The webcast will begin shortly…

Toward personalized total knee arthroplasty - Pre-planning the patient's optimal joint function in robotic-assisted surgery

October 12 , 2023

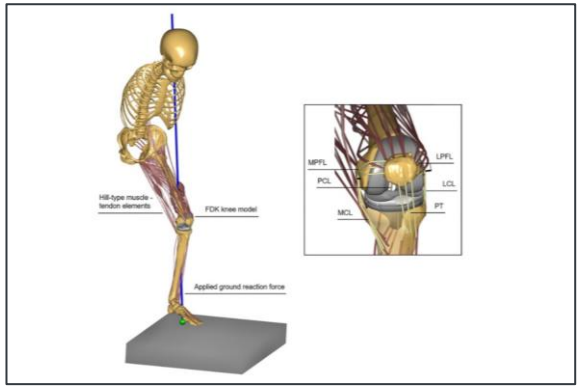
Outline

- Introduction to the AnyBody Modeling System
- Presentation by Periklis Tzanetis
- Upcoming events
- Question and answer session

Presenter:
Periklis Tzanetis
Post Doc
University of Twente

Host:
Kristoffer Iversen
Technical Sales Executive
AnyBody Technology

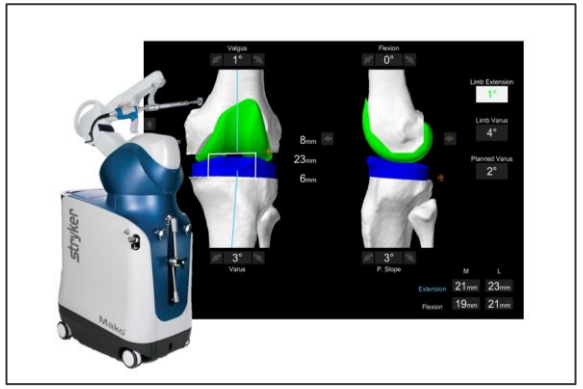
Outline



May 5, 2021

A model-based methodology to predict the biomechanical consequences of tibial insert thickness after total knee arthroplasty

https://www.anybodytech.com/webcasts/a-model-based-methodology-to-predict-the-biomechanical-consequences-of-tibial-insert-thickness-after-total-knee-arthroplasty



October 27, 2022

The future of personalized orthopedics: Kinematic modeling to restore the premorbid knee functionality through robotic-assisted TKA

https://www.anybodytech.com/webcasts/the-future-of-personalized-orthopedics-kinematic-modeling-to-restore-the-premorbid-knee-functionality-through-robotic-assisted-tka/

ISTA
Early Career Investigator Award 2023

October 12, 2023

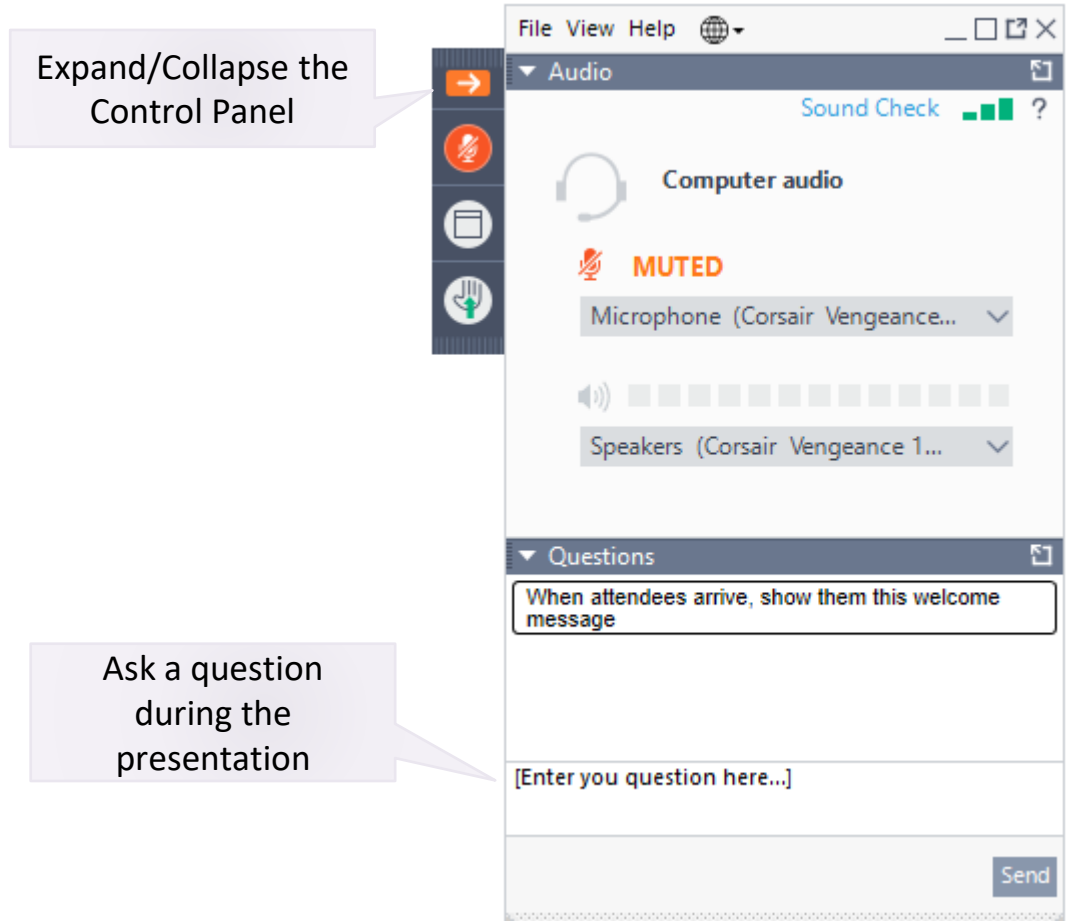
Toward personalized total knee arthroplasty - Pre-planning the patient's optimal joint function in robotic-assisted surgery

Control Panel

The Control Panel appears on the right side of your screen.

Submit questions and comments via the Questions panel.

Questions will be addressed at the end of the presentation. If your question is not addressed, we will do so by email.



