

Kota Z. Takahashi, Ph.D.

North Carolina State University
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Education

Ph.D., Biomechanics & Movement Science Interdisciplinary Program **Jan 2008 – Aug 2012**
University of Delaware (Newark, DE)

Dissertation: “Total Power Profiles of Anatomical and Prosthetic Below-Knee Structures”

Advisor: Steven J. Stanhope

Dissertation Committee: Stephen J. Piazza, James G. Richards, Todd D. Royer, and C. Buz Swanik

M.BE., Biomedical Engineering **Sep 2006 – Dec 2007**
Catholic University of America (Washington D.C.)

B.S., Movement Science **Sep 2002 – May 2006**
University of Michigan (Ann Arbor, MI)

Academic Positions

Postdoctoral Scholar - Human Physiology of Wearable Robotics (PoWeR) Lab **Nov 2012 – present**
Joint Department of Biomedical Engineering, North Carolina State University & University of North Carolina at Chapel Hill (Raleigh, NC)
Principal Investigator: Gregory S. Sawicki

Graduate Research Assistant – Human Performance Lab **Jan 2008 – Aug 2012**
Biomechanics & Movement Science Interdisciplinary Program, University of Delaware (Newark, DE)

Research Interests

Rehabilitation Engineering & Human Movement Biomechanics
Gait Analysis of Individuals with Lower Extremity Pathology (e.g., Limb Amputation, Stroke)
Lower Limb Prosthetics, Orthotics, and Exoskeletons
In-Vivo Muscle-Tendon Mechanics (B-Mode Ultrasound)
Metabolic Energy Cost of Locomotion (Indirect Calorimetry)

Honors/Awards

Top 11 Finalist for Clinical Biomechanics Award, American Society of Biomechanics 2013
Professional Development Award (\$900.00), Office of Postdoctoral Affairs at North Carolina State University
Dr. Kevin Granata Young Investigator Award (\$1,000.00), Gait and Clinical Movement Analysis Society 2011
Student Travel Scholarship (\$350.00), Gait and Clinical Movement Analysis Society 2011
Student Travel Scholarship, Lilly Conference on College & University Teaching 2011
Study Abroad Scholarship, Office of International Programs at University of Michigan

Kota Z. Takahashi – Curriculum Vitae

Peer-Reviewed Publications

Takahashi KZ, Horne JR, and Stanhope SJ. Comparison of mechanical energy profiles of passive and active below-knee prostheses: a case study. *Prosthetics & Orthotics International*. (in press)

Takahashi KZ, and Stanhope SJ. Mechanical energy profiles of the combined ankle-foot system in normal gait: insights for prosthetic designs. *Gait & Posture*, 2013. 38:4, 818-823

Takahashi KZ, Kepple TM, and Stanhope SJ. A unified deformable (UD) segment model for quantifying total power of anatomical and prosthetic below-knee structures during stance in gait. *Journal of Biomechanics*, 2012. 45:15, 2662-2667

Takahashi KZ, and Stanhope SJ. Estimates of stiffness for ankle foot orthoses (AFOs) are sensitive to loading conditions. *Journal of Prosthetics and Orthotics*, 2010. 22:4, 211-219

Manuscripts in Review

Zelik KE, **Takahashi KZ**, and Sawicki GS. Six degree of freedom analysis reveals an improved blueprint of work production during human walking. *Journal of Experimental Biology*

Takahashi KZ, Lewek MD, Sawicki GS. Short-term effects of a user-controlled powered ankle exoskeleton on the neuromechanics and energetics of post-stroke gait. *Journal of NeuroEngineering and Rehabilitation*.

