

Cued Speech and Cochlear Implants: Powerful Partners



Jane Smith

Communication Specialist

Montgomery County Public Schools

Jane_B_Smith@mcpsmd.org

Agenda:

- ❑ Welcome and remarks
- ❑ Cochlear implants—how they work and how they have evolved
- ❑ How cochlear implants are changing the education of the deaf
- ❑ Where does Cued Speech fit in?
- ❑ Research on cochlear implants and Cued Speech
- ❑ Student profiles
- ❑ Wrap up and discussion

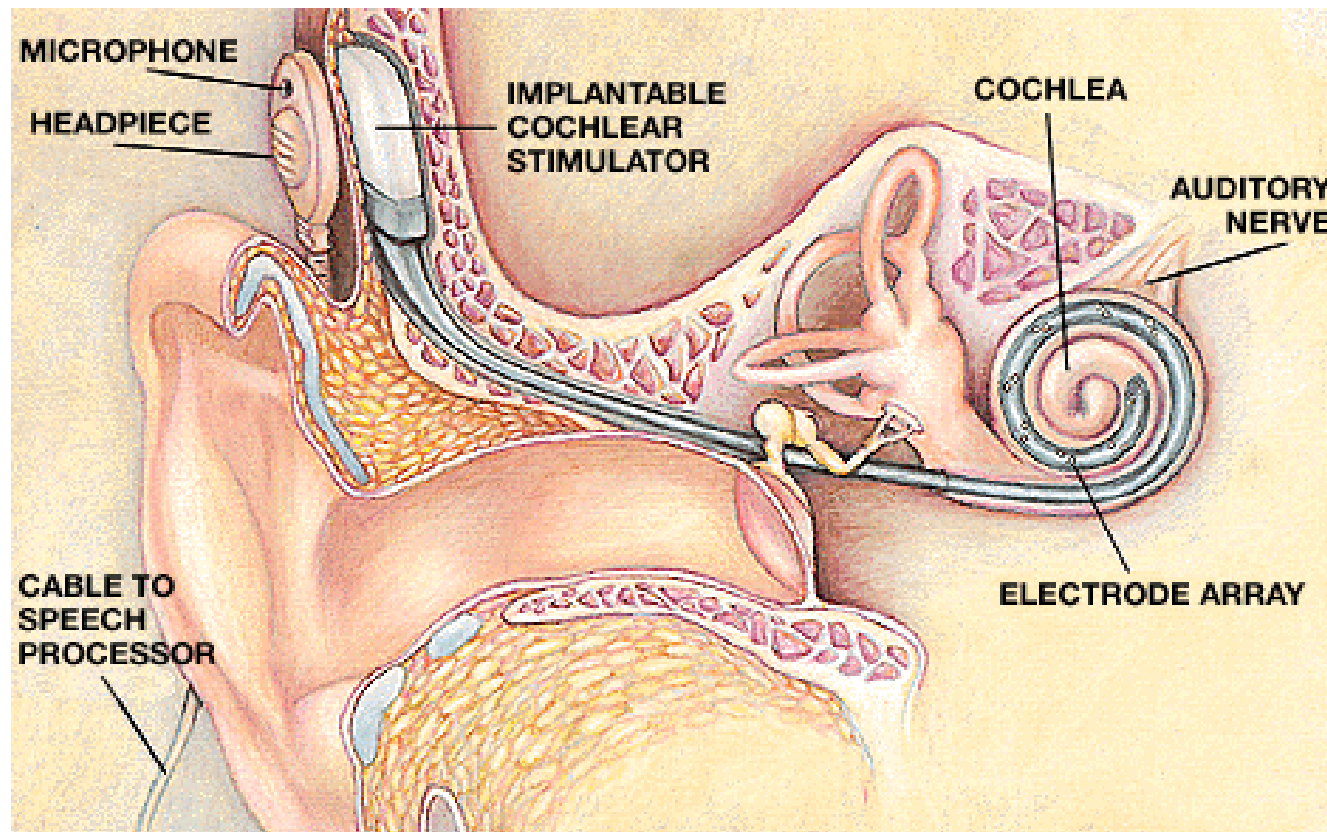
What is a cochlear implant?



“A cochlear implant is an electronic device designed to help individuals with a hearing loss who gain little or no benefit from hearing aids.”

-CI Manufacturer

Cochlear implant



How does a cochlear implant work ?

