

Brain Controlled Piano Keyboard for Children with Severe Motor Impairments

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Background

Brain Computer Interface (BCI): Converts brain signals obtained from an electroencephalogram (EEG) into commands that enable users to interact with their environment

P300 Event Related Potential (ERP): Brain signal that is generated approximately 300ms after presentation of the target stimulus (flashing image)

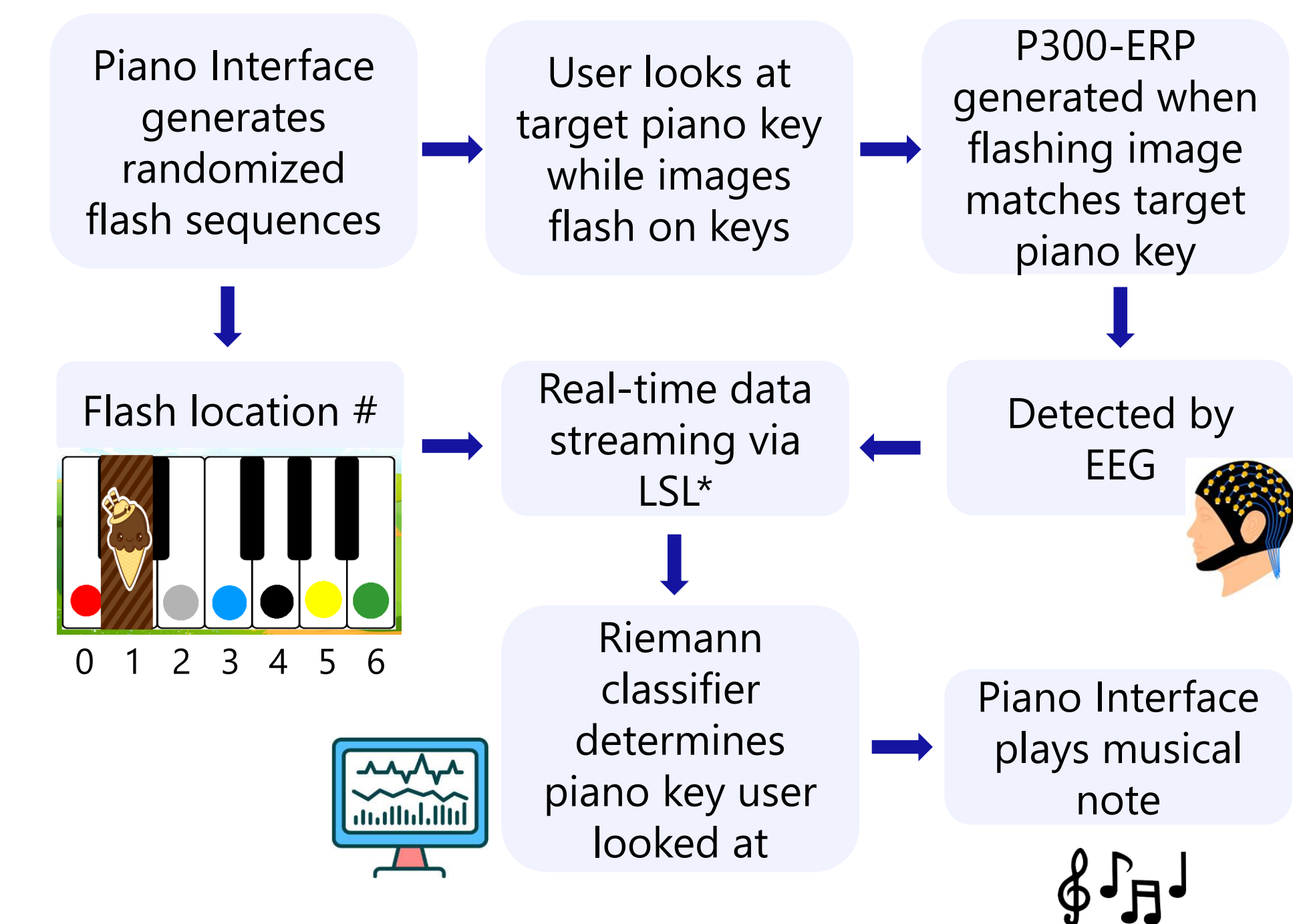
Opportunities: Children with severe motor disabilities, due to neurological conditions, cannot play normal musical instruments. However, BCIs & the P300-ERP can enable children to play music without their hands

