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MAXIMIZING OUTCOMES FOR CHILDREN IN SCHOOLS:
The Responsibility of Clinical Audiologists

Jane R. Madell, PhD
Carol Flexer, PhD

Competing Interests?

- We have no competing interests to report
Learning Objectives

- Attendees will identify factors that are significant for success in school for children with hearing loss.
- Attendees will describe classroom situations that interfere with listening.
- Attendees will be able to explain the legislation that effects children with hearing loss in schools.

What is the Problem?

- Many school districts no longer have educational audiologists.
- Students with hearing loss continue to need all the services that educational audiologists have provided.
- Clinical audiologists now need to pick up this slack if their young patients with hearing loss are going to succeed in today’s challenging academic environment.
- For many children, clinical audiologists in hospitals, clinics, and private practice are the only ones who have the necessary information schools require.
- We will discuss contemporary audiological needs of children with hearing loss in schools.
Audiologic Management of Children

- Prime consideration
  - Child setting (school)
  - Not audiologist setting (clinic)

What Does It Take For A Child With Hearing Loss to Succeed?

- Language at age level
- Literacy at age level
- Social skills at age level
What Does It Take To Reach Age-Appropriate Outcomes?

- Early identification
- Early, appropriately fit technology
- Full time use of technology
- The better you hear the better you learn
- Therapy, preferably auditory-based, involving family
- Family support
- Language-rich environment
- Opportunities to learn
- Educational program willing and able to make the necessary adaptations for maximizing learning

Therefore, the Child Must Have:

- Auditory brain access of auditory information via technology (hearing aids, cochlear implants, etc.)
- Enhanced auditory language stimulation
- Full access to instructional information
What is Hearing Loss? Think about Hearing Loss as a “Doorway” Problem

- The ear is the “doorway to the brain” for sound.
- Hearing problems of any type and degree obstruct that doorway, preventing sound/auditory information from reaching the brain.
- Hearing aids and cochlear implants break through the doorway to allow access, stimulation and development of auditory neural pathways.
- Technology is the critical first step, BUT, technology alone does not solve all problems caused by hearing loss.

The Better You Hear, The Better You Learn

- Yes, children have a hearing loss/doorway problem
- Yes, they are fit with technology designed to deliver auditory information to their brain
- Are they wearing technology? How often?
- IS THE TECHNOLOGY DOING WHAT IT NEEDS TO DO?
  - Never assume
  - If you don’t test, you don’t know
- Do family, therapists, and school personnel know how to maximize auditory function?
What Does The Technology Need To Be Doing To Meet The Needs Of Acoustic Accessibility?

- The child’s brain needs to receive auditory information throughout the frequency range
  - 6000 and 8000 Hz really do matter
  - Missing high frequencies results in missing grammatical markers for pluralization, possessives, and missing non-salient morphemes (e.g. morphemes that are not stressed during conversation, such as prepositions)
- The child needs to hear at a soft enough level
  - Soft speech is about 35 dBHL.
  - If a child cannot hear soft speech, she will:
    - Not hear peers in the classroom or on the playground
    - Not “overhear” conversation and will have limited incidental learning
    - Have reduced language and literacy skills
  - Moeller (2015) reported in her research that 40% of children fit with hearing aids were underfit.
- Aided hearing at 0 dBHL is not the goal
  - It can cause distortion

Speech Banana
Can We Call It The Speech String Bean?

Using the “String Bean”

- Visual example demonstrating what a child is hearing and what she is missing with and without technology
- Useful for planning auditory therapy by identifying phonemes that are not perceived
- Helpful in counseling families, children, therapists and school personnel
- Not a substitute for real-ear measures
Are Aided Thresholds, Alone, Sufficient for Validating Auditory Brain Access, Language and Literacy?

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<thead>
<tr>
<th></th>
<th>Right</th>
<th>Left</th>
<th>Binaural</th>
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<tr>
<td>50 dBHL</td>
<td>76%</td>
<td>68%</td>
<td>72%</td>
</tr>
<tr>
<td>35 dBHL</td>
<td>56%</td>
<td>26%</td>
<td>64%</td>
</tr>
<tr>
<td>50 dBHL+5 SNR</td>
<td></td>
<td></td>
<td>48%</td>
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</table>
Example: Teen Rejecting Hearing Aids

What Does It Take For The Brain To Receive Sufficient Auditory Information For The Acquisition Of Knowledge?

