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New technology to test orthopaedic designs

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Safer and longer lasting hip and knee replacements are expected from new technology to be developed at The University of Auckland's bioengineering institute.

The research is a collaboration led by Dr Thor Besier from the Auckland Bioengineering Institute (ABI), who is working with colleagues in biomechanics from Adelaide's Flinders University and the University of Melbourne.

A funding grant from the Australian Research Council will be matched by funds from industry partner De Puy, a subsidiary of Johnson and Johnson that specialises in orthopaedic implants.

"Our expertise is in creating models of the musculoskeletal system that can estimate muscle and joint loads that can be used to determine the loads placed on implants", says Dr Besier who is a Senior Research Fellow at the ABI and a Senior Lecturer at the Department of Engineering Science.

"Industry partner DePuy design hip and knee replacements and want to be able to test these new designs virtually before moving to clinical trials," says Dr Besier. "Assessing how an implant will behave across a patient population is challenging."

"We can investigate multiple designs early in the design process and then assess them against population-based models. These tools will shorten the design cycle, give greater insight into performance and lead to safer

implants with improved longevity," he says.

"We have a unique dataset of 327 CT scans (via colleagues at the University of Melbourne). Using computational modelling of this CT data we can perform thousands of simulations and show the statistical variation in an implant and let them know if it will work well or not."

This speeds up the process of testing the new orthopaedic implant designs against patient and surgical variability and saves DePuy considerable time. The computer model gives us information on the implications of any design change, says Dr Besier.

The research team will include a post-doctoral student from ABI, Dr Ju Zhang whose doctoral research developed some of the core technology to be used in this project.

Provided by University of Auckland