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Harnessing clinical and surgical expertise to guide a rapidly changing landscape in foot and ankle biomechanics

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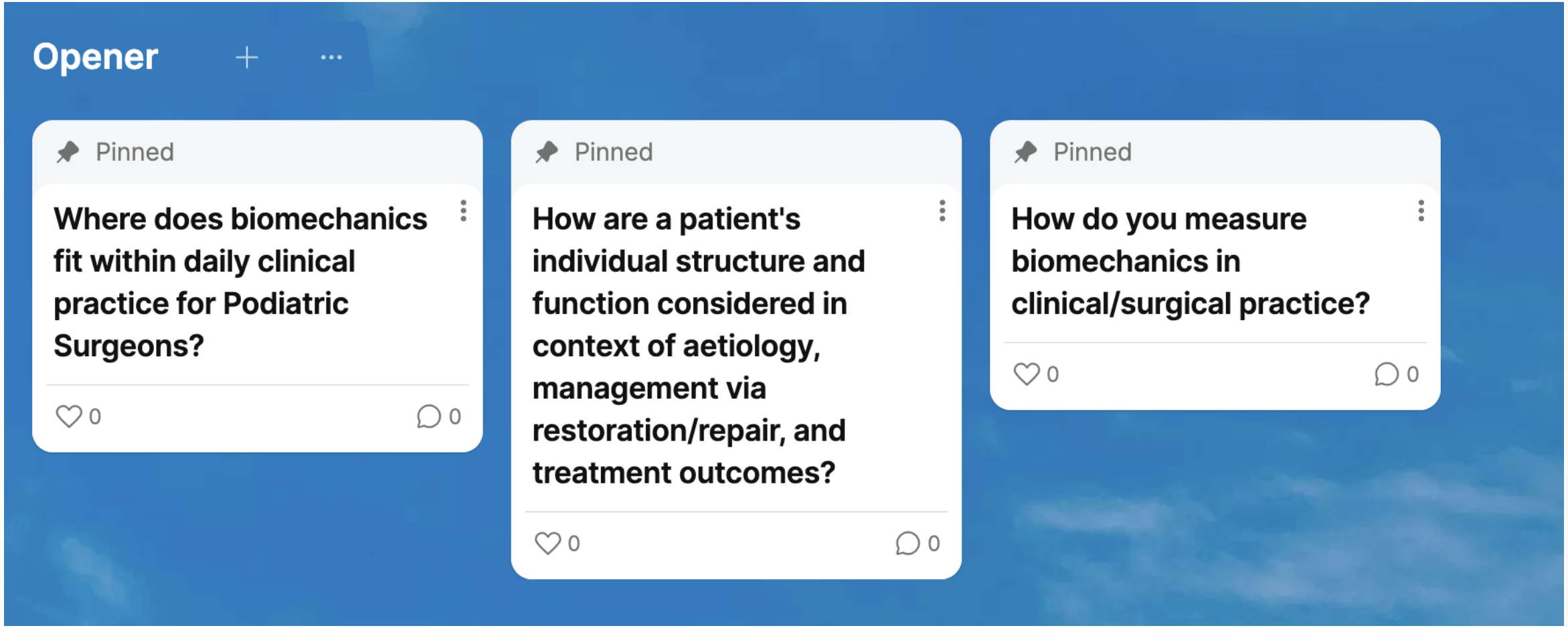
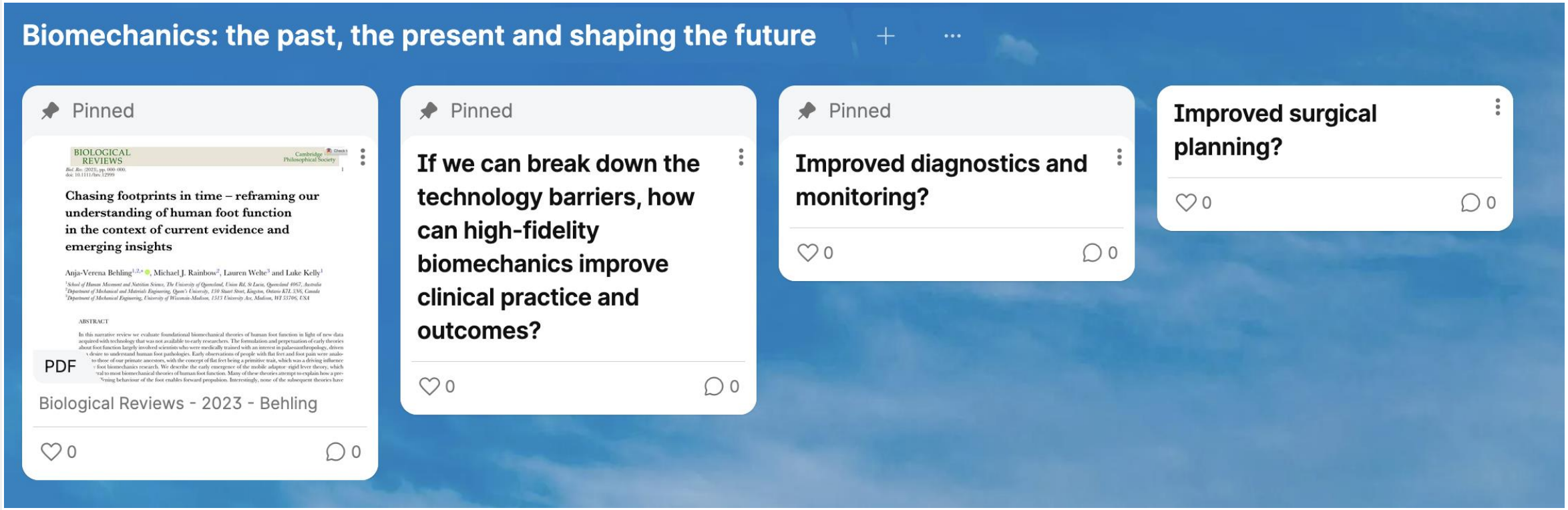
Griffith University, Gold Coast, Australia