- ❑ Sounds are picked up by a microphone
- ❑ The signal is then coded into electrical pulses in the speech processor
- ❑ The pulses are sent to the coil (head piece) and transmitted across the skin to the internal receiver
- ❑ The receiver sends these pulses to the electrodes in the array
- ❑ The electrodes stimulate the hearing nerve
- ❑ The hearing nerve picks up these pulses and sends them to the brain
- ❑ The brain recognizes these signals as sound and interprets them

Hearing aid

- Acoustic signal
- Amplifies sound that travels through the middle ear to the cochlea

Cochlear implant

- Electronic signal
- Bypasses the middle ear
- Electrodes transmit signals to the auditory nerve

Older cochlear implant device



New devices



Advanced Bionics' 90K Hi-Resolution Cochlear Implant System



Cochlear America's Nucleus 24 Contour Cochlear Implant System



Med-El's COMBI 40+ Cochlear Implant System

Differences in devices?

- ❑ No proven differences in effectiveness of devices
- ❑ All have a BTE
- ❑ All are approved for use with children

There are increasing numbers of deaf children with quality access to sound

- Approximately 14,000 children in the US under the age of 18 have cochlear implants (all manufacturers)
- 52% are 0-5 years
- 37% are 6-13 years
- 11% are 14 -18 years

(from Cochlear Corporation, June 2005)

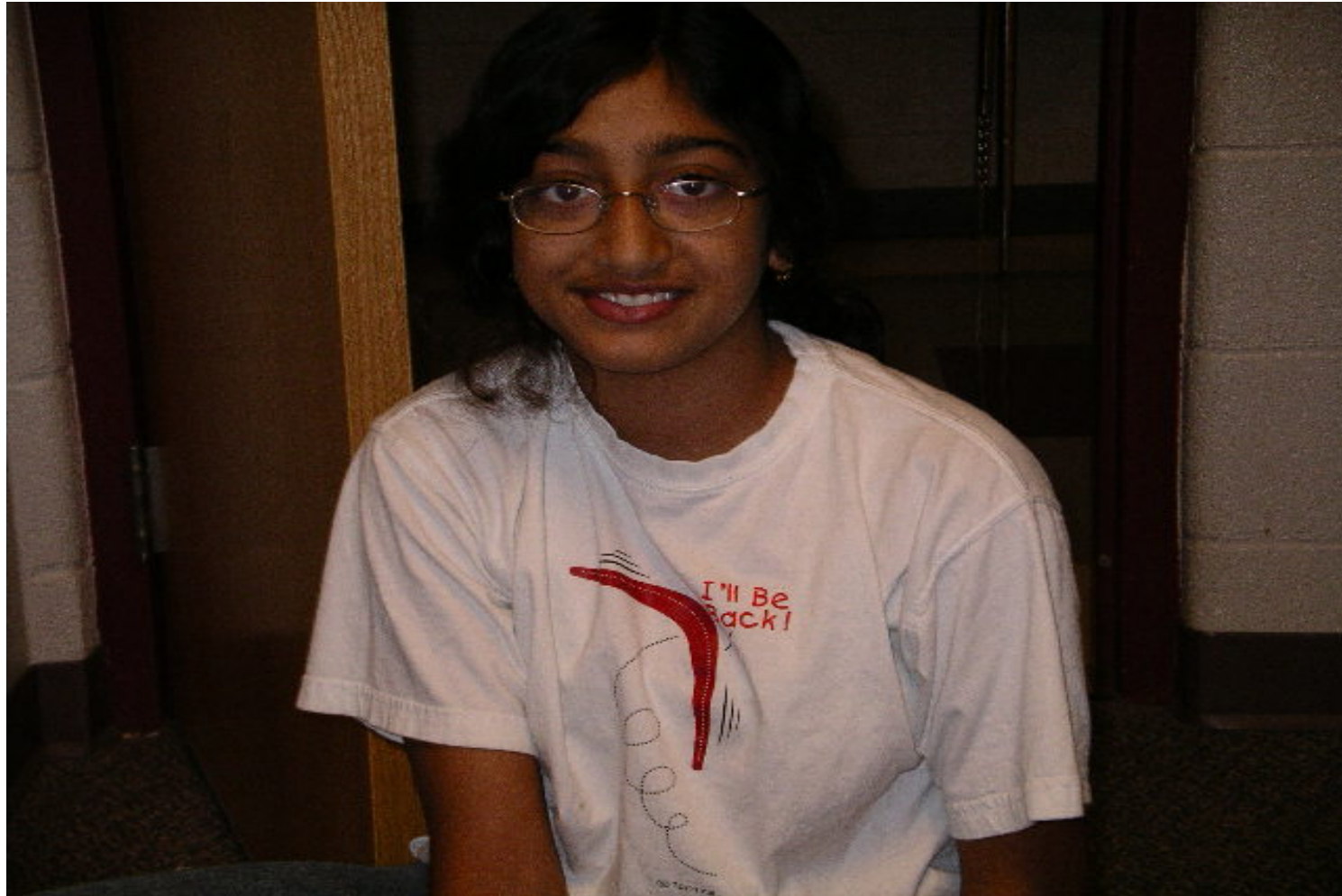
Increasing numbers of children have cochlear implants

