Mild Hearing Loss?
Says Who?

By Katherine Kerns and Gail M. Whitelaw

Case History
A nine-year-old male was referred to the clinic for an audiologic re-evaluation and auditory processing evaluation. Previous audiologic evaluation performed at an outside facility suggested a mild hearing loss at 8000 Hz in the right ear and at 250 Hz in the left ear. The nature of the hearing loss was unclear, as bone conduction was not performed at that time (FIGURE 1).

Otologic history was positive for longstanding fluctuating conductive hearing loss, secondary to otitis media with pressure equalization tube placement. The patient was born full term, but with low APGAR scores and oxygen deprivation resulting in admission to a neonatal intensive care unit. The patient presented with hypernasality, dysmorphic facial features, and persistent developmental delays in speech and language. Submucous cleft palate was identified and repaired at age six, resulting in improvements in speech production. An interdisciplinary assessment indicated cognitive abilities in the low-average-to-average range of performance. Subsequent genetic testing revealed chromosome 6 deletion syndrome in both the patient and his father.

The parents reported primary concerns of communication issues and reduced academic performance. Specifically, the patient struggled to comprehend information presented to him verbally, as the complexity of the information increased or when language was inferential. In contrast to the patient’s previous evaluation, a multifactorial evaluation performed by the school district revealed average intellectual abilities, with strengths noted in the area of working memory. Reception and expressive language abilities were determined to be in the average-to-high-average range; however, language-processing skills and literacy skills were not assessed. Performance on achievement testing was below grade level in reading comprehension, reading for main idea, and mechanics of writing. All other achievement testing was consistent with grade-level performance.

The patient did not qualify through the school district for an Individualized Education Plan (IEP) under the Individuals with...
Disabilities in Education Act (IDEA) or for a plan under Section 504 of the Rehabilitation Act of 1973. Despite having language-learning and reading issues, the student was judged by his teachers to be performing at his potential and his hearing loss was considered insignificant. His parents provided educational support at home, and his educational needs were considered to be addressed by the school through a Response to Intervention (RtI) approach.

The patient’s parents sought out a third assessment privately, which resulted in a diagnosis of mild dyslexia with significant deficits in word finding, literacy, and written language. Deficits in visual motor integration and auditory processing also were suggested.

**Initial Audiologic Evaluation and Auditory-Processing Assessment**

Prior to the evaluation, the teacher and the parents completed the Children’s Auditory Processing Performance Scale (CHAPS) (Smoski, Brunt, and Tannahill, 1998), a questionnaire designed to help compare a patient’s listening behavior to those of peers across a range of environments and situations. The CHAPS responses placed the patient in the at-risk range for an auditory processing disorder. Audiometric evaluation revealed mild conductive components for the right and left ears, respectively (FIGURE 2).

Considering the reported history, additional testing was performed to assist in the assessment of the patient’s complaints that reflected performance in the classroom.

The Bamford-Kowel-Bench Speech in Noise (BKB-SIN) test was used to assess speech-in-noise performance, using the signal-to-noise ratio loss as a measure of real-world listening performance that could not be captured by the audiogram. Results revealed a moderate signal-to-noise hearing loss for a child of his age.

The SCAN-3 for Children: Tests for Auditory Processing Disorders was administered to assess auditory processing skills. The results revealed that the patient demonstrated age-appropriate temporal processing, binaural integration, and binaural separation skills. However, his auditory closure skills and auditory figure-ground skills were in the disordered range for a child of his age.

Auditory closure skills address the ability of the auditory system to fill in missing information, when

**FIGURE 1.** Results from outside audiometric evaluation performed in 2012 suggesting mild to moderate hearing loss bilaterally.

**FIGURE 2.** Pure-tone audiometric results demonstrating mild conductive hearing loss in both ears, left poorer than right.
extrinsic filtering reduces redundancy. Auditory figure-ground skills address the monaural skill of separating a primary signal (speech) from background noise.

Based on the patient’s SCAN-3 composite score, it was determined that he demonstrated atypical auditory processing skills, which may be considered consistent with specific-type auditory processing disorder. Additional testing had been planned but, due to the patient’s slow speed of response and fatigue from completing the SCAN-3, testing was discontinued.

Recommendations
The CHAPS results placed the patient in the at-risk category for overall listening, with specific concerns in quiet and in noise situations, auditory memory/sequencing, and auditory attention span.

When asked about the testing, the patient consistently reported that he believed that his hearing was poorer in his left ear than his right ear. The patient reported frustration that his hearing loss was affecting him in every listening environment, including school, home, and when communicating with his coach on the soccer field.

Based on these results, the patient was referred to his otolaryngologist for further medical management of his conductive hearing loss. In addition, an option for a trial of a frequency modulation (FM) system at school was recommended, along with possible consideration for a mild-gain hearing aid. It was explained that use of a hearing aid with such a mild hearing loss might be viewed as controversial or unconventional; however, the recommendation would likely address the communication issues raised by the patient. Both the FM and hearing aid would be options to improve signal-to-noise ratio issues identified in testing (e.g., BKB-SIN results and asymmetry in auditory closure and auditory figure-ground testing), with a hearing aid providing more flexibility in a wider range of environments outside of school. While open to all options, the family chose to pursue a trial use of an FM system through the school district.

FM System Trial
Prior to implementing the trial, the teacher completed the Listening Inventory For Education-Revised (L.I.F.E.-R.) Teacher Appraisal of Learning Difficulty (Anderson, Smaldino, and Spangler, 2011). The teacher’s responses designated the patient as often or regularly having listening challenges. These results corroborated with the Listening Inventory For Education-Revised (LIFE-R) Student Appraisal of Listening Difficulty: Before-LIFE Questions for Students (Anderson et al, 2011). Both the teacher and student reported positive change in using the FM system. Additionally, post-assessment using the LIFE questionnaire indicated teacher response of rare listening challenges and patient response that listening situations were mostly easy while using the FM system.

