Title: Neuromodulation and rehabilitation after stroke and brain damage

Abstract: Brain damage is an injury that causes the destruction or deterioration of brain cells. In the U.S., every year, about 2.6 million people have some type of brain injury, whether as a result of trauma, stroke, tumor, or other illnesses, according to the Brain Injury Association of America. This research project is focused on the study of plastic rearrangements and neurorehabilitation after brain damage. The main goal is the validation of novel rehabilitative strategies involving robotic devices, non-invasive brain stimulation and manipulation of the inhibitory system to boost functional recovery of perilesional areas in a mouse models of brain injuries, particularly focusing on ischemic stroke. The project will study how the damage affects the excitatory/inhibitory balance and alters motor maps in perilesional cortex and the role of the healthy hemisphere in functional recovery. In this contest, human-inspired robotic rehabilitation coupled with optogenetics, electrophysiological recordings and transcranial Alternating Current Stimulation will be used to identify changes in neural oscillation and interneurons firing pattern during a motor task induced by brain lesions and to find highly translational strategies to restore pre-lesion conditions. The project involves collaborations with clinical partners like Biorobotic Institute of Scuola Superiore Sant’Anna and the Azienda Ospedaliera-Universitaria Pisana. This approach is applied not only in stroke models but also in other pathologies like glioma and brain/heart axis dysfunctions induced by stress and obesity.

References:


7. Quantitative kinematic characterization of reaching impairments in mice after a stroke.
Keywords: neuromodulation, rehabilitation, robotics
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