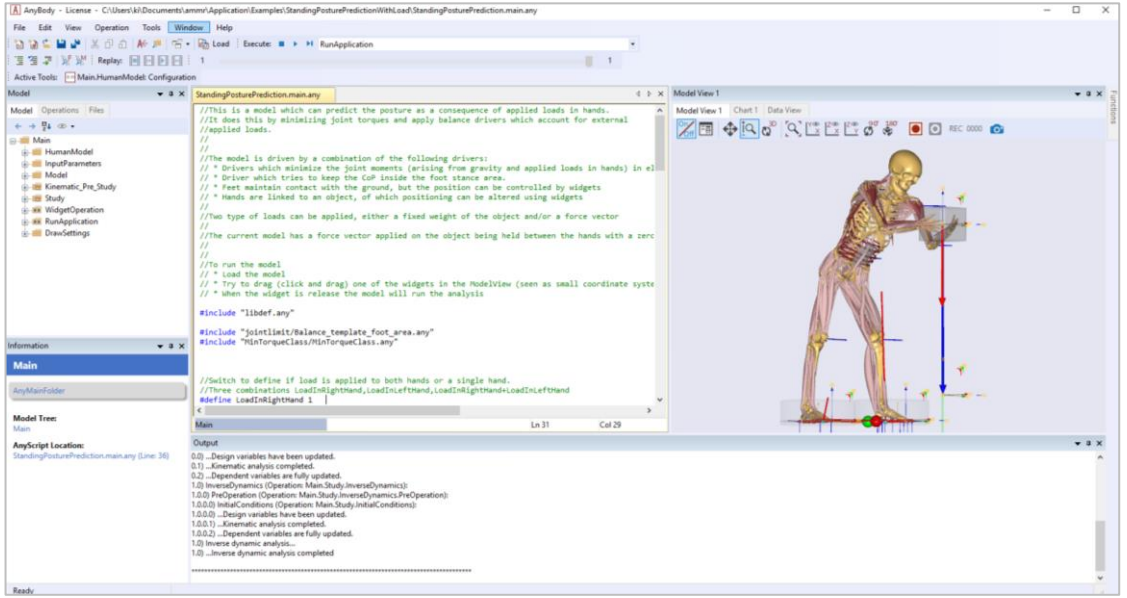
Musculoskeletal Simulation

Motion Data
Kinematics and Forces

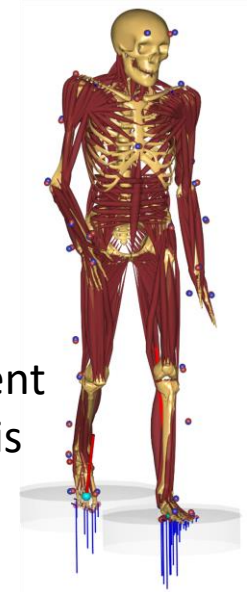
ANYBODY
Modeling System

Body Loads

- Joint moments
- Muscle forces
- Joint reaction forces



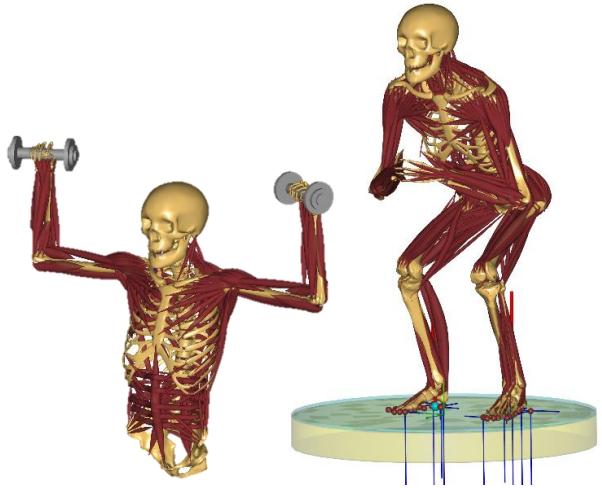
ANYBODY TECHNOLOGY



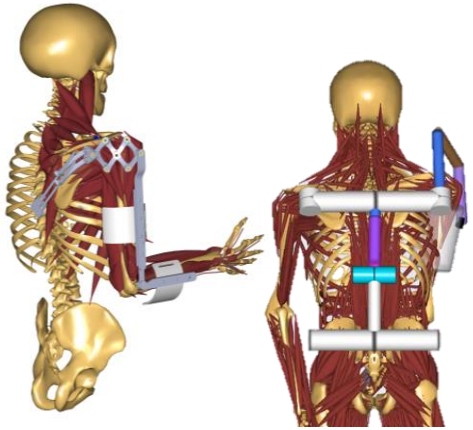
Movement Analysis

Product optimization design

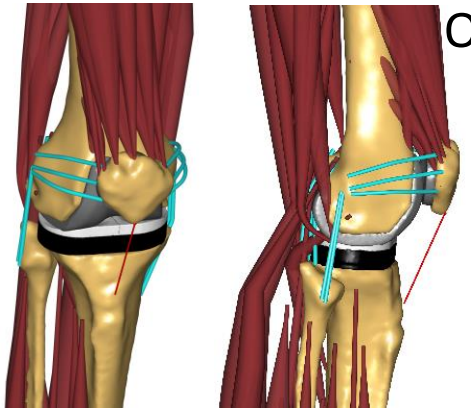
ANYBODY Modeling System



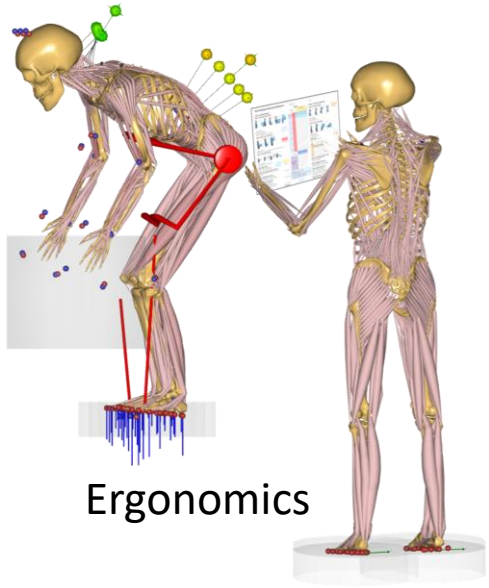
Sports



Assistive Devices



Orthopedics and rehab



Ergonomics

AnyBody Modeling System

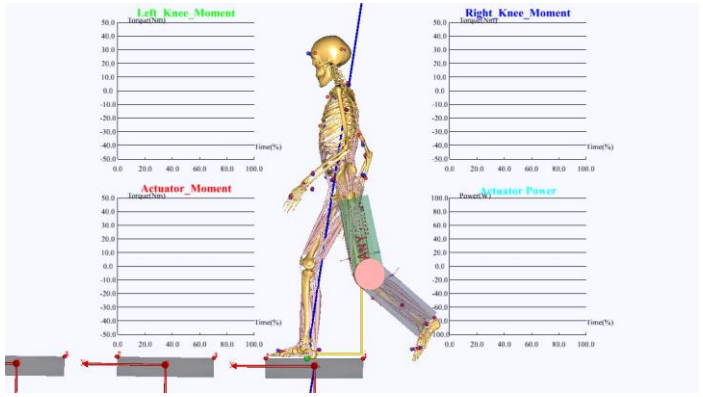
Motion and Forces

Body model

Environment model

Inverse dynamics
Muscle recruitment

Simulation



Internal body loads
- Muscle forces
- Joint moments

Design Optimization

Post Processing (e.g., Finite element tools)

Toward personalized total knee arthroplasty

Pre-planning the patient's optimal joint function in robotic-assisted surgery

Presented by Periklis Tzanetis

Toward personalized total knee arthroplasty

Pre-planning the patient's optimal joint function in robotic-assisted surgery

Periklis Tzanetis, Postdoctoral Researcher Orthopaedics Biomechanics

Orthopaedic Research Group, University of Twente, Technical Medical Center, The Netherlands

Email of Presenting Author: p.tzanetis@utwente.nl

