Owen N. Beck, Ph.D.

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Human Locomotion Lab
GoogleScholar Profile

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Austin, Texas, 78712
Updated: Oct. 1st 2026

EDUCATION & PROFESSIONAL APPOINTMENTS

Assistant Professor, Kinesiology & Health Education 2023 -
University of Texas at Austin
Director, The Human Locomotion Lab

McCamish Postdoctoral Fellow, Biomedical Engineering 2021 - 2022
Emory University (PI: Lena H. Ting, Ph.D.)

NIH Postdoctoral Fellow, Mechanical Engineering 2018 - 2021
Georgia Institute of Technology (PI: Gregory S. Sawicki, Ph.D.)

Ph.D. Integrative Physiology 2014 - 2017
University of Colorado Boulder (PI: Alena M. Grabowski, Ph.D.)

B.S. Kinesiology 2009 - 2013
Humboldt State University (PI: Justus D. Ortega, Ph.D.)

PROFESSIONAL APPOINTMENTS (Secondary)

Affiliate Faculty, Cellular to Clinically Applied Rehabilitation Research & Engineering 2026 -
University of Texas at Austin

Adjoint Professor, Translation Science Graduate Program 2023 -
University of Texas at San Antonio

Affiliate Faculty, Center on Aging and Population Sciences 2023 -
University of Texas at Austin

PEER-REVIEWED ARTICLES

Lab Mentee (**) & Mentor (*)
Corresponding Author (†)

h-index: 19 || Citations: >1800

In Review

- Tang H.,** McMahon N., Heydemann J.A., GoodBody C.M., Little-Letsinger S.E., Baxter J.R., **Beck O.N.† (**In Review**)** Limb Lengthening Induces Substantial Muscle Remodeling in Humans
- Zhao N.,** Miller R.H., Griffin L., **Beck O.N.† (**In Review**)** Neuromodulation Induces More Youthful Walking Mechanics and Energetics in Older Adults

Published

41. Tang H.,** **Beck O.N.†** (2026) Foot-Stiffening Socks Reduce the Metabolic Cost of Walking. *Proceedings of the Royal Society B: Biological Sciences.*
40. Him J.H., Rastogi R., Martino G., **Beck O.N.**, Shepherd M.K., Sawicki G.S.,* Ting L.H.,* Jakubowski K.L.† (2026) More Isn't Always Better: Higher Exoskeleton Torque Does Not Consistently Improve Balance Performance. *Journal of Biomechanics*
39. Miller R.H., Zhao N.,** **Beck O.N.† (**2026**)** Priming the Plantarflexors with Electrical Stimulation Induces More Economical Walking. *Journal of the Royal Society Interface*

38. Joubert D.P.,† **Beck O.N.,** Hayden L., & Cohan A. (2026) Running Economy Benefits of Advanced Footwear Technology are Similar for Treadmill and Overground Running. *Translational Journal of the American College of Sports Medicine.*

38. Escalante Y.R., **Beck O.N.,** Lei Y.† (2026) Dissociable Roles of Primary Motor and Supplementary Motor Cortex in Shaping the Neural Drive to Muscle. *Journal of Neurophysiology*. 136:1121-1132

37. Renninger K.,** **Beck O.N.**† (2026) Shoe Heel-Toe Drop Affects Running Economy. *Journal of Applied Physiology.* 141(1), 280-290

35. Alanis B.M.,** Fallah N.,** Mistry A.,** **Beck O.N.**† (2026) Older Adults Produce Joint Moments Less Economically Than Young Adults. *Journal of Applied Physiology.* 140(2), 558-563

34. Zhao N.,** Miller R.H., Griffin L., **Beck O.N.**† (2026) Functional Electrical Stimulation of the Soleus Attenuates Distal-to-Proximal Redistribution During Walking in Older Adults. *Journal of Applied Physiology.* 140(1), 229-235

33. Tang H.,** Heydemann J.A., McHorse K., McMahon N., **Beck O.N.**† (2025) Limb Lengthening: Slower Distraction Rates May Expedite Patient Joint Recovery. *Journal of Applied Physiology.* 139(6): 1649-1654

32. Tang H.,** **Beck O.N.**† (2025) Wrapping the Transverse Foot Arch Improves Running Economy. *Journal of Experimental Biology*. 228(15): jeb250566

31. Fallah N.,** **Beck O.N**.† (2025) The Metabolic Cost of Producing Joint Moments is Greater at the Hip vs. Ankle. *Journal of Experimental Biology.* 228 (2): jeb249738
    - Featured article: Inside JEB: doi.org/10.1242/jeb.250170

30. Jakubowski K.L., Martino, G., **Beck O.N.,** Sawicki G.S.,* Ting L.H.* (2025) Center of Mass States Render Multi-Joint Torques Throughout Standing Balance Recovery. *Journal of Neurophysiology.* 133(1):206-221

29. **Beck O.N.,**† Schroeder, J.N., Sawicki G.S.* (2024) Habitually Wearing High Heels May Improve User Walking Economy in Any Footwear. *Journal of Applied Physiology.* 136:3, 567-572. doi.org/10.1152/japplphysiol.00016.2024
    - APSselect, April 2024. Top 8 Articles across all American Physiology Society Journals. https://journals.physiology.org/apsselect/archives.2024#april

28. Martino G.,† **Beck O.N.,** Ting L.H.†* (2023) Voluntary Muscle Coactivation in Quiet Standing Elicits Reciprocal Rather Than Coactive Agonist-Antagonist Control of Reactive Balance in Young Adults. *Journal of Neurophysiology.* 129:6, 1378-1388

27. Zhang-Lea J.H.,† Tacca J.R., **Beck O.N.,** Taboga P., Grabowski A.M.* (2023) Prosthetic Legs Run Shorter Than Biological Legs. *Scientific Reports.* 11;13(1):7679. doi: 10.1038/s41598-023-34346-x.

