WALTER MENKE, Ph.D.

PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Dr. Menke earned his Bachelor of Science degree in Kinesiology and Health Promotion and his Master of Science degree in Kinesiology with a concentration on Biomechanics from the University of Kentucky. He went on to obtain his Ph.D. in Kinesiology with a concentration on Biomechanics and a Master of Science degree in Statistics from the University of Tennessee, Knoxville. Dr. Menke's research primarily focused on the biomechanics of patient populations, specifically with his doctoral work on the biomechanics of individuals who had recently received a total knee replacement. He measured full body kinematics and kinetics of patients recovering from their joint replacement while cycling and walking and additionally performed musculoskeletal modeling simulations to evaluate internal joint contact forces. Dr. Menke also conducted veterinary biomechanical analyses which included developing porcine models for blast-induced traumatic brain injury and equine osteoarthritis pharmacology interventions. At the University of Kentucky, Dr. Menke conducted research involving patients with hip femoroacetabular impingement as well as assisted in research investigating the effects of fatigue and simulated body armor use for military applications.

Dr. Menke's work has specialized in human biomechanics with a particular emphasis on the human biomechanical response to surgical intervention of pathological or acute insults to the body. Dr. Menke has developed a broad foundation of knowledge that includes human anatomy, physics, computer science, biomedical, and mechanical engineering principles that allow him to understand the many facets of injury biomechanics. He applies this knowledge currently to analyze kinematics, kinetics, and injury mechanisms present for individuals involved in a wide variety of dynamic and static scenarios and load applications. Dr. Menke has developed and implemented testing protocols involving passenger vehicles and heavy trucks, falling objects, and impact testing using anthropomorphic test devices at ARCCA, LLC. Dr. Menke has additionally developed protocols and conducted athlete biomechanical evaluations for Epic Biomechanics, LLC.

SUMMARY OF EXPERIENCE

- Designed and conducted scientific investigation involving patients with total knee replacements to assess biomechanics during gait and cycling tasks.
- Performed computations and conducted simulations to determine internal joint contact forces during dynamic movement.
- Conducted comprehensive testing and investigation involving patients with hip pathologies to generate a database of affected movements.
- Conducted testing to evaluate the effects of fatigue on human biomechanics in a simulated military training scenario.

AREAS OF SPECIALTY

- Injury Causation Biomechanics
- Trauma and Impact Biomechanics
- Human Kinematics and Kinetics
- Joint Biomechanics
- Head/Brain Biomechanics
- Human Tolerance Thresholds
- Human Injury Mechanisms
- Human Data Capture and Processing
- Accident Reconstruction

EDUCATION

- Ph.D., Kinesiology, University of Tennessee Knoxville, August 2025
    - Concentration: Biomechanics
- M.S., Statistics, University of Tennessee Knoxville, August 2025
- M.S., Kinesiology, University of Kentucky, May 2021
    - Concentration: Biomechanics
- B.S., Kinesiology and Health Promotion, University of Kentucky, May 2019

PROFESSIONAL EXPERIENCE

November 2025 – Present | ARCCA, LLC | Senior Biomechanist

- Determines injury causation mechanisms in various events using a combination of biomechanics, anatomy, engineering, and physics principles.
- Utilizes peer-reviewed studies of human volunteers and anthropometric test devices to determine human response and tolerance to specific events and related forces.
- Reconstructs events to evaluate human kinematics and kinetics through forensic evidence, vehicle and site inspections, computational modelling, and component testing.

August 2021 – August 2025 | University of Tennessee, Knoxville | Graduate Researcher and Teaching Assistant

- Conducted and designed biomechanical research protocols involving patients with total knee replacements.
- Prepared for and collected kinematic and kinetic data utilizing high-speed motion cameras, in-ground force plates, instrumented ergometers, and pressure-sensing insoles for biomechanical research.
- Developed a Python program to comprehensively process and compile biomechanics data that allowed for visual inspection and confirmation of results before performing statistical analysis.
- Conducted biomechanical testing of diabetic insoles during gait.
- Implemented a variety of statistical analyses such as statistical parametric mapping, Passing-Bablok regression, Bland-Altman plots, ANOVAs, and SVM to explore and develop stories with data.
- Designed and managed a database containing dissertation data for a centralized location of total knee arthroplasty kinematic, kinetic, simulation, and demographic data.

