

Temporal Integration in Pitch Perception

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Pitch perception improves with stimulus duration. One hypothesis is that a longer stimulus allows measurements across multiple periods. Within the context of an autocorrelation model, this amounts to taking into account higher-order peaks of the autocorrelation function (ACF). The hypothesis is investigated here using stimuli with ACFs that either have or lack higher-order peaks. Stimulus (1) consisted of a harmonic complex tone in noise at 0 dB SNR. Its ACF has peaks of amplitude 0.5 at the period and all multiples. Stimulus (2) consisted of rippled noise (noise added to itself after a one-period delay). Its ACF has a peak at the period (also with amplitude 0.5), but no higher-order peaks. Stimuli were synthesized with periods of 2, 4, 8 and 16 ms (F0s of 62.5 to 500 Hz) and durations of 192 ms. In a first task, subjects discriminated periods in an adaptive three-interval forced choice procedure. In a second task, white noise was added to the stimulus and subjects discriminated stimulus+noise from noise. At all periods, period discrimination thresholds were lower for (1) than for (2), suggesting that period discrimination indeed involved higher-order peaks of the ACF. A similar relation was found for thresholds in noise, but only for short periods. At longer periods (8 and 16 ms) thresholds for (1) and (2) were similar, suggesting that for that task subjects relied only on the first order peak. A third stimulus type, consisting of period-sized chunks of white noise assembled in pairs according to the pattern AABCC, was included to investigate temporal integration strategies. Finally, several high-pass filtered conditions were included to evaluate alternative, spectrum-based explanations. Results are consistent with a model based on an autocorrelation statistic integrated over a limited time interval and with lags that span a relatively long range.