26. Gill P.K.,† Kipp S., **Beck O.N.,** Kram R. (2023) It is time to abandon single-value oxygen uptake energy equivalents. *Journal of Applied Physiology.* 134(4), 887-890

25. **Beck O.N.,**† Shepherd M.K., Rastogi R., Martino G., Ting L.H.,* Sawicki G.S.* (2023) Exoskeletons Need to React Faster than Physiological Responses to Improve Standing Balance. *Science Robotics*. 8, eadf1080, doi:10.1126/scirobotics.adf1080
    - Featured *Science Robotics* Cover Article

24. Allen S.A.,† **Beck O.N.,** Grabowski A.M.* (2022) Evaluating the "Cost of Generating Force" Hypothesis Across Frequency in Human Running and Hopping. *Journal of Experimental Biology.* 225(18): jeb244755. doi.org/10.1242/jeb.244755

23. **Beck O.N.,**† Trejo, L.H., Schroeder, J.N., Franz J.R., Sawicki G.S.* (2022) Shorter Muscle Fascicle

Operating Lengths Increase the Metabolic Cost of Cyclic Force Production. *Journal of Applied Physiology.* 133:3, 524-533. doi.org/10.1152/japplphysiol.00720.2021

22. Tacca J.R.,† **Beck O.N.,** Taboga P., Grabowski A.M.* (2022) Running-Specific Prosthesis Model, Stiffness, and Height Affect Biomechanics and Asymmetry of Athletes with Unilateral Leg Amputations Across Velocities. *Royal Society Open Science.* **9:** 211691. 211691
21. **Beck O.N.,** Taboga P., Grabowski A.M.*† (2022) Sprinting with Prosthetic versus Biological Legs: Insight from Experimental Evidence. *Royal Society Open Science.* **9:** 211799. 211799
20. Krupenevich R.L.,† **Beck O.N.,** Sawicki G.S.,* Franz J.R. (2021) Reduced Achilles Tendon Stiffness Disrupts Calf Muscle Neuromechanics in Elderly Gait. *The Journals of Gerontology: Series A*. 68:241–251
19. **Beck O.N.,**† Golyski P.R., Sawicki G.S.* (2020) Adding Carbon Fiber to Shoe Soles May Not Improve Running Economy: A Muscle-Level Explanation. *Scientific Reports*. 10:17154
18. **Beck O.N.,** Gosyne J., Franz J.R., Sawicki G.S.* (2020) Cyclically Producing the Same Average Muscle-Tendon Force with a Smaller Duty Increases Metabolic Rate. *Proceedings of the Royal Society B: Biological Sciences*. 287:20200431
17. Alcantara R.S.,† **Beck O.N.,** Grabowski A.M.* (2020) Lower Limb Mass Does Not Affect Biomechanical Asymmetry But Increases Metabolic Power in Runners With a Unilateral Transtibial Amputation. *European Journal of Applied Physiology*. 120, 1449-56
16. Nuckols R.W.,† Dick T.J.M., **Beck O.N.,** Sawicki G.S.* (2020) Ultrasound Imaging Links Soleus Muscle Neuromechanics and Energetics during Human Walking with Elastic Ankle Exoskeletons. *Scientific Reports.* 10:3604
15. Taboga P.,† **Beck O.N.,** Grabowski A.M.* (2020) Prosthetic Shape, but not Stiffness or Height, Affects the Maximum Speed of Sprinters with Bilateral Transtibial Amputations. *Plos One*. 15(2): e0229035
14. Sawicki G.S.,*† **Beck O.N.,** Kang I., Young A.J.† (2020) The Exoskeleton Expansion: Improving Walking and Running Economy. *Journal of NeuroEngineering and Rehabilitation.* 17(25)
    - Editor's pick of the year: https://jneuroengrehab.biomedcentral.com/editors-picks
13. Taboga P.T.,† Drees E.K., **Beck O.N.,** Grabowski A.M.* (2020) Prosthetic Model, but not Stiffness or Height, Affects Maximum Running Velocity in Athletes with Unilateral Transtibial Amputations. *Scientific Reports*. 10, 1763
12. **Beck O.N.,**† Punith L.K., Nuckols R.W., Sawicki G.S.* (2019) Exoskeletons Improve Locomotion Economy by Reducing Active Muscle Volume. *Exercise and Sport Sciences Reviews*. 47(4):237-45
11. **Beck O.N.,**† Grabowski A.M.* (2019) Athletes With vs. Without Leg Amputations: Different Biomechanics, Similar Running Economy. *Exercise and Sport Sciences Reviews*. 47(1):15-21
    - Featured Cover Article
10. **Beck O.N.,**† Azua E.A.,** Grabowski A.M.* (2018) Step time asymmetry increases metabolic energy expenditure during running. *European Journal of Applied Physiology*. 118(10):2147-54
9. **Beck O.N.,**† Grabowski A.M.,* Ortega J.D.* (2018) Neither Total Muscle Activation nor Co-activation Explains How Older Runners Retain Youthful Walking Economy. *Gait and Posture*. 65:163-8
8. **Beck O.N.,**† Kipp S., Byrnes W.C., Kram R. (2018) Viewpoint: Use Aerobic Energy Expenditure Instead of Oxygen Uptake to Quantify Exercise Intensity and Predict Endurance Performance. *Journal of Applied Physiology*. 125(2):672-4
7. **Beck O.N.,**† Grabowski A.M.* (2017) Case Studies in Physiology: The Biomechanics of the Fastest Sprinter with a Unilateral Transtibial Amputation. *Journal of Applied Physiology*. 124(3):641-5

6. **Beck O.N.,**† Taboga P., Grabowski A.M.* (2017) How do Prosthetic Stiffness, Height, and Running Speed Affect the Biomechanics of Athletes with Bilateral Transtibial Amputations? *Royal Society Interface*. 14(131)
5. **Beck O.N.,**† Taboga P., Grabowski A.M.* (2017) Prosthetic Model, but not Stiffness or Height, Affects the Metabolic Cost of Running for Athletes with Unilateral Transtibial Amputations. *Journal of Applied Physiology*. 123(1):38-48
4. **Beck O.N.,**† Taboga P., Grabowski A.M.* (2017) Reduced Prosthetic Stiffness Lowers the Metabolic Cost of Running for Athletes with Bilateral Transtibial Amputations. *Journal of Applied Physiology.* 122(4):976-84
3. **Beck O.N.,**† Taboga P., Grabowski A.M. (2016) Characterizing the Mechanical Properties of Running-Specific Prostheses. *Plos One*. 11(12):e0168298
2. **Beck O.N.,**† Kipp S., Roby J.M., Grabowski A.M.,* Kram R., Ortega J.D.* (2016) Older Runners Retain Youthful Running Economy Despite Biomechanical Differences. *Medicine and Science in Sports and Exercise*. Apr;48(4):697-704
1. Ortega J.D.,*† **Beck O.N.,** Roby J.M., Turney A.L., Kram R. (2014) Running for Exercise Mitigates the Age-Related Deterioration of Walking Economy. *Plos One*. 10.1371/journal.pone.0113471

Peer-Reviewed Conference Proceedings [Engineering]

