

CURRICULUM VITAE
Ke Song, PhD

CONTACT INFORMATION:

Human Motion Laboratory
Department of Orthopaedic Surgery
University of Pennsylvania Perelman School of Medicine
3737 Market Street, 6th Floor
Philadelphia, PA, USA 19104
ke.song@pennmedicine.upenn.edu
(215) 294-9613

PRESENT POSITION:

September 2021 – Present

Postdoctoral Researcher
Human Motion Laboratory
Department of Orthopaedic Surgery
University of Pennsylvania Perelman School of Medicine
Philadelphia, PA, USA
Advisor: Josh R. Baxter, PhD

EDUCATION:

August 2015 – May 2021

Doctor of Philosophy, Mechanical Engineering
Washington University in St. Louis
St. Louis, MO, USA
Dissertation: Subject-Specific Musculoskeletal Modeling of Hip Dysplasia Biomechanics
Advisor: Michael D. Harris, PhD

September 2013 – December 2014

Master of Science, Biomedical Engineering
University of Michigan
Ann Arbor, MI, USA

September 2009 – June 2013

Bachelor of Science, Biomedical Engineering
Hong Kong Polytechnic University
Hong Kong, China
Honours Class II-1

ACADEMIC POSITIONS / EMPLOYMENT:

January 2016 – May 2021

Graduate Research Assistant
Movement Science Research Center
Program in Physical Therapy
Washington University in St. Louis
St. Louis, MO, USA
Advisor: Michael D. Harris, PhD

September – December 2019 September – December 2017	Guest Lecturer <i>IPMS5510: Movement Science II – Biomechanics</i> PhD Program in Movement Science (WUSTL PT) St. Louis, MO, USA Instructors: Michael D. Harris; Michael J. Mueller
September 2015 – April 2016	Graduate Teaching Assistant <i>JEE4980: Electrical Engineering Design Project</i> WUSTL – UMSL Joint Engineering Program St. Louis, MO, USA Instructor: Dedric A. Carter, PhD
September – December 2015	Rotational Research Assistant Applied Biomechanics Laboratory Program in Physical Therapy Washington University in St. Louis St. Louis, MO, USA Advisor: Michael J. Mueller, PT, PhD, FAPTA
September 2013 – December 2014	Research Assistant Biomechanics Research Laboratory Department of Mechanical Engineering University in Michigan Ann Arbor, MI, USA Advisor: James A. Ashton-Miller, PhD

HONORS and AWARDS:

2020	American Society of Biomechanics Three Minute Thesis (3MT) Competition – Winner, PhD Category
2018, 2019	Washington University Graduate Research Symposium – 3 rd Place Poster, Engineering Category
2018	American Society of Biomechanics Student Travel Award

EDITORIAL RESPONSIBILITIES:

Reviewer	<i>Frontiers in Bioengineering and Biotechnology</i>
Reviewer	<i>Scientific Reports</i>
Abstract Reviewer	Orthopaedic Research Society Annual Meeting
Reviewer	<i>Clinical Biomechanics</i>
Reviewer	<i>Computer Methods in Biomechanics and Biomedical Engineering</i>

SERVICE CONTRIBUTIONS:

2023 – Present	Member, American Society of Biomechanics Education Committee
2023	Judge, ASB <i>Journal of Biomechanics</i> Award
2023	Contributor, <i>Learning on a Limb</i> Outreach Program (UPenn Orthopaedics)
2023	Session Moderator, Orthopaedic Research Society Annual Meeting

2023 – Present Member, American Society of Biomechanics Membership Committee
2017 – 2019 Contributor, *National Biomechanics Day* Community Outreach Program

PROFESSIONAL SOCIETIES:

2021 – Present Orthopaedic Research Society Tendon Section
2018 – Present Orthopaedic Research Society
2017 – Present American Society of Biomechanics

TEACHING RESPONSIBILITIES:

Guest Lecturer *IPMS 5510: Movement Science II – Biomechanics* (2017, 2019)
 PhD Program in Movement Science (WUSTL Physical Therapy)
Teaching Assistant *JEE 4980: Electrical Engineering Design Project* (2015 – 2016)
 WUSTL – UMSL Joint Engineering Program

RESEARCH SUPPORT:

Present

NIH NIAMS R01AR078898

PI: Josh R. Baxter

Title: Tendon loading profiles that promote healing in Achilles tendinopathy

Duration: 4/1/2021 – 2/28/2026

Role: Postdoctoral Researcher

Past

NIH NIAMS K01AR072072

PI: Michael D. Harris

Title: Muscle Geometry and its Influence on Function in Patients with Developmental Dysplasia of the Hip

Duration: 4/1/2018 – 3/30/2023

Role: Graduate Research Assistant

BIBLIOGRAPHY:

Peer-Reviewed Journal Articles

1. Scattone Silva R, **Song K**, Hullfish TJ, Sprague AL, Silbernagel KG, Baxter JR. 2023. Patellar tendon load progression during rehabilitation exercises: Implications for the treatment of patellar tendon injuries. *Medicine & Science in Sports & Exercise* [In Press]. doi: 10.1249/MSS.0000000000003323.
2. Wu T, Lohse KR, Van Dillen LR, **Song K**, Clohisy JC, Harris MD. 2023. Are abnormal muscle Biomechanics and patient-reported outcomes associated in patients with hip dysplasia? *Clinical Orthopaedics and Related Research* 481(12):2380-2389. doi: 10.1097/CORR.0000000000002728.
3. **Song K**, Hullfish TJ, Scattone Silva R, Silbernagel KG, Baxter JR. 2023. Markerless motion capture estimates of lower extremity kinematics and kinetics are comparable to

marker-based across 8 movements. *Journal of Biomechanics* 157:111751. doi: 10.1016/j.jbiomech.2023.111751.

4. **Song K**, Scattone Silva R, Hullfish TJ, Silbernagel KG, Baxter JR. 2023. Patellofemoral joint loading progression across 35 weight-bearing rehabilitation exercises and activities of daily living. *American Journal of Sports Medicine* 51(8):2110-2119. doi: 10.1177/03635465231175160.
5. Shepherd MC, Gaffney BMM, **Song K**, Clohisy JC, Nepple JJ, Harris MD. 2022. The Impact of Femoral Version Deformity on Joint Reaction Forces in Dysplastic Hips. *Journal of Orthopaedic Research* 135:111023. doi: 10.1016/j.jbiomech.2022.111023.
6. **Song K**, Pascual-Garrido C, Clohisy JC, Harris MD. 2022. Hip Dysplasia Elevates Loading at the Posterior Acetabular Edge during Double-Legged Squat. *Journal of Orthopaedic Research* 40(9):2147-2155. doi: 10.1002/jor.25249.
7. Harris MD, Shepherd MC, **Song K**, Gaffney BMM, Hillen TJ, Harris-Hayes M, Clohisy JC. 2022. The Biomechanical Disadvantage of Dysplastic Hips. *Journal of Orthopaedic Research* 40(6):1387-1396. doi: 10.1002/jor.25165.
8. **Song K**, Pascual-Garrido C, Clohisy JC, Harris MD. 2021. Acetabular Edge Loading during Gait is Elevated by the Anatomical Deformities of Hip Dysplasia. *Frontiers in Sports and Active Living* 3:687419. doi: 10.3389/fspor.2021.687419.
9. **Song K**, Gaffney BMM, Shelburne KB, Pascual-Garrido C, Clohisy JC, Harris MD. 2020. Dysplastic Hip Anatomy Alters Muscle Moment Arm Lengths, Lines of Action, and Contributions to Joint Reaction Forces during Gait. *Journal of Biomechanics* 110:109968. doi: 10.1016/j.jbiomech.2020.109968.
10. **Song K**, Anderson AE, Weiss JA, Harris MD. 2019. Musculoskeletal Models with Generic and Subject-Specific Geometry Estimate Different Joint Biomechanics in Dysplastic Hips. *Computer Methods in Biomechanics and Biomedical Engineering* 22(3):259-270. doi: 10.1080/10255842.2018.1550577.

Preprint / Non-Peer-Reviewed Articles

1. Phan V, **Song K**, Scattone Silva R, Silbernagel KG, Baxter JR, Halilaj E. 2023. Seven things to know about exercise monitoring with inertial sensing wearables. *TechRxiv*. doi: 10.36227/techrxiv.23296487.v1.
2. **Song K**, Hullfish TJ, Scattone Silva R, Silbernagel KG, Baxter JR. 2023. Markerless Motion Capture Estimates of Lower Extremity Kinematics and Kinetics are Comparable to Marker-based across 8 Movements. *bioRxiv*. doi: 10.1101/2023.02.21.526496.

Conference Abstracts

1. **Song K**, Kwon MP, Smith AK, Silbernagel KG, Baxter JR. Tendon Loads Measured over 2 Weeks of Daily Living are Associated with Achilles Tendinopathy Patient Outcomes. 70th Annual Meeting of the Orthopaedic Research Society. Long Beach, CA, USA, February 2024.
2. **Song K**, Hullfish TJ, Scattone Silva R, Silbernagel KG, Baxter JR. Markerless Motion Capture Estimates of Lower Extremity Biomechanics are Comparable to Marker-based across 8 Movements. 47th Annual Meeting of the American Society of Biomechanics. Knoxville, TN, USA, August 2023.