Anybody Technology A/S Webcast Series 3, 12 October 2023 | 09:00, 17:00 (CEST)

Disclosure

This research project was sponsored by Stryker.

Precision knee surgery

Computer navigated surgery
Shatrov et al. 2020, J Exp Orthop 7: 70

Custom cutting guides
Sariali et al. 2019, Int Orthop 43: 2529-38

Robotic-assisted surgery
Hampp et al. 2019, J Knee Surg 32: 239-50

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Alignment in total knee arthroplasty

Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-023-07458-0

KNEE

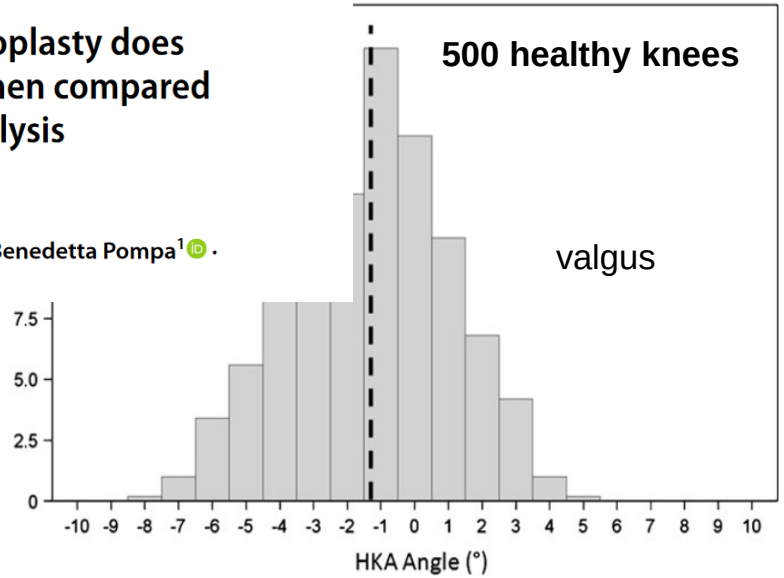
Check for updates

Robotic-assisted mechanically aligned total knee arthroplasty does not lead to better clinical and radiological outcomes when compared to conventional TKA: a systematic review and meta-analysis of randomized controlled trials

Alessandro Bensa[1] · Alessandro Sangiorgio[1] · Luca Deabate[1] · Andrea Illuminati[2] · Benedetta Pompa[1] · Giuseppe Filardo[1,3]

- Debate on alternative implant alignment strategies

toward a more personalized approach



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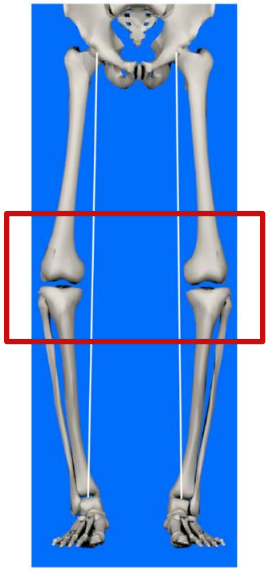
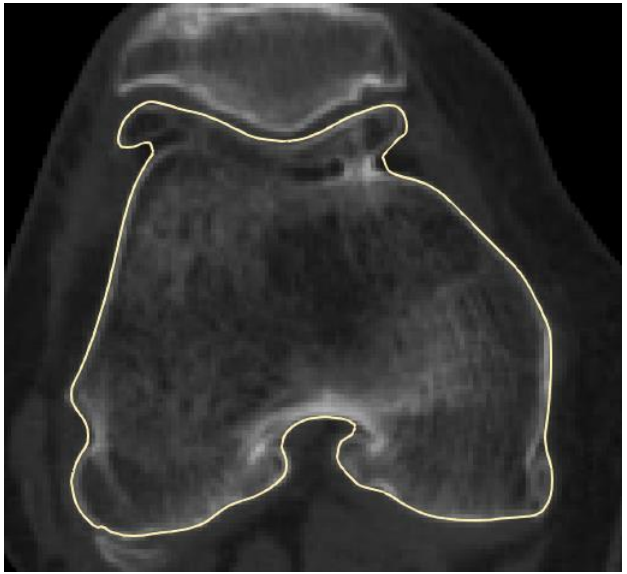
Lee et al. 2017, Knee Surg Sports Traumatol Arthrosc 25: 3467-79.
Clark et al. 2023, Knee Surg Sports Traumatol Arthrosc 31: 1420-26.