- ❑ Children are being implanted early
- ❑ At many hospitals, the majority of children implanted are under the age of two
- ❑ FDA allows implantation at 12 months, many are implanted younger
- ❑ Predictions are that half of all deaf children will have a CI soon

Trends and Facts--CIs

- ❑ 20-25% annual increase in cochlear implants
- ❑ Bilateral implantation is a trend
- ❑ Common and beneficial to use hearing aid on opposite ear
- ❑ Trend is to reduce visual information when teaching deaf children

Cochlear implants have changed the way deaf children can receive information



A child with a cochlear implant has the benefit of:

- ❑ Improved access to sound
- ❑ More incidental learning
- ❑ Less didactic teaching
- ❑ More high frequency listening information available
- ❑ Ability to learn new information through listening

However . . .



Cochlear implants have not solved:

- ❑ Noise, distance and reverberation
- ❑ Speed, depth and complexity of language
- ❑ Hardware problems—A CI *will* malfunction
- ❑ Deafness—a child is deaf when the CI is off
- ❑ The diversity of our deaf population

Deaf children are diverse

- ❑ Outcomes for children with CIs vary
- ❑ Children with secondary disabilities constitute about 40% of D/HH children
- ❑ 41% of the population of D/HH children are from minority or culturally diverse families
- ❑ At least 16% of D/HH children under 18 are living in poverty

Where does Cued Speech fit in?

- ❑ Educators and parents must safeguard language development of deaf children
- ❑ Because deaf children are diverse and because cochlear implants don't conquer every obstacle, a visual representation of spoken language is essential
- ❑ Technology doesn't necessarily bring understanding to the brain



Cued Speech...

- ❑ Conquers distance, noise, and reverberation
- ❑ Gives the child access to language when the CI is off or not working properly
- ❑ Gives something extra for deaf kids with additional learning/processing problems
- ❑ Assures equal opportunity for all CI children
- ❑ Gives visual clarity and specificity for what is being talked about

Visual component in oral programs

- Even oral and A/V programs use vision to clarify what is heard
 - Auditory Verbal mentions “auditory sandwich”
 - Auditory Oral programs use “Mouth Time,” “Visible Speech”
 - Gallaudet’s programs use “Visual Phonics”
 - Some oral and auditory verbal programs use “Rhythmic Phonetics.”

Sign language and cochlear implants

- ASL is not English—cannot speak and use ASL

- Schools for the deaf don't know what to do
 - sign supported speech?
 - Sim/com?
 - SEE or Signed English?
 - Part of the day, all day? Changing guidelines

Recent research

- 2002, Belgium: Information delivered visually through Cued Speech may help to refine the speech perception received through the cochlear implant (Leybaert, 2002)

Recent research *(cont'd)*

- 2003: Cued Speech users use the same parts of their brain –the auditory cortex— to process phonological information as hearing peers (LaSasso, Crain, Lansdale, Cappell, Zeffiro, Eden, 2003)

Recent research *(cont'd)*

- 2003: CI children who used Cued Speech showed rhyme sensitivity equivalent to age-matched peers. Exposure to Cued Speech reinforces the cross-modal interaction between auditory and visual cortex. (LaSasso, Crain, Leybaert, 2003)

Recent research *(cont'd)*

- 2005: Speech, for hearing people, is a bimodal percept when we see and hear the voice and lip movements of the speaker. The brain combines what it sees and hears to make the best guess of what is said. Children who get cochlear implants before 30 months are able to fuse the auditory and visual aspects of speech. (Schorr, Fox, van Wassenhove, Knudsen 2005)