1. Tagliaferri M.T., Campeggi L., **Beck O.N.,** Kang I. Ground Perturbation Detection via Lower-Limb Kinematic States During Locomotion. *2025 International Conference on Rehabilitation Robotics (ICORR)*1197-1202

Non-Peer Reviewed Articles

2. Manabe K., **Beck O.N.,** Ortega J.D.,* Tanaka H.† (2024) Co-Existence of ST-Segment Depression and Exaggerated Blood Pressure Response in Older Runners. bioRxiv. 10.29.620598.
1. **Beck O.N.,** & Kipp S. (2021) Comment on Viewpoint: World Class Cyclists Must Risk it All- Including their Bone Health. *Journal of Applied Physiology.* 131:1, 29-33

SPONSORED RESEARCH FUNDING

Current

Sponsor: National Institute of Health, National Institute on Aging, R21
Project Title: Electrical Stimulation to Restore Youthful Walking in Older Adults
Funding Period: 2026 – 2028 **Role:** PI **Total funding:** $439,569

Sponsor: Texas+ Proof of Concept Award, Discovery to Impact, University of Texas at Austin
Project Title: Foot-Stiffening Socks and Locomotor Performance
Funding Period: 2026 **Role:** PI **Total funding:** $31,800

Sponsor: New Balance Athletics Inc.
Project Title: Foot-Stiffening Socks and Locomotor Performance
Funding Period: 2026 **Role:** PI **Total funding:** N/A (NDA)

Sponsor: National Institute of Health, National Institute of Biomedical Imaging and Bioengineering, R21 Trailblazer
Project Title: AI-Driven Hip Exoskeleton Control Framework That Rapidly Generalizes to a Broad Range of Users and Real-World Locomotor Tasks

Funding Period: 2025 – 2028 **Role:** Multi-PI **Total funding:** $586,079

Under Review

Sponsor: National Institute of Health, National Institute on Aging, R01
Funding Period: 2027 – 2032 **Role:** PI **Study Section Meeting:** Oct. 7th

Sponsor: National Institute of Health, National Institute of Child Health and Human Development, R01
Funding Period: 2027 – 2032 **Role:** PI **Study Section Meeting:** Oct. 7th

Upcoming Submission

Sponsor: National Institute of Health, National Institute on Aging, R01 (Resubmission)
Funding Period: 2028 – 2033 **Role:** PI **Submission Date:** Nov. 5th

Sponsor: National Institute of Health, National Institute of Arthritis and Musculoskeletal and Skin Diseases, R61 (Resubmission)
Funding Period: 2028 – 2031 **Role:** PI **Submission Date:** Nov. 2nd

Sponsor: National Institute of Health, National Institute of Child Health and Human Development, R21
Funding Period: 2028 – 2030 **Role:** PI **Submission Date:** Oct. 15th

Completed

Sponsor: McCamish Bluesky Program, Parkinson's Disease Innovation Postdoctoral Fellowship
Funding period: 2021- 2022 **Role:** PI **Total funding**: $120,000

Sponsor: National Institute of Health, National Institute on Aging, F32
Project Title: Linking Muscle-Tendon Dynamics and Energetics to Inform Exoskeleton Design for Improved Locomotor Economy in Aging
Funding period: 2019- 2021 **Role:** PI **Total funding**: $151,365

Not Funded (Yet)

Sponsor: NIH NIA R01; **Submission Date:** Fall '24; **Role:** PI; **Score:** 30*
"Would have been funded in normal times" – PO
Sponsor: DOD CDMRP OPORP; **Submission Date:** Summer 2023; **Role:** PI; **Score** 2.2 (1-5, 1 = best)
Sponsor: NIH NIA K99/R00; **Submission Date:** Winter '21/Summer '24; **Role:** PI; **Score:** 40 / 26*
***Ineligible due to starting faculty position prior to NOA.

PATENTS

Under Review

Beck O.N., Tang H. A patent application has been filed by Board of Regents, The University of Texas System. Filing dates: July 1, 2025 Serial numbers: U.S. Provisional serial no 63/836,991.

HONORS AND AWARDS

- Mentor, Health Policy Research Scholar, Robert Wood Johnson Foundation ($1,500) 2025 - 2027
- Clinical Biomechanics Award Finalist (Top 3 / ~500 Abstracts) 2025
  Annual Meeting of the American Society of Biomechanics. Pittsburgh, PA
- APS Select, Top 8 Articles across all American Physiology Society Journals, April 2024
- Atlanta Science Communication Fellowship ($600) 2018

- Best Graduate Student Podium Presentation Award ($100) 2017
  Rocky Mountain American Society of Biomechanics Conference
- Beverly Sears Graduate Student Research Grant ($1,000) 2017
- University of Colorado Graduate Assistance Travel Award (3x$300) 2014, 15, 16
- American Society of Biomechanics Student Travel Award ($300) 2014
- Professional Service Award 2013
  Humboldt State University – Department of Kinesiology
- Presidential Scholar Award – Humboldt State University 2012 & 2013
- NCAA Student Athlete All-Academic Award 2011

TEACHING

University of Texas at Austin

Graduate Courses

KIN 386 (Research Methods Proposal Writing): Spring ’24, Spring ‘25
KIN 395 (Clinical Biomechanics): Fall ’23
KIN 397 (MCRS Seminar): Spring ‘24, Spring ‘26
KIN 698B (Thesis), ME 698B (Thesis): Many semesters

Undergraduate Courses

KIN 320 (Applied Biomechanics of Human Movement): Spring ’23, Fall ’23, Fall ’24, Spring ’25, Spring ’26, Fall ‘26
UGS 320K (Undergrad Research Experience), KIN396T (Directed Research Experience), KIN327R (Fieldwork: Lab Research): Many semesters

University of Colorado Boulder

IPHY 4540 (Biomechanics – Lead Teaching Assistant**):** Spring ‘16

Invited Guest Lectures

Fall 2024, University of Texas at Austin, KIN 395 (Stiffen Up for Economical Locomotion)
Spring 2023, University of Texas at Austin, KIN 395 (Running with Prostheses)
Spring 2023, University of Texas at Austin, KIN 397C (Locomotion Performance)
Spring 2023, University of Texas at Austin, Kin 387C (Selecting an Academic Journal)
Fall 2022, Sacramento State University (Running with Prostheses)
Fall 2018, University of Colorado Boulder (Co-activation & Aging)

TRAINEES - HUMAN LOCOMOTION LAB (+Awards External to the College)

