Hunt NH**, Chien J, Stergiou N, Differences in Stride Interval Variability During Stair-Climbing and Treadmill Walking. Proceedings of the American Society of Biomechanics 2012 Meeting. Gainesville, Florida, August 2012.
4. Vallabhajosula S, Renz J, Chien J, **Hunt NH**, Stergiou N, Influence of Stepping Rate on Stride Interval Variability of Stair Climbing. Proceedings of the American Society of Biomechanics 2012 Meeting. Gainesville, Florida, August 2012.
5. **Hunt NH**, Stergiou, N, Manipulation of the Structure of Gait Variability with Rhythmic Auditory Stimulus. *Society for Integrative and Comparative Biology*. San Francisco, California, 2015.
6. **Hunt NH**, Jinn J, Libby T, Jacobs LF, Full RJ, Learning to launch: error-based learning drives changes in performance variables, *Society for Integrative and Comparative Biology*. Portland, Oregon, 2015.
7. Rasmussen CM\*, Walski A\*, Brozek K\*, **Hunt NH**. Functional Characteristics of the Wearable Apparatus for Slipping Perturbations. *Rocky Mountain American Society of Biomechanics*. Estes Park, Colorado, 2018.
8. Rasmussen CM\*, **Hunt NH**. Development of a Wearable Device to Administer Variable, Ecologically Valid Slips. *Human Movement Variability Conference*. Omaha, Nebraska, 2018.
9. Brozek K\*, **Hunt NH**. Design Improvements on a Wearable Apparatus for Slipping Perturbations (WASP). *Human Movement Variability*. Omaha, Nebraska, 2018.
10. Walski A\*, Rasmussen CM\*, **Hunt NH**. Development of a Wearable Apparatus for Slip Perturbations. *Human Movement Variability Conference*. Omaha, Nebraska, 2019.
11. Rasmussen CM\*, **Hunt NH**. The Time of Slip Onset During Stance Influences the Characteristics of Unconstrained Perturbation. *Human Movement Variability Conference*. Omaha, Nebraska, 2019.
12. Walski A\*, Rasmussen CM\*, **Hunt NH**. Improvements on the Wearable Apparatus for Slip Perturbations. *Human Movement Variability Conference*. Omaha, Nebraska, 2020.
13. Goo M\*, **Hunt NH**. Markerless Tracking of Rapid Cockroach Running with Deep Learning. *Human Movement Variability Conference*. Omaha, Nebraska, 2020.
14. Ouattas A\*, Rasmussen CM\*, **Hunt NH**. Validation of Simultaneous Double-Limb Slips in Younger and Older Adults. *Human Movement Variability Conference*. Omaha, Nebraska, 2020
15. Sanwick C\*, Rasmussen CM\*, **Hunt NH**. The Effects of Auditory Cueing on Reactive Movements to Balance Disturbances. *Human Movement Variability Conference*. Omaha, Nebraska, 2020.
16. Mun S\*, Ouattas A\*, Sanwick C\*, Rasmussen C\*, **Hunt NH**. The effects of reactive movements to simultaneous balance disturbances. *North American Conference on Biomechanics*. Ottawa, Ontario. 2022
17. Mun S\*, Rasmussen CM\*, **Hunt NH**. Adaptation to repeated mediolateral foot placement perturbations. *Rocky Mountain American Society of Biomechanics*. Estes Park, Colorado, 2022.
18. Mun S, **Hunt NH**. Adaptation to the Repeated Mediolateral Foot Placement Perturbations. *Great Plains Biomechanics*. Omaha, Nebraska, 2023.
19. Niemeyer KL, **Hunt NH**. Dynamic Lateral Stability During Platform Perturbed Treadmill Walking. *American Society of Biomechanics*. Knoxville, Tenessee, 2023.
20. Mun S, Rasmussen CM, **Hunt NH**. Repetitive Mediolateral Perturbations Induces Motor Adaptation in Wider But Not Narrower Step Width. *Rocky Mountain American Society of Biomechanics*. Estes Park, Colorado, 2024.
21. Mun S, Rasmussen CM, **Hunt NH**. Rapid Adjustments in Step Width and Center of Mass Coordination During Perturbation Walking. *American Society of Biomechanics*. Madison, Wisconsin, 2024.

**Teaching Experience**

2012, Summer Nonlinear Analysis, BMCH 8100, University of Nebraska, Omaha

2016, Spring Teaching Assistant, Bio-Inspired Design, IB32, University of California, Berkeley

2017, Spring Teaching Assistant, Bio-Inspired Design, IB32, University of California, Berkeley

2018, Spring Bioinspired Robotics, BMCH 4100, University of Nebraska, Omaha

2018, Summer Biomechanics, BMCH 4630, University of Nebraska, Omaha

2018, Summer Nonlinear Analysis, BMCH 8100, University of Nebraska, Omaha

2019, Spring Bioinspired Robotics, BMCH 4100/8106, University of Nebraska, Omaha

2019, Summer Nonlinear Analysis, University of Nebraska, Omaha

2020, Spring Bioinspired Robotics, BMCH 4100/8106, University of Nebraska, Omaha

2020, Fall Methods in Biomechanics 1, BMCH 4200/8206, University of Nebraska, Omaha

2021, Spring Bioinspired Robotics, BMCH 4100/8106, University of Nebraska, Omaha

2021, Fall Methods in Biomechanics 1, BMCH 4200/8206, University of Nebraska Omaha

2022, Spring Bioinspired Robotics, BMCH 4100/8106, University of Nebraska Omaha

2022, Fall Methods in Biomechanics 1, BMCH 4200/8206, University of Nebraska Omaha

2023, Spring Bioinspired Robotics, BMCH 4100/8106, University of Nebraska Omaha

2023, Fall Methods in Biomechanics 1, BMCH 4200/8206, University of Nebraska Omaha

2024, Spring Bioinspired Robotics, BMCH 4100/8106, University of Nebraska Omaha

2024, Fall Methods in Biomechanics 1, BMCH 4200/8206, University of Nebraska Omaha

2025, Spring Bioinspired Robotics, BMCH 4100/8106, University of Nebraska Omaha

**Reviewer Responsibilities**

**Journal Article Reviews**

Chaos

Motor Control

International Conference on Intelligent Robotics

Journal of Biomechanics

Journal of Applied Biomechanics

GeroScience

Gait & Posture

Science Robotics

Sensors

Journal of Biomechanical Engineering

**Professional Affiliations**

2012-Present American Society of Biomechanics

2014-Present Society of Integrative and Comparative Biology