YES YOU CAN CUE 30 MILLION WORDS:
Building a Child's Brain with Cued Speech

Presented By: Sandy Mosetick

EHDI National Conference – March 10, 2020

TODAY'S JOURNEY

Our goal is **to "Galvanize"…**

: to cause people to become so excited or concerned about an issue, idea, etc., that they want to do something about it

: to cause a force, that is capable of causing change, to become active (Merriam-Webster)

…**Parents**, with support from EI providers:

- **To combine the use of the latest technology AND "Parent Talk" to "Build a Child's Brain"** and lay the foundation for unlimited academic achievement and social integration;
- To recognize the 0-3 age range as time of greatest "neurological emergency"; **AND**
- **To use Cued Speech**, during this time period and beyond, **to empower parents to communicate effectively and efficiently with their child and *supercharge* their Parent Talk!**

An OVERVIEW OF THE JOURNEY

- Why 30 Million Words?
  - The findings of Hart & Risley re: “Meaningful Differences” in academic achievement of young hearing children
  - Enter Dr. Dana Suskind: Why early implantation is not enough and the science of “Building a Child’s Brain”
  - The “Thirty Million Word (TMW) Initiative” – Dr. Suskind’s curriculum for parents
- Why CUE the 30 Million Words?
  - What is Cued Speech (CS) and how does one learn it?
  - CS makes spoken language accessible in ALL listening conditions
  - Children do not become “dependent” on CS – rather, CS empowers children to understand those who do not cue by creating language, listening and lipreading competence
  - CS is a perfect partner with CI’s and digital HA’s

Why 30 Million Words? The Work of Hart & Risley*

- Method: Hart & Risley followed hearing children from 42 families from 4 different socioeconomic status (SES) groups, from age 7 months old until age 3. Once per month, for an hour, researchers visited each home and recorded copious amounts of data as to the quantity and type of language being used with each child.
- Caveat regarding findings: Although differences in language input varied significantly by SES group, and results were summarized by these groups, "the essential factor that determined the future learning trajectory of a child was the early language environment: how much and how a parent talked to a child…no matter the educational or economic status of that home…. It was as simple as that." (Suskind, 2015)
- Summary of Findings: The "Meaningful Differences" between the highest and lowest SES groups were "staggering" in terms of sheer quantity of words spoken – amounting to a difference of 30 Million Words over the first four years of life, but also significant differences in QUALITY of language used, including richness of vocabulary, responsiveness to children (vs. just giving "directives"), and expressions of verbal approval. [Details on next slide!]

** Summarized from original works by Hart & Risley ("Meaningful Differences" 1995 & "The Early Catastrophe" 2003) and from the book written by Dr. Dana Suskind ("Thirty Million Words: Building a Child's Brain" 2015).*

Findings of Hart & Risley – More Detail*

- The 30 Million Word difference: In one hour, children from the highest SES group heard over 2000 words, while children from the lowest SES group heard just over 600, which extrapolates to a difference of over 30,000,000 words by the end of age 3.
- Richness of Vocabulary: "86%-98% of the words used by each child, by age 3, were derived from their parents' vocabularies…. Not only were the words used nearly identical, but the average number of words used [in an utterance], the duration of conversations, and the speech patterns were all strikingly similar to their caregivers'."
- Responsiveness: The highest SES parents responded to their children about 250 times per hour and the lowest, fewer than 50. Best case: more "chit-chat", less "directives".
- Verbal Approval: Children in the highest SES group heard about 40 expressions of verbal approval per hour and children in the lowest heard only about 4. Best case: use "Affirmations" vs. "prohibitions".

