



## JACQUELINE M. LEWIS, Ph.D.

### PROFESSIONAL BIOGRAPHICAL OUTLINE

#### BACKGROUND

Dr. Lewis received a Bachelor of Science in Mechanical Engineering from the University of Kansas. She went on to obtain a Master of Science degree in Biomedical Engineering, as well as her Ph.D. in Biomedical Engineering from The Ohio State University. Her scientific research has focused on stair climbing function in patients with knee osteoarthritis and after total knee arthroplasty. She evaluated lower extremity joint and trunk kinematics and kinetics using motion capture technology, in conjunction with clinical outcome measures, to evaluate stair climbing ability, and worked to identify how to improve stair climbing function in these knee pathology populations.

Dr. Lewis has specialized in human motion capture, focusing on human injury and pathologies, compensation mechanics, pathological outcomes, and functional deficits. This background in biomedical principles, physics, and human anatomy has provided knowledge of human functional capacities in healthy and pathologic populations. Currently, she specializes in injury biomechanics, focusing on injury mechanisms and associated injury tolerances by analyzing the kinematics and kinetics of the human body during a specific event.

#### SUMMARY OF EXPERIENCE

- Performed various scientific investigations involving motion capture with human volunteers to investigate human kinematics and kinetics during level walking and stair climbing.
- Designed and performed experimental protocols to relate biomechanical data to functional performance in patients with knee pathology.
- Conducted scientific evaluations of the tolerances and compensation mechanisms of humans with degenerative knee osteoarthritis.
- Conducted scientific evaluations to identify biomechanical and clinical factors that affect functional performance after total knee replacement.

#### AREAS OF SPECIALTY

- Injury Causation Biomechanics
- Human Kinematics and Kinetics
- Human Injury Mechanisms
- Human Motion Capture Data Collection and Analysis
- Joint Biomechanics
- Spinal Biomechanics
- Human Tolerance Thresholds
- Vehicular Accident Reconstruction

#### EDUCATION

- Ph.D. in Biomedical Engineering, The Ohio State University, Columbus, Ohio, 2015
- M.S. in Biomedical Engineering, The Ohio State University, Columbus, OH, 2014
- B.S. in Mechanical Engineering, University of Kansas, Lawrence, KS, 2010
  - Participated in the Initiative for Maximizing Student Diversity Research program, University of Kansas, Lawrence, KS, 2009-2010

## PROFESSIONAL EXPERIENCE

### May 2015 – Present | ARCCA, Incorporated | Senior Biomechanist

- Performs injury causation analyses using knowledge of anatomy, physics and biomechanical principles.
- Explores the relationship between accident kinematics and severity and human response.
- Utilizes biomedical investigations involving human volunteers and anthropometric devices to analyze human response to an event, injury mechanisms and human tolerance.

### August 2011 – May 2015 | The Ohio State University | Graduate Research Assistant

- Used motion capture technology and electromyography to analyze human kinematics and kinetics in healthy and pathology populations.
- Biomechanical and clinical outcome study of stair climbing in patients with knee osteoarthritis before and after total knee arthroplasty.

### August 2010 – 2013 | The Ohio State University | Graduate Teaching Assistant

- Introduction to Musculoskeletal Engineering (ME) (Fall 2013)
- Biomechanics (BME) (Spring 2011)
- Biomedical Undergraduate Lab Development (BME) (Fall 2010)

### August 2009 – Spring 2010 | University of Kansas | Undergraduate Research Assistant

- Using pig cadaver knees, tested the laxity and stiffness of the knee joints using a load cell and Optotrak motion capture system. Began the process of analyzing the data and using a fifth-order polynomial to fit the force-displacement curve

### Summers between June 2008 – August 2010 | Northrop Grumman | Systems Engineering Intern

- Involved in the Systems Engineering and software testing at Schriever Air Force Base Missile Defense Agency

### September 2008 – December 2008 | TVN Systems | Test Engineer Intern

- Tested and recorded the conductivity of the PEM fuel cell stacks with various thicknesses of the membrane in the Advanced Membrane and Electrode Assembly.

## PEER REVIEWED PUBLICATIONS AND PRESENTATIONS

**Lewis J**, Freisinger G, Pan X, Siston R, Schmitt L, Chaudhari A.

*Changes in Lower Extremity Peak Angles, Moments and Muscle Activations during Stair Climbing at Different Speeds.* Journal of Electromyography and Kinesiology, Volume 25, Issue 6, December 2015.

Friesinger G.M., Hutter E.E., **Lewis J**, Granger J.F., Glassman, A.H., Beal M.D., Pan X, Schmitt L.C., Siston R.A, Chaudhari A.M.W.

*Relationships Between Varus-Valgus Laxity of the Severely Osteoarthritic Knee and Gait, Instability, Clinical Performance, and Function.* Journal of Orthopaedic Research, 2016.

**Lewis J**, Freisinger G, Schmitt L, Siston R, Chaudhari A.

*The Relationship between Clinical Measures and Stair Climbing Biomechanics in Patients with Total Knee Arthroplasty.* Poster Presentation In: American Society of Biomechanics 39<sup>th</sup> Annual Meeting 2015, Columbus, OH.