Getting started



The past, present and shaping the future



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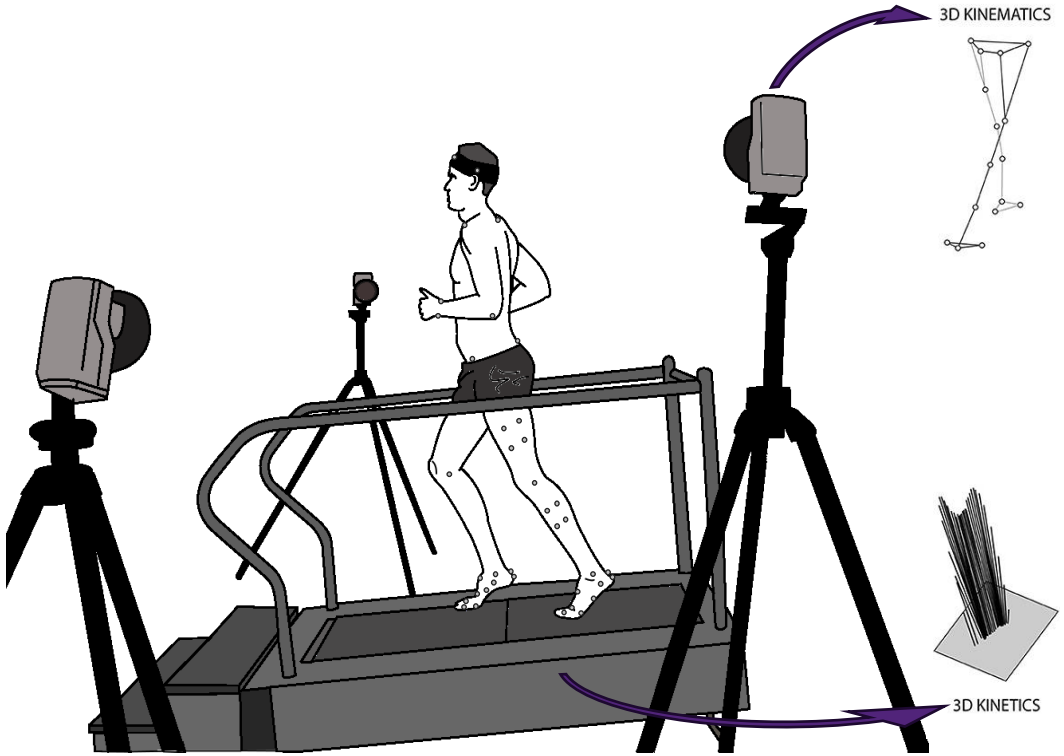
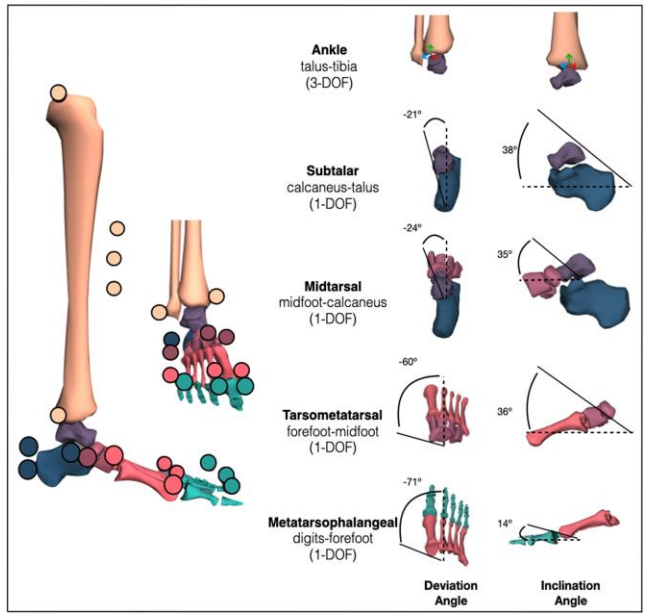
The past, present and future of foot biomechanics