Manuscripts in Preparation (data collection complete) or Planned (collection on-going)

Takahashi KZ, and Stanhope SJ. A spring-loaded roll-over model of biological ankle and foot structures during human walking. *PLOS One*. (In Preparation)

Takahashi KZ, Sawicki GS, and Stanhope SJ. The human foot as a damped lever system. *Exercise and Sport Science Reviews*. (Planned)

Takahashi KZ, Gross MT, van Werkhoven H, Piazza SJ, and Sawicki GS. The effects of foot stiffness on soleus muscle-tendon mechanics during human walking. *Journal of Experimental Biology* (Planned)

Invited Talks

Dr. William M. Scholl College of Podiatric Medicine – Grand Round Lecture **Aug 28, 2014**
Rosalind Franklin University (North Chicago, IL)
“Reverse-Engineering Human Musculoskeletal Design to Drive Rehabilitation of Ankle-Foot Pathologies”

Gait & Clinical Movement Analysis Society 2014 Conference – Tutorial Lecture **Jun 24, 2014**
(Newark, DE)
“From Body to Joints to Muscles: An Integrative Multi-Scale Assessment of Ankle and Foot Function in Human Locomotion”
(Co-Presenter with Robertson BD, Farris DJ, Piazza SJ, and Sawicki GS)

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- Department of Kinesiology Seminar** **Jun 13, 2014**
East Carolina State University (Greenville, NC)
“Paradoxical Ankle and Foot Function during Human Locomotion: Questions for Biology, Opportunities for Engineering”
- Biomechanics & Movement Science (BIOMS) Interdisciplinary Program Seminar** **Feb 14, 2013**
University of Delaware (Newark, DE)
“Reverse-Engineering Human Musculoskeletal Design to Drive Rehabilitation of Ankle-Foot Pathologies”
- Nature Research Center – National Postdoc Appreciation Week Seminar Series** **Sep 18, 2013**
(Raleigh, NC)
“Building the Next RoboCop: Wearable Devices to Help People Move”
- Human Physiology of Wearable Robotics (PoWeR) Lab** **Oct 17, 2012**
North Carolina State University (Raleigh, NC)
“Mechanical Energy Profiles of Ankle-Foot Structures: Insights for Rehabilitation Devices”
- Graduate Student Forum** **May 4, 2012**
University of Delaware (Newark, DE)
“Academic e-Portfolios: Setting Yourself Apart in the Academic Job Market”
- Good Shepherd Rehabilitation Network – Guest Seminar** **Apr 25, 2012**
(Philadelphia, PA)
“Comparisons of Power & Energy in Anatomical and Prosthetic Below-Knee Structures during Gait”
- Independence Prosthetics - Orthotics, Inc** **Mar 5, 2012**
(Newark, DE)
“Comparisons of Power & Energy in Anatomical and Prosthetic Below-Knee Structures during Gait”
- Graduate Teaching Assistant Conference** **Aug 23, 2011**
University of Delaware (Newark, DE)
“Engaging Students in Their Learning: Why and How?”
- Graduate Teaching Assistant Conference** **Aug 22, 2011**
University of Delaware (Newark, DE)
“Life as a Graduate Student and TA: Keeping All the Balls in the Air”
- Conference Presentations (Podium)**

Zelik KE, **Takahashi KZ**, and Sawicki GS. Positively missing: reassessing work production in human gait and the implications for assistive technology. *World Congress of Biomechanics*, July 2014, Boston, MA, USA.

***Takahashi KZ**, and Sawicki GS. A user-controlled powered ankle exoskeleton to assist gait propulsion post-stroke. *American Society of Biomechanics*, September 2013, Omaha, NE.

*received nomination for *Clinical Biomechanics Award (top 11 finalist)*

Kota Z. Takahashi – Curriculum Vitae

Takahashi KZ, Stanhope SJ, and Sawicki GS. Functional interaction between ankle joint and distal foot structures during locomotion. *Dynamic Walking*, June 2013, Pittsburgh, PA.

Takahashi KZ, and Stanhope SJ. Positive news for passive-dynamic prosthetics: the human ankle-foot system does net negative work during stance. *Gait & Clinical Movement Analysis Society*, May 2012, Grand Rapids, MI.

Takahashi KZ, Razzook AR, Guinn LD, Schrank ES, Kepple TM, and Stanhope SJ. A unified deformable segment model of the combined ankle-foot system that does work. *American Society of Biomechanics*, August 2011, Long Beach, CA.