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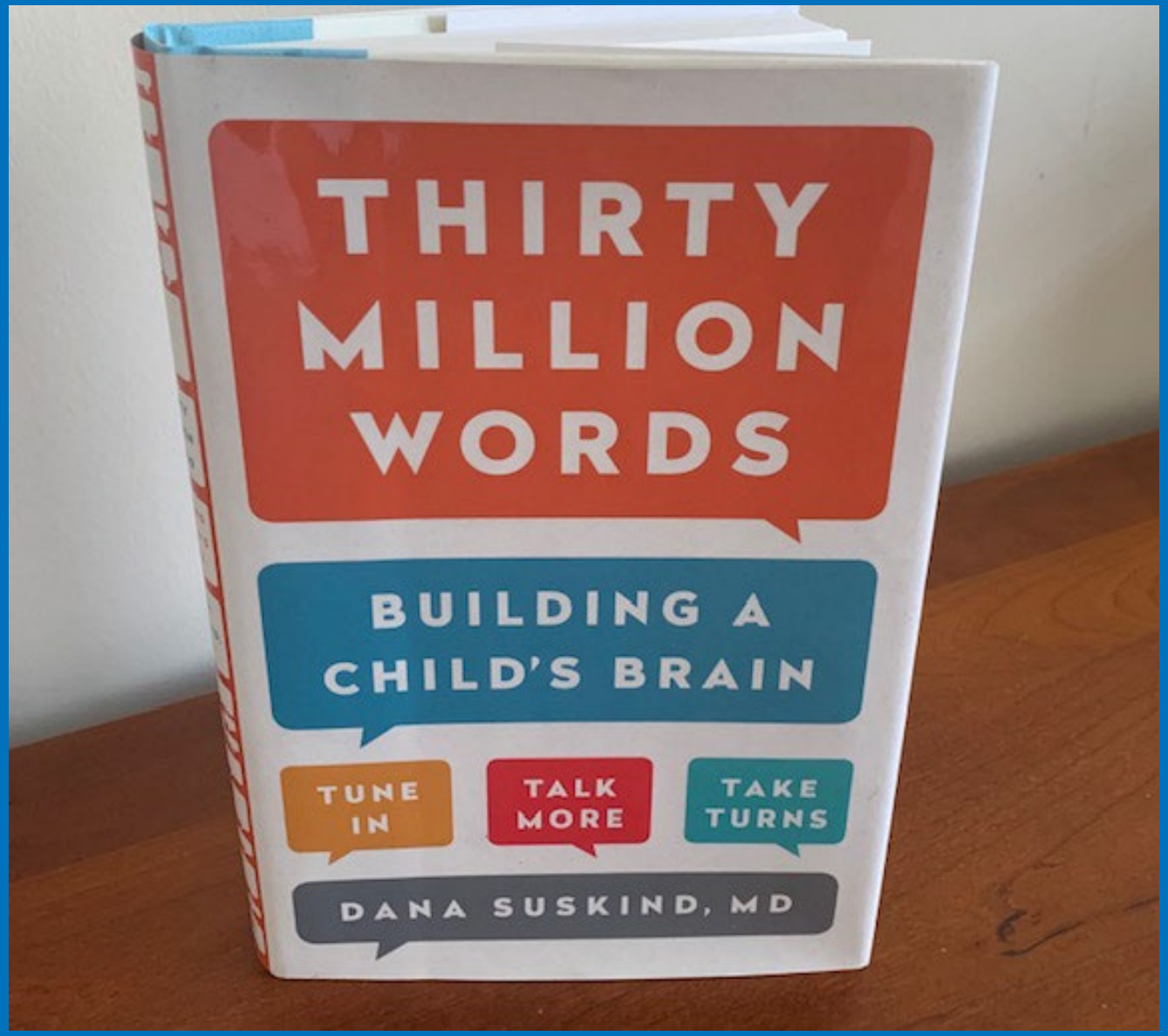

The "Thirty Million Words" Initiative of Dr. Dana Suskind: Why Early Implantation Alone is Not Enough

Dr. Suskind observed that some children who were implanted in infancy did well with their implants, while others did not. Her search for an explanation led her to the work of Hart and Risley and the follow-on research of Anne Fernald, Stanford professor:

"The thirty million word gap is really about the brain and its development."

