

The primary aim of our current research is to determine the degree to which a period of hearing aid (HA) use facilitates language development in children who receive their first cochlear implant (CI) before approximately 4½ years of age. Clinically, we seek to develop recommendation guidelines for proceeding to bilateral CIs (BCI), based on aided detection thresholds and duration of HA use. It is already well-established that CIs support high levels of phoneme perception (segmental), necessary for word recognition. However, CIs generally contribute little to suprasegmental perception (i.e., prosody, or intonation, loudness, and rhythm), considered critical for bootstrapping language development. This deficiency is primarily due to the limited frequency resolution of current CI devices compared to normal acoustic hearing. We hypothesize that, for children with CIs, greater early exposure to suprasegmental features of speech via acoustic hearing and HAs will facilitate better language development.

We have tested 117 pediatric cochlear implant recipients ranging in age from 5-8 years (mean age 7 years, SD 1.3) on tests of speech perception, receptive vocabulary and language. The speech test battery includes tests of both segmental perception (word recognition in quiet and in noise), and suprasegmental perception (talker discrimination, stress discrimination, and emotion identification). Receptive vocabulary and language are assessed using Standardized tests (Peabody Picture Vocabulary [PPVT] and Children's Evaluation of Language Fundamentals [CELF]). In addition to the children with CIs, we have tested 42 age mates (mean age 6.3 years, SD 1.3) with normal hearing sensitivity as controls on all measures. Pre-implant hearing data have been collected for all participants. Our population of pediatric CI recipients represent a continuum of aided and unaided detection thresholds, and duration of HA use. In our population are: i) twenty-nine children with bimodal devices (cochlear implant at one ear and hearing aid at the contralateral ear) who have relatively long periods of HA use and relatively better acoustic hearing, ii) sixty-five sequential bilateral CI users (the time interval between their first and second CI has a mean of 13.5 months and SD of 11.4 months) who have poor detection thresholds and some prior HA use, and iii) twenty-three simultaneous bilateral CI users who have the poorest hearing thresholds and extremely limited prior HA use. The mean age at the time of surgery for the first (or only) CI was 2.1 years (range: 8 months-4.6 years). Analyses are under way to quantify early acoustic hearing experience using unaided and aided detection thresholds, and duration of HA use. These quantities will be used in a multiple regression analysis to determine the effects of early acoustic hearing experience on speech perception (suprasegmental and segmental), and ultimately on vocabulary and language. The results of these analyses and their clinical implications will be discussed.