

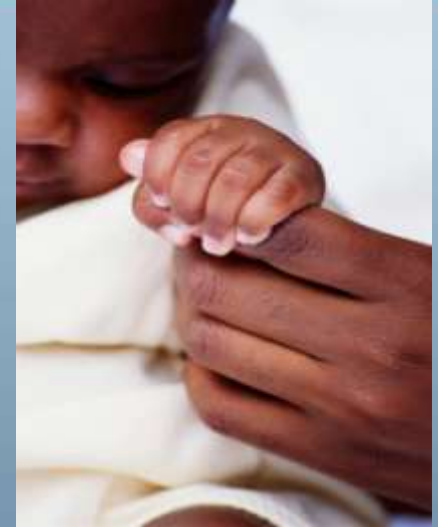


The Two I's in EHDI: Intervention and Impact



Teresa H. Caraway, Ph.D., CCC-SLP, LSLS Cert. AVT
Hearts for Hearing
Oklahoma City, OK

Hearing Loss Facts: Brief Overview



- The most common birth anomaly:
2 to 3 per 1,000 babies
- Each year, 16,000 to 18,000 new babies and toddlers identified with hearing loss in the U.S.
- Left undetected, hearing impairments in infants can negatively impact speech and language acquisition, academic achievement, and social and emotional development. If detected, however, these negative impacts can be diminished and even eliminated through early intervention.

<http://www.infanthearing.org/screening/index.html>

Hearing Loss Facts: Brief Overview



- Ninety-two percent of babies who are born deaf are born to two hearing parents. Mitchell & Karchmer, (2004).



- Low awareness about the incredible opportunities for children today.



Everything we know and understand about childhood hearing loss has changed.

Why?

Because of technology and brain neuroplasticity we are in position to provide new and expanded possibilities for infants who are born deaf or hard of hearing.

At No Other Time in History



- **Infant Hearing Screening**

- ABR
- OAE

- **Technology**

- Hearing Aids
- Cochlear Implants
- FM Systems
- Soundfield Systems



- **Early Intervention**

Built for Change

Hearts for
Hearing
FOUNDATION



It's All About the Brain



- **Hearing loss is not about the ears - it's about the brain**
- **Hearing Aids and Cochlear Implants are not about the ears – they are about the brain**
- **We hear with the brain – the ears are just the way in**