Musculoskeletal foot models

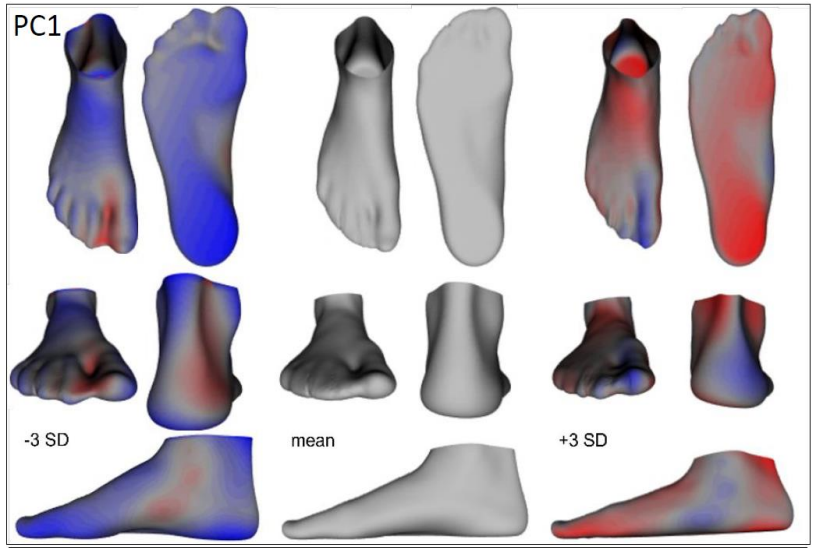


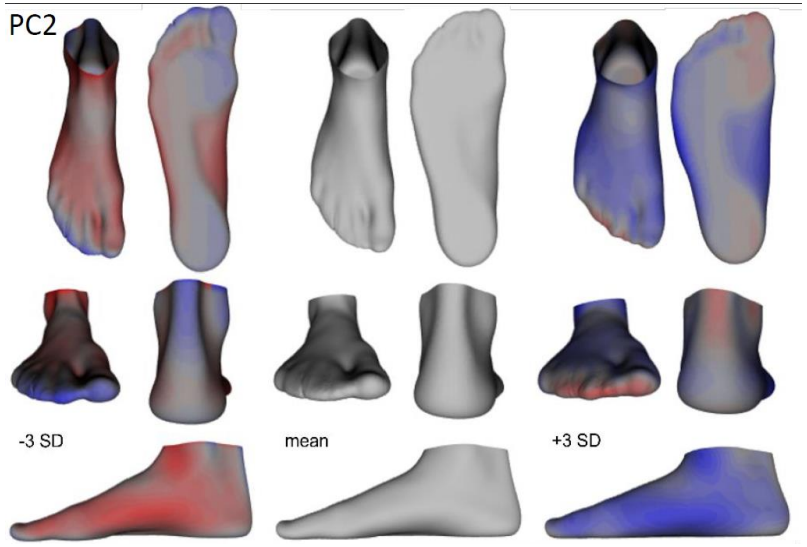


Maharaj et al. (2022)