Personal observations--CIs after 3 years

- After language—Cued Speech children have an internalized “phonological grid”
- Hear what they have internalized visually
- Listening progress is quick
- Children interpret the sound they are hearing through electrical stimulation that they are seeing through Cued Speech

Personal observations--CIs before 3 years

- ❑ Develops internal phonological model of speech that sets a foundation for literacy
- ❑ Child can see morphological structures that are difficult to hear—plurals, possessives, tenses, “little words”
- ❑ Safeguards language development and literacy

Personal observations--school age CI children

- ❑ Additional problems often show up when children start school (apraxia, auditory processing, learning disabilities)
- ❑ Problems of distance, noise and reverberation can be solved only somewhat with FM
- ❑ The speed and amount of information and new vocabulary in mainstream classes is helped

Auditory-oral or A/V first?

- Why wait?
- If you wait to use Cued Speech, the child's progress may lag
- Cued speech supports perception/production loop
- Use Cued Speech as early as possible so that children with cochlear implants can compete with hearing peers

Sign language first?

- ❑ Why wait to use Cued Speech?
- ❑ Most parents of deaf children are hearing
- ❑ Use Cued Speech as early as possible for literacy development
- ❑ Use both, but keep them separate

Literacy, CIs and Cued Speech

- ❑ Reading is understanding spoken language in written form
- ❑ Children *must* make a connection between written and spoken language
- ❑ A typical hearing child's phonemic repertoire of language is complete by seven (Fry, 1966)
- ❑ As a child's vocabulary develops, he/she compares similar sounding words and keeps the words in his brain as a "mental lexicon." (Goswami, 2002)
- ❑ Thus, we remember vocabulary and become flexible with words by storing them based on their parts

More on literacy

- Children with normal hearing understand about 14,000 words by the time they are six (Goswami, 2002)
- You need to know a language in order to hear it properly.
- Meaning determines the grammatical structure of sentences (Smith, F. 2004)
 - The onion was planted by the tree/The onion was planted by the farmer
 -multiple meaning of "check"
 - bring your card to the library....Get carded...

Cued Speech along with cochlear implants supports literacy

Student Profiles



Nick

- ❑ Eleven years old
- ❑ Meningitis at 5
- ❑ Lost all hearing
- ❑ Speech was unintelligible
- ❑ Spanish is the language of the home
- ❑ CS kept phonological grid in place
- ❑ Is on grade level now

Darren

- ❑ Ten years old
- ❑ Implanted at two years
- ❑ Did not seem to process Cued Speech
- ❑ Went to oral program
- ❑ Learned to cue expressively
- ❑ Helps with reading
- ❑ Helps with auditory memory, apraxia, pronunciation

George

- ❑ Six years old
- ❑ Only partial insertion at 2 years
- ❑ BOR syndrome
- ❑ Malformed cochlea
- ❑ Oral/motor issues
- ❑ Processing issues
- ❑ CS helps with reading, rhyming, manipulating language

Victoria

- ❑ Seven years old
- ❑ Implanted at two
- ❑ Russian at home
- ❑ Waardenburg syndrome
- ❑ Severe motor planning problems
- ❑ Reverses sequence of sounds
- ❑ CS helps in segmentation and blending

Sharon

- ❑ Seventeen years old
- ❑ Implanted at fifteen
- ❑ Excellent hearing aid user/CS since preschool
- ❑ Above grade level since kindergarten
- ❑ Excellent benefit from CI
- ❑ Still uses Cued Speech to get every nuance of language in the classroom

Mary

- ❑ Eight years old
- ❑ CI at 2 years
- ❑ Excellent speech
- ❑ Excellent use of hearing
- ❑ Fully mainstreamed
- ❑ Cued Speech clarifies language
- ❑ (Hears “darefoot”/“barefoot”; “icebird”/ice berg”; “movie”/“smoothie”; “Sea cow”/“see saw”)

Summary

- ❑ Cochlear implants are changing deaf education
- ❑ Cued Speech . . .
 - verifies what is heard
 - creates phonological awareness necessary for literacy
 - builds a kinesthetic feedback loop for speech, and
 - ensures progress and safeguards language development for all deaf children
- ❑ Cued Speech and cochlear implants are powerful partners