

## **Matthew R. Titchenal, Ph.D.**

### **Professional Profile**

Dr. Titchenal specializes in accident reconstruction and the biomechanics of injury. His background in mechanical engineering and orthopaedic biomechanics includes experience in dynamic analysis and control, motion capture, vehicle dynamics, failure analysis, magnetic resonance imaging (MRI), laser scanning, medical device design, and sports-related injury.

Prior to joining InSciTech, Dr. Titchenal performed interdisciplinary research at Stanford University, studying post-traumatic knee osteoarthritis after sports injury with the Departments of Mechanical Engineering and Orthopaedic Surgery.

### **Credentials and Professional Honors**

#### **Stanford University**

Ph.D. Mechanical Engineering – August, 2018  
M.S. Mechanical Engineering – June, 2014  
Stanford Bio-X Bowes Graduate Research Fellow (2015-2018)

#### **California Polytechnic State University**

B.S. Mechanical Engineering – June, 2012

#### **FARO Technologies**

FARO Laser Scanner Authorized Technician – May 2019

#### **Award winner**

**2016 O'Donoghue Sports Injury Award** – American Orthopaedic Society for Sports Medicine (AOSSM)  
**2019 Kappa Delta Elizabeth Winston Lanier Award for Outstanding Orthopaedic Research** – American Academy of Orthopaedic Surgeons (AAOS)

**Reviewer**, American Journal of Sports Medicine

**Reviewer**, Journal of Orthopaedic Research

**Reviewer**, Arthritis Care and Research

## Publications

### Peer-Reviewed Journal Articles:

Titchenal MR, Williams AA, Chehab EF, Asay JL, Dragoo JL, Gold GE, McAdams TR, Andriacchi TP, Chu CR. Cartilage Subsurface Changes to MRI UTE-T2\* 2 Years after Anterior Cruciate Ligament Reconstruction Correlate to Walking Mechanics Associated with Knee Osteoarthritis. *American Journal of Sports Medicine*. 2018 Mar;46(3):565-572.

Titchenal MR, Chu CR, Erhart-Hledik JC, Andriacchi TP. Early Changes in the Knee Joint Center of Rotation during Walking Following Anterior Cruciate Ligament Reconstruction Correlate with Later Changes in Patient Reported Outcomes. Winner of 2016 O'Donoghue Sports Injury Award. *American Journal of Sports Medicine*. 2017 March;45(4):915-921.

Titchenal MR, Asay JL, Favre J, Andriacchi TP, Chu CR. Effects of high heel wear and increased weight on the knee during walking. *Journal of Orthopaedic Research*. 2015 Mar;33(3):405-11.

Williams AA, Titchenal MR, Do BH, Guha A, Chu CR. MRI UTE-T2\* Shows High Incidence of Cartilage Subsurface Matrix Changes 2 Years After ACL Reconstruction. *Journal of Orthopaedic Research*. 2019 Feb;37(2):370-377.

Williams AA, Titchenal MR, Andriacchi TP, Chu CR. MRI UTE-T2\* Profile Characteristics Correlate to Walking Mechanics and Patient Reported Outcomes 2 years after ACL Reconstruction. *Osteoarthritis and Cartilage*. 2018 Apr;26(4):569-579.

Chu CR, Sheth S, Erhart-Hledik JC, Do B, Titchenal MR, Andriacchi TP. Mechanically stimulated biomarkers signal cartilage changes over 5 years consistent with disease progression in medial knee osteoarthritis patients. *Journal of Orthopaedic Research*. 2018 Mar;36(3):891-897

### Conference Articles and Presentations:

Erhart-Hledik JC, Titchenal MR, Migliore E, Asay JL, Andriacchi TP, Chu CR. Serum Cartilage Oligomeric Matrix Protein Responses To A Mechanical Stimulus Are Associated With Loading During Gait In Individuals With Anterior Cruciate Ligament Reconstruction. *ORS 2020 Annual Meeting*. Poster #1948. Phoenix, Arizona, February 8-11.

Fischer AG, Titchenal MR, Williams AA, Migliore E, Asay JL, Erhart-Hledik JC, Andriacchi TP, Chu CR. Elevated TNF- $\alpha$ , Reduced Knee Loading And Increased UTE-T2\* 2 Years Post ACL Reconstruction: A Signal For Knee OA In A Subset Of Patients. *ORS 2020 Annual Meeting*. Poster #1925. Phoenix, Arizona, February 8-11.

Titchenal MR, Williams AA, Asay JL, Migliore E, Erhart-Hledik JC, Andriacchi TP, Chu CR. Mechanically Stimulated CS846 Correlates with Ultrashort Echo Time Enhanced T2\* Quantitative MRI and Gait Mechanics 2 Years after Anterior Cruciate Ligament Reconstruction. *OARSI 2018 World Congress*. Poster #344. Liverpool, UK, April 26-29.

## **Publications (*continued*)**

Titchenal MR, Williams AA, Migliore E, Erhart-Hledik JC, Andriacchi TP, Chu CR. Mechanically-Induced Changes in Serum Cartilage Oligomeric Matrix Protein (COMP) after Anterior Cruciate Ligament Reconstruction Correlate with Changes to Medial Knee MRI UTE-T2\*. *ORS 2018 Annual Meeting*. Poster #0513. New Orleans, LA, March 10-13.