How does the shape of our feet influence function?

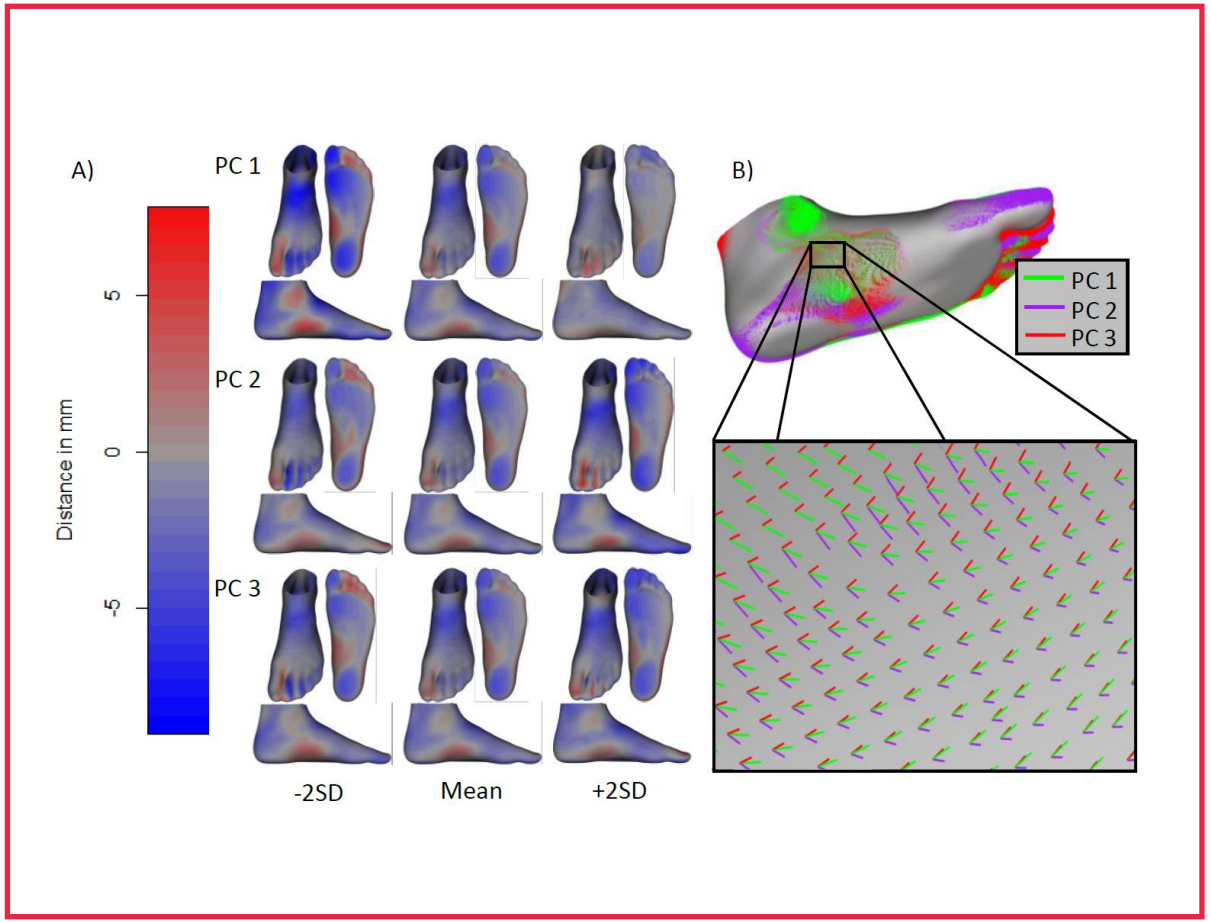
Quantifying external foot shape – Statistical Shape Modelling





