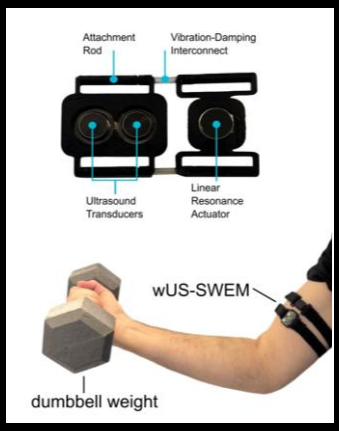
# Wearable Ultrasound Shear-Wave Elastometry (wUS-SWEM) Device

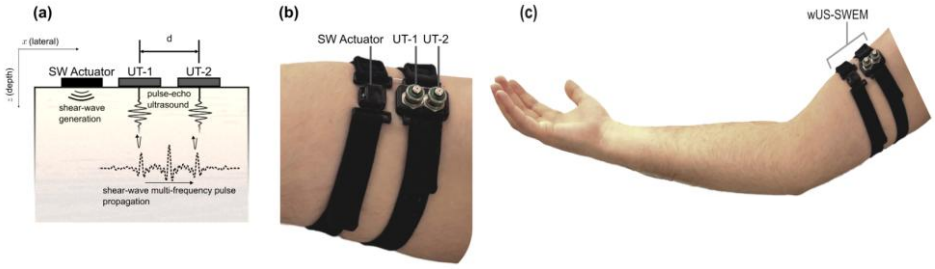



## Background

Ultrasound shear wave elastography (US SWE) is an emerging technology employing transversely-oriented shear waves that propagate through the surrounding tissue and provide biomechanical information about tissue quality and performance. US SWE is a non-invasive method for characterizing the elastic properties of biological soft tissues (e.g., skeletal muscles) where factors such as force production, fatigue level, injury, and response to rehabilitation can affect the elasticity of muscle tissues.

## Description of the Invention

Carleton researchers have developed a unique wearable ultrasound shear wave elastometry (wUS-SWEM) device that enables continuous, non-invasive monitoring of muscle or tendon viscoelasticity during movement. The wUS-SWEM device comprises a vibrator element and two ultrasound sensing elements. Shear waves (SWs) are generated in the muscle by the vibrator and the resulting tissue displacements are detected by the sensing elements. To date, a prototype of the wUS-SWEM device has been built and demonstrated to be effective for tracking time- and depth-resolved muscular parameters.




## Key Benefits and Advantages

- **Direct, quantitative measurement**: By directly measuring muscle tissue displacement, this technology offers quantitative insights into performance, fatigue, and injury risk unlike traditional surface-level methods (e.g. sEMG).
- **Improved spatial resolution**: The wUS-SWEM device can monitor tissue properties of individually selected muscles or tendons. sEMG lacks spatial resolution due to signal interferences from different muscles.
- **Wearable device**: Designed to be portable, cost-effective, and wearable, it opens new possibilities for elite training, sports medicine, and rehabilitation beyond the lab.
- **Low cost**: The wUS-SWEM device does not require complex electronics, resulting in low cost and scalable fabrication.

## Applications

**Continuous, quantitative, non-invasive monitoring of muscle viscoelasticity during movements** is a valuable parameter for various applications including:

- sports medicine and training of high-performance athletes;
- musculoskeletal rehabilitation and evaluating effectiveness of assistive devices;
- monitoring progression and treatment of neuromuscular disease.

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**Development Stage**:
Prototype Validation

**Protection Status**:
International patent application (PCT)

**Seeking**:
Development Partners
Licensees

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