

Research Report 2016 - Murray Maxwell Biomechanics Laboratory

Staff and students

Director

Dr Elizabeth Clarke

Postgraduate students

Ms Carina Blaker (PhD candidate, primary supervision)

Ms Rachel Choi (PhD candidate, primary supervision)

Dr Lauren Meredith (PhD awarded November 2016, associate supervision)

Mrs Anna Chevalier (PhD submitted November 2016, associate supervision)

Mr Ruilong Zhao (MPhil candidate, associate supervision)

BEng Honours Thesis students

Mr Ben Qiu (completed October 2016)

Mr Mitchell Kwok (completed October 2016)

Mr Max Pentecost (completed October 2016)

Engineering interns supervised (Nov 2015 - Feb 2016)

Mr Ben Qiu

Mr Mitchell Kwok

Mr Nathan Doran

Ms Jemma Herbert

MD project students

Mr Jae Lee

Research projects and collaborations in 2016

Knee injury and osteoarthritis

- Understanding the relative contributions of knee injury impact loading and joint instability in the onset and progression of osteoarthritis
- The role of sub-critical knee injuries in risk of critical re-injury and osteoarthritis
- Structural and biomechanical patterns of pre- and early-osteoarthritis in human knee cartilage
- Developing a mouse model for meniscus injury for the study of post-traumatic osteoarthritis

Tendinopathy

- The biomechanical response of different tendon types to changes in mechanical loading
- Structural, molecular and biochemical responses of different tendon types to changes in mechanical loading

Spine and intervertebral disc biomechanics

- Developing a non-invasive MRI method to measure internal strains in spinal disc
- Scaling spinal biomechanical properties from infant and juvenile animal models to paediatric human spine

Injury prevention in vulnerable road users

- Evaluating abrasion resistance of motorcycle protective clothing, and comparison with injuries sustained by riders wearing those materials.
- Older driver (>75 years) involvement in speeding and rapid deceleration behaviour
- Evaluation of a clinical trial to assist older drivers in self-regulating driving behaviour
- Vehicle safety for low birthweight babies – assessing and improving quality of harness fit.

Collaborations with the Department of Hand Surgery and Sydney Shoulder Specialists

Staff and students in the Murray Maxwell Biomechanics Laboratory also contributed to the following projects through collaboration with orthopaedic surgeons:

- Biomechanical variation in headless compression screw fixation
- Effect of the sagittal bands on metacarpophalangeal joint extension
- Effect of extensor tendon adhesions on amplitude of finger joint movements: cadaveric study
- Dynamic and static creep properties of suture materials and tapes used for rotator cuff repair

Grant funding in 2016

1. A Thambyah, E Clarke, C Little, N Broom, Royal Society of New Zealand Catalyst Funding, *Defining the pre-to-early osteoarthritis state in the human joint*, 2016-2018, \$75,626 (NZD) for 3 years
2. E Clarke, C Little, R Choi, Lincoln Foundation for Bone and Joint Disease, *Effects of localised compression on tendon health*, 2016, \$28,087 for 1 year
3. E Clarke, C Little, C Blaker, Arthritis Australia, *Joint Injury and Osteoarthritis Research* 2016, \$25,000 for 1 year
4. E Clarke, C Jones, J Costi, L Bilston, J Tsourtos, B Qiu, AO Spine ANZ, *Non-invasive biomechanics of intervertebral disc using dynamic MRI methods*, \$6,700 pilot funding 1 year.