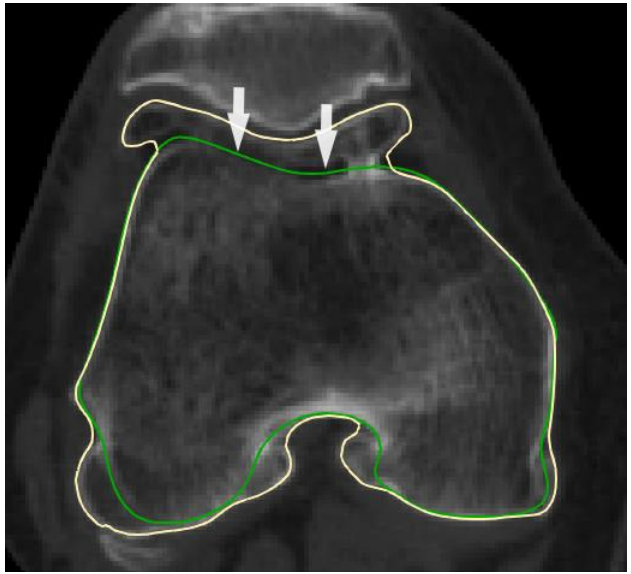
Alignment in total knee arthroplasty

- From a biomechanical standpoint…

Hypothesis: restoring healthy knee biomechanics = ligament strains + kinematics







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Rivière et al. 2017, Orthop Traumatol Surg Res 103: 1047-56.
Oussedik et al. 2012, Clin Orthop Relat Res 470: 3227-32.

Pre-osteophytic bone segmentation

From pre-operative imaging
Bones with osteophytes

From pre-operative imaging
Pre-diseased (healthy) bone shape

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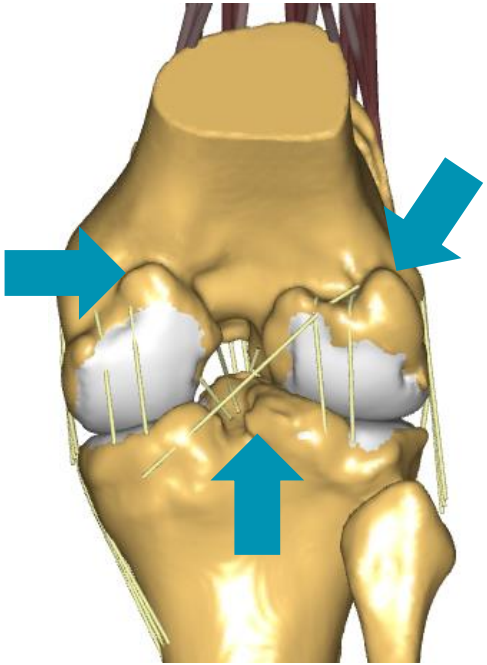
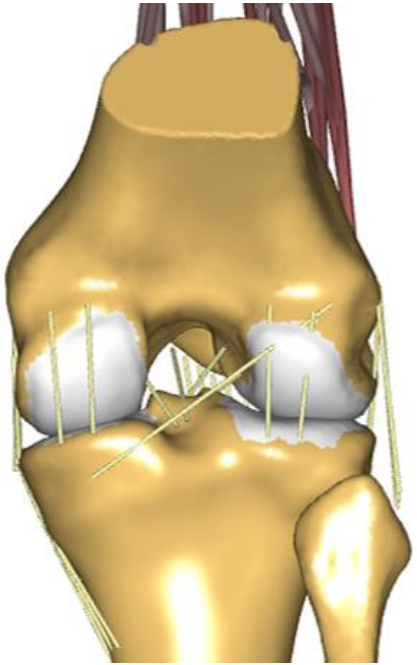
Bowes et al. 2021, Ann Rheum Dis 80: 502-08.
Motesharei et al. 2022, Bone Jt Open 3: 383-89.

Patient-specific musculoskeletal modeling

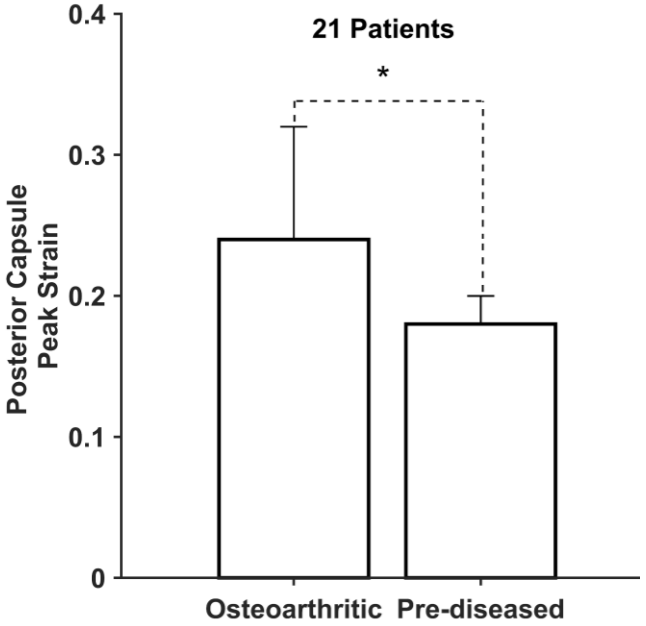
Osteoarthritic



Pre-diseased



Strains and kinematics are affected by the osteophytes



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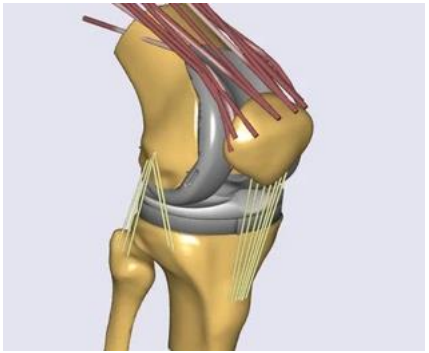
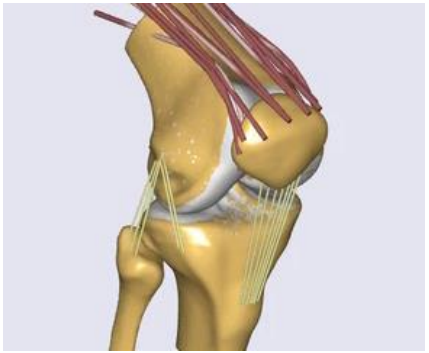
Simulating total knee arthroplasty

