MINIMAL HEARING LOSS
A BIG DEAL?

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Hearing Loss Association of America Convention
June 18, 2011
WHAT IS MINIMAL HEARING LOSS?

• Bilateral sensorineural hearing loss 16-40dB
  (minimal is 16-25dB; mild is 26-40dB)
• Unilateral sensorineural hearing loss >20dB
• High-frequency sensorineural hearing loss above
  3000 Hz in at least 2 frequencies >20dB
• Conductive hearing loss (when due to fluid in
  ear, can range between 20dB to 50dB; although
  temporary, it can last several weeks and it can be
  recurrent)
14.9% of U.S. children aged 6-19 years have a permanent hearing loss (Niskar, 1998).

10-15% of all elementary school children are experiencing a temporary hearing loss caused by fluid in the ear on any given day (Crandell, Smaldino & Flexer, 2005).

15% of children aged 12-19 years have a noise-induced threshold shift (high frequency hearing loss) (Niskar, 2001)

1 in 20 children have hearing loss in one ear (Washington University, 2010)
INCIDENCE COMPARED TO OTHER DEGREES OF HEARING LOSS

• “Although the incidence of mild-to-moderate hearing loss is 16-30 times more frequent than severe-profound hearing loss, only 3% of FM auditory trainer users have mild-moderate hearing loss (Maxon,& Brackett, 1991)” (Johnson,1997).
MINIMAL ISN’T ALL THAT BAD, RIGHT?

• 37% of children with only minimal hearing loss fail at least 1 grade, compared to 3% of children with no hearing loss (Tharpe, 2008).

• Children with MHL have more dysfunctions in the areas of energy level, stress, social support, self-esteem than their normal hearing peers (Tharpe, 2005).

• Attention difficulties and behavior problems have also been noted by Flexer (1995).
WHY WOULD THAT BE?

- Greater listening effort throughout the day
- Greater difficulty in making themselves understood by peers: speech/syntax errors and limited vocabulary (Tharpe, 2008)
- Inappropriate responses due to missing subtle conservational cues (Flexer, 1995)
- Missing important sounds for plurality, tense and possessives (Flexer, 1995)
THE SPEECH BANANA

Comparison of the Frequency and Intensity of Various Environment and Speech Sounds

from SKI-HI

Frequencies in Cycles Per Second
UNFAIR SPELLING TEST

• You will be surprised…
• Think about your listening behavior as you take the test
• Consider how you felt when you could hear, but couldn’t understand what was said.
• Think about how critical soft high-frequency sounds are for speech discrimination (refer to the speech banana)
IN THE CLASSROOM….

• Up to 75% of classroom learning is auditory, so a good listening environment is critical

• Noise, reverberation and distance are the three things that makes listening difficult. They all reduce the signal to noise ratio (SNR) or distort the signal.
WHAT HURTS SNR?

• Background noise is primary negative factor. Classroom noise levels range from 45 to 70 dB.

• Reverberation (echo) reduces SNR by distorting the signal; the softer sounds are masked over by the louder sounds as they bounce off hard surfaces.

• Distance reduces SNR. As sound travels, it drops 6 dB every 3 feet, while classroom noise remains constant. Projecting one’s voice to compensate for distance causes distortion because the voiced sounds are much louder, and mask the non-voiced sounds.
WHO IS AFFECTED?

• SNR requirements for children are much higher than for adults. While adults can get by with a SNR of +6, children need a SNR of +15dB

• Poor SNR hurts all children, but more severely affect those who have a hearing loss of any kind, auditory processing disorder, learning disability, attention deficit disorders, as well as those students who are English language learners, in poverty, or very young (Tuning, 2005).
FACTS ABOUT SUBGROUPS AFFECTED BY POOR SNR

- Those with minimal/mild hearing loss are often overlooked, undiagnosed or misdiagnosed.
- Of those students being medicated for ADHD, 69% had 10 or more episodes of Otitis Media (Hagerman, 1987).
- About 75% of elementary school children in LD classes did not have normal hearing (Flexer, 1989).
MORE ABOUT SUBGROUPS

• The auditory neurological network is not fully developed until about the age of 15, so young children do not hear and process auditory information, especially in the presence of noise, in the same way adults do (Flexer, 2003).

• Children in poverty receive about 35% of early verbal stimulation compared to their middle class peers; this language disadvantage affects auditory comprehension in the classroom (Hart, 2003).
SOUND FIELD AMPLIFICATION MAY HELP ALL SUBGROUPS

• For all subgroups, a clear signal and a SNR of at least +15dB is essential for learning.
• Sound field amplification systems have been found to be very effective in meeting this need for a good listening environment, both in terms of cost and student success, for all children (Flexer, 1995).
WHAT ARE SOUND-FIELD SYSTEMS?

• These sound systems use a wireless microphone that amplifies a teacher’s voice 8-10dB, and evenly distributes that signal through 4-6 speakers placed around the classroom.

• A hand-held microphone is also used by students when speaking aloud to the class. (Flexer, 1995)
DO SOUND SYSTEMS REALLY WORK?

- The first major research regarding sound-field systems was the MARRS project (1978-1981) to see if sound systems would help students with mild/mod. hearing loss.
- Surprisingly, ALL students with classroom amplification made the greatest reading and language arts gains at a faster rate and at a higher level than the others (Use of, 2005).
CLASSROOMHEARING.ORG

• Is an excellent resource for more information about sound-field systems.
• Has numerous references to other studies that support the findings of the MARRS study, as well as a summary of benefits.
• Benefits include: improved student attention, behavior and participation; gains in academic and achievement scores; reduction in special education referrals; reduced teacher stress and vocal strain.
TEACHERS LOVE THEM!

• Laurie Allen, educational audiologist in Iowa, asked teachers to rate 9 items according to usefulness in the classroom.

• Among teachers who used sound systems, the systems received the highest rating, even above projectors, TV and computers.

www.lifelineamp.com/education/research.cfm
HOW CAN I GET ONE?

• Funding sources schools have used: Early Intervening, Title I, Special Education, ELL, Instructional Technology, community partners, grants, PTA, bonds, school improvement funds

• If school administrators are not convinced, offer to do a pilot study. Use rating scales such as LIFE (Listening Inventory for Education) and pre/post reading tests or inventories. Visit other schools using the sound systems.
WRAP UP

• Don’t work on this alone – recruit others to help investigate and share information.

• Build a case by identifying at-risk students who would be affected by poor SNR in your classroom. Use *Fisher’s Auditory Problems Checklist* and *History of Ear and Hearing Problems*. 