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### Audiological Intervention for Late-Identified Children and Teenagers with Hearing Loss

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*For Fulfillment of the Doctor of Audiology Degree*

*Illinois State University, Normal, Illinois*

Audiological Intervention for Late-Identified Children and Teenagers with Hearing Loss

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## **Effects of Monaural Amplification for a Bilateral Hearing Loss: A Case Report**

### **Abstract 1**

Introduction: The family of every child referred for definitive care after a newborn hearing screening should follow up with an audiologist to rule out hearing impairment. Early identification, diagnosis, and intervention are crucial for individualized planning and outcomes. Children who need binaural amplification and are not managed appropriately become exposed to sound deprivation, which leads to diminished speech audibility, sound localization, and speech and language development. Case Presentation: A young child presented to the clinic with an unspecified bilateral mild to moderate hearing loss at 500, 2000, and 4000 Hz. Discussion: Children with monaural amplification have shown decreased speech recognition scores when compared to those fitted binaurally. Decreased speech audibility can affect speech and language development over a lifetime. Conclusion: Children who are prescribed monaural amplification, when binaural amplification is indicated, may demonstrate problems with the development of speech and language.

## **Effects of Monaural Amplification for a Bilateral Hearing Loss: A Case Report**

### **Introduction**

This case is about a child with bilateral hearing loss who was fitted with monaural amplification. Bilateral hearing-impaired children managed with unilateral amplification may be at risk for the poor development of speech-language skills, speech recognition, and sound localization (Madell et al., 2019). Children using monaural amplification had a significant decrease in speech recognition performance when compared to those with binaural amplification (Gelfand & Silman, 1993). Altogether, if the child cannot hear speech, then they cannot learn to produce speech sounds adequately. Madell et al., (2019) stressed the importance of follow-up appointments for the management of children identified with hearing loss, but, as a child matures, the frequency of follow-up appointments may be decreased accordingly.

### **Case Presentation**

A young child presented to the clinic with a known unspecified mild unilateral hearing loss in the right ear, having been brought to the appointment by his grandmother. The child was born prematurely at 31-and-a-half weeks, gestational age, weighing just one pound and four ounces, which classified him as a low-weight baby. He was admitted to the Neonatal Intensive Care Unit for six-and-a-half months and failed to pass his newborn hearing screening. The family reported a history of hearing problems on his father's side.

Otoscopy revealed a pressure equalization tube in the right ear. Tympanometry was performed in the right ear, resulting in a flat tympanogram with no peak pressure and no static immittance pressure with higher than expected ear canal volume. Tympanometry in the left ear revealed a normal ear canal volume and a low compliance value. Conditioned play audiometry

indicated that the child had moderate hearing loss in the right ear (Figure 1.1) with mild hearing loss in the left ear. Distortion product otoacoustic emissions revealed absent responses from 750 through 5000 Hz with responses present from 6000 through 8000 Hz in the right ear. In the left ear, responses were absent from 750 through 6000 Hz and present at 8000 Hz (Figure 1.2). The absence of otoacoustic emissions may suggest middle ear dysfunction, patient noise interference, or abnormal cochlear hair cell function (Madell et al., 2019).

Test results were explained to the family and a treatment plan that was suitable for the child and family was constructed. An earmold impression was obtained without complication and a new hearing aid order was initiated.

## **Discussion**

The Joint Committee on Infant Hearing (JCIH, 2019) recommended that a hearing screening be administered by the age of one month, diagnosis by three months, and intervention services within six months. Nevertheless, for children, hearing loss is commonly identified after the JCIH guidelines. In this case, the original amplification prescription did not satisfy the JCIH guideline because the child was fitted with monaural, not binaural, amplification. Because this patient had hearing loss in the unaided ear, the original treatment plan appears to be unfavorable. Additionally, intervention services were not initiated at six months due to extenuating factors, including his general medical health.

Gelfand and Silman (1993) studied the impact of monaural versus binaural amplification on speech recognition scores in children with bilateral moderate sensorineural hearing loss and more than four years of amplification use. They reported that monaural hearing aid users had a significant decrease in speech recognition scores in the unaided ear. There was no decrease in speech recognition performance for subjects fitted with binaural amplification. Children who

cannot understand speech will more than likely not learn to produce speech (Madell et al., 2019), so children who have been amplified inadequately may have been placed at risk for developmental speech and language problems.

