

EFFECTS OF INTERAURAL TIME DIFFERENCE IN THE TEMPORAL FINE STRUCTURE

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In normal hearing, interaural time differences (ITD) in the fine structure are important for the lateralization of sound sources and for speech understanding in noise. Here we present the results of three studies on the effects of ITD in the temporal fine structure and envelope in electric hearing. In all studies, the pulse rate was varied as an independent parameter. In the first study (Laback et al. 2007; *J. Acoust. Soc. Am.* 121, 2182-2191), unmodulated four-pulse-sequences were used and ITD was presented either in the ongoing pulses, or in the onset and offset pulses. Four bilateral CI listeners were tested. All of them were sensitive to ongoing ITD, one up to 800 pulses per second (pps), two up to 400 pps, and one at 100 pps only. This result reveals the importance of ITD in the fine structure. For three CI listeners, the sensitivity to onset ITD increased with the pulse rate.

In the second study (Majdak et al., 2006; *J. Acoust. Soc. Am.* 120, 2190-2201), amplitude modulated 300 ms pulse trains were used and ITD was independently presented in the fine structure and the envelope. For all four bilateral CI listeners tested, fine structure ITD had the strongest impact on lateralization at lower pulse rates, with significant effects up to 800 pps. At the higher pulse rates tested (up to 1600 pps), lateralization discrimination depended solely on envelope ITD.

The data from both studies suggest that bilateral CI listeners benefit from transmitting fine structure ITD at lower pulse rates. However, the rate limit in the perception of fine structure ITD in CI subjects (100-800 pps) is lower than the 1500 Hz fine structure rate limit in NH subjects listening to sinusoids (Zwislocki and Feldman, 1956; *J. Acoust. Soc. Am.* 28, 860-864).

In the third study, a new stimulation method has been evaluated with five CI listeners, showing large improvements of fine structure ITD sensitivity at higher pulse rates.

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