

Duration of Isolated Vowels in Infants with Cochlear Implants

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Abstract : The present work investigates developmental aspects of the duration of isolated vowels in infants with normal hearing compared to those who received cochlear implants (CIs) before two years of age. Infants with normal hearing produced shorter vowel duration since this find related with more mature production abilities. First isolated vowels are transparent during the protophonic stage as evidence of an increased motor and linguistic control. Vowel duration is a crucial factor for the transition of prelexical speech to normal adult speech. Despite current knowledge of data for infants with normal hearing more research is needed to unravel productions skills in early implanted children. Thus, isolated vowel productions by two congenitally hearing-impaired Greek infants (implantation ages 1;4-1;11; post-implant ages 0;6-1;3) were recorded and sampled for six months after implantation with a Nucleus-24. The results compared with the productions of three normal hearing infants (chronological ages 0;8-1;1). Vegetative data and vocalizations masked by external noise or sounds were excluded. Participants had no other disabilities and had unknown deafness etiology. Prior to implantation the infants had an average unaided hearing loss of 95-110 dB HL while the post-implantation PTA decreased to 10-38 dB HL. The current research offers a methodology for the processing of the prelinguistic productions based on a combination of acoustical and auditory analyses. Based on the current methodological framework, duration measured through spectrograms based on wideband analysis, from the voicing onset to the end of the vowel. The end marked by two co-occurring events: 1) The onset of aperiodicity with a rapid change in amplitude in the waveform and 2) a loss in formant's energy. Cut-off levels of significance were set at 0.05 for all tests. Bonferroni post hoc tests indicated that difference was significant between the mean duration of vowels of infants wearing CIs and their normal hearing peers. Thus, the mean vowel duration of CIs measured longer compared to the normal hearing peers (0.000). The current longitudinal findings contribute to the existing data for the performance of children wearing CIs at a very young age and enrich also the data of the Greek language. The above described weakness for CI's performance is a challenge for future work in speech processing and CI's processing strategies.

Keywords : cochlear implant, duration, spectrogram, vowel

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