

Exponent®
Engineering & Scientific Consulting

Lin Wei, Ph.D.

Associate | Biomechanics
Tampa
+1-813-379-3478 | lwei@exponent.com

Professional Profile

Dr. Lin Wei is an expert in biomechanics, specializing in human movement analysis, sports biomechanics, and the application of advanced data science to complex biomechanical datasets. His expertise encompasses the operation of motion capture systems, the integration of wearable sensors, machine learning (ML), and artificial intelligence (AI) to model human performance.

With over 10 years of experience bridging biomechanics and data engineering, Dr. Wei is skilled at translating complex multimodal data, ranging from laboratory measurements to real-world environments, into actionable insights. He consults on matters related to product innovation, injury risk reduction, and performance optimization, providing critical insights for clinical, occupational, and sports-related applications.

Dr. Wei has extensive experience in the collection and analysis of biomechanical data using optical motion capture systems, inertial measurement units (IMUs), force platforms, and electromyography (EMG). Beyond traditional testing, he possesses a strong background in data engineering, including the design of automated ETL (extract, transform, load) pipelines and the development of predictive models using Python and large language model (LLM) programming techniques. Dr. Wei applies these computational methods alongside finite element analysis (FEA) to assess injury mechanisms, evaluate footwear and apparel performance, and validate consumer products under dynamic loading conditions.

Prior to joining Exponent, Dr. Wei served as the Laboratory Manager and Data Engineer at the University of South Florida, where he directed lab operations and developed reproducible processing workflows for human movement research. Previously, as a Sports Medicine Clinical Biomechanist at Texas Health Resources, he led the strategy and operations of a newly established motion capture lab. In this role, he collaborated with physicians and athletic trainers to analyze fatigue and injury risk in professional athletes, including those in the MLB and NFL. Dr. Wei earned his Ph.D. in Rehabilitation Sciences from the University of Pittsburgh. His doctoral research was conducted at the U.S. Department of Veterans Affairs (VA) Human Engineering Research Laboratories (HERL), where he developed machine learning algorithms to optimize biomechanics for veterans and service members, with applications in rehabilitation engineering.

Academic Credentials & Professional Honors

Ph.D., Rehabilitation Sciences, University of Pittsburgh, 2021

M.S., Mechanical Engineering, University of Pittsburgh, 2013

Winner of the 2019 Young Investigator of Veterans Affairs Pittsburgh Healthcare System (2019)

Winner of student scientific paper competition (RESNA) (2018)

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Prior Experience

Research Lab Manager / Data Engineer, University of South Florida, 2025

Sport Medicine Clinical Biomechanist, Texas Health Resources, 2021–2025

Graduate Student Researcher (Ph.D.), US Veterans Affairs Human Engineering Research Laboratories, 2014–2021

Research Engineer, Allegheny General Hospital, 2013–2014

Professional Affiliations

American Society of Biomechanics (ASB)

SAE International (Society of Automotive Engineers)

Publications

Koontz AM, Neti A, Chung CS, Ayiluri N, Slavens B, Davis C, Wei L. "Reliability of 3D depth motion sensors for capturing upper body motions and assessing the quality of wheelchair transfers." Sensors 2022; 22(13):4977.

Koontz AM, Wei L, Crytzer TM. Influence of direction and surface type on independent wheelchair transfer technique. Journal of Taiwan Occupational Therapy 2022 (Special Issue: Emerging Technology in Rehabilitation Science).

Wei L, Chung CS, Koontz AM. "Automating the clinical assessment of independent wheelchair sitting pivot transfer technique using machine learning algorithm." Topics in Spinal Cord Injury Rehabilitation 2021; 27(3):1-11.

Kulich H, Wei L, Crytzer TM, Koontz AM, Cooper RA. "Preliminary evaluation of an automated robotic transfer assist device in the home setting." Assistive Technology 2021; 18(2):1-8.

Presentations/Abstract

Parker A, Imbus S, Wei L. Energy absorption analysis reveals persistent knee deficits underestimated by isokinetic testing during return-to-sport following ACL reconstruction. American Society of Biomechanics (ASB) Annual Meeting, Pittsburgh, PA, 2025.

Wei L, Ka HW, Koontz AM. Using the Microsoft Kinect and machine learning to evaluate wheelchair sitting pivot transfer. Veterans Affairs Pittsburgh Healthcare System Research Day, Pittsburgh, PA, 2019.

Sallinger N, Wei L, Bass S, Ka HW, Koontz AM. Real time transfer technique assessment using the Kinect2 sensor. Platform presentation, Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Annual Conference, Arlington, VA, 2018.

Wei L, Tsai CY, Koontz AM. The relationship between joint ranges of motion and joint kinetics during sitting pivot wheelchair transfers. Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Annual Conference, Arlington, VA, 2018.

Wei L, Brown T, Ka HW, Koontz AM. Evaluating wheelchair transfer technique by Microsoft Kinect. Platform presentation, 33rd International Seating Symposium (ISS), Nashville, TN, 2017.

Wei L, Ka HW, Tsai CY, Koontz AM. Can the Kinect detect differences between proper and improper

wheelchair transfer techniques? Platform presentation, Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Annual Conference, Arlington, VA, 2016.

Wei L, Miller MC. Muscular stabilization during supination reduces radial head translation while increasing axial load. Platform presentation, Orthopedic Research Society (ORS) Annual Meeting, Orlando, FL, 2016.

Wei L, Tsai CY, Bass S, Koontz AM. Differences in the upper limb mechanical demands between wheelchair to bench and bench to wheelchair sitting-pivot transfers. Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Annual Conference, Denver, CO, 2015.

Project Experience

Conducted comprehensive biomechanical evaluations for professional baseball pitchers and hitters to optimize performance and mitigate injury risks. Utilized 3D motion capture, high-frequency video, and force plate data to quantify kinematic sequencing, joint angular velocities, and fatigue-induced mechanical changes over longitudinal periods. Developed custom Python algorithms to process large datasets, identifying mechanical inefficiencies and providing data-driven recommendations to coaching staff regarding velocity enhancement and kinetic chain optimization.

Managed the biomechanical assessment protocol for a professional athlete’s return-to-play process following ACL reconstruction surgery. Executed 3D motion capture assessments, including jump-landing tasks and isokinetic strength testing, to quantify movement quality and identify lower-limb asymmetries. Analyzed energy absorption and strength metrics to provide objective functional status reports to the medical team, supporting clinical decision-making regarding the athlete's readiness to compete.

Designed and deployed automated data engineering pipelines using Python and SQL to streamline the collection, processing, and analysis of large-scale datasets. Established end-to-end protocols for workload management that significantly reduced manual data handling and minimized processing errors. Enhanced operational efficiency and data accuracy, enabling rapid reporting of performance and medical metrics for cross-functional organizational stakeholders.

Developed machine learning models integrated with optical motion capture systems to evaluate wheelchair transfer biomechanics for veterans and service members. Collaborated with clinicians and engineers to analyze multimodal datasets to identify motion patterns associated with upper-limb injury risks. Prototyped and validated user-centered assessment tools approved for clinical deployment to enhance safety and accessibility.

Reviewed case materials, including medical records and incident reports, to assess injury causation and mechanisms from a biomechanical perspective. Applied principles of human dynamics, tissue mechanics, and injury tolerance to evaluate the consistency between alleged events and physical evidence. Synthesized technical findings to assist in the preparation of expert opinions for legal proceedings.

Additional Education & Training

Machine Learning (Online non-credit course authorized by Stanford University and offered through Coursera) (Completed: October 23, 2018)

Military Service: Sailor, Taiwan Navy, 2010–2011