Pediatric patients and their families should be seen for follow-up appointments every three months until they reach the age of three years. Thereafter, they should be seen every six months for monitoring appointments. These encounters may include, but are not limited to, annual audiological evaluations, hearing aid selections, hearing aid fittings, hearing aid reprogramming, earmold re-makes, and hearing aid checks (Madell et al., 2019). In this case, the family was very motivated and engaged in the customization of a management plan.

### **Conclusion**

It is pivotal for patients with early-onset hearing loss to receive appropriate amplification as soon after diagnosis as possible. Family involvement should improve opportunities for successful hearing aid use for their developing child. Thus, amplification and family involvement are key contributing factors for positive outcomes in children with early-onset hearing loss. Besides the selection of appropriate amplification, teaching a family to advocate for and support their child should improve success with amplification, speech and language development, and attendance at future appointments.

## **Acceptance of Hearing Aids Among Teenagers: A Case Report**

### **Abstract 2**

**Introduction:** Teenagers may have difficulty accepting hearing aids, due to a perceived negative self-image and what their peers will think of them when seen wearing hearing aids. **Case**

**Presentation:** A teenager presented to the clinic with unilateral conductive hearing loss in the right ear. A hearing aid was selected, and adult Desired Sensation Level targets were utilized for the prescription. **Discussion:** Teenagers with a hearing impairment want to be socially

compatible with their normal-hearing peers. This raises personal concerns about the aesthetic appearance of their hearing-assistive devices, causing some teenagers to abandon their hearing

aids and avoid wearing them. Audiologists and other healthcare professionals should help teenagers to see the purpose and value of hearing aids, accept their hearing loss, and learn to self-

advocate. **Conclusion:** Family support is important for teenagers to gain acceptance of their hearing aids, increase wear time of the device, and advocate for themselves.



## **Acceptance of Hearing Aids Among Teenagers**

### **Introduction**

Many teenagers do not easily accept hearing loss or adopt hearing assistive devices. This may be partly due to their beliefs about the physical appearance of hearing aids, being bullied by their classmates, and having a lack of self-awareness (Anderson, 2012). For example, teenage hearing aid users who are bullied are less likely to wear them consistently. As a result, they may have increased difficulties communicating and interacting in social settings, where their hearing aids might be most beneficial. Before beginning middle school, young hearing aid users are most successful after they have recognized their role in their community or society (Anderson, 2012).

### **Case Presentation**

A teenager presented to the clinic with unilateral hearing loss in the right ear. The child was accompanied by her mother who reported an extensive middle ear history consisting of eustachian tube dysfunction, serous and chronic otitis media, and bloody otorrhea, including two tympanic membrane perforations, mastoiditis, and myringitis. She had pressure equalization tubes several times and tympanoplasty surgery. Additionally, the child reported tinnitus and difficulty hearing.

An otoscopic inspection revealed that the patient's ear canals were clear, and the tympanic membranes were unobstructed, bilaterally. Tympanometry in the right ear resulted in low admittance (Type As) but showed normal middle ear admittance in the left ear (Type A). Pure tone air and bone conduction audiometric testing was administered, which revealed severe rising to mild conductive hearing loss from 250-2000 Hz, sloping to a moderately severe conductive hearing loss in the right ear. The left ear revealed essentially normal hearing from

250 Hz-2000 Hz, with mild sensorineural hearing loss from 4000-8000 Hz (Figure 2.1). A Stenger test was performed to rule out malingering and, subsequently, the child was considered reliable.

After counseling, the family decided to invest in a Phonak Audeo receiver in-the-canal hearing aid with a custom Slim-tip earmold for the right ear. Although binaural amplification may have been more advantageous for this patient, her family decided to pursue amplification for the right ear only, due to the condition of her better-left ear, financial position, and the child's preference. At the request of her family, monaural amplification was pursued.

A few weeks later, the child and family returned for their hearing aid fitting appointment. During this encounter, real ear measurements were administered to verify that hearing aid output levels were age-appropriate and adequate for her ear canal volume and hearing loss. The child became extremely uncomfortable and upset when the real-ear probe tube was inserted into her right ear canal. Alternatively, real ear measurements were performed in an electroacoustic test box using Desired Sensation Level (DSL) v 5.0 adult targets. Targets were closely approximated for 500-8000 Hz; however, the target was unable to be met at 250 Hz due to the degree of hearing loss (Figure 2.2). The predicted uncomfortable loudness levels were not exceeded by the maximum power output of her hearing aid. The hearing aid feedback manager was tested, and no significant feedback was observed. Upon insertion of the hearing aid, the child reported echoing of her voice, so she was counseled empathetically about the necessary adjustment period for the hearing aid, the implications of perceiving previously inaudible environmental sounds again, and her occlusion sensation.

