Hearing Loss Terminology Should Be Evidence Based: A Reply to Clark and Martin (2014)

This letter is in response to a note by Clark and Martin (2014) in which they urged discontinuance of the term “sensorineural,” replacing it with “sensory/neural.” They indicated that when introduced in the 1960s, the term “sensorineural” served as a descriptor of hearing loss to indicate that the auditory impairment was owing to dysfunction in the sensory (inner ear), the neural (auditory nerve), or both auditory sites. Clark and Martin go on to suggest that with “today’s diagnostic capabilities” sensory and neural sites of lesion can be separated accurately, although they acknowledge that oftentimes “a clear differentiation” cannot be made between the two sites of lesion. We think that now, more than ever, the term “sensorineural” should be retained as the descriptor of hearing loss involving the sensory end organ and the VIIIth nerve. We suggest that the terms “hearing loss” and “normal hearing” are a more appropriate focus of a discussion of misleading terminology. The following is offered in support of our lines of reasoning.

In the 1960s, an audiological evaluation consisted of air- and bone-conduction pure-tone thresholds, speech recognition thresholds, and word recognition performance usually at one presentation level. “Special auditory tests” (tone decay, SISI, ABLB, Bekesy audiometry, and speech recognition “rollover”) were used to distinguish between cochlear and retrocochlear etiologies and certain patterns of results were thought to separate the two sites of lesion. In the 1970s, aural acoustic immittance measures ( tympanometry and acoustic reflexes) were incorporated into audiological evaluation protocols. The results of those tests were useful for differentiating between conductive and sensorineural hearing loss but, as Clark and Martin (2014) enunciated, provided little insight into the sensory and neural components of the sensorineural descriptor. In the 1980s, auditory brainstem response and otoacoustic emissions were added to the test battery, providing direct measurements of sensory and neural processes. Improved imaging techniques, such as gadolinium-enhanced MRI, have largely replaced audiological tests for locating foci of otologic lesions.

The basis for our disagreement with Clark and Martin is that sensory and neural lesions almost never occur separately. It is not true that “the majority of hearing losses do not involve the auditory nerve at all.” Nor do we agree that “today’s diagnostic capabilities ... have greatly increased the audiologist’s ability to accurately separate sensory from neural lesions.” The most common causes of sensorineural hearing loss, age and noise, are now known to involve pathology of the synaptic connections between hair cells and auditory neurons (Kujawa and Liberman, 2009; Sergeyenko et al, 2013). Ménière’s disease, commonly attributed to cochlear pathology, is accompanied by degeneration of auditory neurons (Pulec and Patterson, 1997). Vestibular schwannomas (acoustic neuroma) affect hearing by interruption of the cochlear blood supply, destroying hair cells and other cochlear structures, both before (Lapsiwala et al, 2002) and after (Colletti et al, 1997) surgical removal.

The misconception that cochlear and retrocochlear pathologies can be distinguished by audiological tests originated when VIIIth nerve tumors were commonly quite large (>2 cm) at the time of diagnosis. Enhanced MRI is capable of detecting tumors that are 0.5 cm and smaller. The large tumors produced patterns of special auditory test results that differed from those commonly associated with more common etiologies such as noise, aging, and infectious labyrinthitis. Smaller tumors are not distinguishable with auditory tests, probably because there is both cochlear and neural pathology. Even the asymmetrical hearing loss that is expected in unilateral VIIIth nerve tumors is not effective for screening for VIIIth nerve lesions (Margolis and Saly, 2008).

We want to shift the focus and consider our use of the terms “hearing loss” and “normal hearing.” Based on the typical audiological evaluation we say that the patient with pure-tone thresholds outside of the range of normal hearing (i.e., usually ≤20 dB HL, ANSI, 2010) has a hearing loss, meaning there is a threshold shift, which is a sensitivity measure (Ward, 1964). As Carhart (1951) long ago suggested and Plomp (1978) later formalized, hearing loss should be thought of as having two components, “acuity and clarity” (Carhart) and “attenuation and distortion” (Plomp). People can and do have hearing loss for pure tones and no apparent hearing loss or impairment for word recognition in quiet but performance degradation on a speech-in-noise task (Wilson and McArdle, 2005). The point here is that there are different domains of auditory function that may or may not reflect the same sites/degrees of auditory impairment.

Finally, the term “normal hearing,” as used in both clinic and research reports, is almost exclusively based on pure-tone thresholds. It is not uncommon to label a group of older individuals as having normal hearing, meaning that their pure-tone thresholds are equal to or less than the 20-dB HL rule. The implication, although often unintended, is that based solely on pure-tone
thresholds and an arbitrary cutoff like 20-dB HL older individuals have normal auditory systems. Examination of the mean pure-tone thresholds of young and older groups of listeners with so-called normal hearing reveals that the pure-tone thresholds for the older individuals are typically 10 dB or so higher (poorer) in the lower frequencies than comparable thresholds for young adults with the threshold discrepancy between the two groups increasing in the higher frequencies (e.g., Pichora-Fuller et al., 1995; Smith et al., 2012; Füllgrabe and Moore, 2014). It is not accurate to characterize the hearing of older people as normal because the pure-tone thresholds do not exceed 20 dB HL.

The practice of defining hearing loss based on hearing sensitivity measures is the expected result of the Law of the Instrument, usually attributed to Abraham Maslow (1966): If all you have is a hammer, everything looks like a nail. The audiological evaluation is primarily an assessment of auditory sensitivity. Measures of auditory processing are not usually included, perhaps because there is no consensus on how to evaluate it. Although, speech recognition in noise is widely regarded as a relevant test of auditory function that is separate from measures of hearing sensitivity, speech in noise has not been widely incorporated into the clinical evaluation of hearing. Pure-tone audiometry, on the other hand, is widely accepted, billable, and interpretable. A reconsideration of our clinical evaluation of hearing is needed that takes into account current knowledge of auditory pathology, how best to evaluate it, and how best to describe it.

Richard H. Wilson  
Robert H. Margolis

Acknowledgment. The authors are grateful to Dr. Charles Liberman for his helpful insights on the pathology of sensorineural hearing loss.

REFERENCES