- A quiet environment with a good clear signal
- Technology that is appropriately fit
- Clear speech
  - Clear speech used by the talker can improve speech perception of the listener by as much as 40%
  - Talk at a slower rate
    - Adults often speak very fast -- about 200 words/minute
    - Children need to receive slower speech -- about 120 words/minute – in order to process auditory information for learning
What Is “Good” Speech Perception?

- Speech Perception Qualifiers – Madell et al, 2011
  - Describing performance
    - Excellent 90-100%
    - Good 80-89%
    - Fair 70-79%
    - Poor < 70%

- Children with hearing loss need to hear as well as children with normal hearing in order to learn.
- We need to describe performance, accurately.

ACOUSTIC ACCESSIBILITY
Acoustic Accessibility in Today’s Classrooms – Collaborative Learning – Ecological Psychology

- **Collaborative learning** is a situation in which two or more people learn or attempt to learn something together.
- If children cannot consistently and clearly receive spoken information in all of its forms, the major premise of the educational system is undermined -- and that is what “acoustic accessibility” is about.
- **Acoustic accessibility** is critical because in environments relying on spoken language communication, all detailed speech sounds/spoken information must reach the brain in order for neural development and learning to occur.

What Are The Negative Effects Of Poor Classroom Acoustics?

- Misunderstanding verbal instruction
- Missing verbal information
- Fatigue
**Signal-to-noise Ratio (SNR)**

- **SNR** is the relationship between the primary or desired auditory signal to all other unwanted background sounds.
- The more favorable the SNR, the more intelligible the spoken message.
- Adults with normal hearing require a SNR of approximately +6 dB in order to hear the spoken message as consistently intelligible.
- The desired signal needs to be about **twice as loud** as background sounds.

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**Who Needs a Better SNR to Receive Intelligible Speech?**

- Typical children.
- Children with any type and degree of hearing problem including ear infections and unilateral hearing loss.
- Children with auditory processing problems.
- Children with learning disabilities.
- Children with attention problems.
- Children with behavior problems.
- Children with developmental disabilities.
- Children with visual disabilities.
- Children whose first language is not the language of the speaker.
How Much Better SNR Do They Need?

- Approximately +15 dB to +20dB
  - the desired signal needs to be about 10 times louder than background sounds
- Children require a better SNR than adults because they do not have the same “top-down” processing capabilities as adults

Unfortunately, A Typical Classroom Has An Inconsistent And Poor SNR Of About +4 dB.

A classroom’s SNR can vary minute by minute from about +5 dB to worse than -20dB, depending on teacher and pupil positions and background noise.
How to Manage, Improve, and Control the SNR

- Positioning: Remain, physically, as close as possible to the desired sound source -- ideally within 6 inches.
- Unfortunately, physical positioning does not work in a classroom environment where teacher and pupils cannot remain in fixed positions.
- Think “Strategic Seating” for the child with hearing loss!

Use a Remote Microphone (RM)! Technologies That Use RM:

- Personal-worn remote wireless system; provides the best SNR for a child with hearing loss
- Sound-Field system -- FM or Infrared -- also called “Classroom Audio Distribution Systems” for everyone in the room
Peer Use of RM Systems

- Peers are encouraged to use the FM/DM microphone during activities such as partner work, calendar, show and tell, book reports, presentations, reading aloud, etc.
- An easy way to do this is with the use of a Micro Cup.
  - Place the FM/DM transmitter in a plastic or paper cup.
  - If it is able to jiggle inside the cup, pack with foam to create a secure fit.
  - Clip microphone to edge of cup.
  - Students can hold the cup like a hand-held microphone and pass it easily from student to student.
- This “pass-mic” will provide access to important peer learning opportunities.

Key Reference from The American Academy of Audiology

- HAT Guidelines – Hearing Assistance Technology
Classroom Example of RM Use by Jane Madell

- https://www.youtube.com/watch?v=RBrnvGKLFQ

WHAT HAPPENS WHEN THERE IS NO EDUCATIONAL AUDIOLOGIST?
What Happens If There Is No Educational Audiologist?