Robert Schuster

How do feet change shape? - Foot shape deformation modelling



Contents lists available at ScienceDirect

Journal of Biomechanics

journal homepage: www.elsevier.com/locate/jbiomech
www.JBiomech.com

Reliability and quality of statistical shape and deformation models constructed from optical foot scans

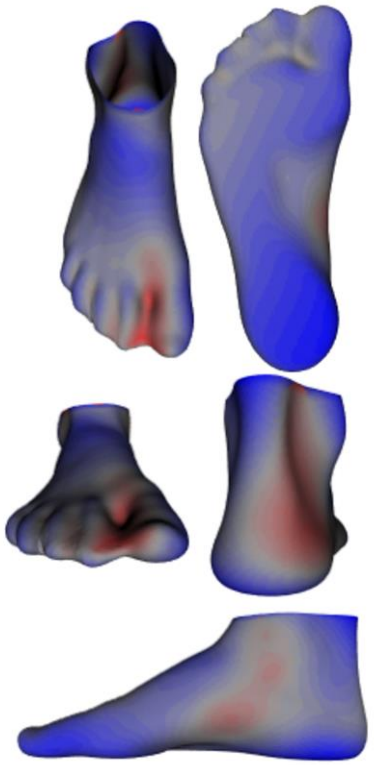
Robert Wolfgang Schuster *, Andrew Cresswell, Luke Kelly

School of Human Movement & Nutrition Sciences, The University of Queensland, Australia