Journal articles accepted in 2016 (members of the laboratory underlined)

1. Choi R, Smith M, Martin J, Clarke J, Dart A, Little C, Clarke E, *Chondroitin sulfate glycosaminoglycans contribute to widespread inferior biomechanics in tendon after focal injury*, **Journal of Biomechanics**, Accepted 2/6/2016
2. Blaker C, Little C, Clarke EC, *Effects of age, sex and body mass on ACL failure load and mode, in a mouse injury model*, **Journal of Orthopaedic Research**, Accepted 30/8/16
3. Brown, J, Sinn, J, Chua, AL, Clarke, EC, *Quality of harness fit for normal and low birthweight infants observed among newborns in infant car seats*, **Injury Prevention**, Accepted 25/6/16
4. Clarke E, Fletcher D, Bilston L, *Sustained high-pressure in the spinal subarachnoid space while arterial expansion is low may be linked to syrinx development*. **Computer Methods in Biomechanics and Biomedical Engineering**, Accepted 29/9/16.
5. Blaker CL, Clarke EC, Little CB, *Using mouse models to investigate the pathophysiology, treatment and prevention of post-traumatic osteoarthritis*, **Journal of Orthopaedic Research**, Accepted 1/6/16
6. Smith M, Clarke E, Little C, *Considerations for the Design and Execution of Protocols for Animal Research and Treatment to improve reproducibility and standardization: "DEPART well-prepared and ARRIVE safely"*. **Osteoarthritis and Cartilage**, Accepted 20/10/16

7. Coxon K, Chevalier A, Brown J, Clarke E, Billot L, Boufous S, Ivers R, Keay L, *Behind the wheel: A randomised controlled trial evaluating driving exposure and community participation from a safe-transport program for older drivers*, **Journal of the American Geriatrics Society**, Accepted 5/7/16
8. Meredith L, Hurren C, Clarke E, Fitzharris M, Baldock M, de Rome E, Olivier J, Brown J, *Validation of the abrasion resistance test protocols and performance criteria of EN13595: the probability of soft tissue injury to motorcycle riders by abrasion resistance of their clothing*, **Journal of Safety Science**, Provisionally Accepted 21/7/16
9. Brown J, Coxon K, Fong C, Clarke E, Rogers K, Keay L, *Seatbelt repositioning and use of vehicle seat cushions is increased among older drivers aged 75 years and older with comorbidities*, **Australasian Journal of Ageing**, Accepted 30/6/16.
10. Gomes AR, Campos TF, Beckenkamp PR, Diong J, Clarke EC, Clarke JL, Herbert RD, *Effects of Isokinetic Eccentric Training on the Human Achilles Tendon*, **Journal of Exercise Physiology**, 2016, 19(2), 46-54.
11. Chevalier A, Chevalier AJ, Clarke EC, Coxon K, Brown J, Rogers K, Boufous S, Ivers R, Keay L, *Naturalistic rapid deceleration data: drivers aged 75 years and older*. **Data in Brief**, Accepted 27/10/16
12. Chevalier A, Coxon K, Rogers K, Chevalier AJ, Wall J, Brown J, Clarke EC, Ivers R, Keay L., *A longitudinal investigation of the predictors of older drivers' speeding behavior*, **Accident analysis and Prevention**, Accepted 6/4/16.
13. Chevalier A, Coxon K, Chevalier AJ, Wall J, Brown J, Clarke EC, Ivers R, Keay L., *Older Drivers' Involvement in Speed Events*, **Transportation Research Part F: Psychology and Behaviour**, Accepted 25/1/16
14. Chevalier A, Coxon K, Rogers K, Chevalier AJ, Wall J, Brown J, Clarke E, Ivers R, Keay K. *Predictors of older drivers' involvement in high-range speeding behavior*, **Traffic Injury Prevention**, Accepted, 13/8/16
15. Chevalier, A., Coxon, K., Chevalier, A. J., Clarke, E., Rogers, K., Brown, J., Boufous, S., Ivers, R., Keay, L. *Predictors of older drivers' involvement in rapid deceleration events*. **Accid Anal Prev**. Accepted 9/10/16.
16. Chevalier A, Chevalier AJ, Clarke E; Wall J, Coxon K, Brown J, Ivers R, Keay L, *Naturalistic speeding data: drivers aged 75 years and older*, **Data in Brief**, Accepted 11/5/16.