THE SCIENCE OF BUILDING A CHILD'S BRAIN*

- How the brain develops and why "the early language environment is the catalyst for who we are and what we can become."
  - From birth to about 3, the brain creates 700-1000 additional neuronal connections per second, affecting all brain function, including memory, emotion, behavior, motor skills, and LANGUAGE.
  - Synaptic pruning also occurs during this period, such that superfluous connections are weeded out and those used more often are fine-tuned, creating the "**connectome**".
  - "Never again will the brain have the same degree of neuroplasticity".
  - Language accrual in the first 3 years helps provide a foundation for social, emotional AND cognitive development.
- "The incredible power that helps nurture the brain into optimum intelligence and stability is '***Parent Talk'*** or ***parent language".***

**All of the above are summarized or quoted from Suskind, 2015.*

THE IMPORTANCE OF PARENT TALK / PARENT LANGUAGE

"Parent language influences our ability to reach our potentials in math, spatial reasoning, and literacy; our ability to regulate our behavior; our reaction to stress; our perseverance; and even our moral fiber." (Suskind, 2015)

- What kinds of language would influence these abilities?
- What about "verbal praise"? The "growth mindset movement", led by Stanford professor Carol Dweck, affirms that verbal praise should be process-based, recognizing hard work, drive and determination ("grit"), rather than simply labeling a child as "smart" or "good".
- Development of "executive functioning" and "self regulation" – and how does parent talk play a role in developing these abilities?
  - The "zone of proximal development" – using language that eases children to the next level of understanding and behavior
  - The power of suggestions and prompts vs. directives and commands
  - Using language and modeling behavior that encourages self-regulation
- What about the bilingual home?

TRANSLATING THEORTY INTO ACTION:
Dr. Suskind's "TMW Initiative"

- Dr Suskind's "TMW Initiative" uses a curriculum with a core strategy of the 3 T's:
  - Tune In: Parent makes conscious effort to notice what child is focused on and then, when appropriate, talks with the child about it. Get to his level, use child-directed speech, respond promptly, use repetition, show warmth. Provides sense of security.
  - Talk More: Talk with the child, not to him. Narrate what you are doing and use parallel talk to describe what he is doing. Use labels instead of pronouns. Use abstractions. Expand on his language.
  - Take Turns: Read communication clues from babies, decode and respond. Wait for child's response. Ask open-ended questions.
- Book Sharing is important: "Reading with a child from the first day of life develops literacy skills and love of books…. How much a parent reads to a child during the first few years of life has a significant impact on the child's school readiness and ultimate life trajectory."
- See Dr. Suskind's book for hundreds of ideas/examples of fantastic "Parent Talk" advice.