- No one to provide educationally relevant hearing evaluations
- No one to monitor classroom acoustics and make recommendations
- No one to teach staff the effects of HL on language, learning, literacy and social development
- No one to explain audiological assessment results to school personnel
- No one to recommend and monitor technology
- No one to monitor academic progress
- No one to be sure IEP/504 meet the student’s auditory needs
- No one to collaborate with parents and school personnel
- No one to assist in program placement decisions and make specific recommendations to address listening and communication needs
- No one to make appropriate medical, educational and community referrals
- No one to coordinate hearing screening programs
- No one to facilitate programs for listening, communication strategies, and use and care of technology
- No one to administer APD evals
- No one to develop daily living and assistive technology recommendations

Responsibilities: Can the TOD do the Audiologist’s Job?

<table>
<thead>
<tr>
<th>(Educational) Audiologist</th>
<th>Teacher of the Deaf (TOD)</th>
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<tbody>
<tr>
<td>Monitor hearing and performance with technology</td>
<td>Assess educational performance of children with hearing loss and other auditory issues</td>
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<tr>
<td>Assess auditory processing and manage APD issues in the classroom</td>
<td>Work with children to preview and review academic material to help children with HL learn with classmates</td>
</tr>
<tr>
<td>Provide RM systems and monitor use</td>
<td>Classroom observation to determine how well a child with HL or APD is functioning academically</td>
</tr>
<tr>
<td>Monitor classroom acoustics</td>
<td>Educate school staff about the educational effects of HL</td>
</tr>
<tr>
<td>Classroom observation to determine how well a child with HL or APD is functioning, audiorally</td>
<td>Participate in IEP ad 504 meetings to be certain hearing issues are covered adequately</td>
</tr>
<tr>
<td>Educate school staff about educational effects of HL</td>
<td>Provide emotional support to children with HL and other auditory disorders</td>
</tr>
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<td>Participate in IEP and 504 meetings to be certain hearing issues are covered adequately</td>
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LET’S LOOK AT THE LAWS

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ADA

- Under the Americans with Disabilities Act, schools are responsible for ensuring that communication access is as effective for children with hearing loss as it is for their typically hearing peers.
- To be compliant with ADA, the child with HL needs to hear well.
ADA: Specifics

- Communication for students who are deaf or hard of hearing must be "as effective as communication for others" [ADA Title II 28 C.F.R. 35.160 (a)(1)]
- Provision of appropriate aids and services "affording an equal opportunity to obtain the same result, to gain the same benefit, or to reach the same level of achievement as that provided to others" [ADA Title II 28 C.F.R. 35.130 (b)(1)(iii)]
- Students who are deaf or hard of hearing should be able to participate in and enjoy the benefits of the district's services, programs, and activities" (DOJ-DOE p14)
- These requirements apply to all school-related communications, and when a public school is deciding what types of auxiliary aids and services are necessary to ensure effective communication, it must give "primary consideration" to the particular auxiliary aid or service requested by the person with the disability. (DOJ-DOE p27)

Individuals with Disabilities Education Act (IDEA): Specifics

- Opportunities for direct communication with peers in the student’s language and communication mode
- Opportunities for direct communication with professional personnel in the student’s language and communication mode
- Opportunities for direct instruction in student’s language and communication mode
- IDEA 2004, §300.324(a)(2)(iv)
- Routine checking of hearing aids and external components of surgically implanted medical devices to ensure they are functioning properly
- IDEA 2004, §300.113(a)(b)(1)
IDEA Assistive Technology: Specifics

IDEA Part B 34cfr300.5-6 and C 34CFR303.12

- Assistive Tech Device means any piece of equipment or product system …used to increase, maintain, or improve functional capabilities of children with disabilities. (Does not include surgically implanted devices.)
- Assistive device service – any service that directly assists a child with a disability in selection, acquisition or use of assistive technology devices
  - a) evaluation of needs of a child including functional evaluation of child
  - b) purchasing, leasing or providing assistive technology
  - c) Selecting, designing, fitting, customizing, adapting, maintaining, repairing or replacing assistive technology

IDEA Assistive Technology: Specifics (Cont.)

