Pediatric Brain-Computer Interface (BCI) Participant Predictors and Experiences: Learnings from Year 1 of a Registry Project

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Introduction: Recent studies have demonstrated that children with severe physical disabilities can successfully control non-invasive brain-computer interface (BCI) systems [1,2]. There is a present need for translational research to improve the BCI user experience for children with physical disabilities, as well as evidence to inform guidelines for identifying suitable pediatric BCI candidates [3]. We have established a local research registry to (a) describe the experiences and engagement of children with physical disabilities and their caregivers participating in the Glenrose Rehabilitation Hospital's BCI Program and (b) determine the relationship of clinical characteristics with participant experiences and engagement using BCI. Here, we present an overview of this ongoing project and summary of early findings.

Materials, Methods, and Results: Participants: All BCI Program participants aged 5-18 years and their caregivers were invited to take part in this study. All child participants were patients with a severe physical disability, defined as nonambulatory and with minimal functional hand use, and were part of a clinical program at a tertiary rehabilitation hospital in Edmonton, Alberta, Canada. Measures: To describe children's activities and participation, caregivers completed the PEM-CY at baseline and after BCI Program participation. Engagement during BCI sessions was assessed using the PRIME-SP and PRIME-P, respectively. After participating in the BCI program, children and their caregivers each completed a BCI Experience Survey. To characterize body functions and structures, study staff collected information from medical records, aligned with National Institute of Neurological Disorders and Stroke (NINDS) common data elements (e.g., the child's diagnosis; MRI characteristics; motor function; attention; language and communication; behaviour and mood; cognition and neurodevelopment; vision; and hearing). Results: To date, three individuals have enrolled in the project, with seven more expected by July 2023. Characteristics of the enrolled participants will be described as well as preliminary participation, engagement, and experience outcomes.

Discussion: This project will inform the systematic description of unique pediatric BCI participants and experiences. We anticipate that this project will lead to improved identification and characterization of potential participants for clinical programs and subsequent research studies.

Significance: This study will provide insight into characteristics of a pediatric population using BCI and knowledge to improve children's experiences using BCI.

References:
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