Two weeks later, the family returned for a follow-up appointment. Their child reported wearing the hearing aid during all waking hours and the sensation of occlusion had subsided.

Although satisfaction with the hearing instrument was good, the child reported that it appeared weak at times. To take up this complaint, the target gain was increased, which improved the patient's level of satisfaction with the loudness and sound quality of the device. The family was encouraged to return every six months for a routine evaluation and hearing aid check.

## **Discussion**

Hearing loss has been classified as an invisible disability, meaning the difficulties of individuals with hearing loss are not often easily discerned. This forms the basis of the difficulty teenagers have accepting their hearing loss. Ellington and Lim (2013) investigated the positive and negative impacts on teenagers with hearing loss, including the functional qualities and aesthetics of hearing devices. They reported that the most common aesthetic features of hearing devices were color-changing and smaller in size. Regarding the functionality of hearing devices, teenagers requested increased gain of amplification. Remarkably, those with more severe hearing loss acknowledged that the functional qualities of their hearing devices were more important than the aesthetic qualities (Ellington & Lim, 2013).

The self-esteem of most teenagers is significantly affected by their perception of their own physical appearance (Ellington & Lim, 2013). Correspondingly, hearing-impaired teenagers may elect not to wear their hearing aids to be accepted by normal-hearing peer groups. When this is done, the hearing aid wear time may decrease dramatically. According to Anderson (2012), hearing-impaired teenagers wear their hearing aids to school but remove them upon arrival. Parents may be unaware that the hearing aid is not being used by their child during school hours. Unfortunately, teenagers may believe that removing their hearing devices satisfies their self-esteem and self-image (Anderson, 2012), and until they accept the hearing aid as an extension of themselves, the development of their self-confidence, self-concept, and self-esteem will likely be

impeded. To improve a child's acceptance of their hearing aids, strong support from family members, their audiologist, and other health professionals must be provided.

Supporting and encouraging teenagers to build a strong self-concept and self-esteem can help reconcile who they are (Johnson & Seaton, 2007). Audiologists and other health professionals should acknowledge the difficulties teenagers face with hearing aids. Teenagers must be encouraged to advocate for themselves, accept their hearing loss as a part of who they are, and openly discuss their feelings (Anderson, 2012; DeConde-Johnson et al., 2021). For example, at school, a child may need to advocate for themselves by requesting better lighting, captioning, preferential seating, assistive devices, and other accommodations. Additionally, children who advocate for themselves should receive positive reinforcement (Johnson & Seaton, 2007).

## **Conclusion**

This case demonstrated that proactive support from family members and clinical service providers will positively influence a teenager's willingness to accept new hearing aids. When young patients receive support from their families and clinical advocates, they are more likely to wear their hearing aids consistently and develop self-efficacy. Once they realize the benefit of their hearing aids, they should begin to wear them confidently in more listening environments. Therefore, clinicians should be mindful of the insecurities and fears of teenage patients because, if mismanaged, this may cause long-lasting social, emotional, and educational problems.

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Figure (Case 1)

Figure 1.1

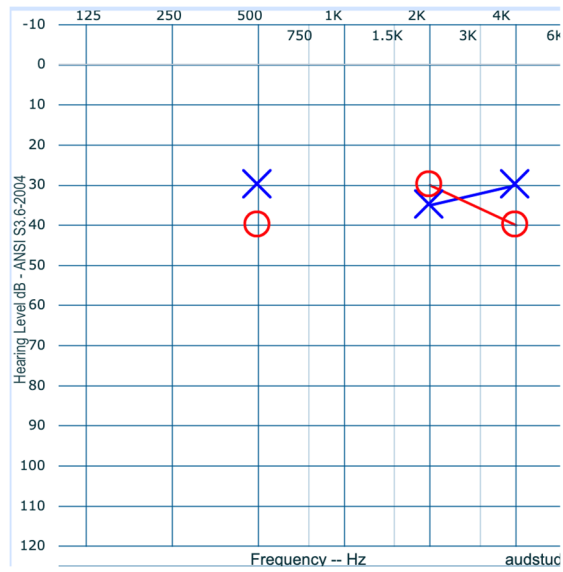


Figure 1.1. Audiometric data for the left and right ear, using conditioned play audiometry with supra-aural headphones.