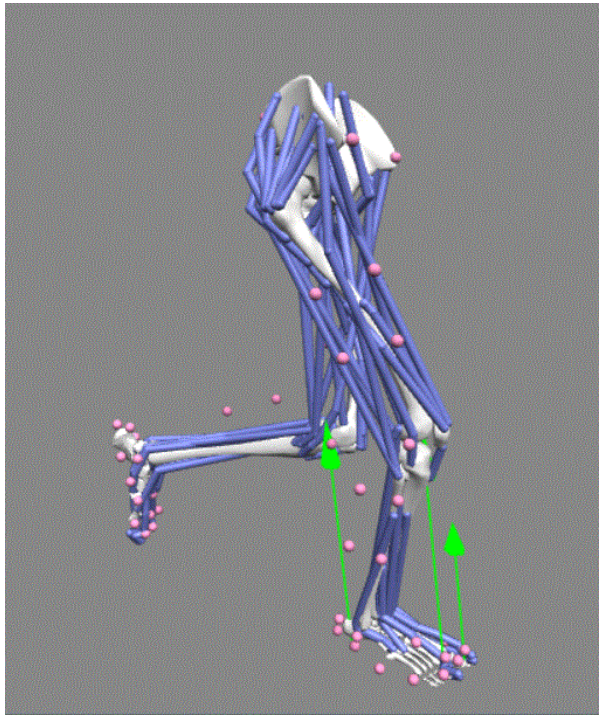
Robert Schuster

Predicting complex function from shape data

Does Foot Shape Matter? – Predicting foot function from external foot shape



Predictive Models



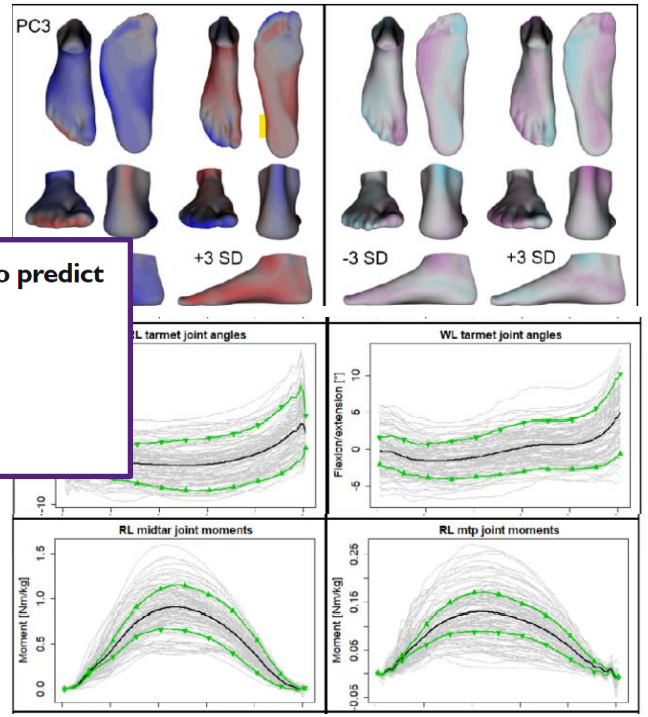
Predicting complex function from shape data

Does Foot Shape Matter? – Predicting foot function from external foot shape

Foot form and function: Variable and versatile, yet sufficiently related to predict one from the other

Robert W. Schuster, Andrew Cresswell, Luke A. Kelly

doi: https://doi.org/10.1101/2022.10.02.510569

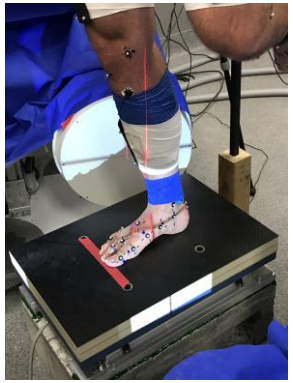


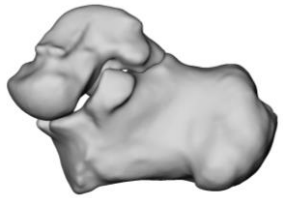
Non-invasive high-resolution foot biomechanics

Biplanar Video-radiography

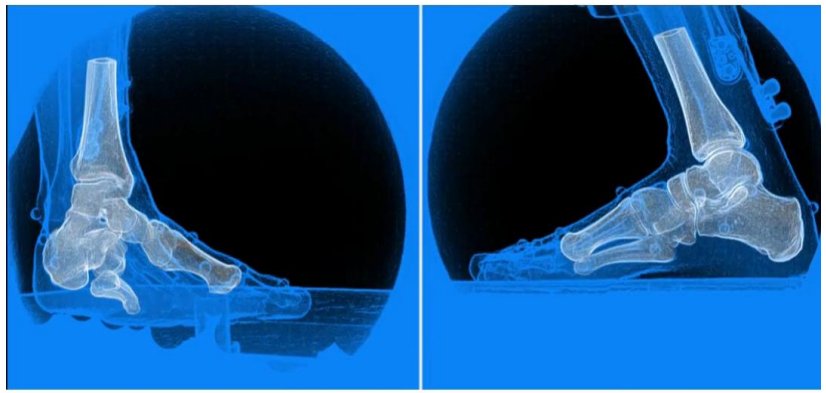
A/Prof Michael Rainbow
Queens University