- Cole and Flexer , 2007

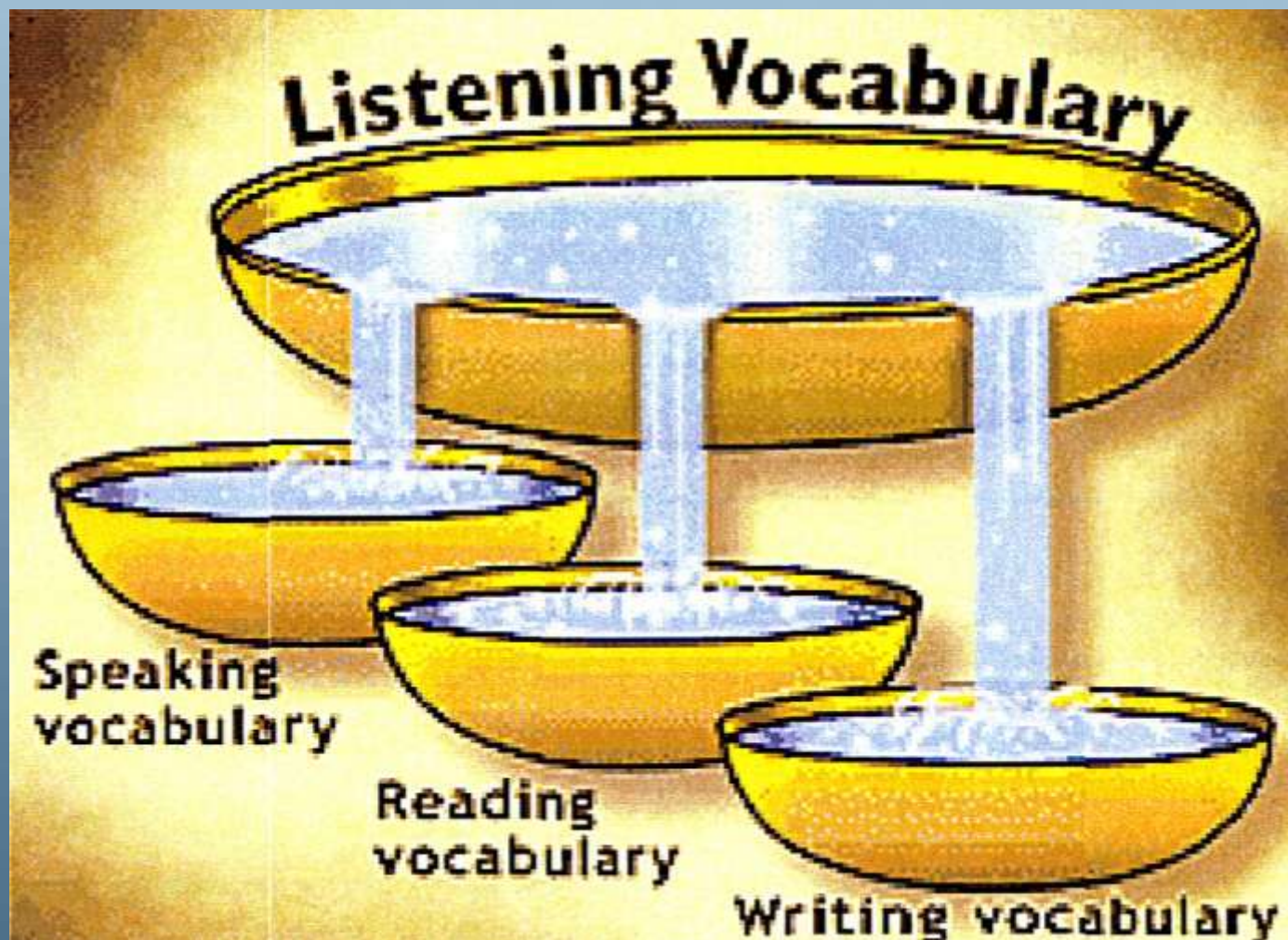
Hearing Is a First Order Event



- Hearing is acoustic access to the brain
- Hearing is a first-order event for the development of spoken communication and literacy skills.
- Anytime the word "hearing" is used, think "**auditory brain development**".
- Acoustic accessibility of *intelligible* speech is essential for brain growth.
- Hearing is the "velcro" to which other skills such as attention, spoken language, reading, and academic competencies are attached.

-Cole and Flexer, 2007

Hearing is a First Order Event



Neuroplasticity



- Hearing loss/deafness has been shown to change the higher auditory brain centers.
- The auditory cortex is directly involved in speech perception and language processing in humans (Kretzmer et. al, 2004).
- Normal maturation of the central auditory pathways is a precondition for the normal development of speech and language skills in children (Sharma et. al, 2008).

Neuroplasticity



- Early Literacy Development
 - In the first six months, babies can discriminate many speech sounds, but by the end of the 1st year, there is a functional reorganization to language specific phonemes; infants become language specific listeners between 6 and 12 months of age.

Werker, 2007

The Infant's Brain

- An infant's brain is neuroplastic
- The younger the infant, the greater cortical real estate
- An infant's brain continues growing beyond the womb – not just in size, but in forming connections
- An infant's brain changes itself from experiences (Doidge, 2007)



EDHI: I²

Intervention and Impact



Because of EHDI, hearing technology and brain neuroplasticity....

When clear programmatic alternatives are available, the choices made by parents of children who are DHH have changed dramatically over time.

- In 1995: 40% chose spoken language outcome, compared to 60% who chose sign-language outcomes
- In 2005: 85% chose spoken language outcomes, compared to 15% who chose sign-language outcomes

Brown, C. (2006)

EDHI: I²

Intervention and Impact



Because of EHDI, hearing technology and brain neuroplasticity....

- The family's desired outcome guides us
- The audiologist's role is key in early intervention
- The landscape of deafness has changed
- The infants of today represent a new and different generation of children who are deaf.

Hearing Loss is a



Neuro-developmental Emergency



Remember 1, 3, 6!



“ Muddy inMuddy out”



***Every childhood hearing loss,
no matter how slight,
warrants auditory management***

Hearing Loss in Infants and Children

Classifications of hearing loss:

- congenital or acquired
- degrees of severity
- type of hearing loss

conductive
sensorineural
mixed



aimee
adams
photo

Severity of Hearing Loss: Minimal to Profound



An important classification of hearing loss is severity:
How much sound reception is blocked from the brain.
(Northern & Downs, 2002).

