Editorial

Safe Stimulus Intensities for VEMP Testing

DOI: 10.3766/jaaa.28.8.1

We have spent a great deal of time, as have others, trying to understand the controllable factors that influence the latency, amplitude, and recordability of both the cervical vestibular evoked myogenic potential (cVEMP) and ocular vestibular evoked myogenic potential (oVEMP). These factors include stimulus frequency, intensity, duration, stimulus presentation rate, the effect that the magnitude of tonic EMG has on the cVEMP, and the effect that reference electrode location has on the recordability of the oVEMP.

Most of us have not thought a great deal about the potential impact that the high stimulus intensities, required to evoke EMG responses, have on the peripheral auditory system. That is, usually when reporting test results, we will place somewhere on the report form the stimulus and recording parameters (e.g., the stimulus was a 500 Hz tone burst was presented at a rate of 5.1/sec and at a stimulus intensity of 85–95 dB nHL). But, how many of us know what level is the stimulus intensity when measured in dB pSPL or dB peSPL? Further, what is the precise sound pressure level in an enclosed space, like the distance between the sound port of the earphone tip and the tympanic membrane? Further yet, what is the difference in SPL when the stimulus is routed into a smaller space, for example, the ear canal of an infant? These are some of the issues confronted by Portnuff and colleagues from University of Colorado Hospital in Aurora, Colorado and Mayo Clinic in Scottsdale, Arizona this month in the Journal.

In this report, the authors make the point that stimuli used to evoke VEMPs are between 120 pSPL and 140 pSPL and these levels represent the upper limit of safe stimulus intensities for the peripheral auditory system. The authors describe what has been published in the past regarding the effects of these stimuli on otoacoustic emissions recordings. The authors describe methods that may be used to measure these transient stimuli.

The investigators have identified patient populations that deserve special considerations when considering maximum sound levels presented to the ear. For these individuals, it might be argued that the risks of conducting the VEMP test outweigh the benefits of proceeding with testing. These populations include children (i.e., for whom lesser stimulus levels are indicated), the elderly (i.e., who likely will fail to generate VEMPs even at the highest stimulus intensities and for whom this information may be of little diagnostic assistance), patients with tinnitus and/or hyperacusis (i.e., who may find the stimulus uncomfortable or painful and for whom the protocol might be modified to ensure that the greatest amount of information is obtained in the shortest amount of time), patients with SSCDS (i.e., where ascending versus descending approaches to threshold estimation should be considered), and, patients with prior exposure to high intensity sounds who may be more susceptible to noise-induced hearing loss. Lastly, the authors have recommended a protocol that should ensure safe levels of exposure. They have provided a tool for calculating noise exposure for stimuli often used in VEMP testing.

Herein, Portnuff and colleagues have offered up a thoughtful assessment of how we have been conducting these assessments and how we might alter existing protocols for vulnerable populations. The editors hope you enjoy this issue of the Journal.

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Editor-in-Chief