Acquiring and Decoding Neural Signals for Sensory Applications

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The purpose of this study was to investigate differences in electroencephalography (EEG) responses between active and passive sensory stimulation to identify neural patterns beneficial for improving sensory functions, such as Braille learning among visually impaired individuals. A custom EEG prototype was designed and constructed, which is still under development. Due to technical difficulties encountered during this development, data collection was completed using only a commercial EEG device originally intended for meditation purposes. Utilizing the commercial device's software development interface, detailed EEG data were collected from multiple subjects during tasks involving active engagement and passive sensory stimuli. Analysis of EEG amplitude data from the PO3 and PO4 channels indicated higher neural responses during passive sensory stimulation compared to active stimulation. Although statistical analysis did not reach significance due to high individual variability and limited sample size, consistent visual trends were evident. These observations suggest passive sensory stimulation may engage neural pathways more effectively, potentially aiding the design of educational programs tailored for those with visual impairments. Moreover, substantial individual variability underscores the importance of personalized educational and therapeutic strategies. This research represents a meaningful step toward neuroscience-based methods to enhance educational strategies and improve quality of life for visually impaired learners.

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