University of Texas at Austin

PhD Students - Kinesiology

2025 - Kaitlin Jackson

2023 - Ningzhen Zhao
- Promising Scientist Award Finalist – 1st place, South Central American Society of Biomechanics (2026) $250

2023 - Hui Tang
- Outstanding Graduate Research Fellowship, UT Austin Graduate School, ~$54,000 (2026)
- Promising Scientist Award Finalist – 2nd place, South Central American Society of Biomechanics (2026) $100
- Top Clinical Biomechanics Abstract (Top 3/500 Abstracts), Annual Meeting of The American Society of Biomechanics (2025)

- Doctoral Student Travel Award, Annual Meeting of The American Society of Biomechanics (2025) $320
- Joseph Hamill Access to Science Award, De Luca Foundation (2024) $2000

PhD Students - Translational Science

2024 - Ciera Price
- Health Policy Research Scholar, Robert Wood Johnson Foundation (2025 - 2027) $124,000

PhD Students – Mechanical Engineering

2026 - Negin Fallah (Co-advised by Dr. Fey)
2025 - Dylan Page (Co-advised by Dr. Fey)
- Best Graduate Poster Presentation, South Central American Society of Biomechanics (2026) $100

MS Students - Kinesiology

2026 – Ethan Lim
2026 – Crystal Tang
2025 – Andrew Thronton
- Integrative Movement Sciences Institute Summer Institute at the University of California at Irvine (2026) $8000

2025 – Jason Cullum
2023 – 2025 Brooke Measeles (Next position: Lecturer at Southwestern University, TX)
2022 – 2024 Negin Fallah (Next position: Mechanical Engineering MS Student, UT Austin)

MS Students - Mechanical Engineering

2023 – 2025 Kaleigh Renninger (Next position: Product Performance Analyst, Saucony)
- Best Graduate Student Podium Presentation, South Central American Society of Biomechanics Conference (2024) $50

Undergraduate Students w/ Independent Research Projects

2026 – Karthik Peddu, Public Health
2026 – Hanna Guerrero, Mechanical Engineering
2026 Lidia Gutierrez, Biomedical Engineering (McNair Scholar)
2024 – 2026 Dev Rajagopalan, Neuroscience (Polymathic Honors)
- 2nd Best Undergraduate Podium Presentation, South Central American Society of Biomechanics (2026) $50

2023 – 2024 William Dure, Liberal Arts & Sciences (Option II Honors)
2023 – 2026 Kamen Wong, Biology
2023 – 2024 Jason Cullum, Kinesiology
- Undergraduate Research Fellowship, School of Undergraduate Studies, The University of Texas at Austin

PROFESSIONAL SERVICE

Service to Professional Society

Journal Reviewer

Nature Computational Science, elife, Science Robotics, Proceedings of the Royal Society B, Journal of Applied Physiology, Journal of Biomechanics, IEEE: Transactions on Neural Systems and Rehabilitation Engineering, Scientific Reports, Medicine and Science in Sports and Exercise, Bioinspiration & Biomemetics, PLoS One, Prosthetics and Orthotics International, Sports Biomechanics, European Journal of Applied Physiology, International Journal of Sports Physiology and Performance, Journal of Applied

Biomechanics, Sports Medicine, Sports Medicine – Open, Footwear Science, Journal of Experimental Biology, Physiological Reports, PeerJ

Conferences

Organizing Committee Member

Annual Meeting of the American Society of Biomechanics 2020
Dynamic Walking Conference 2018 & 2021

Conference Abstract Reviewer

North American Congress on Biomechanics 2022, American Society of Biomechanics Annual Conference (2021 – 2025), Dynamic Walking Conference, & International Conference for Biomedical Robotics and Biomechatronics

Conference Awards Committee

Manuscript award committee, Texas American College of Sports Medicine, 2025
Best podium presentation committee, South Central American Society of Biomechanical Annual Meeting, 2023, 2024, 2026
Junior faculty research award committee *Ad Hoc*, American Society of Biomechanics Annual Meeting, 2023

Conference Mentoring Programs

Mentor-Mentee Program

Annual Meeting of the American Society of Biomechanics. 2023, 2024, 2025
South Central American Society of Biomechanics Meeting, Fort Worth, TX. 2023

Trainee Round Table Host, Preparing Materials for Faculty Applications. Annual Meeting of the American Society of Biomechanics. Knoxville, Tenn. 2023

University of Texas at Austin

University of Texas at Austin Research and Creative Grants Reviewer, 2026
Biomechanics and Neurorehabilitation Tenure-Track Faculty Search Committee, 2026 - 2027
Dept. KHE Faculty Other Awards Sub-Committee, 2026 - 2027
Exercise Science Tenure-Track Faculty Search Committee, 2025 - 2026
ASICS Prospective Partnership Committee, 2025
Tower Fellows, Biomechanics Lab Tour, 2025
Undergraduate Research Fellowship Reviewer, 2024
Dept. KHE Merit Committee, 2024, 2025
Dept. KHE GSC & BNR Committee member, 2023 - 2026

Student-Related Service

Dissertation Committees

Jake McGrath, Physics, 2026 (Member)
Montgomery Berschy, Kinesiology, University of Massachusetts Amherst, 2026 (Member)
Tharan Suresh, Kinesiology, 2026 (Member)
Forouzan Foroughi, Kinesiology, 2024 (Member)
Keng-Hung Shen, Kinesiology, 2024 (Member)
Huiying Zhu, Kinesiology, 2024 (Member)
Donald Prible, Kinesiology, 2025 (Member)

PhD Proposal Committees

Kathleen Carroll, Translations Science, University of Texas San Antonio, 2024 (Member)
Nafiz Ahmed, Kinesiology, 2025 (Member)
Tharan Suresh, Kinesiology, University of Texas at Austin, 2025 (Member)

Ciera Price, Translational Science, University of Texas San Antonio, 2025 (Chair)
Montgomery Berschy, Kinesiology, University of Massachusetts Amherst, 2025 (Member)
Donald Prible, Kinesiology, 2024 (Member)
Matthew Gonzalez, Translations Science, University of Texas San Antonio, 2024 (Member)

PhD Qualifying Exam Committees

Jason Tsai, Kinesiology, 2025 (Member)
Hui Tang, Kinesiology, 2025 (Chair)
Ningzhen Zhao, Kinesiology, 2025 (Member)
Nafiz Ahmed, Kinesiology, 2025 (Member)

