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Threshold fine structure and its role in temporal integration

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Normal hearing listeners often show periodic ripples in the audiogram when measured with a high frequency resolution. The present study investigates how the fine structure influences temporal aspects of auditory processing near threshold. Pure-tone thresholds in quiet were measured for different signal durations in the range from 8 to 512 ms at frequencies corresponding to minima and maxima of the fine structure. In addition, thresholds were obtained for frequencies corresponding to a transition region between adjacent extrema and at regions with a flat threshold curve. To select the frequencies, threshold fine structure was measured individually prior to the main experiment using an optimized Békésy tracking method [FINESS]. For all frequencies, thresholds decreased as the duration increased reflecting the well known temporal integration properties of the auditory system. The steepest decrease was observed for a minimum of the fine structure. The shallowest threshold curves were obtained for frequencies corresponding to a maximum of the fine structure. The same intermediate temporal integration curves were found for frequencies in a flat region and between two extrema. Fine structure was largely reduced or absent for the shortest duration. The threshold curves were simulated with an effective model taking into account general characteristics of the fine structure, spectral splatter and temporal integration. The simulations indicate (1) that the data can be modelled with a single time constant for the leaky integrator and (2) the differences in the curvature are largely due to the characteristics of the fine structure. A slightly larger time constant derived from the data for the maximum than for the minimum may indicate slight changes in the compression between the extrema.

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