Figure (Case 1)

Figure 1.2

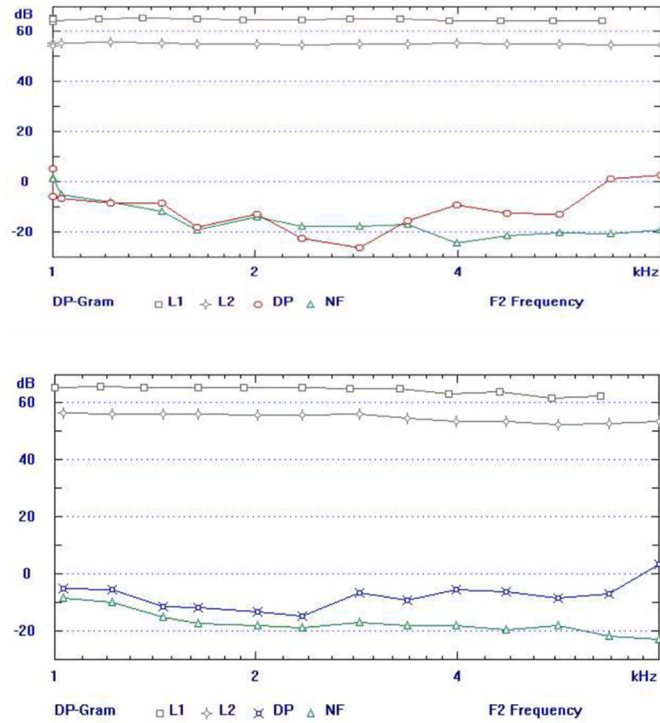


Figure 1.2. Distortion product otoacoustic emission data for the right ear (top panel) and left ear (bottom panel).

Figure (Case 2)

Figure 2.1

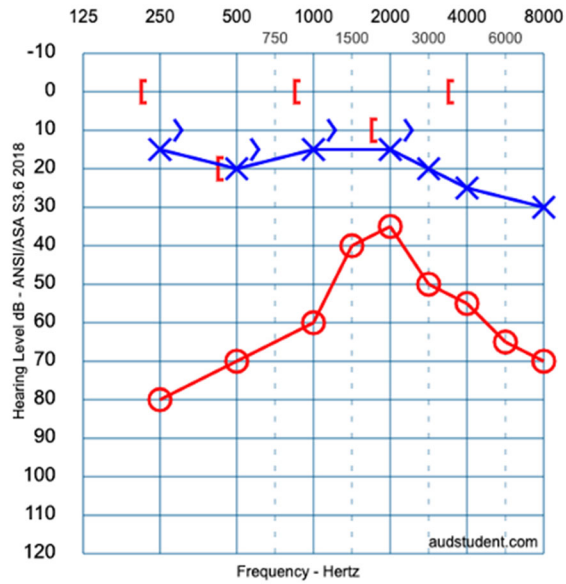


Figure 2.1. Audiometric data for the left and right ear, using pure tone audiometry with insert earphones from 2020.



Figure (Case 2)

Figure 2.2

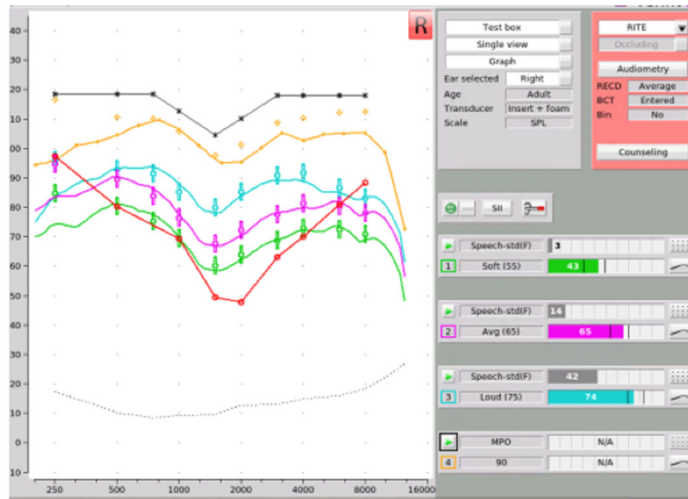


Figure 2.2. Speech mapping for the right hearing aid using DSL adult targets from hearing aid fitting appointments.