Data Collection

transposition on speech perception in adults with high-frequency hearing loss.

Case Studies. Auriemmo, Kuk and Stenger (2008) described two case studies of school-aged children with normal hearing sloping to a profound high-frequency hearing loss. Speech perception of the 13 and 8 year old children were measured using the California Consonant Test (CCT) and NST respectively, with their own hearing instruments and then after six weeks of wearing Widex Inteo hearing instruments containing frequency transposition. Both children participated in weekly half-hour auditory training sessions during the six weeks. Other outcome measures of speech production and environmental sound awareness were assessed, but are not relevant to the purposes of the present review and therefore, will not be discussed further.

Perception of consonants by the 13 year old changed by 7% at 30 dB HL and 9% at 50 dB HL after six weeks with frequency transposition and training. The 8 year old showed considerable improvement in perception of consonants at 30 and 50 dB HL, both at the initial fit and after six weeks. However, these comparisons were made to the children's previous hearing instruments, which may have different frequency responses than the Inteo hearing instruments used in the study, irrespective of the application of frequency transposition. Also, limited information is given with respect to the hearing instrument fitting protocol in this study, and it is unclear whether default settings were used or adjustments were made to the Inteo instruments. Therefore, other factors than frequency transposition may account for the observed increase in speech perception. Also, it was not reported whether the tests were conducted with recorded stimuli or monitored live voice, which can affect

be difficult to decipher and can be distorted, and subjective decisions are required to score correct replies. Therefore, even though importance of the results is suggestive, they must be interpreted with caution due to design and methodology concerns.

Single Subject Study. McDermott and Knight (2001) analyzed the effects of frequency transposition on the speech perception of three adults with varying degrees of hearing loss, using three tests for each subject: monosyllables similar to the consonant-

reliability and validity are established if recorded stimuli and responses are used.

Procedures for fitting hearing instruments used in the study are also important to ensuring valid results and inferring causality. In the studies by Auriemmo et al. (2008), Miller-Hansen et al. (2003) and McDermott and Knight (2001), baseline results were measured using hearing instruments that were previously worn by the subjects. However, only McDermott and Knight (2001) matched the frequency response of these instruments when fitting the hearing instruments used for the frequency transposition condition. Without controlling for the frequency response, improvements in speech perception cannot be singularly attributed to the frequency transposition technology, but may also be due to differences in electroacoustic characteristics other than frequency transposition between the two types of hearing instruments.

Therefore, in order to address the concerns associated with experimental procedures, it is recommended that future studies of frequency transposition consider including the following: a greater number of subjects, statistics, recorded stimuli and responses, multiple outcome measures of speech perception, adaptive procedures, and procedures to match electroacoustic characteristics of hearing instruments used for baseline and treatment condition measurements.

Clinical Implications

Overall, the evidence failed to provide sufficient support for improvement in speech perception in individuals with high-frequency hearing loss fitted with the commercially available hearing instruments containing