Master's Thesis/Report Committees

Faith Lucas, Kinesiology, 2026 (Member)
Brooke Measeles, Kinesiology, 2025 (Chair)
Jide Adebiyi, Kinesiology, 2025 (Member)
Kaleigh Renninger, Mechanical Engineering, 2025 (Chair)
Negin Fallah, Kinesiology, 2024 (Chair)
Ningzhen Zhao, Kinesiology, 2023 (Member)

Undergraduate Honors Thesis

Dev Rajagopalan, Neuroscience (Polymathic Honors), 2025 (Chair)
William Dure, Liberal Arts & Sciences (Option II Honors), 2025 (Chair)

RESEARCH PRESENTIONS

Mentee (**)

Invited Research Presentations

- **Beck O.N.** Title TBA. Kinesiology Seminar, Texas A&M, Oct. 2026. *Honorarium: $300.*
- **Beck O.N.** Effortless Locomotion. CARE Research Day, Dell Medical School, University of Texas at Austin, April. 2026.
- **Beck O.N.** Running Prostheses and the Olympics. Lucian Symposium. Saint Edwards University, Austin, TX, Sept. 2025. *Honorarium: $500*
- **Beck O.N.** Stiffen Up for More Economical Locomotion. Human Movement and Rehabilitation Science Seminar. Northeastern University, Boston, MA, March 2025
- **Beck O.N.** Stiffen Up for More Economical Locomotion. 8th International Autumn School on Movement Sciences. Berlin School of Movement Science, Germany, Oct. 2024
- **Beck O.N.** Distance Running with Prostheses. Highlighted Symposium, The Annual Meeting of the Annual College of Sports Medicine (ACSM). Boston, MA, May 2024
- **Beck O.N.** Faster Grandparents: Maintaining Mobility into Advanced-Age. Center for Non-Linear Dynamics Seminar. University of Texas at Austin, Feb. 2023

Conference Presentations [submitted]

- Price C.A.,** **Beck O.N.** Characterizing Physical Function Across Activity Profiles in Lower-Limb Prosthesis Users. International Society for Prosthetics and Orthotics World Congress. Bangkok, Thailand.

Conference Podium Presentations

- Wong K.,** Tang H.,** **Beck O.N.** Foot-Stiffening Socks May Improve Running Economy. World Congress of Biomechanics. Vancouver, CAN. July 2026.
- Zhao N.,** Miller R.H., Griffin L., **Beck O.N.** Eliminating the Distal-to-Proximal Redistribution in Older Adult Joint Mechanics Improves Walking Economy. World Congress of Biomechanics. Vancouver, CAN. July 2026.
- Tang H.,** **Beck O.N.** Foot-Stiffening Socks Reduce the Metabolic Cost of Walking. South Central American Society of Biomechanics Conference. Fort Worth, TX, March 2026.

- **Beck O.N.** Carry-Over Effects of Electrical Stimulation Improves Walking Economy. Dynamic Walking. Mount Rainier, WA. June 2026.
- Zhao N.,** Miller R.H., Griffin L., **Beck O.N.** Eliminating the Distal-to-Proximal Redistribution in Older Adults Improves Walking Economy. South Central American Society of Biomechanics Conference. Fort Worth, TX, March 2026.
    a. Promising Scientist Award Finalist – 1st place, South Central American Society of Biomechanics (2026) $250
- Rajagopalan D.S.,** **Beck O.N.,** Taboga P. From 100 m to 400 m: Speed Decline and Biomechanical Changes in Elite Male and Female Sprinters. South Central American Society of Biomechanics Conference. Fort Worth, TX, March 2026.
    a. 2nd Best Undergraduate Podium Presentation, South Central American Society of Biomechanics (2026) $50
- Tang H.,** **Beck O.N.** Foot-Stiffening Socks Reduce the Metabolic Cost of Walking. South Central American Society of Biomechanics Conference. Fort Worth, TX, March 2026.
    a. Promising Scientist Award Finalist – 2ne place, South Central American Society of Biomechanics (2026) $100
- Tang H.,** Heydemann J.A., McMahon N., Rickert K., McHorse K., **Beck O.N.** Limb Lengthening: Slower Distraction Rates May Improve Joint Recovery. Annual Meeting of the American Society of Biomechanics. Pittsburgh PA. Aug. 2025.
    a. Top 3 Finalist, Clinical Biomechanics Award
- Rennginer K.,** **Beck O.N.** Shoe Heel-Toe Drop Affects Running Economy. Annual Meeting of the American Society of Biomechanics. Pittsburgh PA. Aug. 2025.
- Zhao N.,** Griffin L., **Beck O.N.,** Soleus Functional Electrical Stimulation Attenuates Older Adult Distal-to-Proximal Redistribution During Walking. Annual Meeting of the American Society of Biomechanics. Pittsburgh PA. Aug. 2025.
- Kim J., Rastogi R.,** Martino G., **Beck O.N.,** Shepherd M.K., Sawicki G.S., Ting L.H., Jakubowski K.L. Excess Exoskeleton "Assistance" Disrupts Standing Balance by Altering Sensory Feedback." Annual Meeting of the American Society of Biomechanics. Madison WI. Aug. 2024.
- Measeles B.,** Fallah N.,** Mistry A.,** **Beck O.N.** Neural or Musculoskeletal: which system drives the age-related decline in walking economy? Annual Meeting of the American Society of Biomechanics. Madison, WI. Aug. 2024.
- Renninger K.,** **Beck O.N.** Is There an Ideal Heel-Toe Drop for Economical Running? South Central American Society of Biomechanics Conference. Fort Worth, TX, April 2024.
    a. Won best oral presentation by a graduate student ($50).
- Tang H.,** **Beck O.N.,** The Influence of Foot Arch Stiffness on Running Biomechanics and Economy. South Central American Society of Biomechanics Conference. Fort Worth, TX, April 2024.
- **Beck O.N.,** Schroeder J.S., Sawicki G.S. Wearing High Heels Remodels Leg Muscle-Tendons and Improves Walking Economy. Annual Meeting of the American Society of Biomechanics. Knoxville, TN. 2023.
- Jakubowski K.L., Martino G., **Beck O.N.,** Sawicki G.S, Ting L.H. The Intrinsic and Neurally-Mediated Contributions to the Balance-Correcting Torque Response Differ Between the Ankle and Hip. International Society of Biomechanics. Fukuoka, Japan 2023.
- Rastogi R., Jakubowski K.L., Martino G., **Beck O.N.,** Shepherd M.K., Sawicki G.S, Ting L.H. Too Much Exoskeleton "Assistance" Can Disrupt User Balance Correction. Annual Meeting of the American Society of Biomechanics. Knoxville, TN. 2023.
- Schroeder J.S., **Beck O.N.,** Sawicki G.S. Impact of Triceps-Surae Operating Lengths on Whole Body Metabolic Cost. Annual Meeting of the American Society of Biomechanics. Knoxville, TN. 2023.
- **Beck O.N.,** Shepherd M.K., Rastogi R., Ting L.H., Sawicki G.S. Exoskeletons Need to React Faster than Reflexes to Improve Standing Balance. North American Congress on Biomechanics. Ottawa, Canada. 2022.