- d) Coordinating and using other therapies, interventions or services with assistive technology devices such as those associated with existing education and rehabilitation plans and programs
- e) Training or technological assistance for a child with a disability or, if appropriate, with that child’s family
- f) training or technological assistance for professionals (including individuals providing education or rehabilitation services), employers, or other individuals who provided services to, employ, or are otherwise substantially involved in the major life functions of children with disabilities
### IDEA Assistive Technology: Specifics

- Section 614(d)(3)(B)(v) of the Act, requires the IEP Team to consider whether the child needs assistive technology devices and services.
- Sec. 300.704(b)(4)(v) that allows States to use funds to support the use of technology to **maximize access** to the general education curriculum for children with disabilities.
- Whether a device is eligible for a child depends on whether the **device is used to increase, maintain, or improve the functional capabilities** of a child with a disability, and whether the child’s individualized education program (IEP) Team determines that the child needs the device in order to receive a free and appropriate public education (FAPE).

### IDEA: Eligibility

- “Each State must ensure that FAPE is available to any individual child with a disability who needs special education and related services, even though the child has not failed a course or grade, and is advancing from grade to grade.” (CFR Section 300.101)
- 300.101(c) that a **child does not have to fail** or be retained in a course or grade in order to be considered for special education and related services.
- However, a child must have one or more of the **impairments** identified in section 602(3/a/i) of the Act and need special education and related services because of that impairment. [From 602(3/a/i) **hearing impairments (including deafness)** ...(602(3/a/ii) who, by reason thereof, needs special education and related services.]
IDEA: Non-Academic Settings

Section 300.117 (Nonacademic settings) has been changed to clarify that each public agency must ensure that each child with a disability has the supplementary aids and services determined by the child’s individualized education program (IEP) Team to be appropriate and necessary for the child to participate with nondisabled children in the extracurricular services and activities to the maximum extent appropriate to the needs of that child.

WHAT IS EVERYBODY’S JOB?
Role of the Audiologist

### In Clinic
- Diagnosis hearing loss
- Select, fit, and monitor technology
- Assess performance with technology
  - Assurance that technology is providing sufficient auditory brain access
  - Assess speech perception at normal and soft conversational levels, with and without competing noise
- Select, evaluate, and fit remote microphone systems
- Monitor the child’s progress – auditory, speech-language, academic

### In School
- Educate school staff about effects of HL on academic development
- Assist school staff in understanding how to successfully use RM system
- Monitor classroom noise
- Help school administration understand services required for children with HL
- Participate in IEP and 504 meetings, either in person or by phone or video-conferencing
**Role of the Classroom Teacher**

- Monitor technology daily
  - RM
  - Is it working?
  - Is the child hearing?
    - How do you know?
- Recognize what the child is missing
  - Academically
  - Auditorially
- Academic expectations – same as peers
- Social skills
- Communicate with others on the team

**Role of the Teacher of the Deaf/Special Education Teacher**

- Same as classroom teacher
- Preview and Review of academic materials
- Monitor academic performance
- Vocabulary required for academics
  - Math
  - Science
- Improve the child’s self-advocacy skills
Role of the Speech-Language Pathologist/Auditory-Verbal Therapist (LSL)

- Develop auditory learning skills
- Monitor speech perception
- Monitor progress
- Monitor language development
  - Vocabulary required for academics
- Develop self-advocacy skills

Role of the Family

- It is not the job of the family to teach the IEP Team and other school personnel about hearing loss, their child’s technology, and what their child needs in school
- Provide a language-rich home environment
- Be sure the child is ready to learn
- Be sure equipment is working and worn – at least 10 hours per day
- Take child for evaluations as needed
- Know what is happening at school
- Develop social skills
- Develop self-advocacy skills
How Do You Get Paid?

- Make sure parents understand what their child needs
- Make sure parents understand their legal rights
- Make sure schools understand their legal requirements
- Make a case for how a clinical audiologist can provide these legally-mandated audiological services in the absence of an educational audiologist
- Help school administration understand the risk of not meeting legal requirements
- Figure out what it costs you to provide these services
  - School visit (highly recommended!!!)
  - Participate in IEP meeting via phone/Skype
- Develop a contract with the school
- Bill the school

THANK YOU FOR LISTENING

References/Resources


Contact