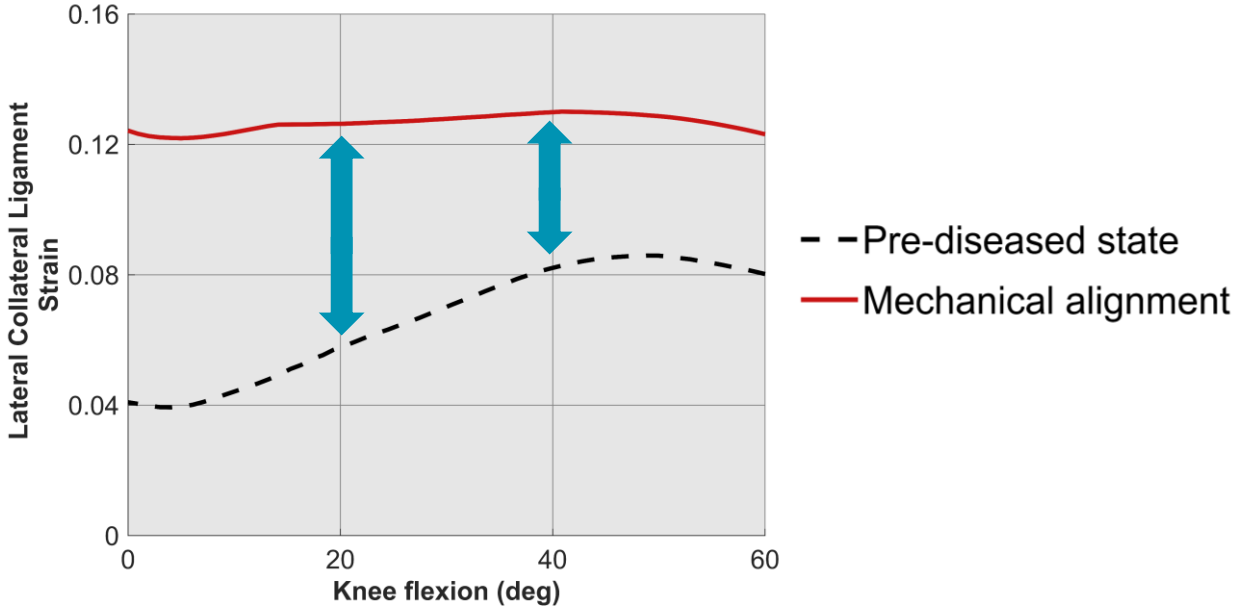
Mechanical alignment



Pre-diseased state



Mechanical alignment had an important effect on strains and kinematics



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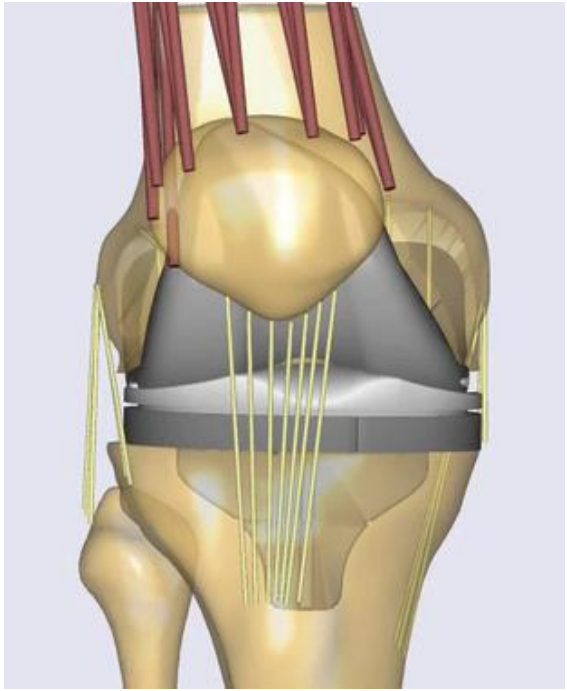
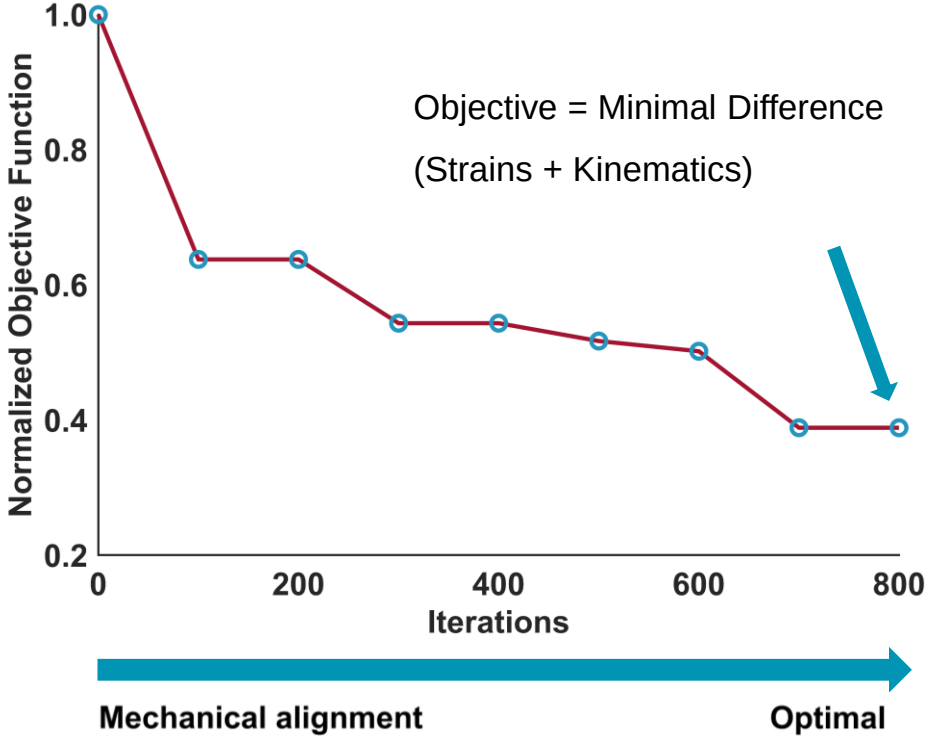
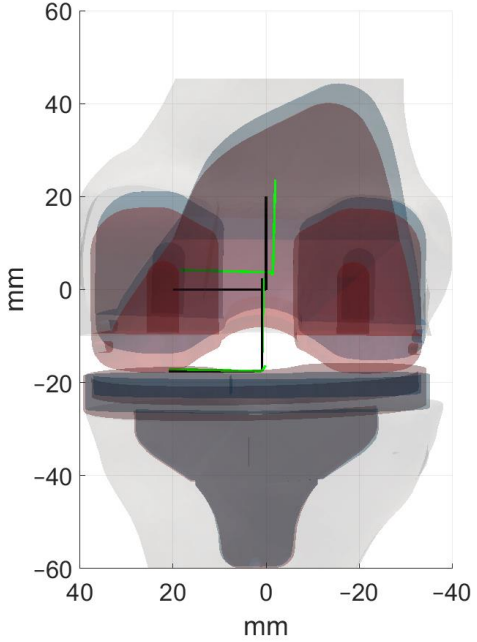
Delport et al. 2015, Knee Surg Sports Traumatol Arthrosc 23: 2159-69.
Provenzano et al. 2002, J Appl Physiol 92: 362-71.