REVIEW: An OVERVIEW OF THE JOURNEY

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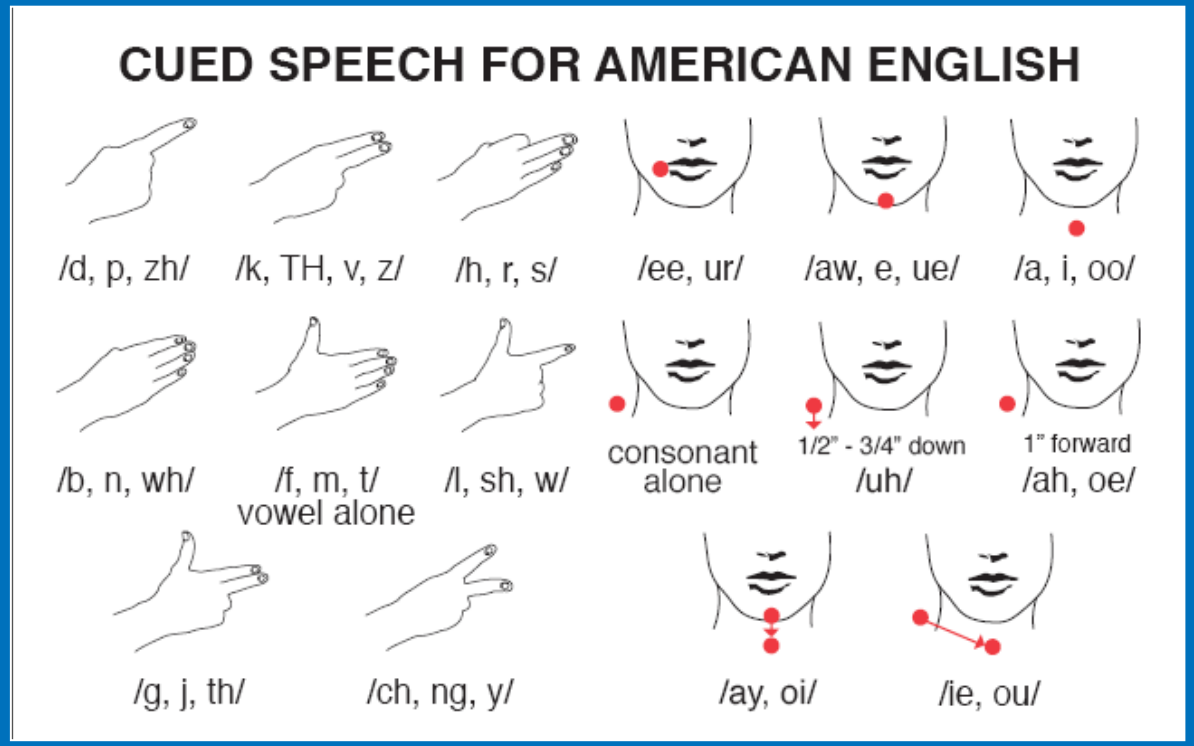
What is Cued Speech?

Cued Speech is a communication mode which combines hand “cues” with the natural mouth movements of speech, making the phoneme stream (sounds) of virtually any spoken language 100% visually distinct.

Cued Speech is a finite system, consisting of 8 different handshapes, representing consonant sounds, and 4 different locations around the mouth, representing vowel sounds.



Basic Cueing Methodology

In general, we Cue CV (consonant/vowel) pairs.

Place the consonant handshape in the appropriate vowel placement and say and Cue the CV pair (with or without voice).

Cue lone consonants in the side placement.

Cue lone vowels in the appropriate vowel location with default (number 5) handshape.

Cue diphthongs as the appropriate combination of 2 consecutive vowels.

We cue "phonemes"...not letters

English words are composed of a series of sounds we call “phonemes”.

A phoneme can be a consonant sound, a vowel sound, or a diphthong.

We Cue phonemes, not letters: when Cueing a word, think about how to pronounce it, not how to spell it.

