Human cochlear tuning estimates from stimulus-frequency otoacoustic emissions

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Two objective measures of human cochlear tuning, using stimulus-frequency otoacoustic emissions (SFOAE), have been proposed. One measure used SFOAE phase-gradient delay and the other twotone suppression (2TS) tuning curves. Here, it is hypothesized that the two measures lead to different frequency functions in the same listener. Two experiments were conducted in ten young adult normal-hearing listeners in three frequency bands (1-2 kHz, 3-4 kHz and 5-6 kHz). Experiment 1 recorded SFOAE latency as a function of stimulus frequency, and experiment 2 recorded 2TS isoinput tuning curves. In both cases, the output was converted into a sharpness-of-tuning factor based on the equivalent rectangular bandwidth. In both experiments, sharpness-of-tuning curves were shown to be frequency dependent, yielding sharper relative tuning with increasing frequency. Only a weak frequency dependence of the sharpness-of-tuning curves was observed for experiment 2, consistent with objective and behavioural estimates from the literature. Most importantly, the absolute difference between the two tuning estimates was very large and statistically significant. It is argued that the 2TS estimates of cochlear tuning likely represents the underlying properties of the suppression mechanism, and not necessarily cochlear tuning. Thus the phase-gradient delay estimate is the most likely one to reflect cochlear tuning.

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