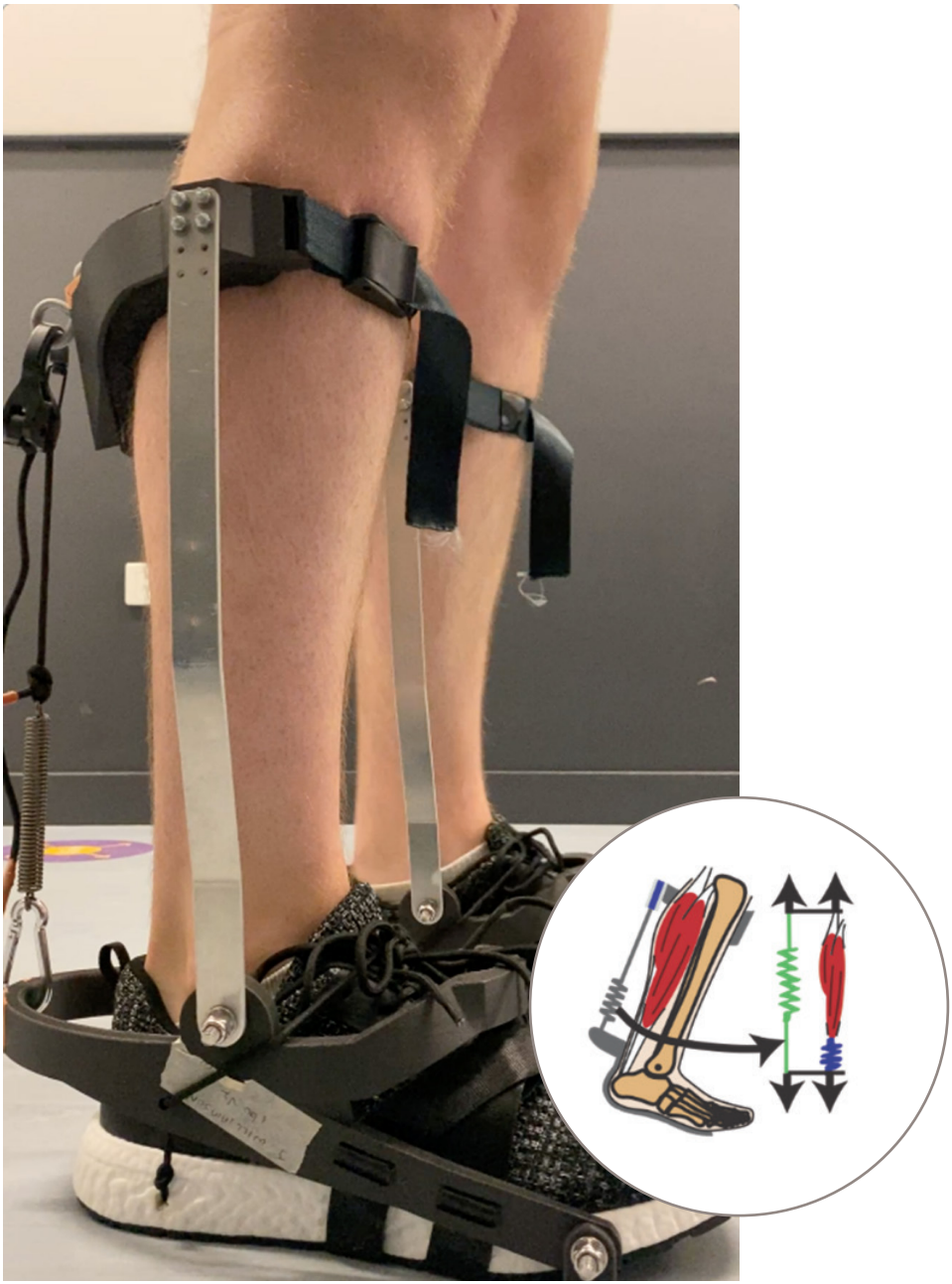
THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Biomedical Sciences

Neuromuscular Biomechanics Research Group



Wearable assistive devices are transforming the way humans move. A goal of our laboratory is to design, test, and implement wearable assistive devices (exoskeletons and prosthetics) that have the capacity to augment, improve and restore movement, posture, and balance in healthy and pathological populations.

State-of-the-art engineering has led to great advances in assistive device designs, such as prosthetics, exoskeletons, and orthotics, but these devices often fail to move beyond the lab environment into the real world. To enable this transition, we take an 'under the skin approach' to understand how bio-enhancement technologies interact with the individual user. We envision a future where devices are personalised and present in our daily lives.

We aim to:

- Understand how *muscle activity and motor coordination* are modified in response to wearing a device
- Quantify how *muscle and tendon loading* varies during movement with and without using a device
- Measure how *movement patterns*, including gait (ie: walking and running), balance, and posture are affected when using a device

In doing so, we can (1) test the feasibility of device prototypes and better match devices to the individual user and (2) adapt current innovative technologies to provide individualised support for clinical populations.

We specialize in our state-of-the-art experimental framework that allows us to simultaneously measure the following in vivo human physiological signals, non-invasively:

- Neural control and muscle coordination using wireless surface electromyography sensors
- Muscle and tendon length changes using novel dynamic ultrasound imaging
- Loading and unloading responses on muscle-tendon tissues using kinetic measurement tools
- Movement patterns and joint angles using 3D motion capture technology
- Static and dynamic balance performance using force plates

UQ's School of Biomedical Sciences – mission statement:

By harnessing our diversity across the breadth of biomedical science,

we will generate, disseminate and apply foundational biology underpinning health and disease to inspire and empower the next generation of leading researchers, educators, and healthcare professionals to innovate together for better health outcomes globally.

Our innovative research encompasses basic discovery through translational pathways to medical solutions:

Cell architecture: We use sophisticated molecular and imaging techniques to explain how various cellular components and pathways contribute to building healthy bodies.

Receptors and signalling: We decipher the passage of external messages from the cell surface, through cytoplasmic signalling pathways, and ultimately to genetic regulatory circuits in the nucleus.

Chronic disease: We characterise the genetic, molecular and cellular microenvironments associated with diseases, such as Alzheimer's disease, cancer, MND and others.

Drug design and development: We identify critical biological targets and design drugs based on structural analyses to develop novel therapies.

Functional and comparative anatomy: Our interdisciplinary studies of structure and function across phylogenetically disparate species advance our understanding of the human body in healthy, aging and diseased states.

Injury and repair: We study fundamental mechanisms of cells in response to stress, consequences of repair processes and how these may be influenced for optimal outcomes.

Musculoskeletal and motor control: We develop and apply novel tools, to investigate muscle function and neural control of muscles in humans.

Neurobiology and brain function: We search for and discover genetic and environmental factors that lead to and maintain healthy nervous systems.

Reproduction: We investigate the genetic and molecular environment during early fetal development to advance reproductive technologies and facilitate healthy pregnancies.

Contact

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