

Update on the Biedermann Lab for Orthopaedic Research

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Over the last year, the Biedermann Lab for Orthopaedic Research has been working on a variety of biomechanical research projects that focus on the biomechanical characterization of bone-implant behaviors. The portfolio of active projects in the Biedermann Lab contains experiments that are in various stages of development, execution, or publication, and include collaborations with DePuy Synthes, Integra LifeSciences, and Zimmer Biomet. The lab uses a wide spectrum of techniques to objectively measure implant performance, including *in silico* modeling, cyclic testing of implants, 3-D motion capture, measurement of articulating joint forces, and *in vitro* simulations of activities of daily living. So far in 2018, the Lab has had three peer reviewed manuscripts accepted for publication at *Injury*, *Orthopedics*, and *The Journal of Bone and Joint Surgery Reviews*.

In one of our more recent studies, the Lab conducted an experiment in collaboration with Dr. John Kelly and Dr. Josh Baxter. The team investigated superior capsule reconstruction—a technique that can be used to address ‘irreparable’ rotator cuff tears. In this study, we used a combination of *in vitro*, *in vivo*, and *in silico* experimental techniques to determine repair strategies that may maximize graft utility and minimize the likelihood of failure.

Additionally, the study was able to identify high-risk activities of daily living that may lead to premature graft failure immediately after surgery. At the time of writing this article, the findings from the superior capsule reconstruction study



Figure 1: An overview of the techniques used to create an optimization capable of providing guidelines for both surgeons and patients involved with a superior capsule reconstruction.

were provisionally accepted as a full-length manuscript in the *Journal of Orthopaedic Research*. A copy of an abstract for this study can be found within this journal.

The continuous goal of the Biedermann Lab is to perform research that is relevant and translatable so that the standard of care and quality of life for patients can be improved. The Biedermann Lab will continue to pursue this goal by focusing its research on investigations of bone-implant behaviors. If you have a research interest that may be suitably addressed with the research competencies of the Biedermann Lab, you are encouraged to contact Michael Hast directly. For contact details and more information about the Biedermann Lab, please visit the Biedermann Lab’s website: www.med.upenn.edu/biedermann/