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Interaural-time-difference sensitivity to acoustic
temporally-jittered pulse trains

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Bandpass-filtered pulse trains in acoustic hearing have been used to understand the high-rate pulse trains used in electrical stimulation strategies. In a left-right discrimination test, sensitivity to interaural time differences (ITD) in 600-pulses-per-second (pps) periodic pulse trains and aperiodic (temporally-jittered) pulse trains was tested with six normal-hearing listeners. It was found that jitter significantly and systematically increased ITD performance. A second experiment using 1200-pps pulse trains was performed to show that listeners were not solely benefiting from the longest interpulse intervals and thus the instances of reduced rate by adding jitter. To better understand the effect of jitter, the output of a basilar membrane model and a higher-level physiologically-based model was observed. Results from the modeling were reminiscent of an effect called "release from binaural adaptation" where the binaural system is reactivated by a temporal irregularity and this release possibly occurs at the level of the cochlear nucleus or lower. These results help understand pulse-rate limitations of ITD in cochlear-implant listeners.