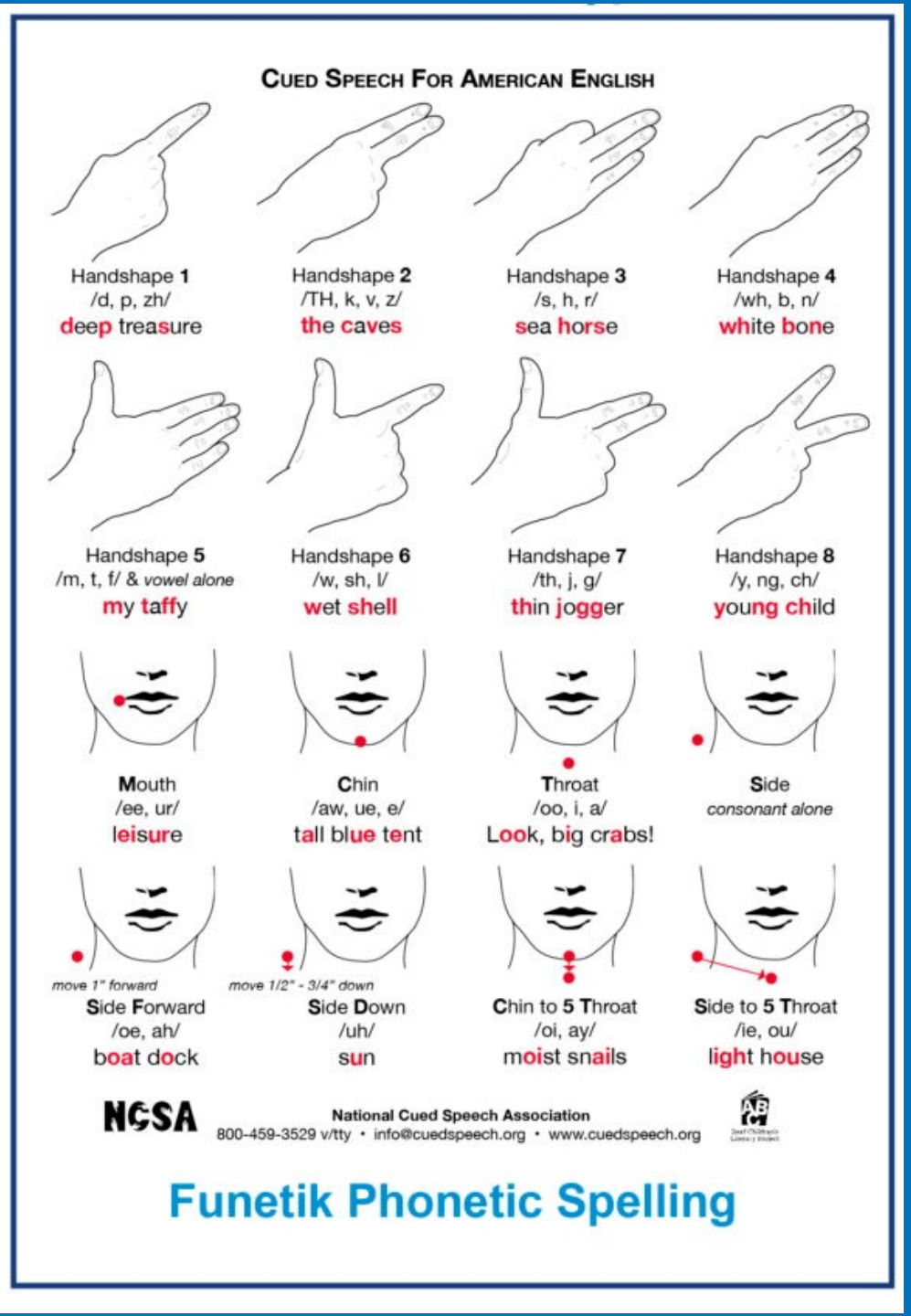
English has only 40 phonemes. That is the number of sounds you will need to learn to Cue!

What phonemes make up each word?

Tough -- /t/, /uh/, /f/

Though -- /TH/, /oe/

Through -- /th/, /r/, /ue/



Let's Cue a few words!

- Mommy 5sf,5m
- Daddy 1t,1m
- All gone 5c,6s,7c,4s
- Hi 3s-5t
- Boy 4c-5t
- Girl 7m,6s
- Pink 1t,8s,2s
- Blue 4s,6c
- I love you 5s-t,6sd,2s,8c

Cued Speech is Easy to Learn

Most people, until recently, have learned the system via in-person, face-to-face instruction by attending a 1 or 2 day workshop offered in various geographic areas where CS resources can be found. NOW THERE IS ALSO THE OPTION TO LEARN ONLINE, at www.cuecollege.org via a self-study course that can be completed within 10-20 hours. Whether the system is learned in person or online, the average person can finish memorizing the system, and cue slowly and accurately, within a couple of weeks. Speed is acquired over time…. Parents normally increase their fluency in sync with their child's growing language base!

Cued Speech enables families to communicate easily with their deaf children, from infancy onward, using the spoken language(s) of the home.

Online instruction via Cue College is free to families with children ages 0-5.

WHY TALK ABOUT CUED SPEECH?