***Takahashi KZ**, Razzook AR, Guinn LD, Schrank ES, and Stanhope SJ. A model of normal gait roll-over dynamics: one step closer to customizing prosthetic ankle-foot components. *Gait & Clinical Movement Analysis Society*, April 2011, Bethesda, MD.

**received award for Dr. Kevin Granata Young Investigator Award (best student podium presentation)*

Takahashi KZ, Razzook AR, Guinn LD, Schrank ES, and Stanhope SJ. A method for characterizing combined ankle-foot dynamics during stance phase of gait. *Center for Biomedical Engineering Research Symposium*, May 2010, University of Delaware.

Conference Presentation (Thematic Poster)

Takahashi KZ, and Stanhope SJ. Net efficiency of the combined ankle-foot system in normal gait: insights for passive and active prosthetics. *American Society of Biomechanics*, August 2012, Gainesville, FL.

Conference Presentations (Poster)

Takahashi KZ, Lewek MD, Sawicki GS. A user-controlled powered ankle exoskeleton to drive gait modifications post-stroke. *World Congress on Biomechanics*, July 2014, Boston MA.

Takahashi KZ, Razzook AR, Guinn LD, Schrank ES, Kepple TM, and Stanhope SJ. A unified deformable (UD) segment model for measuring combined shank-foot power. *Center for Biomedical Engineering Research Symposium*, May 2011, University of Delaware.

Takahashi KZ, Razzook AR, Guinn LD, Schrank ES, and Stanhope SJ. Roll-over shape dynamics during stance in natural gait. *American Society of Biomechanics*, August 2010, Providence, RI.

Takahashi K, and Stanhope SJ. Sensitivity analysis of loading conditions on mechanical stiffness measurements of a passive dynamic ankle foot orthoses. *American Society of Biomechanics*, August 2009, State College, PA.

Takahashi K, and Stanhope SJ. A novel method for estimating stiffness of passive dynamic ankle foot orthoses. *Center for Biomedical Engineering Research Symposium*, May 2009, University of Delaware.

Kota Z. Takahashi – Curriculum Vitae

Grant Support

North Carolina State University – Rehabilitation Engineering Center Pilot Grant Jul 2014 – Jun 2015

“Reverse-Engineering Human Musculoskeletal Design to Inform Rehabilitation of Ankle-Foot Pathologies”

Role: Co-PI

Co-PI: Gregory S. Sawicki (North Carolina State University & University of North Carolina at Chapel Hill)

Co-PI: Michael T. Gross (University of North Carolina at Chapel Hill)

Total Award: \$25,000.00

Aim: Examine the role of foot mechanical properties on ankle muscle-tendon mechanics and whole-body metabolic cost during human locomotion.

Grant Proposals (submitted – not funded)

National Institute of Health - F32 Individual Postdoctoral Fellowship (Role: PI)	Apr 2013, Dec 2013
1 st Submission: Priority Score 48 2 nd Submission: Not Discussed	
North Carolina State University – Research Innovation Seed Funding (Role: Co-I)	Oct 2013
Burroughs Wellcome Fund – Career Award at the Scientific Interface (Role: PI)	Sep 2013
Helen Hay Whitney Foundation – Postdoctoral Research Fellowship (Role: PI)	Jul 2013
North Carolina State University – Research Innovation Seed Funding (Role: Co-I)	Feb 2013
Whitaker International Fellows and Scholars (Role: PI)	Jan 2013

IRB-Approved Research Protocols

“Powered Ankle-Orthoses to Restore Limb Mechanics and Reduce Metabolic Cost of Walking Post Stroke”

North Carolina State University & University of North Carolina at Chapel Hill **Fall 2012 – present**
Study Number: 10-0691

“The Mechanics and Energetics of Human Locomotion at Different Movement Frequencies”

North Carolina State University & University of North Carolina at Chapel Hill **Fall 2012 – present**
Study Number: 10-0764

“Human Movement Analysis Database”

University of Delaware **Spring 2012 – Fall 2012**
Study Number: 324555-1

"Gait Adaptations to Passive Dynamic Ankle-Foot Orthosis Use -Technology Development Pilot Project"

University of Delaware **Fall 2009 – Fall 2012**
Study Number: 142086-3

Teaching Experience

Instructor	Biomechanics of Human Motion	Spring 2011
	Department of Kinesiology & Applied Physiology (HESC 425)	
	University of Delaware	
	Created a course syllabus, coordinated laboratory activities with a Graduate Teaching Assistant, designed lectures, and assigned grading for homework and exams. Total of 36 students enrolled, majoring in Athletic Training, Physical Education, and Health Behavior Science.	

