

# Gold Coast Orthopaedic Research, Engineering and Education Alliance (GCORE)

## *Developing innovations to prevent and treat orthopaedic and neuromusculoskeletal conditions*

Orthopaedic and neuromusculoskeletal conditions form some of the leading causes of life-altering disability in individuals across Australia, and are accompanied by large personal, social and healthcare system costs.

These conditions include osteoarthritis, musculoskeletal tissue injury, limb loss, spinal cord or peripheral nerve injury from sport or other accidents, and neurological conditions such as cerebral palsy and stroke.

Professor David Lloyd and Professor Randy Bindra, along with an elite team of orthopaedic surgeons, biomedical scientists and engineers, and health professionals, make up the Gold Coast Orthopaedic Research, Engineering and Education Alliance (GCORE) in the Menzies Health Institute Queensland at Griffith University.

GCORE and its dedicated world-class researchers are driving life-changing, innovative advancements to prevent and manage orthopaedic and neuromusculoskeletal conditions, aimed at improving health and social wellbeing, while minimising the economic consequences on a disabled person's quality of life.

GCORE's work is underpinned by the 'Personalised Digital Human'—a revolutionary technology using advanced computational methods to analyse personal and big data acquired from medical imaging, motion capture and wearable sensors. These models simulate an individual's movement and tissue loading, accounting for personalised differences in anatomy, neurophysiology and movement.

**Your generosity can support this life-changing research. Please donate today.**



GCORE has five main areas of research:

**1 Optimising surgeries using simulation and 3D printing:**

We use 'Personalised Digital Human' models and advanced medical imaging to plan orthopaedic surgeries, simulate outcomes, and design and 3D print implants and surgical instrumentation. We also generate 3D anatomical models to plan orthopaedic and neurovascular surgeries.

**2 Assistive functional training and rehabilitation devices:**

We measure and simulate the complex interaction between brain, human and machine, using real-time 'Personalised Digital Human' models to create assistive rehabilitation and neuro-restoration devices. We are also developing 'thought driven' controllers for motor-driven and electrically stimulated functional neuro-restorative therapies for individuals with spinal cord injury and cerebral palsy.

**3 Hip and knee osteoarthritis:**

Using advanced medical imaging and 'Personalised Digital Human' models, we estimate patients' hip and knee tissue loading, stresses, and strains in daily activities. In this we determine the causes of tissue degeneration and develop innovative therapies to slow or prevent disease. We are also researching methods to improve surgeries and rehabilitation after sporting injuries to slow patients' subsequent onset of osteoarthritis.

**4 Tissue engineering and regenerative medicine:**

We use biological and medical-grade polymer tissue engineered and regenerative therapies to repair nerves and musculoskeletal tissues. We are developing devices to improve nerve repair, and designing tissue engineered constructs and regenerative therapies to repair tissues such as Achilles tendons, ligaments and hamstring tendons.

**5 Prevention and management of sporting injuries:**

Lower limb sporting injuries, particularly in youth, are highly prevalent and are possibly one of the most common causes of subsequent osteoarthritis. We have researched the causes of these injuries and developed effective injury prevention training programs, and are now developing training methods enabled by wearable technologies. We are also involved in leading the development of national policies to prevent such injuries and osteoarthritis.

**Your support**

By donating to GCORE, your support will make a meaningful contribution to the health and wellbeing of children and adults for generations to come.

**For more information on supporting this research, contact:**

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***'Our research generates new knowledge and innovative technologies to better understand and more effectively manage neuromusculoskeletal conditions.'***

– Professor David Lloyd