- Minimal or slight hearing loss: 15 to 25 dB
- Unilateral hearing loss
- Mild hearing loss: 25 to 40 dB
- Moderate Hearing Loss: 40 to 50 dB
- Moderately-Severe Hearing Loss: 55 to 70 dB
- Severe Hearing Loss: 70 to 90 dB
- Profound Hearing Loss: 90 dB or Greater

**The severity of hearing loss no longer
determines outcomes**

The Effects of Minimal or Hearing Loss 15 to 25dB



A minimal, borderline, or slight hearing loss may cause difficulty for children in the following areas:

- Distinguishing distant or soft speech
- Responding appropriately to subtle conversational cues
- Keeping up to speed in rapid-paced interchanges
- Detecting subtle phonetic markers in grammar – plurals, possessives, regular tense

(Northern & Downs, 2002; Tharpe, 2006)

The Effects of Unilateral Hearing Loss



- Bess et al (1986) showed that approximately 1/3 of children with unilateral hearing loss failed a grade. Children with unilateral losses are 10 times greater risk for academic failure.
- 37% fail if loss in poor ear is severe to profound (even when hearing in good ear is normal).
- Children with right ear as poor ear have a 35% chance of failing as opposed to only a 7% chance if left ear is the poor ear.
- Recently, Lieu (2004) described similarly negative consequences for children with unilateral hearing loss.
- **Remember, these studies examined children with one normal hearing ear!**

The Effects of Mild Hearing Loss 25 to 40 dB



Without audiological management a child with:

- A 30 dB hearing loss can miss 25 to 40% of the speech signal (Mueller & Killion, 1990; Northern & Downs, 2002).
- A 30 to 40 dB hearing loss can miss up to 50% of family or class discussions, especially with far-off or soft voices.
 - “Daydreamer”; “Hearing when he wants to”; “Not trying” (Estabrooks, 2006; Tharp, 2006)

The Effects of Mild Hearing Loss 25 to 40 dB



Without audiological management a child with a mild hearing loss:

- May be at least one grade level behind (Northern & Downs, 2002; Tharpe, 2006).
- Often is more fatigued or irritable than typical hearing peers (Anderson, 2004).

Appropriate hearing aids/FM systems and early intervention can overcome the secondary negative effects of hearing loss.

(Cole & Flexer, 2007).



Children with minimal, mild or unilateral hearing loss can benefit from early intervention services. Left undetected, mild or unilateral hearing loss can result in delayed speech and language acquisition, social-emotional or behavioral problems, and lags in academic achievement.

Yoshinaga-Itano et al,(1998); Bess, F. (1985). Bess, F. et al, (1988).

The Effects of Moderate Hearing Loss 40 to 55 dB



A child with a moderate hearing loss may understand face-to-face conversational speech from 3 to 5 feet away in a quiet room if content and vocabulary of the message are known. Without audiological management:

- A 40 to 50 dB hearing loss, can miss 50 to 75% of speech in a classroom. (Mueller & Killion, 1990.)
- Impaired speech production, delayed or defective syntax and limited vocabulary, deficits in social interactions often occurs. (Meyer, 2003).

The Effects of Moderate Hearing Loss 40 to 55 dB



By 4th grade, children without appropriate early intervention for their hearing losses often fall at least two grade levels behind. (Northern & Downs, 2002; Ross et al, 1991).

Appropriate use of hearing aids/FM systems and early intervention supporting the parents' desired outcome can overcome the secondary negative effects of hearing loss.

The Effects of Moderately-Severe Hearing Loss: 55 to 70 dB



Without audiological management:

- A child with an unamplified 55 dB hearing loss can miss 100% of classroom content. (Mueller & Killion, 1990).
- Spoken communication must be very close and loud to be minimally understood if amplification is not worn.
- Will have significant difficulty in school evidenced by delayed language, syntax, reduced speech intelligibility, and perhaps atonal vocal quality. Social interactions likely difficult.

Appropriate use of hearing aids/FM systems and in some cases cochlear implants and early intervention supporting the parents' desired outcome can overcome the secondary negative effects of hearing loss.

The Effects of Severe Hearing Loss 70 to 90 dB



A child with a severe hearing loss:

- Cannot hear conversational speech without amplification.
- With appropriate amplification (hearing aids or more likely cochlear implants) should be able to detect all the speech sounds and conversational speech. (Ling, 2002).
- Will not develop spoken language well or at all without appropriate early use of technology followed by language intervention that focuses on learning spoken language through listening.

With Appropriate use of hearing technology and specialized early intervention children can learn in a mainstream environment.

The Effects of Profound Hearing Loss 90 dB or Greater



A child with a profound hearing loss:

- Cannot hear speech or environmental sounds without amplification.
- Degree of hearing loss does not determine outcomes because of early use of hearing technology and auditory habilitative services.
- Audiometric deafness does not preclude auditory brain access and auditory neural development when cochlear implants are used.
- If the family has spoken language as a desired outcome for their baby that outcome is likely if we do what it takes.