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Instructor	Strength & Conditioning Laboratory Department of Health, Nutrition, and Exercise Science (HESC 317) University of Delaware Constructed a course syllabus, and designed laboratory activities. Total of 42 students enrolled in two sections, majoring in Athletic Training, Nutrition, and students minoring in Strength & Conditioning.	Spring 2008
Teaching Assistant	Functional Anatomy Department of Kinesiology & Applied Physiology (HESC 420) University of Delaware Assisted human cadaver dissections, and anatomical interpretation of dissected specimens. Total of 20 students enrolled, composed of students majoring in Athletic Training.	Fall 2010
Teaching Assistant	Biomechanics Department of Biomedical Engineering (BE 202) Catholic University of America Tutored students with understanding of course materials. Held weekly office hours. Graded homework assignments and exams. Class composed of undergraduate students majoring in Biomedical Engineering.	Spring 2007
Guest Lecturer	Anatomy & Physiology Department of Kinesiology & Applied Physiology (HESC 220) University of Delaware Presented a lecture on "Integumentary system of the human body" Presented a lecture on "Overview on tissues of the human body"	Fall 2010
Guest Lecturer	Introduction to Laboratory Instruments Department of Health, Nutrition, and Exercise Science (HESC 689) University of Delaware Introduced and demonstrated the appropriate use of 3D motion capturing instruments to graduate-level students in Biomechanics & Movement Science program. Presented a workshop on obtaining accurate measures of force platform and 3D motion capturing data through live-demonstrations.	Fall 2009
Guest Lecturer	Neuromechanical Basis of Human Movements Department of Health, Nutrition, and Exercise Science (HESC 375) University of Delaware Performed a demonstration of 3D motion capturing capabilities, and provided an introduction of commercially available softwares for biomechanical analysis.	Fall 2009 & Spring 2009

Short-Term Professional Experience

Software Specialist, C-Motion Inc. Visual3D Software Workshop (Tokyo, Japan)	Aug 29-31, 2011
Designed and instructed a three-day training seminar on Visual3D software for employees of a Japanese reseller of Visual3D (Inter-Reha Co., LTD), and a professor of biomechanics. Collected gait data of a single human subject, and taught basic principles of biomechanical modeling, computation, data analysis, and data reporting using Visual3D.	

Kota Z. Takahashi – Curriculum Vitae

IT Specialist/Volunteer, Biomechanics Priorities Conference (Newark, DE, USA)

Jun 9-11, 2010

Assisted in preparation and organization of the conference. Provided IT support during the conference.

Software Specialist/Interpreter, C-Motion Inc.

May 12-14, 2010

Visual3D Software Workshop (Tokyo, Japan)

Executed on-site English-Japanese translations during Visual3D software training. Provided one-on-one training for existing and potential Visual3D users. Visited a laboratory of an existing Visual3D user (Digital Human Research Center) to supply customer support and expertise.

Software Specialist/Interpreter, C-Motion Inc.

Apr 23-24, 2009

Visual3D Software Workshop (Kingston, ON, Canada)

Executed on-site English-Japanese translations during Visual3D software training for employees of a Japanese reseller of Visual3D (NAC Imaging Technology Inc.). Provided on-one-on software training.

