

Visual and somatosensory cross-modal reorganization in children with cochlear implants

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Cross-modal reorganization, which occurs when a deprived sensory modality's cortical resources are recruited by other intact modalities, has been proposed as a source of variability underlying speech perception in hearing-impaired cochlear implant (CI) users. Visual and somatosensory cross-modal reorganization of auditory cortex has been documented separately in children with CIs, but reorganization in these modalities has not been documented within the same subject group. Thus, this study's goal was to examine cross-modal reorganization across visual and somatosensory modalities within a single group of CI children (n=10) using high-density electroencephalography. We analyzed evoked potentials in response to visual and somatosensory stimuli and performed current density reconstruction (CDR) of brain activity sources. Speech perception-in-noise testing was also performed. CDR patterns were analyzed within the entire subject group and across groups of CI children exhibiting good vs. poor speech perception. Results showed a positive correlation between visual and somatosensory cross-modal reorganization, suggesting that neuroplasticity in different sensory systems may be interrelated. Further, CI children with good speech perception did not show recruitment of frontal or auditory cortices during visual processing, while subjects with poor speech perception did. Findings reflect widespread changes in cortical networks in CI children that relate to functional performance.

Keywords: cross-modal reorganization, high-density EEG, speech perception