This study aims to identify the brain patterns (neural correlates) of spastic events during upper limb movements.

Volunteer participants who experience upper limb spasticity in their everyday lives due to Spinal Cord Injuries (SCI) are welcome to participate in our study. This project is aimed to constitute the basis for further projects that will develop brain-computer interface interventions to provide timed spasticity therapies.

The participants will be asked to be assessed through the Modified Ashworth scale, while having their brain and muscle activity recorded. The participants will also be asked to perform repetitive movements both actively and passively.

The related brain activity will be recorded with the electroencephalogram (EEG) and the muscular activity will be recorded with the electromyogram (EMG). Both those instruments are just recording devices. Additional information like velocity and angle can be provided by an electronic goniometer (measures passively the joint position). Together those data will constitute the basis for future therapies. Our final aim is to detect the biomarkers of spasticity to be able to develop a proper feedback mechanism to lower the spastic reflexes.

In one condition, both when moving the arm actively and when the arm will be moved passively the participants will be asked to listen and repeat a short story.

The reason behind repeating the story while performing the movements relies on the fact that the level of attention, the velocity and the conscious proprioception of ones own body while moving, impacts on the level of spasticity.
Recruitment criteria:

✓ Volunteers with upper limb spasticity.

✓ Age range 18 - 70 years old.

✓ No known cognitive impairments that would impede the task following and execution.

✓ No under recreational drugs.

18 - 70 because of the legal age to take part voluntarily in an experiment and because of the brain activity that normalize in order to be comparable with older adults.

70 because with aging the brain activity starts to fire in a different pattern to achieve the same goals, hence would become complicated to compare the brain firing activity.

18 - 70 because the spinal cord lesion population with upper limbs spasticity is very heterogeneous.

We will recruit no more than 20 participants.

Benefits:
There will be no direct benefit for the participants, other than taking part in the research project. There are no guarantees that the results of this project will be beneficial for future works. However, the results will feed into the wider RESPONSS project that aims to develop rehabilitation technologies to support clinical and self-management of spasticity.

Venue:
The experiment will take place in the Institute of Orthopaedics and Musculoskeletal Science, UCL, in the Aspire Create Lab unit, Brockley Hill, Stanmore, Middlesex, HA7 4LP.

Contacts:
If you are willing to take part in our experiment or you have additional questions, please send an e-mail at: nadia.sciacca.17@ucl.ac.uk or send a message to 07466 264252 and you will be contacted.

Personal Information:
The participants will be asked to fill in a consent form, that can be provided to them via mail before deciding if they will be willing to take part in the experiment or not. The consent form will state that the withdraw from the study will be accepted at any moment without any explanation. Moreover, the volunteers can decide to withdraw their data up to the end of the experiment session (after which point it will be fully anonymised and will not be possible to link the data back to their identity).

Data to be collected:

- Non-invasive electrophysiological recordings: EMG (electromyogram = muscle activity) and EEG (electroencephalogram = brain activity)
- Kinematic data (e.g. joint angles, recorded from a goniometer)
- a close-up video recording (without audio) of the single arm used during the experiment (the participant’s face will not be in the video frame).
- Participant age
- Participant handedness (dominant hand)