Optimizing implant alignment

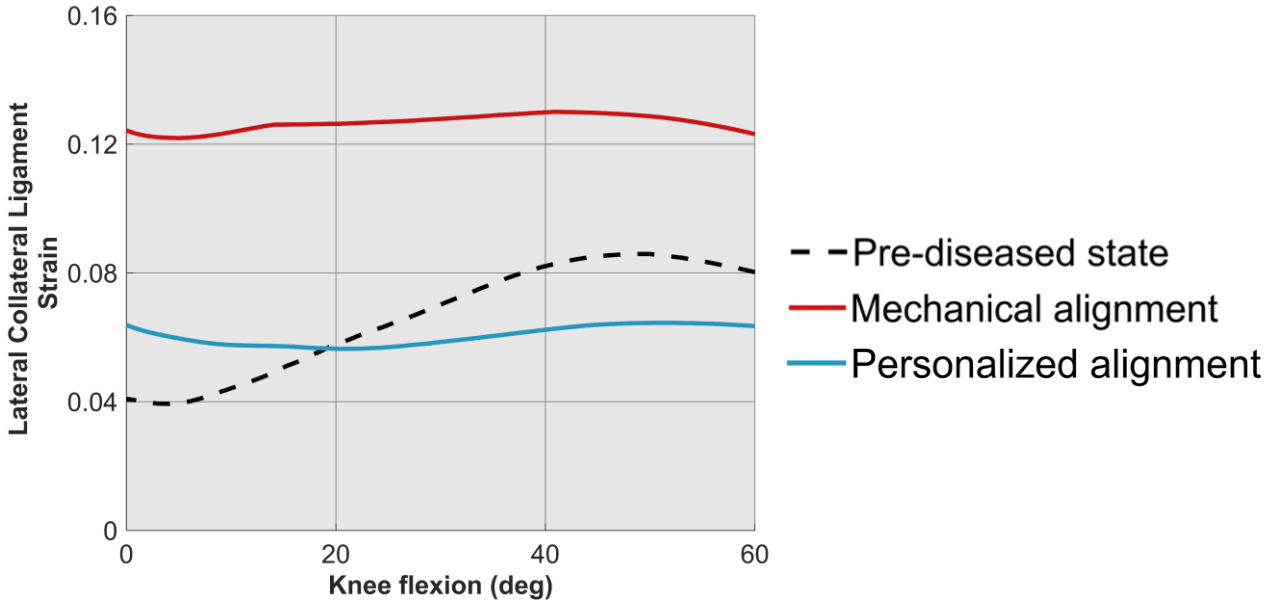




Personalized implant alignment



Pre-diseased and shape-driven alignment over the range of motion



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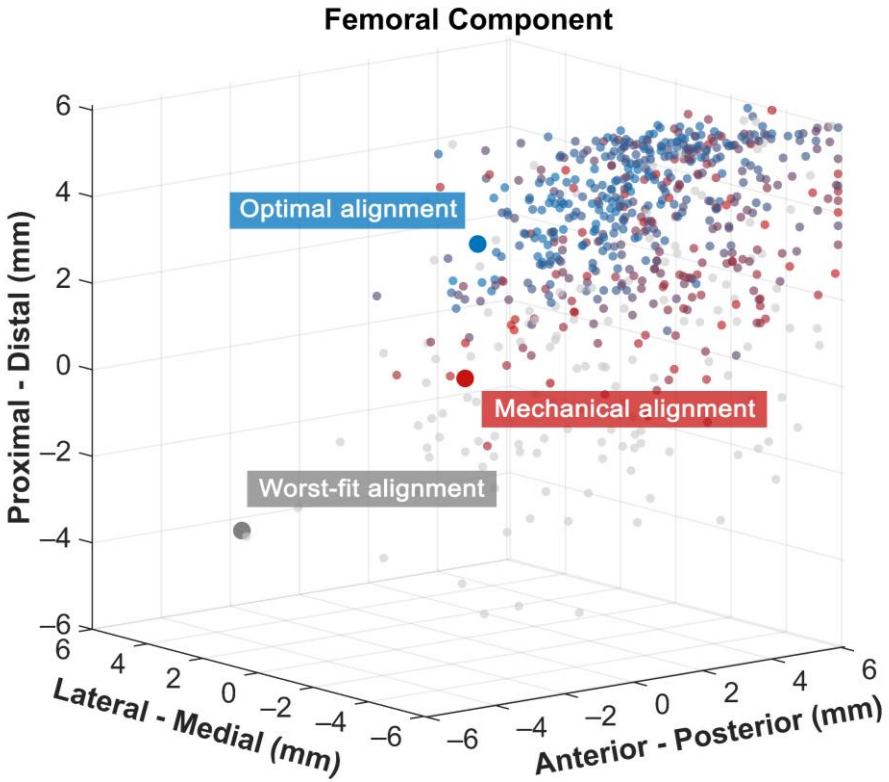
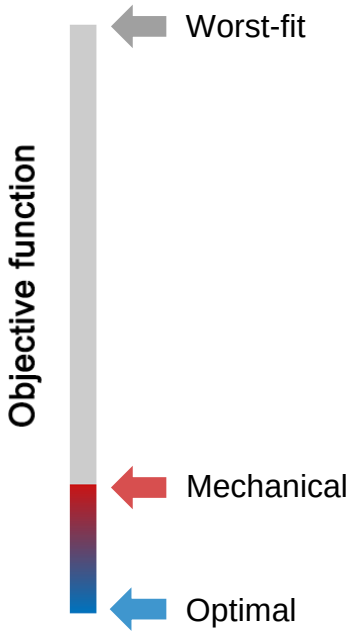
Tzanetis et al. 2023, Bioengineering 10: 543.

