Hybrid measurement of auditory steady-state responses and distortion product otoacoustic emissions using an amplitude-modulated primary tone.

Abstract:
A maximum auditory steady-state response (ASSR) amplitude is yielded when the ASSR is elicited by an amplitude-modulated tone (f(m)) with a fixed modulation frequency (f(m) = 40 Hz), whereas the maximum distortion product otoacoustic emission (DPOAE) level is yielded when the DPOAE is elicited using a fixed frequency ratio of the primary tones (f2/f1 = 1.2). When eliciting the DPOAE and ASSR by the same tone pair, optimal stimulation is present for either DPOAE or ASSR and thus adequate simultaneous DPOAE/ASSR measurement is not possible across test frequency f2 or f(c), respectively. The purpose of the present study was to determine whether the ASSR and DPOAE can be measured simultaneously without notable restrictions using a DPOAE stimulus setting in which one primary tone is amplitude modulated. A DPOAE of frequency 2f1-f2 and ASSR of modulation frequency 41 Hz were measured in ten normal hearing subjects at a test frequency between 0.5 and 8 kHz (f2 = f(c)). The decrease in the DPOAE level and the loss in ASSR amplitude during hybrid mode stimulation amounted, on average, to only 2.60 dB [standard deviation (SD) = 1.38 dB] and 1.83 dB (SD = 2.38 dB), respectively. These findings suggest simultaneous DPOAE and ASSR measurements to be feasible across all test frequencies when using a DPOAE stimulus setting where the primary tone f2 is amplitude modulated.