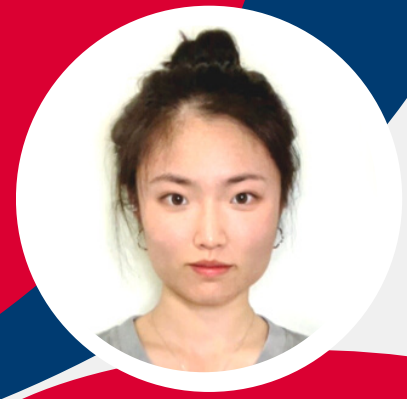


# YUYAO (AMY) MA

PHD STUDENT | PROGRAM 4  
ARC TRAINING CENTRE FOR JOINT BIOMECHANICS

**PhD duration:** July 2022 to June 2026

**My interests:** Musculoskeletal conditions and Chronic pain, wearable sensors, computer modelling, machine learning and deep learning. I hope to apply my skillset to the development of better assessment and/or management framework for people with musculoskeletal conditions.



**BPhys (Hons Class I) (UC)**

**Supervisors:**

Prof. Paul Hodges, Prof Graham Kerr & Dr. Wolbert van den Hoorn

## PROJECT OVERVIEW

**Project Title:** Understand neuromuscular control of the shoulder using Transcranial Magnetic Stimulation

### THE PROBLEM

- The shoulder complex is highly mobile which is capable of movements in multiple directions and planes. While it being highly functional, the shoulder complex relies on sophisticated coordination between multiple shoulder muscles for control and stability. It has been proposed that aberrant muscle coordination may be one of the mechanisms for injury or sustained dysfunction.
- Central Nervous System (CNS) including the corresponding brain areas and neural pathways responsible for muscle contraction is of crucial importance.

### **Why Does neuromuscular control of the shoulder require more research?**

There is yet a consensus on how muscle control is altered in people with shoulder pain or pathologies. This is partly due to a limited understanding on the underlying mechanism involving the CNS in both healthy and symptomatic population.

### **How can musculoskeletal modelling of pathological conditions of the shoulder help?**

- Transcranial Magnetic Stimulation (TMS) can stimulate the CNS (certain brain areas and neural pathways) by generating electrical current, which can create a muscle response in the form of subtle contraction. Analysing the property of muscle response gives us some insights on the characteristics of the CNS and the pathways involved.
- Only few studies to date examined the shoulder using TMS.

### HYPOTHESIS

We hypothesised that 1) there is a pattern of muscle coordination and CNS features that is task specific in the healthy population, and 2) this pattern is altered/absent in people with shoulder pain or pathology.

### PROJECT AIMS

1. Understand the CNS mechanism in healthy individuals of shoulder muscle coordination and control.
2. Compare the observed CNS features to individuals with shoulder pathology.

### OUR SOLUTION & EXPECTED OUTCOMES:

The project will help both researchers and clinicians understand how and why neuromuscular control is impaired after onset of pathology or pain, which may shed light on shoulder rehabilitation and potentially diagnosis.

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**Joint Biomechanics**  
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