Objective

Develop a motor independent BCI piano keyboard & determine if a robust P300 brain signal is produced & detected while this interface is in use



Methods



*LSL: Lab Streaming Layer (software)

P300 Brain Signals can be used to Control a Brain Computer Interface Piano Keyboard



Scan QR for a Project Demo

BCI Piano Keyboard Interface

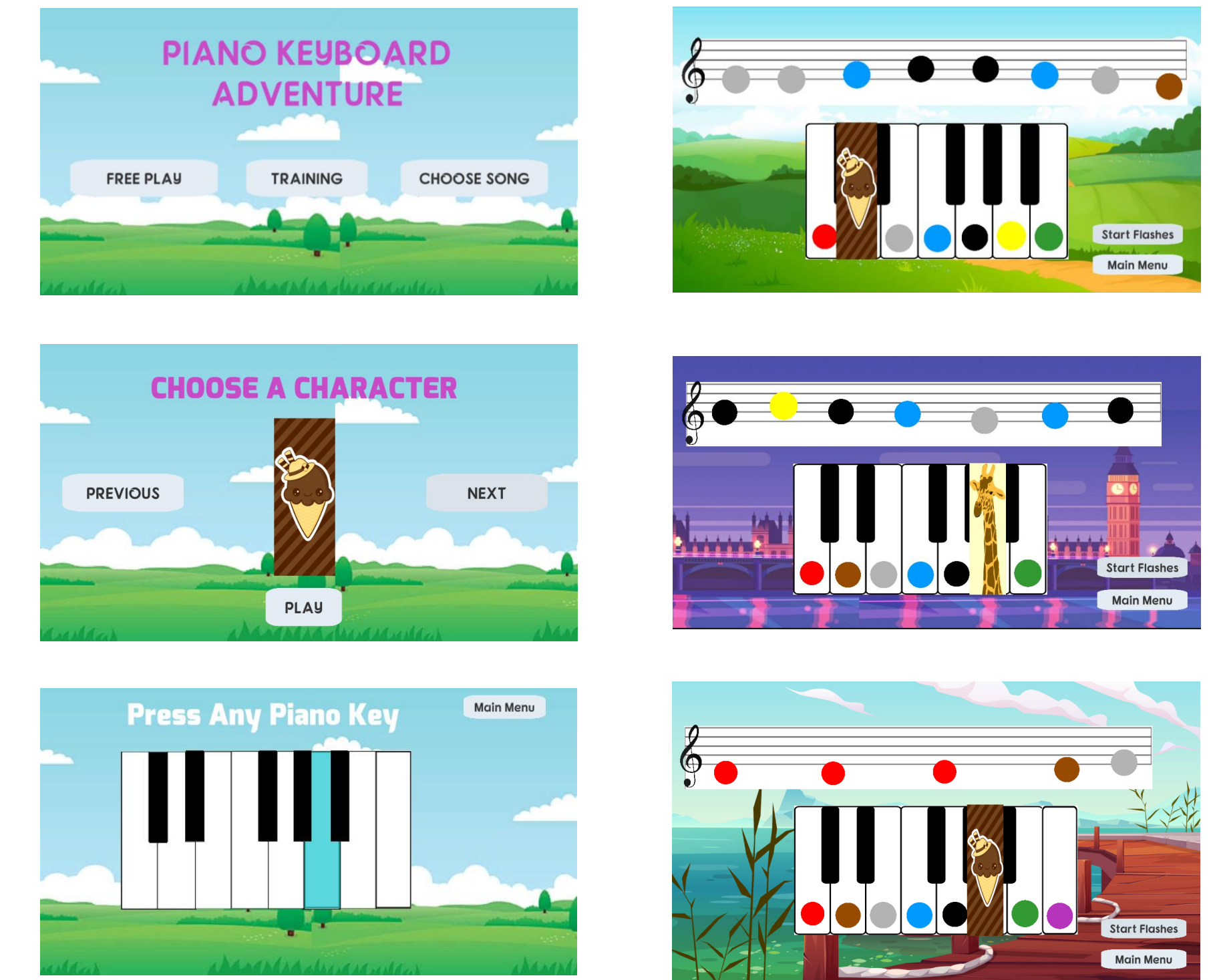
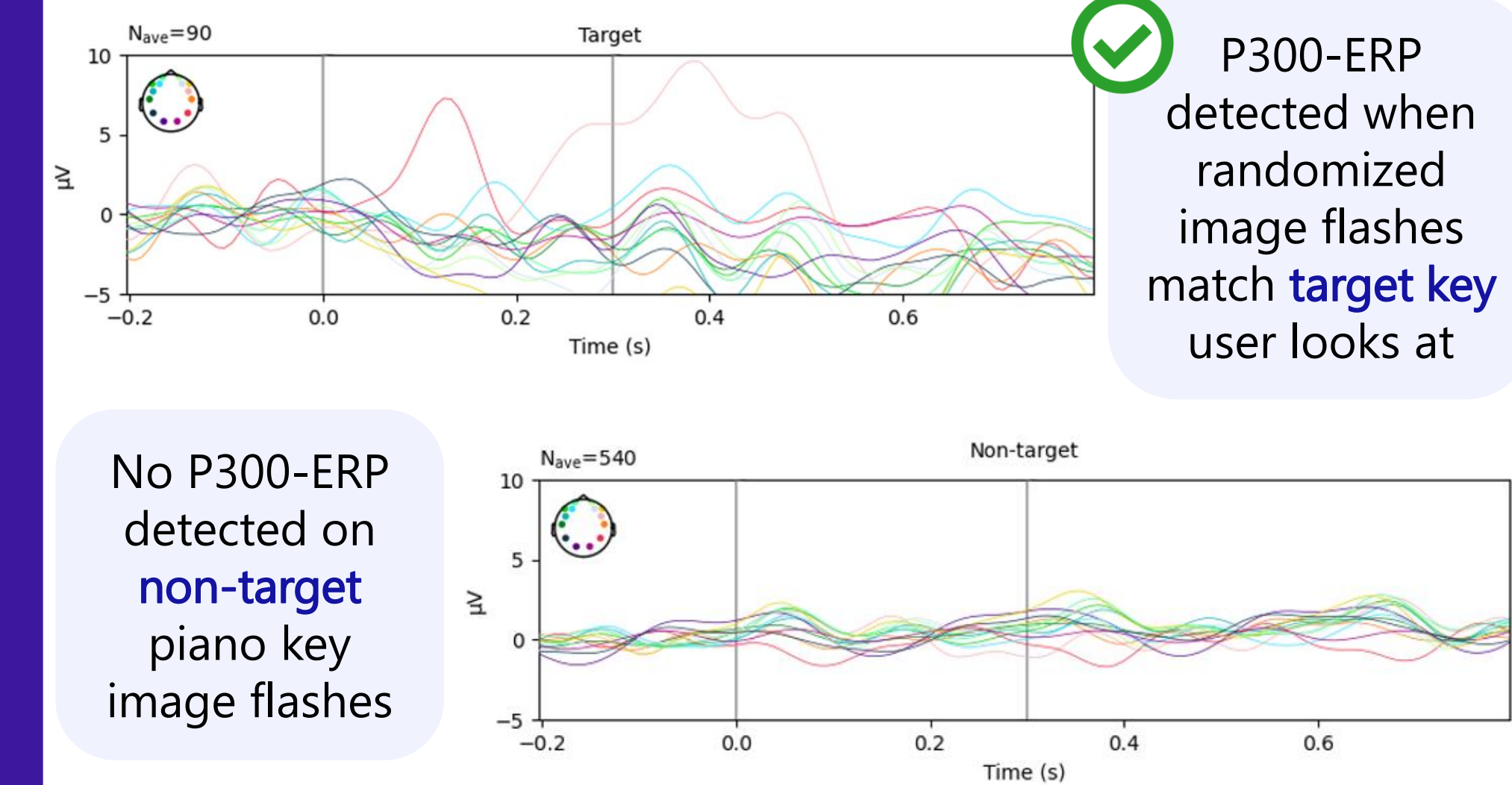


Figure 1: Interface has 3 modes – Free Play Mode, Training Mode and Song Choice Mode; (Scan QR code for demo)

Results



No P300-ERP detected on non-target piano key image flashes

Conclusion & Next Steps

P300 signal detection will enable children to play the piano by simply looking at a piano key on the interface. Interface will be used as a **rehabilitation tool in music therapy sessions** (8 weeks) and structural/functional changes will be **evaluated in the brain** with MRI.



Relevance

Children with severe motor impairments will:

1. Experience the **joy** of playing music
2. **Exercise** their brains throughout the process of rehabilitation
3. Be **included** in musical activities