February 2023 – August 2025 | University of Tennessee, Knoxville Department of Chemistry | Researcher

- Assisted with design, testing, implementation, and processing of a blast tube for inducing brain injury to porcine models.
- Set up for data collections using high-speed motion capture cameras and accelerometers for blast testing.
- Conducted pre- and post-blast gait analyses with a custom marker set for pigs.

February 2023 – August 2025 | University of Tennessee, Knoxville College of Veterinary Medicine | Researcher

- Assisted with design, testing, implementation, and processing of equine osteoarthritic gait biomechanics during multiple pharmacological interventions.

August 2019 – May 2021 | University of Kentucky Biomechanics Laboratory | Graduate Teaching Assistant

- Conducted dozens of biomechanical data collections for patients with femoroacetabular impingement as well as age- and sex-matched controls.
- Instructed participants in balance testing, strength testing, and functional movement testing and acquired pain measurements throughout each session.
- Assisted with fatigue induced biomechanical analyses of simulated military armor vest use during repetitive lifting movements.

August 2018 – May 2019 | University of Kentucky Exercise Physiology Lab | Data Collection Technician

- Assisted with collections of VO2 max measurements during a longitudinal nutrition intervention study.

FELLOWSHIPS AND AWARDS

- Graduate Student Writing Award, *American Kinesiology Association,* 2025
- Doctoral Scholar, *American Kinesiology Association,* 2025
- Andy Kozar Graduate Scholarship, *American Kinesiology Association,* 2025
- Matching Dissertation Grant, *International Society of Biomechanics,* 2024
- Graduate Student Senate Travel Award, *University of Tennessee, Knoxville,* 2023
- J. Wallace and Katie Dean Graduate Fellowship, *University of Tennessee, Knoxville,* 2021
- Tennessee Fellowship for Graduate Excellence, *University of Tennessee, Knoxville,* 2021-2025

PROFESSIONAL AFFILIATIONS

- International Society of Biomechanics
- American Society of Biomechanics

PEER-REVIEWED PUBLICATIONS

Menke, W., Ovispo-Martinez, A., Lu, TL., Stevens, K., Cates, H. (2026). Effects of unilateral crank arm adjustment on knee biomechanics of people with total knee arthroplasty during stationary cycling. *Clinical Biomechanics (Accepted)*.

Brown, S., **Menke, W.**, Martin, J., Zhang, S. (2025). Effects of Asymmetric Crank Adjustment on Knee Biomechanics during Stationary Cycling. *Submission in Progress*.

Menke, W., Shaw, A., & Zhang, S. (2024). Cycling Power Characteristics between Instrumented and Favero Assioma Duo Road Power Meter Pedals. *Journal of Science and Cycling*, *13*(1), 67-74. https://doi.org/10.28985/1324.jsc.08

Menke, W., Estler, K., Springer, C., Zhang, S. "Validity, Reliability and Bias between Instrumented Pedals and Loadsol Insoles during Stationary Cycling." *PLOS One*. 2024

Zhang, S.; Wen, C.; Brown, S.; **Menke, W.**; Estler, K.; Cates, H. "Effects of different slopes on hip and ankle biomechanics of replaced and non-replaced limbs of patients with total knee arthroplasty during incline ramp walking." *Journal of Biomechanics*. 2024, 172. https://doi.org/10.1016/j.jbiomech.2024.112205

Goh, J.; **Menke, W**.; Herrick, L.P.; Campbell, M.S.; Abel, M.G.; Fleenor, B.S.; Bergstrom, H.C. "Examination of Curcumin and Fenugreek Soluble Fiber Supplementation on Submaximal and Maximal Aerobic Performance Indices." *J. Funct. Morphol. Kinesiol.* 2020, *5*, 34.

Herrick LP, Goh J, **Menke W**, et al. "Effects of Curcumin and Fenugreek Soluble Fiber on the Physical Working Capacity at the Fatigue Threshold, Peak Oxygen Consumption, and Time to Exhaustion." *J Strength Cond Res*. 2020;10.1519/JSC.0000000000003852. doi:10.1519/JSC.0000000000003852

ABSTRACTS AND PRESENTATIONS

Zhang, S., **Menke, W.**, Ovispo-Martinez, A., Lu, T., Stevens, K., Cates, H. (2026, July), "Knee Contact Forces of TKA Patients with Asymmetrically Shortened Crank Arm Lengths during Ergometer Cycling." Poster session presented at the *10th World Congress of Biomechanics*, Vancouver, Canada.