Ideally, the FM system at school would have been a strong solution based on feedback from the patient, his teacher, and his parents. However, the FM system required repeated repairs and, each time the system was returned for repair, it appeared the educators became a bit less vested in using it. Monthly checks by the educational audiology consultant indicated that the student was often without his FM system. When questioned, he indicated that he still wanted to use it, but it often was not working or not charged.

The classroom teacher shared her frustrations that the system was not consistently available or functioning the way it should. This led her to revise her view that the student needed the FM, noting that she did not see much difference between him having the system or not having the system.

Without an IEP and with no reported effect on academic performance, the district determined there was no need for FM system use in the classroom.

The importance of ongoing monitoring of children who use hearing technology at school is critical. The initial impression was that the FM was appropriately fit and functioning. However, ongoing educational audiology follow-up identified that the treatment was not successful and provided the opportunity to move on to a more appropriate treatment for this patient.

The patient chose to pursue the option of a hearing aid for his ear with poorer hearing so that he could hear better in school and in other environments, such as when he was playing soccer.

Hearing Aid Trial
The patient was fitted with an entry-level receiver-in-the-ear (RITE) hearing aid on his left ear for a 30-day period and reported similar benefits on the LIFE-R as observed with the FM system. His classroom teacher noted improved performance with the hearing aid, and his mother reported improved ability to listen and focus at home.

Following a successful trial, he was fitted with an Oticon Sensai RITE hearing aid for the left ear. The patient reported that he felt like a normal kid when he was wearing the hearing aid, as it helped him to “make his ears equal.” He used the hearing aid all day and reported he...
liked that it worked consistently and he was in control of it. A trial use of an FM audioshoe may be initiated for the upcoming school year.

**Discussion**

Our patient had a number of subtle, yet significant, issues that appeared to be factors in his success in school and growth as a student. Let’s review:

- Late diagnosis of mild dyslexia
- Long history of speech/language delays
- Multifactorial assessment performed through school failed to identify some key issues that could have helped the patient build learning and communication skills
- Documented hearing loss more often than normal hearing, most notably for the left ear
- Complaints of inability to hear in noisy and reverberant environments, which was supported by speech-in-noise testing, LIFE questionnaire results, and results of the SCAN-3

Is a hearing loss always a hearing loss? Are some hearing losses too minimal to address? In this case, it is likely that the patient’s hearing loss, albeit mild and unilateral, contributed to deficits in the processing of auditory information, which would not necessarily be considered an auditory processing disorder but, rather, would reflect asymmetry in peripheral hearing.

The misconception that a mild or unilateral hearing loss is unlikely to result in any significant impairment far too often results in lack of appropriate intervention. The effect is reduced academic, social, and behavioral outcomes, with more than 30 percent of children with mild or unilateral hearing loss failing at least one grade (Bess, Dodd-Murphy, and Parker, 1998; Bess and Tharpe, 1986).

Recent research on children with minimal hearing loss, including those with unilateral losses, reported that the effects are highly variable, but key areas such as attentiveness must be monitored to ensure success in the classroom (Porter et al, 2013; Kuppler et al, 2013).

Porter et al (2013) suggest that future research should focus on the child’s self-perceived listening difficulties and achievement. Our patient’s self-reported inability to hear and comprehend information in the classroom went unaddressed. While the patient had several other factors that likely contributed to his academic performance, addressing the hearing loss could certainly improve his overall function and well-being in school.

This case demonstrates the importance of listening to a patient’s concerns and not being led astray by misleading factors such as a patient’s age or minimal degree of hearing loss. Clearly, it is important to take into account the child’s self-perceived effect of a hearing loss. In addition, the use of the term “mild” is misrepresentative of the potential effect the hearing loss can have on academic performance.

Bess and Tharpe (1986) suggested that unilateral hearing loss of any degree could negatively affect the growth and development of a child. The recent meta-analysis on unilateral hearing loss and academic performance by Kuppler, Lewis, and Evans (2013) reported that there is evidence to support that complex cognitive development requires optimal hearing, including restoring bilateral hearing if possible. They suggested that it is time to change the dogma for a minimalist approach to the management of patients with unilateral hearing loss, and that the approach should be modified by current evidence.

This case highlights how even a mild hearing loss can negatively affect a patient. In addition, intervention can result in significant reductions in handicap and increased benefit. The patient indicated that, after getting fitted with his hearing aid, he finally felt normal. Increasing
Audibility for this child resulted in increased confidence and motivation, leading to positive changes in social and behavioral outcomes as well.

Closing Arguments

The risk associated with fitting a hearing aid on the mild-hearing-loss ear was minimal and the reward was great.

It is important to remember that an appropriate fitting protocol includes real ear measures, no matter how minimal the degree of hearing loss.

A trial with a hearing aid and FM is a strong first step for children with a mild hearing loss who are reporting difficulties in school, particularly if they have an associated diagnosis such as a learning disability or dyslexia. A slight improvement in the signal-to-noise ratio (SNR) in listening environments throughout their day might be just what they need to communicate effectively with the people in their world.

Both options offered to this patient addressed improving audibility for him. The key is finding the right option for each patient. Kuk (2011) noted that the noise reduction and directional microphone options provided in hearing aids are proven techniques for enhancing speech understanding in noise. In this case, the audiologist was able to improve the signal-to-noise ratio while optimizing binaural hearing for this patient.

In short, monitoring the child’s progress long-term and being flexible with the treatment approach allowed for a successful outcome. Now we know that mild isn’t always so mild after all.

Another “case closed” until the next issue of AT! 🎤

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References