**Lewis J**, Freisinger G, Schmitt L, Siston R, and Chaudhari A.

*Biomechanical Changes during Stair Climbing at the Knee, Hip, and Trunk after Total Knee Arthroplasty.* Podium Presentation In: American Society of Biomechanics 39<sup>th</sup> Annual Meeting 2015, Columbus OH.

Baker R, Freisinger G, **Lewis J**, Schmitt L, Pan X, Granger J, Glassman A, Beal M, Chaudhari A, Siston R. *Factors Influencing Frontal Plane Kinematics and Kinetics Before and After Total Knee Arthroplasty.* Poster Presentation In: American Society of Biomechanics 39<sup>th</sup> Annual Meeting 2015, Columbus, OH

Freisinger G, Hutter E, **Lewis J**, Baker R, Granger J, Beal M, Pan X, Schmitt L, Siston R, Chaudhari A. *Active and Passive Knee Stability in Patients with Severe OA.* Poster Presentation In: American Society of Biomechanics 39<sup>th</sup> Annual Meeting 2015, Columbus, OH

**Lewis J**, Freisinger G, Pan X, Schmitt L, Siston R, Chaudhari A.

*Sagittal Plane Hip and Knee Biomechanics during Stair Climbing at Different Speeds.* Poster Presentation In: 7th World Congress of Biomechanics 2014, Boston, MA

**Lewis J**, Freisinger G, McNally M, Jamison S, Givens D.

*Validation of a Device for Measuring Seated Pelvic Position.* Poster Presentation In: 7th World Congress of Biomechanics 2014, Boston, MA

Freisinger G, Hutter E, **Lewis J**, Ewing J, Beal M, Granger J, Pan X, Schmitt L, Siston R, Chaudhari A.

*Passive Knee Laxity, Varus-Valgus Excursion during Gait, and Perceived Instability are Uncorrelated in Subjects with Severe Osteoarthritis.* In: 7th World Congress of Biomechanics 2014, Boston, MA

McNally M, **Lewis J**, Freisinger G, Jamison S, Chaudhari A, Givens D.

*Effect of Pelvic Position Feedback on Maintenance of Seated Pelvic Posture.* In: In: 7th World Congress of Biomechanics 2014, Boston, MA

**Lewis J**, Freisinger G, Beal M, Schmitt L, Siston R, Chaudhari A.

*The Relationship between the Stair Climbing Test, Knee Extension Strength, and Peak External Knee Flexion Moment in Patients Awaiting Total Knee Arthroplasty.* In: American Society of Biomechanics 37<sup>th</sup> Annual Meeting 2013, Omaha, NE

Freisinger G, **Lewis J**, Beal M, Pan X, Schmitt L, Siston R, Chaudhari A.

*Secondary Kinematic Patterns of Osteoarthritic Knees during Active Extension and Flexion.* In: American Society of Biomechanics 37<sup>th</sup> Annual Meeting 2013, Omaha, NE

**Lewis J**, Jamison S, Schmitt L, Siston R, Chaudhari A.

*Sagittal Plane Knee Kinematics and Kinetics during Stair Climbing at Different Speeds.* In: Gait and Clinical Movement Analysis Society Annual Conference 2013, Cincinnati, OH

Baker, R.K., Kaufman, M.K., Caruthers, E.J., Freisinger, G.M., **Lewis, J.M.**, Schmitt, L.C., Best, T.M., Chaudhari, A.M.W., Siston, R.A.

*Muscle Force & Cost During a Sit-To-Stand Transfer in Subjects with Knee Osteoarthritis.* ORS Conference 2016.

### **Manuscripts in Progress**

**Lewis J**, Freisinger G, Pan X, Siston R, Schmitt L, Chaudhari A.

*The relationship between knee extension strength, peak knee flexion moment during stair climbing and the stair climbing test time in patients with severe osteoarthritis awaiting total knee arthroplasty.*

**Lewis J**, Freisinger G, Hutter E, Pan X, Siston R, Schmitt L, Chaudhari A.

*Predicting stair climbing test time at six months after total knee arthroplasty with clinical measures before surgery and intraoperative measures.*

Chaudhari, A.M.W., Schmitt, L.C., Freisinger, G.M., **Lewis, J.M.**, Hutter, E.E., Pan, X., Siston R.A.  
*Perceived Instability is associated with strength, not frontal knee laxity in patients with advanced knee osteoarthritis.*

Caruthers, E.J., Oxendale, K.K., **Lewis, J.M.**, Chaudhari, A.M.W., Schmitt, L.C., Best, T.M., Siston R.A.  
*Forces generated by vastus lateralis and vastus medialis decrease with increasing stair descent speed.*

Baker, R.K., Kaufman, M.K., Caruthers, E.J., Freisinger, G.M., **Lewis, J.M.**, Pan, X., Schmitt, L.C.  
Chaudhari, A.M.W., Siston, R.A.

*Muscle Forces in Subjects with End-Stage Knee Osteoarthritis during a Sit-to-Stand Transfer.*