

## Master thesis abroad – Proposal

**Title:** Adaptations of neural activity for muscle co-contraction

**Host Institution:** Georgia Institute of Technology, School of Applied Physiology

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**Web site:** <http://www.gatech.edu>, <http://ap.gatech.edu/>

### Aim

Co-contraction of opposing muscles about a joint (*i.e.* antagonistic muscles) is commonly increased involuntarily due to healthy aging and various neurological disorders (*e.g.* spasticity after stroke). Co-contraction degrades rapid and smooth movement but can help stabilization, for example, when interacting with a robot. The aim of the project is to understand the adaptations of neural strategy for muscle co-contraction and motor performance due to noninvasive interventions in humans.

### Methodology

Noninvasive interventions (to be determined) will be applied during muscle co-contraction in human subjects. Neural activity during muscle contraction will be recorded using surface electromyography (EMG). The specific noninvasive interventions will be determined based on the exploration during the pilot experiments.

### Current status of the work

Related studies have been conducted that are examining the adaptations in neural oscillations during co-contraction due to mechanical vibrations and due to unique contraction training. The master thesis will be the extension of these current studies into different types of interventions and assessments. The new student will be asked to collect human data using the existing setup with some modifications and to analyze and interpret the collected data.

### What is expected from the Master Student

The student is expected to acquire the knowledge and technique for conducting this human neuromuscular research study. For collecting human data, the student is expected to have appropriate communication skills to work with human subjects in English. Other than that, the required knowledge and technique include the planning of a research study and collection and analysis of neural and mechanical signals using Matlab (MathWorks) and Labview (National Instruments). More specifically, the student will be expected to:

- Learn the knowledge by reading literature and discussing with lab members
- List a few possibilities for specific research questions and procedures
- Adjust the existing experimental setup for starting a new study
- Run pilot experiments to decide the type of intervention and muscle contraction to be tested
- Recruit and instruct human subjects for collecting data appropriately
- Provide visual feedback to subjects and collect data using Matlab or Labview
- Process data by adjusting the existing Matlab code
- Run the statistical analysis
- Interpret and report results in oral and written forms