Personalized implant alignment





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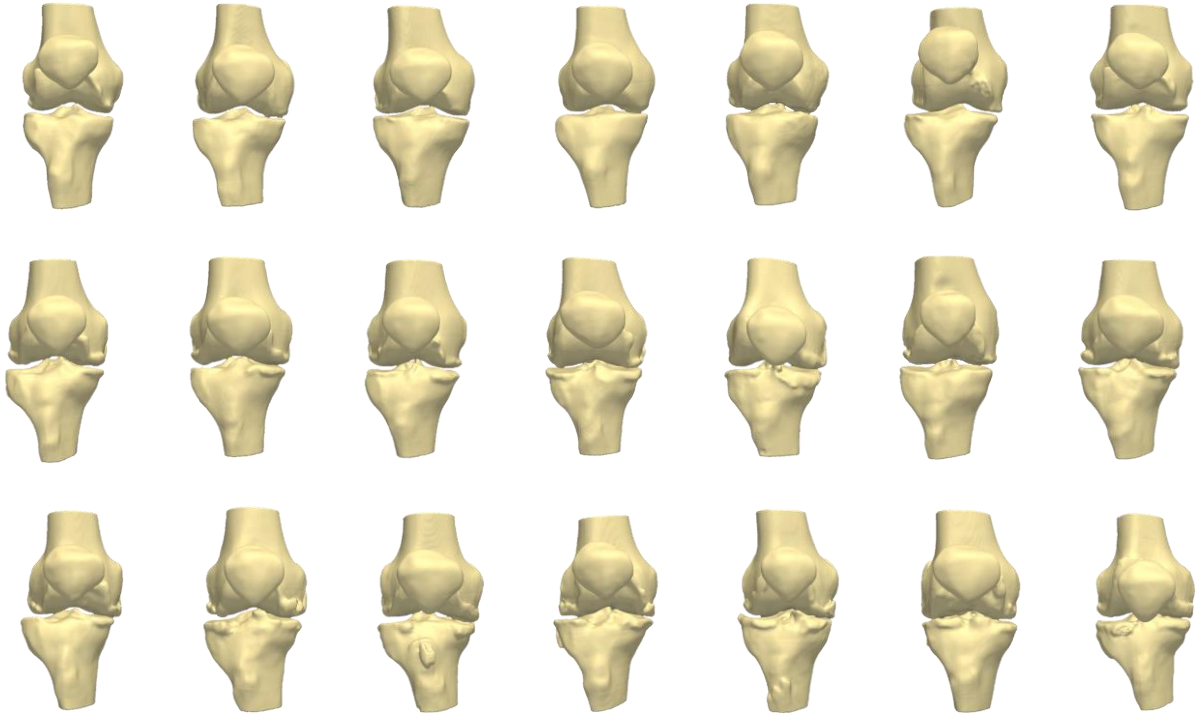
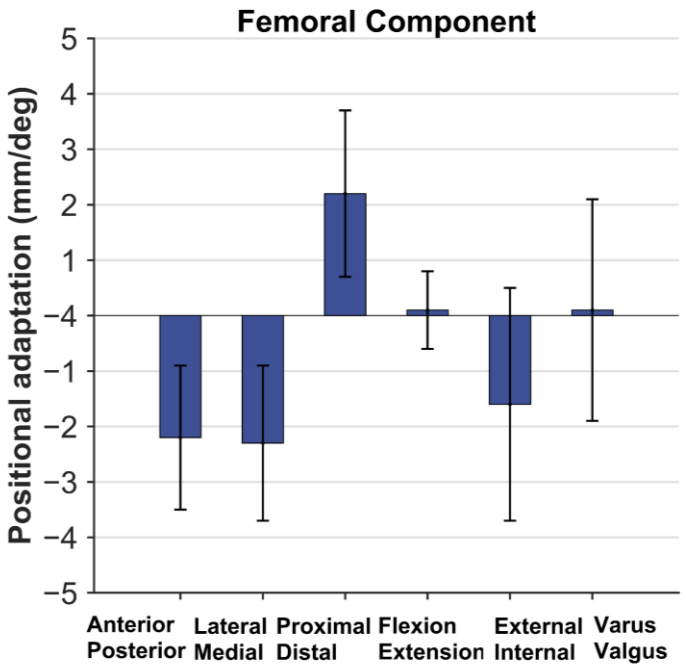
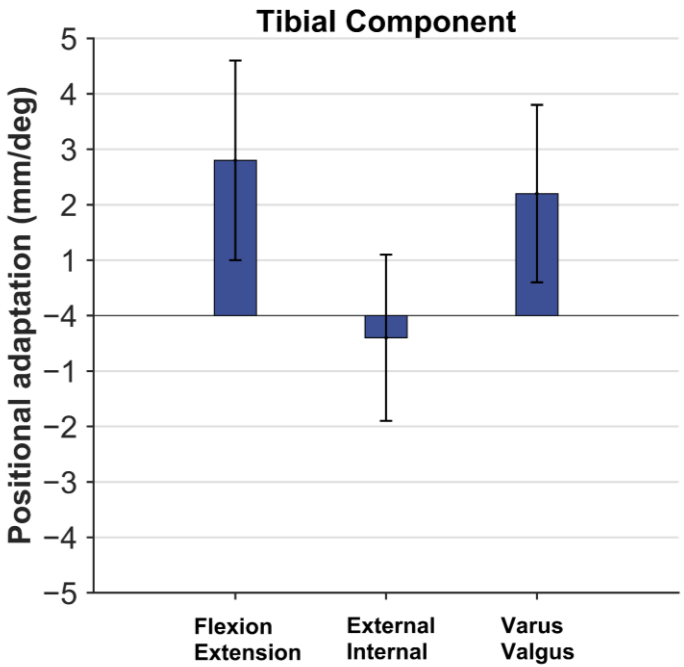
Tzanetis et al. 2023, Bioengineering 10: 543.