- Martino G., **Beck O.N.,** Rastogi R., Ting L.H. Shear wave tensiometry of the Achilles tendon to estimate muscle force and coactivation during balance perturbations. International Society for Posture and Gait Research World Congress. Montreal, Canada. 2022.
- Rastogi, R., Shepherd, M.K., Sawicki, G.S., Ting, L.H., **Beck, O.N.** Ankle exoskeleton torque improves reactive standing balance capacity if delivered before physiological response. International Society for Posture and Gait Research World Congress. Montreal, Canada. 2022.
- **Beck O.N.,** Taboga P., Grabowski A.M. Sprinting with Prosthetic versus Biological Legs: An Unfair Advantage? Annual Meeting of the American Society of Biomechanics, 2021.
- **Beck O.N.,** Schroeder, J.N., Trejo, L.H., Franz J.R., Sawicki G.S. Relatively Shorter Muscle Lengths Increase the Metabolic Rate of Cyclic Force Production. Congress of the International Society of Biomechanics, 2021.
- Allen S.P., **Beck O.N.,** Grabowski A.M. Biomechanics Predict Changes in Metabolic Cost during Running and Hopping at Different Frequencies. Congress of the International Society of Biomechanics, Calgary, CAN. 2019.
- **Beck O.N.** & Sawicki G.S. Exoskeletons Improve Locomotion Economy by Steering Muscle Dynamics. American Society of Mechanical Engineers Dynamics Systems and Controls Conference. Atlanta, GA. 2018.
- Southern E.K., **Beck O.N.,** Taboga P.T., Grabowski A.M. Running-Specific Prosthetic Model Affects Top Sprinting Speed in Athletes with Unilateral Transtibial Amputations. Annual Meeting of the American Society of Biomechanics, Rochester, MN. 2018.
- **Beck O.N.,** Taboga P.T., Grabowski A.M. How do Prosthetic Stiffness, Height, and Running Speed Affect the Biomechanics of Running for Athletes with Bilateral Transtibial Amputations? Rocky Mountain Regional Conference of the American Society of Biomechanics, Estes Park, CO. 2017; Annual Meeting of the American Society of Biomechanics, Boulder, CO. 2017.
- Azua E., **Beck O.N.,** Grabowski A.M. Asymmetric Step Frequencies Increase the Metabolic Cost of Running. Rocky Mountain Regional Conference of the American Society of Biomechanics, Estes Park, CO. 2017.
- Dassler A., **Beck O.N.,** Grabowski A.M. How do Asymmetric Biomechanics Affect the Metabolic Cost of Running for Athletes with a Unilateral Transtibial Amputation? Rocky Mountain Regional Conference of the American Society of Biomechanics, Estes Park, CO. 2017.
- **Beck O.N.**, Taboga P.T., Grabowski A.M. Characterizing the Stiffness of Running-Specific Prostheses. Annual Meeting of the American Society of Biomechanics, Raleigh, NC. 2016; & National Assembly of the American Orthotic Prosthetic Association, Boston, MA. 2016.
- **Beck O.N.**, Taboga P.T., Grabowski A.M. Characterizing the Stiffness of Running-Specific Prostheses.
- Jeffers, J.R., **Beck O.N.**, Taboga P.T., Grabowski A.M. Optimizing leg prostheses for walking and running: Can we augment performance? Annual Meeting of the American Society of Biomechanics, Columbus, OH. 2015.
- Roby J.M., **Beck O.N.,** Turney A.L., Grabowski A.M., Kram R., Ortega J.D. Walking Energetics and Biomechanics of Older Runners. Rocky Mountain Regional Conference of the American Society of Biomechanics, Estes Park, CO. 2014.
- **Beck O.N.,** Roby J.M., Turney A.L., Grabowski A.M., Kram R., Ortega J.D. Do Older Runners Lose the Spring in Their Step? Rocky Mountain Regional Meeting of the American Society of Biomechanics, Estes Park, CO. 2014.

Conference Poster Presentations – Thematic

- Zhao N.,** Griffin L., **Beck O.N.,** Soleus Functional Electrical Stimulation Attenuates Older Adult Distal-to-Proximal Redistribution During Walking. Annual Meeting of the American College of Sports Medicine. Atlanta GA. May. 2025.
- **Beck O.N.,** Schroeder, J.N., Trejo, L.H., Franz J.R., Sawicki G.S. Relatively Shorter Muscle Lengths Increase the Metabolic Rate of Cyclic Force Production. Annual Meeting of the American Society of Biomechanics, Virtual. 2021.
- Alcantara R.S., **Beck O.N.**, Grabowski A.M. Mass Added to a Running-Specific Leg Prosthesis Increases Metabolic Power During Running. Annual Meeting of the American Society of Biomechanics, Rochester, MN. 2018.
- **Beck O.N.**, Sawicki G.S. Tuning Shoe Stiffness for More Economical Muscle Force Production During Running. Dynamic Walking. Pensacola, FL. 2018.
- **Beck O.N.**, Grabowski A.M. Is the Metabolic Cost of Running Different for Athletes with Unilateral versus Bilateral Transtibial Amputations? Annual Meeting of the American College of Sports Medicine. Denver, CO. 2017.

- **Beck O.N.**, Taboga P.T., Grabowski A.M. Lower Prosthetic Stiffness Minimizes the Metabolic Cost of Running for Individuals with Bilateral Leg Amputations. Annual Meeting of the American Society of Biomechanics, Columbus, OH. 2015.
- **Beck O.N.**, Taboga P.T., Grabowski A.M. Asymmetric Forces Increase the Metabolic Cost for Individuals with a Unilateral Leg Amputation. Annual Meeting of the American Society of Biomechanics, Columbus, OH. 2015.