3. **Song K**, Scattone Silva R, Hullfish TJ, Silbernagel KG, Baxter JR. Patellofemoral Joint Loading Progression Across 35 Weight-Bearing Rehabilitation Exercises and Activities of Daily Living. 69th Annual Meeting of the Orthopaedic Research Society. Dallas, TX, USA, February 2023.
4. **Song K**, Cone SG, Zellers JA, Thelen DG, Baxter JR. Tracking Day-to-Day Achilles Tendon Loading Progression during Rupture Recovery. 5th North American Congress on Biomechanics. Ottawa, ON, Canada, August 2022.
5. **Song K**, Cone SG, Zellers JA, Thelen DG, Baxter JR. Day-to-Day Loading Progression in Repaired Achilles Tendon Corresponds to Real-World Events of Tendon Health. 2022 ORS Tendon Section Conference. Philadelphia, PA, USA, May 2022.
6. **Song K**, Pascual-Garrido C, Clohisy JC, Harris MD. Hip Dysplasia Elevates Loading at the Posterior Acetabular Edge during Double-Legged Squat. 67th Annual Meeting of the Orthopaedic Research Society. *Virtual*, February 2021.
7. Shepherd MC, Gaffney BMM, **Song K**, Clohisy JC, Harris MD. The Influence of Femoral Version Deformity on Joint Reaction Forces in Dysplastic Hips. 67th Annual Meeting of the Orthopaedic Research Society. *Virtual*, February 2021.
8. Harris MD, Shepherd MC, **Song K**, Gaffney BMM, Hillen TJ, Clohisy JC. The Mechanical Disadvantage of Dysplastic Hips. 67th Annual Meeting of the Orthopaedic Research Society. *Virtual*, February 2021.
9. **Song K**, Shepherd MC, Clohisy JC, Harris MD. Periacetabular Osteotomy for Hip Dysplasia Alters Dynamic Flexor and Abductor Muscle Moment Arms and Lines of Action. 44th Annual Meeting of the American Society of Biomechanics. *Virtual*, August 2020.
10. **Song K**, Clohisy JC, Harris MD. Effects of Periacetabular Osteotomy on In-Vivo Loading at the Edge of Dysplastic Acetabula during Gait. 66th Annual Meeting of the Orthopaedic Research Society. Phoenix, AZ, USA, February 2020.
11. Gaffney BMM, **Song K**, Harris-Hayes M, Clohisy JC, Harris MD. Influence of Hip Kinematic Perturbations during Walking on Joint Loading in Patients with Acetabular Dysplasia. 66th Annual Meeting of the Orthopaedic Research Society. Phoenix, AZ, USA, February 2020.
12. **Song K**, Clohisy JC, Harris MD. Dysplastic Hip Anatomy and Joint Reaction Forces Affect Instantaneous and Accumulative Loads at the Acetabular Edge. ISB Congress XXVII / 43rd Annual Meeting of the American Society of Biomechanics. Calgary, AB, Canada, August 2019.
13. **Song K**, Gaffney BMM, Harris MD. Hip Joint Reaction Force Contributions to Acetabular Edge Loading in Dysplastic Hips: A Subject-Specific Musculoskeletal Modeling Study. 65th Annual Meeting of the Orthopaedic Research Society. Austin, TX, USA, February 2019.
14. **Song K**, Gaffney BMM, Pascual-Garrido C, Harris MD. Effects of Dysplastic Pelvis Morphology on Hip Muscle Lines of Action, Moment Arm Lengths, and Contributions to Joint Reaction Forces. 42nd Annual Meeting of the American Society of Biomechanics. Rochester, MN, USA, August 2018.
15. Harris MD, **Song K**, Gaffney BMM. How femoral version changes joint loading in patients with developmental dysplasia of the hip. 42nd Annual Meeting of the American Society of Biomechanics. Rochester, MN, USA, August 2018.

16. **Song K**, Anderson AE, Weiss JA, Harris MD. Musculoskeletal Models Scaled with CT Images versus Skin Markers in a Population with Hip Deformity Compared to Controls. 41st Annual Meeting of the American Society of Biomechanics. Boulder, CO, USA, August 2017.
17. Harris MD, **Song K**, Davidson BS, Decker MJ, Shelburne KB. Multi-joint Compensations during Landing and Cutting at least One Year after Return to Sport following ACL Reconstruction. 63rd Annual Meeting of the Orthopaedic Research Society. San Diego, CA, USA, March 2017.
18. Harris MD, **Song K**, Davidson BS, Decker MJ, Shelburne KB. The Influence of a Functional Knee Brace and Orthopaedic Tights on Lower Extremity Mechanics During Land and Cut Maneuvers. 63rd Annual Meeting of the Orthopaedic Research Society. San Diego, CA, USA, March 2017.

RESEARCH INTERESTS:

- Human motion capture & analysis
- Subject-specific musculoskeletal modeling
- Wearable technology, artificial intelligence & machine learning
- Muscle-tendon biomechanics of the shoulder joint
- Multi-joint biomechanics of the lower extremity
- Biomechanics of hip morphological conditions
- Tendon mechanics & physiology
- Sports biomechanics, injury rehabilitation & prevention

TECHNICAL SKILLS:

Proficient: Python, MATLAB, OpenSim, Amira, Visual3D, Theia3D, Optitrack Motive, Vicon Nexus, Motion Analysis Cortex, APDM Motion Studio, PreView/PostView, SPSS Statistics, MS Office

Skills with: Ultrasonic imaging, R, C/C++, LabView, Abaqus, SolidWorks, SketchUp/LayOut, Mimics/3-Matics