Williams AA, Titchenal MR, Guha A, Chu CR. MRI UTE-T2\* Shows High Incidence of Cartilage Subsurface Matrix Changes 2 Years After ACL Reconstruction. *ORS 2018 Annual Meeting*. Paper #0173, Spotlight Oral Presentation. New Orleans, LA, March 10-13.

Titchenal MR, Williams AA, Asay JL, Andriacchi TP, Chu CR. Bilateral assessment of cartilage with UTE-T2\* quantitative MRI and associations with knee center of rotation following anterior cruciate ligament reconstruction. Poster #163. *OARSI 2017 World Congress*. April 27-30.

Williams AA, Titchenal MR, Chu CR. UTE-T2\* Profile Analyses Correlate UTE-T2\* to Patient Reported Outcomes 2 Years After ACL Reconstruction. Program #5095. *ISMIRM 2017 Annual Meeting*. April 22-27.

Williams AA, Titchenal MR, Chu CR. UTE-T2\* Profile Analyses Correlate with Walking Mechanics 2 Years After ACL Reconstruction. Program #5094. *ISMIRM 2017 Annual Meeting*. April 22-27.

Williams AA, Titchenal MR, Chu CR. MRI UTE-T2\* Profile Analyses Correlate to Patient Reported Outcomes 2 years after ACL Reconstruction. Poster #2284. *ORS 2017 Annual Meeting*. March 19-22.

Titchenal MR, Chu CR, Erhart-Hledik JC, Andriacchi TP. Early Changes in the Knee Joint Center of Rotation during Walking Following Anterior Cruciate Ligament Reconstruction Correlate with Later Changes in Patient Reported Outcomes. Winner of 2016 O'Donoghue Sports Injury Award. Orally presented at *AOSSM 2016 Annual Meeting*. Paper #139. July 7-10, 2016.

Williams AA, Titchenal MR, Chu CR. 3-D cones UTE-T2\* maps show early cartilage degeneration 2 years after ACL reconstruction. *ISMIRM 2016 Annual Meeting*. Oral Presentation. May 7-13, 2016.

Williams AA, Titchenal MR, Chu CR. Quantitative UTE-T2\* MRI Correlates to Patient Reported Symptoms 2 Years After ACL Reconstruction. *ORS 2016 Annual Meeting*. March 5-8, 2016.

Titchenal MR, Chu CR, Andriacchi TP. Prospective Changes in Cartilage Thickness Correlate with Knee Kinematics at Peak Loading During Walking Following Anterior Cruciate Ligament Reconstruction. *OARSI 2016 World Congress*. March 30-April 3, 2016.

## **Publications (*continued*)**

Titchenal MR, Williams AA, Dadhwal S, Dhulipal S, Andriacchi TP, Chu CR. Bilateral Assessment of Cartilage with UTE T2\* Quantitative MRI and Relationships with Serum-Derived Biomarkers of Osteoarthritis Two Years after Anterior Cruciate Ligament Reconstruction. *ORS 2016 Annual Meeting*. Poster #1360. March 5-8, 2016.

Titchenal MR, Williams AA, Chehab EF, Asay JL, Dragoo JL, Gold GE, McAdams TR, Andriacchi TP, Chu CR. Bilateral Assessment of Cartilage with UTE T2\* Quantitative MRI and Relationships with Walking Mechanics Two Years after Anterior Cruciate Ligament Reconstruction. *ORS 2016 Annual Meeting*. Poster #0481. March 5-8, 2016.

Chehab EF, Titchenal MR, Asay JL, Andriacchi TP. Gait Characteristics That Influence Cartilage Thickness Are Related to Serum Concentrations of Cartilage Oligomeric Matrix Protein Before and After a Mechanical Stimulus. Volume 23, Supplement 2, Pages A90–A91. *OARSI 2015 World Congress*. 4/30-5/3/2015. Poster #119.

Sheth S, Erhart-Hledik JC, Do BH, Titchenal MR, Andriacchi TP, Chu CR. Mechanically-induced Changes In Serum Cartilage Matrix Biomarkers Predict Regional Changes In Cartilage Thickness 5 Years Later In Human Subjects With Knee OA. *ORS 2015 Annual Meeting*. Paper #1991. March 28-31, 2015.

Titchenal MR, Chu CR, Andriacchi TP. Prospective Changes in the Knee Joint Center of Rotation Relative to the Contralateral Knee and over Time Provide a Comprehensive View of Kinematic Changes Following Anterior Cruciate Ligament Reconstruction. *Osteoarthritis and Cartilage*, Volume 23, A96 - A97. *OARSI 2015 World Congress*. April 30-May 3, 2015. Poster #128.

Titchenal MR, Favre J, Asay JL, Andriacchi TP, Chu CR. High Heel Shoes and Heavier Mass Induce Similar Changes in Ambulatory Knee Function to Those Associated with Osteoarthritis. *7th World Congress of Biomechanics*. Abstract W332. July 6-11, 2014.