BVR Data

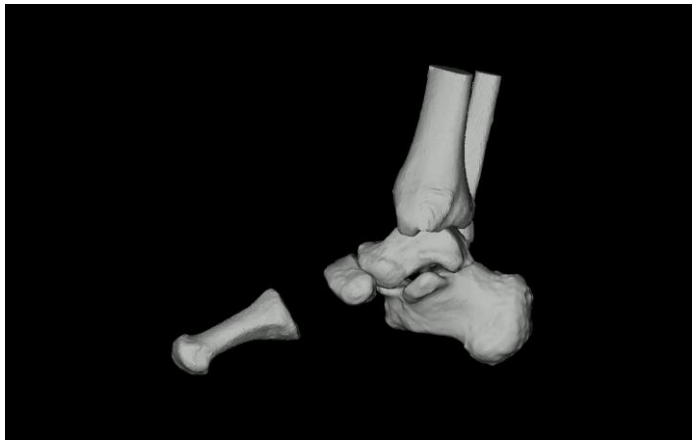




3D Bone models



Align bone models to x-ray data



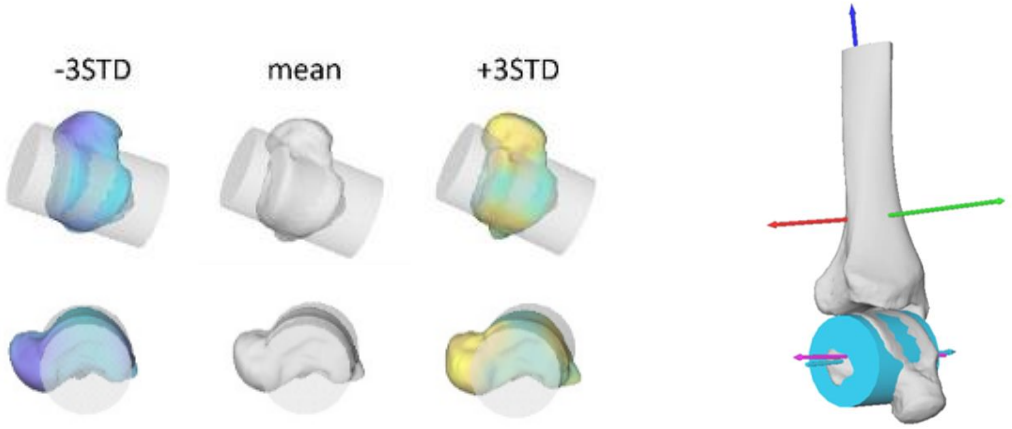
Dynamic 3D bone reconstructions

Non-invasive high-resolution foot biomechanics

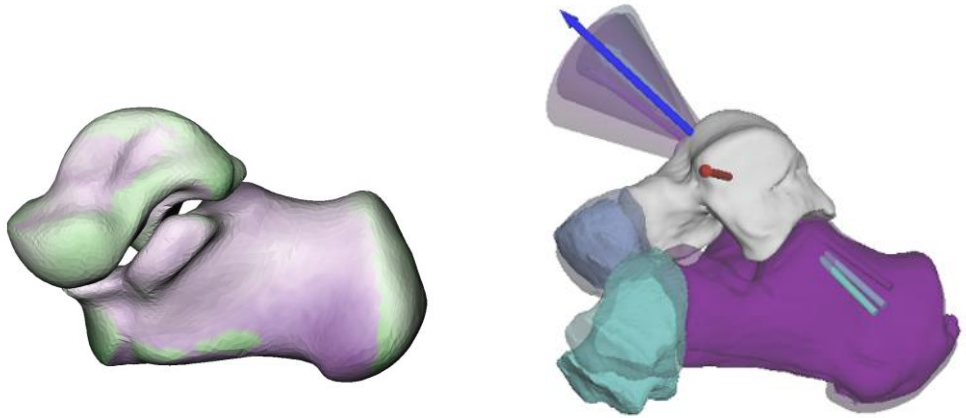
A/Prof Michael Rainbow
Queens University

Combining shape models with BVR to understand subject specific function

Talocrural joint



Subtalar and midtarsal joints



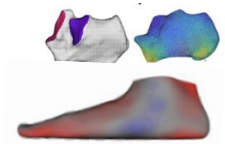
What's in the future?

