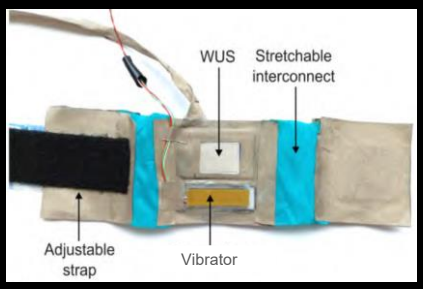
Carleton University

Wearable Shear-Wave Ultrasound Elastometry (wSWUE) Device

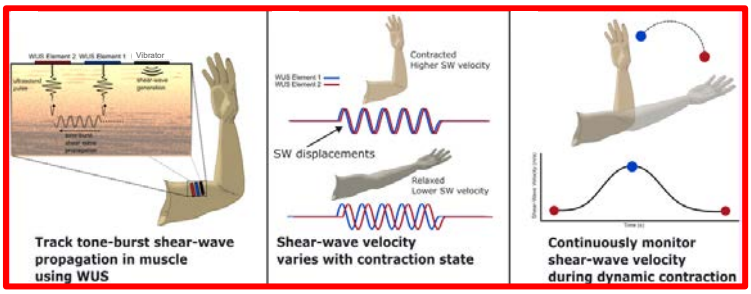


Background

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. 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

The wSWUE 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 ultra-sound sensing elements. To date, a prototype of the wSWUE device has been built and demonstrated to be effective for measuring muscle displacement of a human forearm during static contraction.



Key Benefits and Advantages

- **Increased Accuracy**: SWs from the wSWUE device propagate *inside* the tissues so that internal tissue/muscle displacement caused by muscle contraction can be directly measured. In contrast, techniques like surface electromyograph (sEMG) "indirectly" monitor motion via electrical signals.
- **Improved Spatial Resolution**: The wSWUE device can monitor tissue displacement on individually elected muscles. sEMG lacks spatial resolution due to signal interferences from different muscle.
- **Wearable device**: The wSWUE system is an easily portable and wearable device that can enable continuous monitoring of moving subjects outside of a hospital or laboratory.

Applications

The ability to measure changes in elasticity of muscle tissues during movements is a valuable parameter for various applications including:

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

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Prototype Validation

Protection Status:
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Seeking:
Development Partners
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