Special Issues: Auditory Neuropathy/Dys-synchrony Spectrum Disorders



- **Auditory Neuropathy/Dys-synchrony (AN/AD)** is a hearing disorder in which sound enters the inner ear normally but the transmission of signals from the inner ear to the brain is impaired.
- **Incidence**: About 11% of children with moderate or greater hearing losses also have AN/AD; 50% of children with AN have at least a moderate loss.
- **Characteristics of AN/AD** are variable across patients and over time and can include:
 - normal hearing
 - hearing loss ranging from mild to greater
 - difficulty understanding speech clearly, inconsistent with degree of hearing loss
 - difficulty understanding speech in noise
 - fluctuation of hearing loss from day to day and hour to hour

Special Issues: Auditory Neuropathy/Dys-synchrony Spectrum Disorders



As many of 50% of infants with AN/AD may experience improvement in their thresholds over time (12 to 18 months).

What should be done about AN/AD?

- Early Identification
- Family focused intervention
- Treat each child on case-by-case basis
- Fit hearing aids to behavioral thresholds
(Rance, 2005)



Special Issues: Auditory Neuropathy/Dys-synchrony Spectrum Disorders



What should be done about AN/AD? Continued...

- CIs in children with AN/AD have resulted in similar benefits as children with SNHL and CIs (Shallop 2003)
- Careful monitoring of functional hearing and emerging language and speech perception by an experienced team
- Evaluate needs of child and family before treatment is determined; treatment and technological recommendations may change over time
- Research will continue to guide clinical practice



Challenges and Opportunities

- CDC reports that only 64% of children identified with hearing loss begin ANY KIND of Part C early intervention services before 6 months of age. Centers for Disease Control and Prevention, DC. *2007 EHDI Hearing Screening Reports.*
- Despite extraordinary advances in early identification, early access to sound through technology and early intervention, there is widespread agreement among researchers, clinicians, program administrators and policy makers that many children ages 0-5 with permanent hearing loss are not receiving the benefits. White KR (2007); White KR (2004).



Challenges and Opportunities



- Improving early intervention services of children with hearing loss will require a coordinated sustained initiative. Given state budget limitations, public-private collaborations continue to be an attractive alternative. Continued efforts should address documented gaps in service to:
 - Improve family support/education programs
 - Establish new or strengthen existing EI programs in both public and private settings
 - Establish new or strengthen existing personnel prep programs
 - Develop and disseminate public awareness and education materials
 - Conduct applied research and outcome studies
 - Explore use of distance education and technological solutions for pre-service and in-service education of early interventionists, health care providers, audiologists and others
 - Work with professional organizations to develop appropriate certifications/credentials for services to the DHH pediatric population.

Call to Action



- Establish and continue close working relationships with your state EHDI program.
- Determine the average age of enrollment in early intervention for children diagnosed with hearing loss. Goal is before 6 months or as soon as possible...what is at stake?

BRAIN DEVELOPMENT

- Enhance professional development opportunities for providers to support the early learning of this new and different generation of children who are deaf or hard of hearing.



“The fellow that can only see a week ahead is always the popular fellow, for he is looking with the crowd. But the one that can see years ahead, he has a telescope but he can't make anybody believe that he has it.”

- Will Rogers

Summary

Hearing loss is about the BRAIN... The infants of today represent a new and different generation of children who are deaf.

- As soon as possible, audiologists, must determine the nature, degree, and configuration of a child's hearing loss.
- Parents should engage in a discussion of their desired outcomes for their child. Unbiased and clear programmatic options supporting the desired outcomes of the parents should be provided.
- As soon as possible, audiologists, speech-language pathologists, early interventionists, educators of the deaf and family members must team together to ensure consistent provision of a signal that makes soft, medium, and high level speech audible but comfortable.

Summary

Hearing loss is about the BRAIN... The infants of today represent a new and different generation of children who are deaf.

- Current hearing technology must be maximized to give children optimal auditory brain access.



- At all times, audiologists, speech-language pathologists, early interventionists, educators of the deaf and family members must team together to ensure that a child's speech, language, and auditory skill development is optimized with the goal being to match or exceed age-appropriate development.

Contacts



Hearts for Hearing

3525 N.W. 56th Street

Building A, Suite 150

Oklahoma City, OK 73112

Teresa.Caraway@heartsforhearing.org

National Center for Hearing Assessment and Management

NCHAM

www.infanthearing.org

Kwhite@usu.edu