Innovative technologies to enable precision clinical care

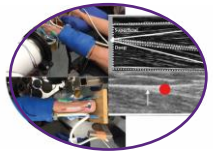
Subject specific data

Muscle size

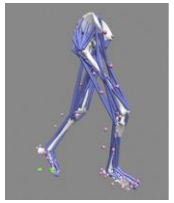
Shape & deformity



Material properties (stiffness)



Motion

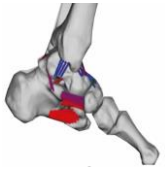


Physics based models

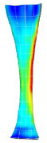
Time intensive data collection

Quantify individual tissue loads

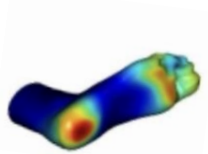
Joint Loading



Tendon strain



Soft tissue stress



AI informed models

Reduce complexity of data capture to enable clinical use

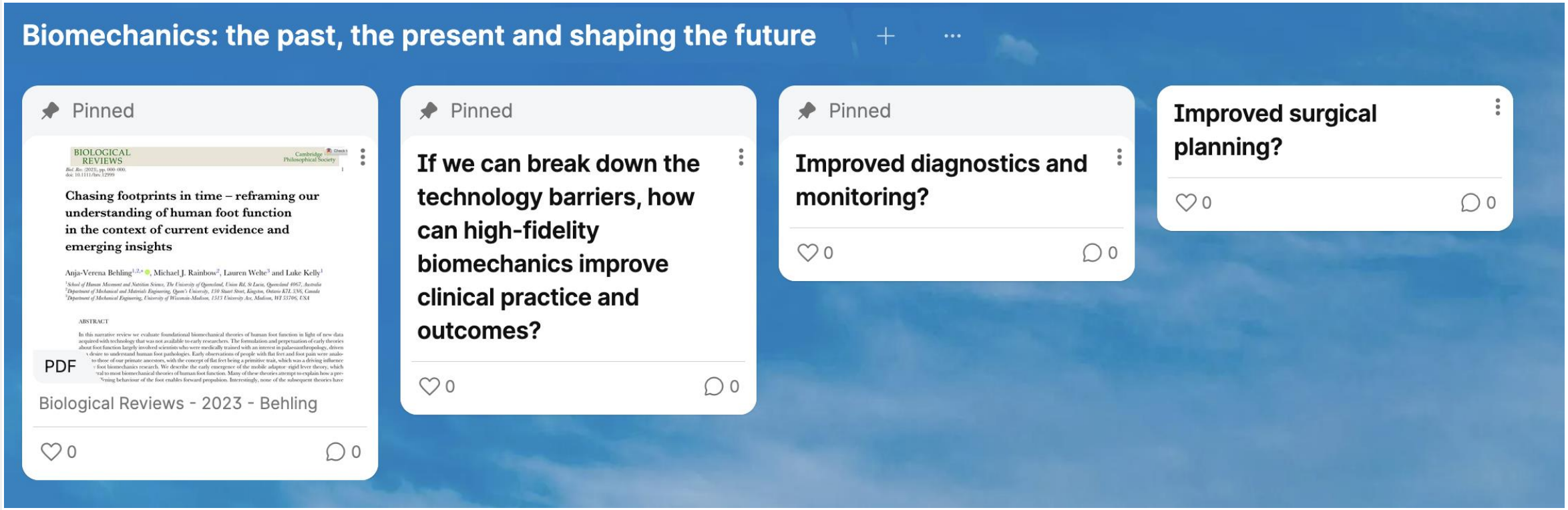
Precision Clinical Measurements

Treat to target model for clinical practice

Precision surgical simulations

In-silico simulations to predict surgical outcomes

The past, present and shaping the future



Where can research and development have the greatest impact for your practice?