Editorial

The Auditory Steady-State Response

From the very moment that auditory evoked potentials were first recorded from the human brain, audiologists have sought to exploit these responses to evaluate the hearing status of persons difficult to test by conventional behavioral techniques, especially infants and young children. But early efforts were frustrating and disappointing. Neither the middle-latency response nor the late vertex response proved entirely satisfactory. Reproducibility and dependence on the state of the central nervous system were persistent problems. In the 1970s, the advent of the auditory brainstem response (ABR) raised our hopes substantially. Here was a response that could be reproduced with amazing accuracy, yet seemed utterly impervious to fluctuations in CNS state. And, indeed, during the past 2 decades the ABR has revolutionized audiologic practice, especially in the arena of pediatric evaluation. But the ABR has two inherent problems that limit its usefulness. First, it is not sufficiently frequency specific for many applications. Second, it works best as a response to an acoustic transient rather than a response to a continuous acoustic signal. Because of these inherent limitations, efforts to use the ABR in, for example, the measurement of the functional gain of a hearing aid have had only limited success.

But for the past 2 decades an evoked potential particularly suited to frequency-specific measurement, the auditory steady-state response, has been under close scrutiny. The steady-state response is a brain potential evoked by periodic amplitude modulation of a carrier frequency. It yields a waveform closely following the time course of the stimulus modulation and a response specific to the frequency of the carrier. By varying the intensity of the eliciting stimulus, one can seek the threshold response. Investigators have shown that steady-state responses can be recorded at intensities very near behavioral thresholds at the frequency under test in both normal-hearing and hearing-impaired individuals.

In this issue of JAAA, a group of Canadian investigators, Terry Picton, André Durieux-Smith, Sandra Champagne, JoAnne Whittingham, Linda Moran, Christian Giguère, and Yves Beauregard, show that the steady-state response can be successfully employed to measure both unaided and aided soundfield thresholds in hearing-impaired children. Moreover, they show that testing time can be minimized by the simultaneous presentation of multiple stimuli at different test frequencies using differing “signature” modulation rates. This is an important contribution to pediatric audiologic evaluation. It fills a gap between the desirable properties of the transient-induced ABR and the often excessive state dependence of the later, frequency-specific evoked responses. The ability to measure hearing aid functional gain in very young children is particularly relevant to the rapidly expanding arena of universal newborn hearing screening.

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