

Development of a Device to Assess Closed-loop Reaching in Children with Motor Disability

Team 30: Elizabeth Avery, Marian Karam, Tucker Lau, Taylor Ly, and Yue Zeng

Advisor: Claudio Ferre (BU, Sargent College)

Functional near-infrared spectroscopy (fNIRS) and movement sensors have been used to track motor and sensory function, but by using these in tandem, then we can understand the interrelatedness of sensorimotor functions as it relates to motor disabilities. We propose a non-invasive and child-friendly device that tracks data of reaching trajectories in an adaptive reaching task where signals will be synchronized across movement sensors and fNIRS measurements. The design has three synchronized components: a movement tracking bracelet and a motor-driven moving toy car (keyestudio Smart Small Turtle Robot)—each enclosing an inertial measuring unit (IMU) sensor, an Arduino Uno, and a bluetooth module—and an fNIRS cap that obtains concurrent measurements of brain activity. The adaptive reaching task will be carried out using a closed-loop feedback system between the tracking bracelet that is attached to the child's wrist and the moving toy car that will move away when the child reaches. The objective of creating this device is to promote collection of data that highlights fundamental mechanisms that shape sensorimotor function in healthy children compared to those with CP. This data has potential to help pave the way for redesigned and refined therapies that specifically target systems and functions that might be particularly malleable during sensitive periods of brain development or later when sensorimotor circuits don't have as high of plasticity.

