Can a static nonlinearity account for the dynamics of otoacoustic emission suppression?

This study investigates whether time-dependent compression mechanisms in the cochlea are necessary to explain dynamic properties of otoacoustic emissions (OAEs). Dynamic properties of click-evoked OAEs (CEOAEs) have been observed in temporal suppression; the effect where the CEOAE magnitude is reduced when a click is presented less than 10ms before the test click. A timedomain model of the cochlea that represented the basilar membrane (BM) as a cascade of coupled bandpass filters was used to investigate the cochlear origin of temporal suppression in CEOAEs. The model, implemented with a time-invariant nonlinearity, was able to simulate temporal suppression, but was unable to account for the exact time scale and magnitude of the effect. The results suggest that temporal overlap of BM impulse responses can account for suppression in CEOAEs, but that an additional time-dependent cochlear gain mechanism may be needed to account the high suppression maxima at inter-click intervals larger than zero.

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