Testing on a patient population



Optimal alignment is patient specific





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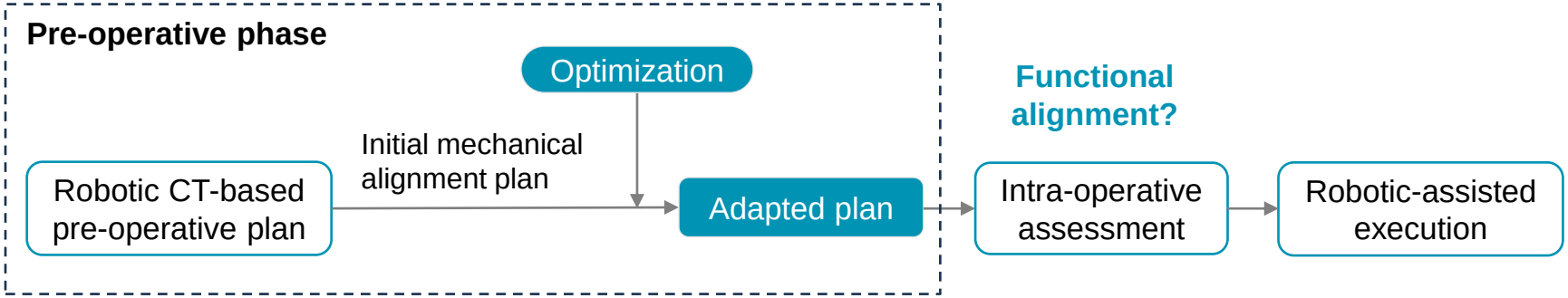
Discussion



- New position for subsequent functional alignment
- Surgeon remains in the loop

Further include clinically relevant aspects, e.g., how well the implant fits to the bone?

Acknowledgments

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Seonaid Robertson
Eric Garling
Daniele De Massari
José-Luis Moctezuma
Arman Motesharei
Michael Kohnen

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- Wiki, Blog, Repositories, Forum

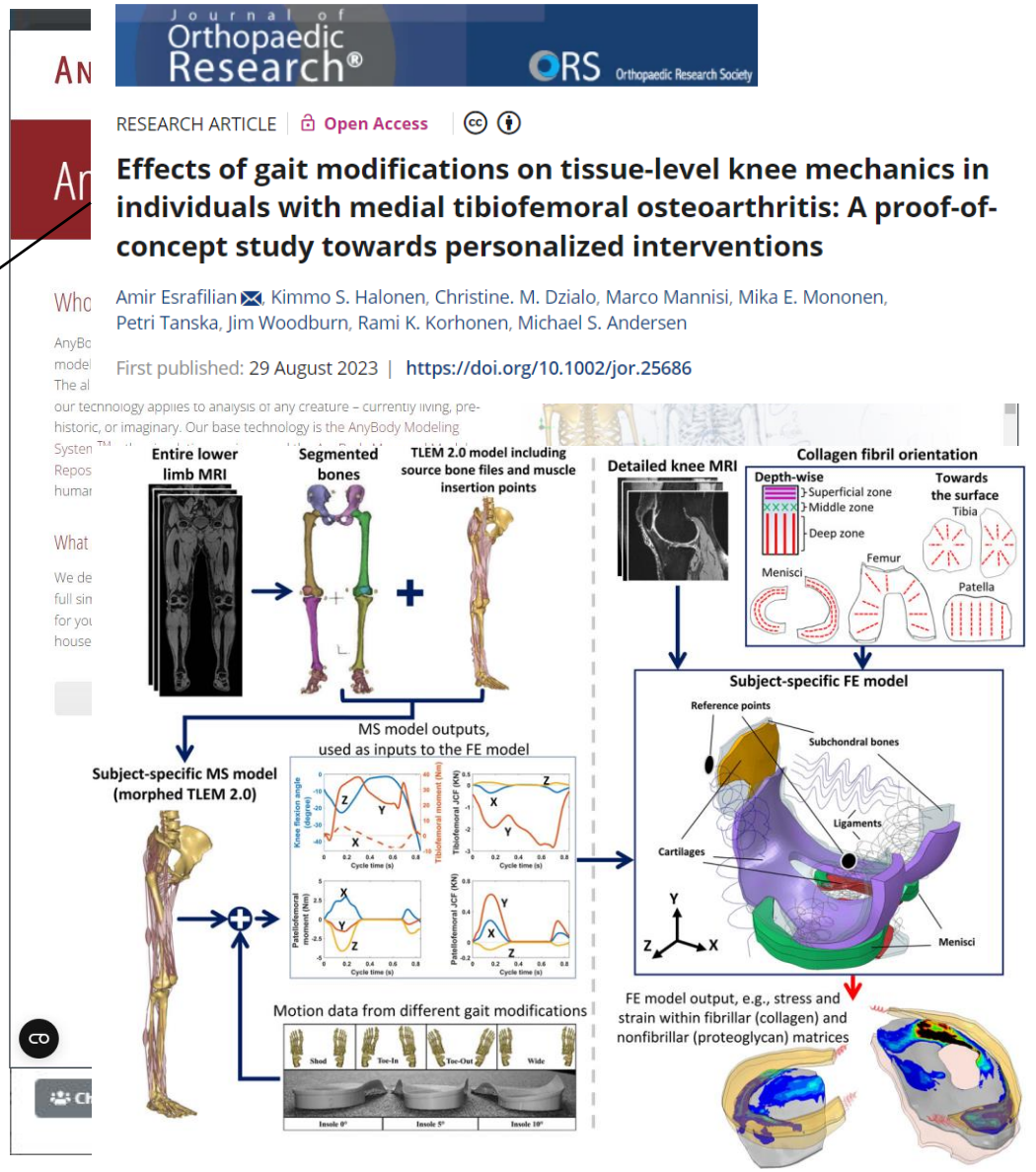
Events

- Upcoming webcast mid November
  - Registration will open soon
- 15th Annual Meeting of the Danish Society of Biomechanics
  - 24 November 2023 in Aalborg, Denmark

Meet us? Send email to sales@anybodytech.com

Want to present? Send email to ki@anybodytech.com

Find us:



Thank you for your attention - Time for questions