Menke, W., Ovispo-Martinez, A., Lu, T., Stevens, K., Cates, H., Zhang, S. (2025, July), "Effects of Asymmetric Crank Arm Shortening on Knee Biomechanics for Patients of Total Knee Arthroplasty." Poster session at the *Congress of International Society of Biomechanics*, Stockholm, Sweden.

Menke, W., Shaw, A., Zhang, S. (2024, May), "Comparison of Cycling Crank Power Measured by Instrumented Pedals and a Commercial Power Meter." Poster session presented at the meeting of the *American College of Sports Medicine*, Boston, Massachusetts, USA.

Zhang, S., **Menke, W**. (2024, May), "Crank Power Changes and Characteristics across Different Workloads during Stationary Cycling." Poster session at the meeting of the *American College of Sports Medicine*, Boston, Massachusetts, USA.

Menke, W., Zhang, S. (2023, August), "Using Loadsol Data to Estimate Knee Joint Moments in Stationary Cycling." Poster session presented at the meeting of the *American Society of Biomechanics,* Knoxville, Tennessee, USA.

Menke, W., Zhang, S. (2023, July) "Reliability of the Loadsol Insole for Measuring Kinetics during Stationary Cycling." Poster session presented at the meeting of the *International Society of Biomechanics,* Fukuoka, Japan.

Menke, W., Springer, C., Zhang, S. (2023, July) "Systematic and Proportional Bias using Loadsol during Stationary Cycling." Poster session presented at the meeting of the *Footwear Biomechanics Symposium*, Osaka, Japan.

Estler, K., **Menke, W.**, Abbott, A., Zhang, S. (2023, February). "How do different incline slopes affect knee joint loading in seated stationary cycling?" Poster session at the meeting of *American Society of Biomechanics: Mid-South Conference,* Memphis, Tennessee, USA.

Menke, W., Estler, K., Abbott, A., Zhang, S. (2023, February). "Pedal Reaction Force Measurement Variability in Cycle Ergometry with Instrumented Pedals and Loadsol." Poster session presented at the meeting of *American Society of Biomechanics: Mid-South Conference,* Memphis, Tennessee, USA.

Menke, W., Samaan, M. (2022, May). "Verbal-Cue Altered Gait in the Femoroacetabular Impingement Syndrome Population." Virtual presentation presented at the meeting of *American College of Sports Medicine,* San Diego, California, USA.

Zhang, S, Brown, S, Estler, K, **Menke, W**, Wen, C, and Cates, H. (2022, August). "Ankle Biomechanics of Patients with TKA During Uphill Walking." Oral presentation presented at the meeting of *North American Congress on Biomechanics,* Ottawa, Ontario, Canada.

Zhang, S, Brown, S, **Menke, W**, Estler, K, Wen, C, and Cates, H. (2022, July). "Hip Biomechanics in Uphill Walking on Different Inclines in Total Knee Arthroplasty Patients." Poster session presented at the meeting of *World Congress of Biomechanics*, Taipei City, Taiwan.

DOCTORAL DISSERTATION

Walter Menke. (2025). "Biomechanical Effects of Asymmetric Crank Arm Lengths for Ergometer Cycling in Patients with Total Knee Arthroplasty." University of Tennessee, Knoxville.
https://trace.tennessee.edu/utk_graddiss/12744

MASTER'S THESIS

Walter Menke. (2021). "Mechanical Deviations and Verbal-Cue Altered Gait in the Femoroacetabular Impingement Syndrome Population." University of Kentucky.
https://doi.org/10.13023/etd.2021.311

SKILLS

Technical

- Software: Vicon Nexus, Motion Analysis Cortex, R Studio, OpenSim.
- Analysis and Development: Python, Matlab, SPSS, PostgreSQL, bash, git.
- Hardware: Vicon Vantage cameras, Bertec and AMTI force plates, Kistler sensors, Monark ergometer, novel loadsol, BioDex isokinetic dynamometer.

Dissemination

- Small-group teaching formats in laboratory settings.
- Large-group teaching formats in auditoriums.
- Presentation of research results at various national and international conferences.
- Creation of figures to simplify and display complex biomechanical and statistical concepts.

Project Management

- Awarded a dissertation grant and developed the proposal that included a literature review, study design and methodology, analysis, timeline, and budget breakdown.
- Assisted with keeping longitudinal studies on track and on budget.
- Organized large volumes of data for personal and lab team use.
- Consolidated results into abstract and dissertation formats.