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Carpometacarpal Osteoarthritis: Toward Identification of Biomechanical, Neuromuscular, and Somatosensory Mechanisms

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STATUS QUO

Carpometacarpal osteoarthritis (**CMC OA**) is a painful, debilitating disease. Individuals with symptomatic CMC OA can lose up to 50% of hand function.[1]

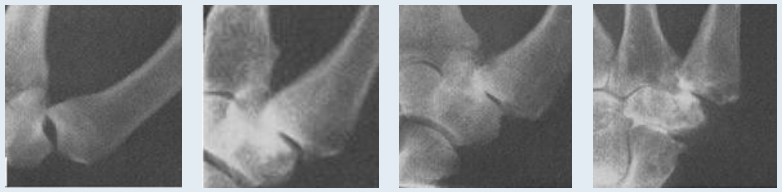
Current conservative and surgical treatments do not provide the pain relief, strength, and mobility needed to restore both fine and gross motor function.[2]

New treatments are challenging to develop because the **mechanisms that influence the severity of CMC OA have not been fully identified**, and therefore cannot be clinically targeted.

CLINICAL PROBLEM

The **presentation of symptoms is highly variable** and little is known about how symptoms, such as pain and instability, relate to the underlying disease.

Eaton Classification of CMC OA[3]



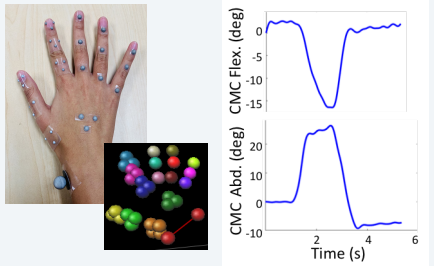
Stage I | Stage II | Stage III | Stage IV

Objective: Elucidate biomechanical, neuromuscular, and somatosensory mechanisms that contribute to the symptomology of CMC OA.

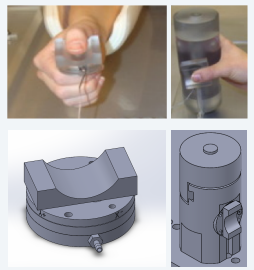
ONGOING RESEARCH

Biomechanics: Thumb Motion & Force Production

Joint Kinematics

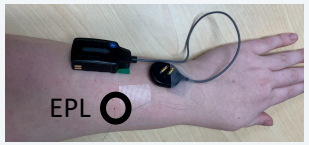


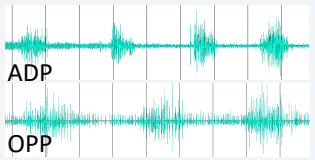
Joint Kinetics[4]



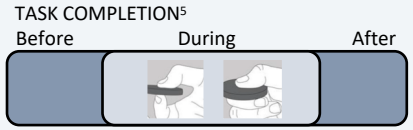
Neuromuscular Control: Thumb Muscle Activity

Electromyography (EMG)

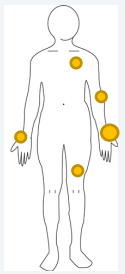




Movement-Evoked Pain



Somatosensory: Biopsychosocial Pain Assessment



Quantitative Sensory Testing

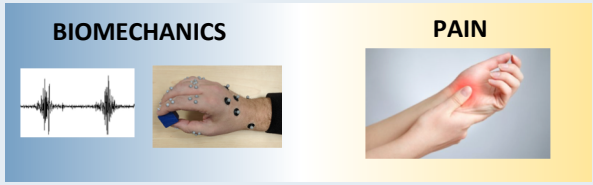
- Mechanical
- Thermal

Self-Reported Measures

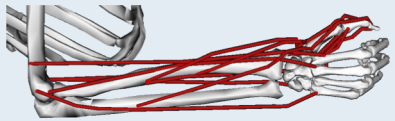
- Pain History
- Graded Chronic Pain Scale
- AUSCAN (Clinical Hand Scale)

TECHNICAL IMPACT

Integrate scientific approaches from two siloed fields: orthopaedic biomechanics and quantitative pain research.



Advance our understanding of the complex, multi-joint system that is the human thumb.



SOCIETAL IMPACT

Enhance thumb function and improve quality of life for individuals with CMC OA by informing clinical treatments.

References: [1] Ateshian et al. (1995) *J Orthop Res.* [2] Ladd et al. (2013) *Instr Course Lect* [3] Eaton & Littler (1973) *J Bone J Surg* [4] Kerkhof et al. (2015) *J Electromyogr Kinesiol* [5] Wohlman (2015) *Ph.D. Dissertation*