Conference Poster Presentations

- Miller R.H., Zhao N.,** **Beck O.N.** Shifting Preferred Joint Kinetics Distally Reduces the Metabolic Cost of Walking in Young Adults. World Congress of Biomechanics. Vancouver, CAN. July 2026.
- Page D.M.,** Zhao N.,** Monteiro A.S., Changseob S., Kang I., **Beck O.N.,** Fey N.P. Temporal Convolutional Networks Enable Prediction of Bilateral Joint Kinetics of Walking in Young and Older Adults Before, During, and After Functional Electrical Stimulation of Plantar Flexors. Vancouver, CAN. July 2026.
- Cullum J.,** Stone A.J., Niehaus P., Lopez A., Mossayebi A., **Beck O.N.** Morphological and Bioenergetic Adaptations to Environmental Temperature in Endotherms. World Congress of Biomechanics. Vancouver, CAN. July 2026.
- Thornton A.M.,** Schroeder J.N., Sawicki G.S., **Beck O.N.** Why Does Wearing High Heels Stiffen the Achilles Tendon? World Congress of Biomechanics. Vancouver CAN. July 2026.
- Cullum J.,** Stone A.J., Niehaus P., Lopez A., Mossayebi A., **Beck O.N.** Environmental Temperature Alters Anatomical Dimensions and Shifts Electron Transport Chain Coupling Strategy. South Central American Society of Biomechanics Conference. Fort Worth, TX, March 2026.
- Wong K.,** Tang H.,** **Beck O.N.** Foot-Stiffening Socks May Improve Running Economy. South Central American Society of Biomechanics Conference. Fort Worth, TX, March 2026.
- Page D.M.,** Zhao N.,** Monteiro A.S., Changseob S., Kang I., **Beck O.N.,** Fey N.P. Subject Independent Baseline Walking Data Predicts Lower Limb Joint Kinetics Across Age Groups and Functional Stimulation Conditions. South Central American Society of Biomechanics Conference. Fort Worth, TX, March 2026.
    a. Best Graduate Poster Presentation, South Central American Society of Biomechanics (2026) $100
- Wong K.,** Tang H.,** **Beck O.N.** Do Stiffer Foot Arches Improve Top Sprint Speed? Annual Meeting of the American Society of Biomechanics. Pittsburgh PA. Aug. 2025.
- Tang H.,** **Beck O.N.** Wearing Socks That Stiffen Foot Arches Reduce the Metabolic Cost of Walking. Annual Meeting of the American Society of Biomechanics. Pittsburgh PA. Aug. 2025.
- Tagliaferri M.T., Campeggi L., **Beck O.N.,** Kang I. Detection of Translational Perturbations using Lower-Limb Kinematics During Locomotion. Annual Meeting of the American Society of Biomechanics. Pittsburgh PA. Aug. 2025.
- Kim J.H., Rastogi R., Martino G., **Beck O.N.,** Shepherd M.K., Sawicki G.S., Ting L.H., Jakubowski K.L. Cortical Contribution to Balance is Related to Ideal Exoskeleton Assistance Levels. American Society of Neurorehabiliation, Atlanta, GA, May 2025.
- Wong K.,** Tang H.,** **Beck O.N.** Foot-Stiffening Socks May Improve Top Sprint Speed. Undergraduate Research Forum, University of Texas at Austin, April 2025
- Wong K.,** Tang H.,** **Beck O.N.** Foot-Stiffening Socks May Improve Top Sprint Speed. Longhorn Research Forum, University of Texas at Austin, April 2025
- Rennginer K.,** **Beck O.N.** Shoe Heel-Toe Drop Affects Running Economy. Texas American College of Sports Medicine, Waco TX. Feb. 2025
- Tang H.,** Heydemann J.A., McMahon N., Rickert K., McHorse K., **Beck O.N.,** Limb Lengthening: Slower Distraction Rates May Improve Joint Recovery. Texas American College of Sports Medicine, Waco Tx. Feb. 2025
- Zhao N.,** Griffin L., **Beck O.N.,** Soleus Functional Electrical Stimulation Attenuates Older Adult Distal-to-Proximal Redistribution During Walking. Texas American College of Sports Medicine, Waco Tx. Feb. 2025
- Measeles B.,** Fallah N.,** Mistry A.,** **Beck O.N.,** Older Adults Consume More Metabolic Energy to Produce Joint Moments. Texas American College of Sports Medicine, Waco Tx. Feb. 2025