Professional Development (Research)

Grant Writing: Hands-On Workshop on Grant Review

Fall 2013

Office of Postdoctoral Affairs, North Carolina State University

A hands-on workshop for post-doctoral researchers to practice submitting grant proposals and to perform mock grant reviews

‘Securing Funding for Your Work’ Workshop

Fall 2013

Office of Postdoctoral Affairs, North Carolina State University

A 2 hour workshop for post-doctoral researchers on resources for securing funding and tips for effective grant writing

‘Twelve Keys to Successful Grant Writing’ Seminar

Summer 2013

Office of Research Development, University of North Carolina at Chapel Hill

A one-day workshop for post-doctoral researchers on tips for successful grant writing strategies

‘Managing the Tenure Process’ Workshop

Spring 2013

Preparing the Professoriate Program, North Carolina State University

A one-day workshop for graduate students and post-doctoral scholars to familiarize on the tenure and promotion process and recognize differences in institutions

Grant Writing Workshop

Winter 2012

Delaware Rehabilitation Institute, University of Delaware

A one-day workshop targeted to senior graduate students and post-doctoral researchers for gaining understanding of the NIH structure, components of R01 proposals, and career development awards

Responsible Conduct of Research Training

Winter 2009

Research Office, University of Delaware

A two-day course for graduate students exploring current issues in areas of responsible conduct of research. Completed classes include: *UNIV 604: Ethics*, *UNIV 605: Research*, *UNIV 606: Authorship*, and *UNIV 607: Funding Opportunities*.

Kota Z. Takahashi – Curriculum Vitae

Human Subject Research Training Certification

Spring 2008

Research and Graduate Studies, University of Delaware

A training session on the use of human subjects in research. Topics included: federal regulations and institutional procedures for using humans in research, and procedures for obtaining informed consent.

Professional Development (Teaching)

Higher Education Teaching Certification (HETC) Program

Winter 2011 – Fall 2011

Center for Teaching and Learning, University of Delaware

A program designed to enhance teaching effectiveness and provide a systematic preparation for all aspects of academic careers. Completed classes in: *Pedagogy in Higher Education, Academic Job Search, Learning in the College Classroom, and Faculty Roles in Institutions of Higher Education.*

Symposium on ‘Teaching Biomechanics’

Summer 2011

American Society of Biomechanics 2011 Annual Conference (Long Beach, CA)

A symposium where faculty of different disciplines shared their experiences of teaching undergraduate biomechanics classes

Lilly Conference on College & University Teaching

Summer 2011

(Washington, DC)

A teaching conference designed for future faculty to refine their teaching skills, support their growth as teacher-scholars in the discipline, and deepen their understanding of faculty roles in different institutional contexts

Graduate Teaching Assistant Conference

Fall 2010

Center for Teaching and Learning, University of Delaware

A conference offered to newly appointed Graduate Teaching Assistant (TA) designed specifically to meet the pedagogical needs of the TAs. Attended workshop sessions in: "Learning and Teaching with Technologies", and "Low-Stakes, Easy-to-Grade Writing".

Academic Service/Outreach

BME Research Retreat – Panel Speaker

Sep 26, 2014

University of North Carolina at Chapel Hill and North Carolina State University (Raleigh, NC)

Served on a panel as a postdoc representative to offer perspectives on issues related to research activities at UNC and NC State, writing peer-reviewed publications and grants, and work-life balance.

Conference Tutorial Lecture – Lead Organizer

Jun 24, 2014

Gait & Clinical Movement Analysis Society Annual Conference 2014 (Newark, DE)

Organized a tutorial lecture series and invited established scientists with unique expertise related to ankle and foot biomechanics and human locomotion.

Open Minds: Teen Science Cafés – Guest Speaker

Mar 7, 2014

North Carolina Museum of Natural Sciences (Raleigh, NC)

Presented a talk on ‘Wearable Robotics’ and demonstrated a thought-controlled robotic ankle exoskeleton to an audience of young teens.

