Dynamic Binaural Detection in Bilateral Cochlear-Implant Users: 
Implications for Processing Schemes

Matthew J. Goupell¹, Ruth Y. Litovsky¹, Seyma Celik¹
¹Binaural Speech and Hearing Laboratory, 
University of Wisconsin – Madison

A majority of binaural research in bilateral cochlear-implant (CI) users has employed constant-amplitude or regularly time-varying stimuli. The purpose of this work is to explore binaurally dynamic stimuli, namely detection of changes in interaural correlation and detection of out-of-phase sine tones embedded in in-phase noise (NoSπ). These tasks were tested using bilaterally pitch-matched pairs of electrodes in eight bilateral CI listeners. The inherent envelope modulation rate and pulse rate of electrical stimulation were varied. CI listeners were on average worse at detecting changes in interaural correlation than normal-hearing (NH) listeners tested with vocoder simulations, although performance in the best CI listeners was similar to the average NH data. Some CI listeners showed effects of envelope modulation rate and stimulation rate, although inter-individual variability obscured overall significant effects. In comparison, NH listeners showed no effect of envelope modulation rate and stimulation rate. An analysis of the electrical stimuli properties suggests factors related to stimulus processing (e.g., electrical dynamic range, loudness growth curves, and compression) affected performance more than sensitivity to static interaural time differences. These data will be discussed in terms of challenges and considerations for bilateral and multi-electrode processing strategies that are designed for speech understanding.

Support provided by the National Institutes of Health Grants K99 DC010206-01 and R01 DC003083.

Words = 196, Characters = 1448