What Are They Hearing?
The Educational Impact of Hearing Loss
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Facts about Hearing Loss
- Hearing difficulties are often “invisible”
- About 5 per 1000 children between age of 3 and 17 have hearing loss
- 3 out of 4 children have an ear infection by the age of 3
- 2013-2014 Head Count, 2069 children ages 3-21 being served primary HI in North Carolina (DPI data)
- About 85% of all Deaf and H/H students are educated in public school systems
- 43% of Deaf and H/H kids spend most of the day in a mainstream classroom (2008 data, probably more now)
Parts of the Ear

Outer Ear: "Catches" the sound: Conductive Loss

Middle Ear: "Turns Up" the Sound: Conductive Loss

Inner Ear: Fine tunes and sends sounds to the brain: Sensorineural Loss

Causes & Types of Hearing Loss
Conductive Loss
• Sound is blocked or can’t reach the inner part of the ear
• Solution: Increase volume, sometimes fixable through medical intervention (tubes, surgery, medication)
• Can lead to delayed speech and language in kids
• Possible causes:
  Deformed ear/ear canal, problems with middle ear bones
  Foreign objects in the ear canal or wax
  Fluid/ear infections, some syndromes (i.e. Down Syndrome)

Sensorineural Loss
• Damage in the inner part of the ear to the hair cells that help to send sound to the brain; can lead to delayed speech and language
• Permanent & not typically responsive to medical intervention
• Solution: Need increased volume and clarity for distortion—may not resolve better clarity depending on severity of distortion
• Deafness from birth or acquired later in life (i.e. meningitis)
• Syndromes, genetic disorders or mitochondrial disorders
• Noise damage
• Aging

Mixed Hearing Loss
• Combination of both conductive and sensorineural; outer/middle and inner ear problems
• Sound can’t get in correctly, and the sound is distorted.
• May need increased volume and help with clarity
Degrees of Hearing Loss

Normal hearing: 0 to 20 dB
Mild Loss: 21 to 40 dB
Moderate Loss: 41 to 55 dB
Moderate-severe Loss: 56 to 70 dB
Severe Loss: 71 to 90 dB
Profound Loss: 91+ dB

Hearing Aids

• Hearing aids can be fit on infants. The earlier a hearing aid is fit, the better the chances of developing near normal or normal speech and language (provided there are no other cognitive or related factors).
• In North Carolina, all babies have a hearing screening at birth, so hearing aids can be fit within the first 6 months of life.
• Consists of microphone (picks up sound), amplifier (turns it up), and receiver (converts electrical signal back to acoustic for ear to hear).
• Hearing aids are NOT a "cure" for hearing loss, they do not restore normal hearing to damaged ears.

Cochlear Implant

• Surgical option for children who are deaf in both ears and cannot benefit well enough from hearing aids.
• "Electrical" hearing, not "acoustic hearing".
• As of 2012, 38,000 children have an implant.
How does a Cochlear Implant work?
- Microphone picks up the sound on the processor that’s worn on the ear
- Speech processor selects and arranges sound that the microphone picks up
- Transmitter and receiver/stimulator takes sounds from speech processor and converts to electrical impulses
- These electrical impulses are sent to electrodes inside the cochlea (inner ear), to be sorted and sent to the hearing nerve and from there to the brain to be processed.
- Simulation of how we hear with an implant: [Simulation]

Possible Effects of Hearing Loss in the Classroom

Mild Loss
- Hard to hear faint or distant speech
- Child can miss from 10-40% of speech signal depending upon degree of mild loss and up to 50% of classroom discussions
- Percent of speech signal missed increases with background noise
- Younger kids may watch & copy actions of classmates rather than try to listen to teacher
- Maybe be unaware of subtle conversational cues
- May sound like ears are “plugged”
- Self-esteem may begin to suffer and may increase in fatigue

Moderate Loss
- Speech, language and learning will be affected
- Up to 80% of speech signal can be missed with a 50dB hearing loss
- Significant trouble hearing in noise
- May have limited vocabulary and disordered syntax
- Socialization with peers will be more difficult, especially in noise
- FATIGUE due to effort needed to listen
- May rely more heavily on visual cues in the classroom
- This is the level where teachers will probably begin to notice the hearing loss effects
- Will need FM in the classroom
Hearing Loss Simulations

- Flinstones Video
  http://viewpure.com/TD5E88fFnxE?ref=search

Moderately Severe to Severe Loss

- Without hearing aids speech must be very loud to be understood
- Without early intervention (before age 1), speech, intelligibility, syntax will be delayed
- With hearing aids ALONE, ability to understand is reduced in noise and distance
- Child will be aware of people talking around him/her but will miss parts of what said, making communication one-on-one or in groups very difficult
- Greater difficulty socializing, especially in noisy situations
- Tendency for poorer self-concept and/or social immaturity
- FM/amplification crucial
- Remember: Even on their best “hearing” day, they will still have a mild to moderate hearing loss with amplification

Academic Achievement

- Difficulty in all areas of academics, mostly reading and mathematical concepts
- Kids with mild to moderate loss may be one to four grade levels behind normal hearing peers without appropriate management
- Kids with severe to profound loss usually top out at a 3rd or 4th grade level without appropriate and early educational intervention
- Gap in academic achievement between normal hearing and children and those with hearing loss may widen as they go through school
- Level of achievement is influenced by parental involvement and timing, quantity, quality and support the children receive

www.asha.org/public/hearing/disorders/effects.htm
What Does the Child Need at School to Improve Access to Sound?

- Better classroom acoustics: reduce noise in the classroom. Examples: carpet, window treatments, tennis balls on chair legs, acoustic tiles, anything to reduce and absorb sound
- Preferential seating: Child sits closer to the teacher/speaker to have better view of the teacher’s face and be closer in distance to the teacher
- Good lighting
- Support from school personnel to wear personal hearing aids during the school day and at home
- Appropriately fit, functioning hearing aids and/or cochlear implant
- FM system!

What is an FM System?

- Hearing aid microphones are only designed to “pick up” sound up to around 6 feet
- In a classroom, teachers don’t stand in one place!
- Teacher wears a microphone (boom mic, necklace type mic, or lapel mic), and the student wears a receiver on his/her hearing aid
- This acts like a personal radio for the child, and the teacher/speakers voice is brought directly to the child’s ear or to a speaker in the classroom
- This overcomes the problem of noise and distance
- BUT, some kids still struggle depending upon the severity and type of hearing loss

Types of FM systems

- Ear level/ personal: Used with hearing aids
Classroom Amplification System

- Tower Classroom Speaker and teacher microphone, work on FM or Infrared

Role of the Audiologist in the Schools

- Evaluate hearing and provide appropriate amplification for educational use (i.e., FM system) or refer for medical/outside intervention
- Be a part of the IEP team and recommend appropriate accommodations/modifications
- Give educationally relevant interpretation of hearing test findings
- Provide counseling to parents, students, and other school personnel
- Provide trainings about hearing loss and hearing to school personnel, students, and parents to help facilitate understanding of the impact of hearing loss on language, learning, reading and social development
- Collaboration with outside agencies to share information and implement student programs
- Give assistance regarding selection, purchase, installation, maintenance, calibration and utilization of audiological equipment
- Provide supervision for mass hearing screening initiatives
- Make recommendations for improving acoustic accessibility in the classroom setting
Discussion and Questions

References

- CDC website, data and statistics. Downloaded from www.cdc.gov/ncbddd/hearingloss/data.html
- www.asha.org
- Current NC DPI data