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Temporal pitch processing by cochlear implant users

Robert Carlyon[a], Ying-Yee Kong[b], Cathy Lynch[c] and John Deeks[a]
[a]MRC CBU, 15 Chaucer Rd., CB2 7EF Cambridge, UK
[b]Notheastern University, 106A Forsyth, Boston, MA Ma 02115, USA
[c]Addenbrooke's NHS Trust, Hills Rd, CB2 2QQ Cambridge, UK

Modern cochlear implants (CIs) convey fundamental frequency (F0) information using a purely temporal code. However, temporal pitch processing - as measured by the discrimination of the changes in the rate of a pulse train applied to a single electrode - is often worse than in normal hearing (NH) at low pulse rates, and usually deteriorates dramatically at rates above about 300 pps. We will describe evidence that at low pulse rates, the value of the pitch perceived can be affected by refractory effects at the level of the auditory nerve (AN), and can also be influenced by small (< 0.5 dB) changes in stimulus level. In contrast, the deterioration in rate discrimination at high rates appears to be impervious to a wide range of manipulations that would be expected to strongly affect the representation of the stimulus at the level of the AN. One example of this is the finding that the variation in rate discrimination performance with baseline rate for single-pulse-per-period pulse trains correlates, across listeners, with discrimination of different rates of sinusoidal amplitude modulation imposed on a 5000-pps carrier. The implications of these findings for attempts to improve pitch coding in CIs will be discussed.