Kota Z. Takahashi – Curriculum Vitae

- Mentoring from the Postdoc Perspective Workshop – Panel Speaker** **Feb 26, 2014**
Office of Faculty Development, North Carolina State University
Participated in a panel consisting of postdoctoral scholars for a workshop dedicated to faculty members regarding tips and good practices for mentoring postdocs.
- Secretary – Postdoctoral Association** **Fall 2013 & Spring 2014**
North Carolina State University
Reported and recorded minutes for monthly Postdoctoral Association meetings and played a leadership role to promote visibility of all Postdoctoral Scholars at NCSU.
- ‘Live at Nine’ – Guest Speaker** **Jun 4, 2013**
WBFT TV (Sanford, NC)
Appeared for a 1-hour local television show, demonstrated a myoelectrically controlled robotic ankle exoskeleton and discussed rehabilitation applications.
- UNC Science Expo – Exhibitor** **Apr 13, 2013**
North Carolina Science Festival (Chapel Hill, NC)
Demonstrated a myoelectrically controlled robotic ankle exoskeleton to a general audience of students and their parents.
- BEST Fest (Biotechnology, Engineering, Science and Technology) – Exhibitor** **Apr 6, 2013**
North Carolina Museum of Natural Science (Raleigh, NC)
Demonstrated a myoelectrically controlled robotic ankle exoskeleton to a general audience of students and their parents.
- Student Career Symposium – Panel Speaker** **May 9, 2012**
Gait & Clinical Movement Analysis Society Annual Conference 2012 (Grand Rapid, MI)
Participated in a panel consisting of senior professors, post-docs, and graduate students for a symposium dedicated to graduate/undergraduate students regarding future career decisions.
- Roundtable Discussion Facilitator** **Jun 17, 2011**
INBRE Undergraduate Researcher Retreat, University of Delaware
Offered career advice to undergraduate summer interns, and fielded questions on ‘*Should I go to graduate school/professional school?*’
- Biomechanics Laboratory Demonstrations** **Oct 16, 2010 & Oct 10, 2009**
Parents and Family Weekend, University of Delaware
Presented an overview of the research projects at the Biomechanics Laboratory, and provided a demonstration of motion capturing technology and biomechanical software
- Research Symposium Student Committee** **May 7, 2010**
Center for Biomedical Engineering Research (CBER) Research Symposium 2010, University of Delaware
Created and collected a total of 67 surveys at the annual CBER Research Symposium, and summarized survey results to offer guidelines for improving future symposiums

Ad hoc Journal Reviewer

Journal of Biomechanics	2012-present
Journal of Theoretical Biology	2013-present
IEEE Transactions on Neural Systems & Rehabilitation Engineering	2014-present
Prosthetics & Orthotics International	2014-present

Student Mentoring

Undergraduate Students

Arianna Nasser (Biomedical Engineering, North Carolina State University)	Summer 2014 - present
Leighanne Davis (Biomedical Engineering, North Carolina State University)	Fall 2013 - present
Samuel Ray (Biomedical Engineering, North Carolina State University)	Summer 2013-Spring 2014
Brittany Wilder (Mechanical Engineering, University of Delaware)	Summer & Fall 2008
Alissa Kregling (Exercise Science, University of Delaware)	Summer 2009

High School Student

Rohan Chandrasekhar (Enloe High School, Raleigh, NC)	Summer 2013
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Professional Affiliations

American Society of Biomechanics	2009-present
Gait and Clinical Movement Analysis Society	2012-present
International Society of Biomechanics	2007
National Council on Strength and Fitness	2006-2008

Professional Certifications

First Aid/CPR, <i>American College of Emergency Physicians</i>	2008-2009, 2010-present
Personal Training, <i>National Council on Strength and Fitness</i>	2006-2008

Software/Hardware Experience

Visual3D
Matlab
Labview
Oxycon Mobile
Bertec Instrumented Treadmill
AMTI Force Platforms
Telemed Ultrasound
Vicon Nexus
EvaRT/Cortex
Microsoft Office (PowerPoint, Word, Excel)

Language Skills

Fluency in English and Japanese

References

Gregory S. Sawicki, Ph.D.

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North Carolina State University
Joint Department of Biomedical Engineering
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Office: 919-513-0787

Steven J. Stanhope, Ph.D.

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Associate Vice Provost for Research
University of Delaware
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Department of Mechanical Engineering
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James G. Richards, Ph.D.

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Vice Provost for Graduate and Professional Education
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Todd D. Royer, Ph.D.

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