Examining the Development of Multisensory Integration in Speech Processing through the McGurk Illusion

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Multisensory Integration (MSI) is the basis upon which perception functions, and enables humans to form meaningful interpretations of their surroundings. It is impaired in individuals afflicted by Autism Spectrum Disorders (ASDs), and has been relatively unexamined in typical and clinical populations. This study mapped the trajectory of multisensory integration development from childhood to adolescence by examining change detection ability (Mismatch Negativity [MMN] waves) via electroencephalography (EEG). The paradigm consisted of three McGurk Illusion video conditions: auditory, visual and audiovisual. Audiovisual standard stimuli consisted of congruent visual/auditory syllables (“ba”:/ba/); deviants were incongruent (“ba”:/va/). EEG data epochs were extracted surrounding stimuli, and standards were subtracted from deviants to calculate the MMN. The results indicated progressive MSI development with age; average MMN peak amplitude increased from the 10 - 12 age group (-.785 microvolts) to the 13 - 15 age group (-1.846 microvolts), and even further to the adult (18+) group (-3.052 microvolts). The highest degree of integration in the adult group indicated that cortical modification of speech multisensory domains continues past late adolescence. Activity became left-lateralized as age progressed, suggesting specialized speech MSI localization. In addition, preliminary data gathered from ASD participants showed less MSI, and a dissimilar topography of activity compared to the TD participants. Lateralization was non-specific, in line with prior research suggesting that ASD children have difficulty receiving multi-sensory data. This research established a novel method to assess individuals’ ability to integrate information and provides a baseline for future research.

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