- Foroughi F., Sadeh S., **Beck O.N.,** Hsiao H. Effect of Real-Time Vertical Ground Reaction Force Biofeedback on Hip and Knee Neuromechanical Characteristics During Walking in Older Adults. Gait & Clinical Movement Analysis Society Annual Conference. Atlanta, GA. Aug. 2024.
- Tang H.,** **Beck O.N.,** The Influence of Foot Arch Stiffness on Running Biomechanics and Economy. Annual Meeting of the American Society of Biomechanics. Madison, Wisc. Aug. 2024.
- Renninger K.,** **Beck O.N.** Is There an Ideal Heel-Toe Drop for Economical Running? Annual Meeting of the American Society of Biomechanics. Madison, Wisc. Aug. 2024.
- Zhao N.,** Griffin L., **Beck O.N.** Electrically Stimulating the Soleus During Walking May Not Affect Metabolic Rate. Annual Meeting of the American Society of Biomechanics. Madison, Wisc. 2024.
- Fallah N.,** & **Beck O.N.** This Hip Expends More Metabolic Energy to Produce Extension Moments than the Ankle. South Central American Society of Biomechanics Conference. Fort Worth, TX, April 2024.
- Measeles B.,** Fallah N.,** Mistry A.,** **Beck O.N.** Neural or Musculoskeletal: which system drives the age-related decline in walking economy? South Central American Society of Biomechanics Conference. Fort Worth, TX, April 2024.
- Fallah N.,** **Beck O.N.** Does the Distal-to-Proximal Redistribution of Joint Mechanics Affect Walking Economy? Annual Meeting of the American Society of Biomechanics. Knoxville, TN. 2023.
- Schroeder J.S., **Beck O.N.,** Sawicki G.S. Relatively Small Changes in Foot-Ankle Mechanics Over Months Alter Musculoskeletal Structure. Annual Meeting of the American Society of Biomechanics. Knoxville, TN. 2023.
- **Beck O.N.,** Martino G., Ting L.H. Background muscle activity decouples muscle fascicle excursion from joint rotation and drives long latency feedback response during support surface translations. International Society for Posture and Gait Research World Congress. Montreal, Canada. 2022.
- **Beck O.N.,** Taboga P., Grabowski A.M. Sprinting with Prosthetic versus Biological Legs: An Unfair Advantage? Congress of the International Society of Biomechanics, Virtual. 2021.
- **Beck O.N.,** Gosyne J., Franz J.R., Sawicki G.S. Cyclically Producing the Same Average Muscle-Tendon Force with a Smaller Duty Increases Metabolic Rate. Annual Meeting of the American Society of Biomechanics, Virtual, 2020.
- **Beck O.N.,** Punith L.K., Nuckols R.W., Sawicki G.S. Exoskeletons Improve Locomotion Economy by Reducing Active Muscle Volume. Congress of the International Society of Biomechanics, Calgary, CAN, 2019.
- *Alcantara R.S., **Beck O.N.**, Grabowski A.M. Mass Added to a Running-Specific Leg Prosthesis Increases Metabolic Power During Running. Rocky Mountain Regional Conference of the American Society of Biomechanics, Estes Park, CO. 2018. **Best Student Poster.*
- Taboga P.T., **Beck O.N.**, Grabowski A.M. Sprint Biomechanics of Athletes with Bilateral Transtibial Amputations using Different Prosthetic Configuration. International Research Forum on Biomechanics of Running-Specific Prostheses. Tokyo, Japan. 2018.
- **Beck O.N.**, Grabowski A.M. How do Prosthetic Stiffness, Height, and Running Speed Affect the Biomechanics of Running for Athletes with Bilateral Transtibial Amputations? Military Health System Research Symposium, Kissimmee, FL. 2017.
- Azua E., **Beck O.N.,** Grabowski A.M. Asymmetric Step Frequencies Increase the Metabolic Cost of Running. Annual Meeting of the American Society of Biomechanics, Boulder, CO. 2017.
- Taboga P.T., **Beck O.N.**, Grabowski A.M. Top Sprinting Speed is Influenced by Prosthetic Model, but not Stiffness or Height, for Athletes with Bilateral Transtibial Amputations. Annual Meeting of the American Society of Biomechanics, Boulder, CO. 2017.
- Taboga T., **Beck O.N.**, Grabowski A.M. Optimal Running Prostheses for Sprinters with Unilateral Leg Amputations. Annual Meeting of the American Society of Biomechanics, Columbus, OH. 2015.
- Taboga T., **Beck O.N.**, Grabowski A.M. Optimal Running Prostheses for Sprinters with Bilateral Leg Amputations. Annual Meeting of the American Society of Biomechanics, Columbus, OH. 2015.
- **Beck O.N.**, Taboga T., Grabowski A.M. Lower Prosthetic Stiffness Minimizes the Metabolic Cost of Running for Individuals with Bilateral Leg Amputations. Rocky Mountain Regional Conference of the American Society of Biomechanics, Estes Park, CO. 2015.

- **Beck O.N.**, Taboga T., Grabowski A.M. Asymmetric Forces Increase the Metabolic Cost for Individuals with a Unilateral Leg Amputation. Rocky Mountain Regional Meeting of the American Society of Biomechanics, Estes Park, CO. 2015.
- Taboga T., **Beck O.N.**, Grabowski A.M. Optimal Running Prostheses for Sprinters with Unilateral Leg Amputations. Rocky Mountain Regional Meeting of the American Society of Biomechanics, Estes Park, CO. 2015.
- Taboga T., **Beck O.N.**, Grabowski A.M. Optimal Running Prostheses for Sprinters with Bilateral Leg Amputations. Rocky Mountain Regional Meeting of the American Society of Biomechanics, Estes Park, CO. 2015.
- **Beck O.N.,** Roby J.M., Turney A.L., Grabowski A.M., Kram R., Ortega J.D. Do Older Runners Lose the Spring in Their Step? World Congress of Biomechanics, Boston, MA. 2014.
- **Beck O.N.,** Roby J.M., Turney A.L., Grabowski A.M., Kram R, Ortega J.D. Running Improves the Economy of Walking Among Older Adults. Annual Meeting of the American College of Sports Medicine, Orlando, FL. 2014.

PROFESSIONAL AFFILIATIONS

- American College of Sports Medicine (ACSM) 2022-
- American Society of Biomechanics (ASB) 2014-
- CITI Training Certified 2012-

CONSULTING + INDUSTRY PERKS

- *Topic Expert for Legal Proceedings*
  - *a.* Stiener vs. Puma/Mercedes F1 2026-
  - *b.* Blake Leeper vs. World Athletics I & II (*Pro Bono)* 2018-2021
- LaceClips Activity Tracker Donation ($2000 value) 2026
- New Balance Athletics Inc., Ultrasound Consulting 2025

SELECT MEDIA

Footwear

- The $5 Hack That Could Improve Your Running Economy. July, 2026. https://marathonhandbook.com/the-5-hack-that-could-improve-your-running-economy/
- The Late Show with Stephen Colbert. The Sounds of Science Skit. March, 2024. https://youtu.be/mtSJQrEY3nc?si=4R7_etLNuQZXAk1p&t=265
- The Washington Post "High heels improve walking efficiency, study finds" 2024 https://www.washingtonpost.com/wellness/2024/02/21/high-heels-walking-health/

Exoskeletons

- The Conversation. "Faster-than-reflexes robo-boots boost balance" 2023 https://theconversation.com/faster-than-reflexes-robo-boots-boost-balance-199485

Prostheses

- Runners World "New Study Shows Blade Runners Do Not Have a Competitive Advantage" 2023 https://www.runnersworld.com/news/a44521586/blade-runners-do-not-have-competitive-advantage/
- ABC News, Denver "CU-Boulder Lab Pushes Athletes and Their Prosthetics to be Stronger and Go Faster" 2015 https://www.youtube.com/watch?v=N-1lXYyU1tU
- CCTV America "Helping Amputees: New Technologies in Prosthetics" 2014 https://www.youtube.com/watch?v=eAFAOyzVWJc

Aging

- New York Times "Run to Stay Young" 2014 http://well.blogs.nytimes.com/2014/12/03/run-to-stay-young/?_r=0
- NPR "To Stay Energy Efficient As You Age, Keep On Running" 2014

http://www.npr.org/blogs/health/2014/11/21/365692427/to-stay-energy-efficient-as-you-age-keep-on-running

- Runner's Word "Older Runners Walk like People Decades Younger" 2014
  http://www.runnersworld.com/newswire/older-runners-walk-like-people-decades-younger

Cycling

- Outside "How Cyclists Can Avoid Low Bone Density" 2021
  https://www.outsideonline.com/health/training-performance/cyclists-low-bone-density/?utm_medium=social&utm_source=twitter&utm_campaign=onsitesha