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Gathering Clinicians' Perspectives for an Initial Design for Hybrid BCI Wheelchair Control

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Introduction: Brain-computer interfaces (BCIs) offer a potential solution for children with significant motor disabilities who experience limitations using powered wheelchairs with conventional control methods. Hybrid-BCI (hBCIs) offer enhanced control options compared to single-input BCI [1], yet their optimal design for pediatric users remains unexplored. This poster presents the pilot testing of an online asynchronous codevelopment method to build a clinically-informed initial design of an hBCI for wheelchair control before doing user-centred design and usability testing with children with motor disabilities and their families [2].

Material, Methods and Results: Using usability design approaches, we conducted sequential remote think-out-loud sessions with two occupational therapists (OTs) via Zoom™. OTs interacted with a low-fidelity prototype [3] of a switch and motor imagery-based hBCI, while controlling a simulated wheelchair with direct and indirect control methods (Fig. 1). The prototype included simulated input buttons, a wheelchair image that responded to directional commands, and targets in three predefined positions. OTs thought-out-loud about the function and design of the system while moving the wheelchair and their comments were recorded. GUI modifications based on clinician issues and feedback were implemented during sessions. Qualitative data was collected through structured interviews (recorded, transcribed) addressing system functionality, graphics, accessibility, and usability. Recommended changes were made to the design and then used as the starting interface for the next OT. The two clinicians identified 14 design suggestions. Key modifications identified included using colour for engagement, enhanced contrast and interface element sizing for accessibility, and integration of audio for users with visual impairment (Fig 1).

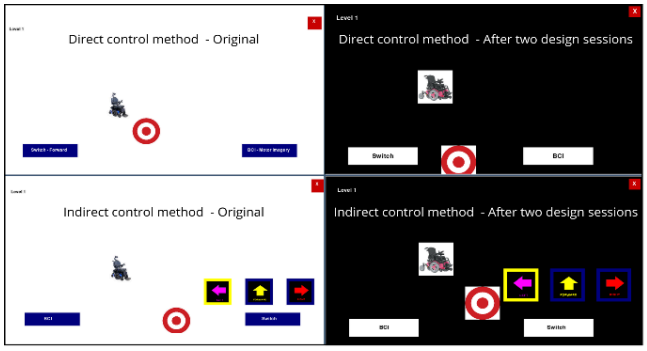

Figure 1: Prototype representing GUI before (left) and after (right) both sessions. Direct control is on the top (switch controls forward and BCI controls right turn) and indirect control is on the bottom (switch scans direction options and BCI selects the option).

Conclusion: This pilot study involved clinicians in the early stages of hBCI design for wheelchair control. The iterative, clinician-informed design process advanced an initial prototype incorporating essential clinical considerations. This process and initial prototype will be used in a future study to gather user and system requirements with more clinicians. This clinician-driven approach will potentially lead to a more effective and user-friendly hBCI system for use in subsequent usability testing with children with motor disabilities to control powered mobility.

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