

Effects of interaural delay in ongoing fine structure, onset, and offset in electric and acoustic hearing: Model results

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The relative contributions of interaural time differences (ITD) in the ongoing fine structure and in the gating portions of signals to lateralization discrimination were studied in three cochlear implant (CI) subjects and five normal hearing (NH) subjects listening to an acoustic model of electrical stimulation. The first and last pulse of rectangularly gated pulse trains represented, per definition, the gating portions, and the remaining pulses the fine structure. In experiment I, the stimuli consisted of four pulses of constant amplitude at rates of 100, 200, 400, and 800 pulses per second (pps). Two of the CI listeners showed sensitivity to fine structure ITD up to 800 pps, one CI listener at 100 pps only, and the NH listeners up to 400 pps. The relative contribution of gating ITD, in particular the onset, increased with increasing pulse rate. Experiment III used stimuli with constant durations and loudness adjusted amplitudes across all pulse rates. Up to 400 pps, the sensitivity to fine structure ITD increased and to gating ITD decreased with increasing duration. Most effects were successfully modeled by a multiple looks cross-correlation model, in which ITD information is integrated across time after applying a rate-dependent and subject-specific onset-weighting function.