Average literacy outcomes and academic achievement for deaf children, even those with CI's, are generally below those of hearing children of the same age – and vary widely among individual children.*

Some of the variations can be explained by differences in "Parent Talk" among families with deaf children, as per Dr. Suskind's findings.

But to make "Parent Talk" work for deaf children, we need to consider the technological and practical limitations of CI's…and how use of CS can enable parents to surmount these limitations.

*Summarized from "Literacy Outcomes in Deaf Students with Cochlear Implants: Current State of the Knowledge" (Mayer & Trezek, 2017)

THE TECHNOLOGICAL LIMITATIONS OF CI'S

- **CI's cannot accurately convey differences between certain phonemes.** Due to technological limitations, CI's do not provide the necessary acoustic information for a child to detect differences between phonemes that differ only by "place of articulation". If auditory perceptions are not accurate enough, children will develop their language based on ambiguities, which will result in errors and delays. By design, the manual cues of CS overcome this limitation by providing unambiguous visual access to each of the phonemes of spoken language. (Leybaert & LaSasso, 2010)

- **Deaf individuals using CI's experience significantly degraded speech perception in noise**. Speech-reading can only partially help mitigate missing auditory information. An SNR (signal-to-noise ratio) of 0 dB is typical for conversation with multiple partners – and -6 dB is typical for the classroom. At these SNR's, a deaf child with a CI in an AV environment (with no CS) would have very low spoken language comprehension. Use of Cued Speech increases comprehension to the same level of that of a typically hearing person in the same listening environment. (Bayard, et. al., 2019)

CS & CI'S: PERFECT PARTNERS

- **Cue pre-implant**: Cueing prior to implantation creates a phonological language base onto which the auditory input from a CI will later be overlaid. This enables the child to rapidly (within 6 months of implantation, per Descourtieux, 1999) understand via the new auditory channel, all language acquired previously via CS. Using CS early also prevents the loss of neuroplasticity that might otherwise happen in cases of late implantation.
- **Cue during "Parent Talk" to Build Your Child's Brain:** It is important to cue when the child is being exposed to new language to make communication easy and effective (since the CI is not efficient at conveying all phonemes). There will be plenty of opportunities for auditory-only input.
- **Cue to promote auditory training AND improved speech reading abilties:** The manual cues precede the auditory signal by milliseconds, which results in a proven auditory training effect. CS users are proven to be better speech readers.
- **Cue to maintain a backup system:** A backup system is important to have at times when the implant is "off" and at times when there are adverse listening conditions (multiple speakers, noise, child is tired, etc.)

Speech Sounds (Phonemes) That Differ Only by Place of Articulation

Place Differences	Manner & Voicing the same
/b/ vs. /d/, /g/	(plosive, voiced)
/p/ vs. /t/, /k/	(plosive, voiceless)
/m/ vs. /n/, /ng/	(nasal, voiced)
/v/ vs. /TH/, /z/, /zh/	(fricative, voiced)
/f/ vs. /th/, /s/, /sh/, /h/	(fricative, unvoiced)
/w/ vs. /y/	(semi-vowel, voiced)
/l/ vs. /r/	(liquid, voiced)

Rachel's Journey...

The
Children's
Memorial
Hospital

DEPARTMENT OF COMMUNICATIVE DISORDERS

2300 Children's Plaza
Chicago, Illinois 60614
(312) 880-4000

AUDITORY BRAINSTEM RESPONSE (ABR) EVALUATION

Dates of Evaluations:
6/17/91

Auditory Status:
Severe to profound bilateral sensorineural hearing loss across all frequencies.

RE: Mosetick, Rachel
BD: 5/30/90
Parent: Sandra/Matthew
Address: 9 S. 542 Dixon Ct, Downers Grove, IL. 60516
Phone: (708) 985-4724
CMH #: 513091

REASON FOR REFERRAL: Rachel, age 1 year, was referred to the CMH Department of Communicative Disorders by Dr. Sam Girgis for an ABR to assess her hearing status. Mr. and Mrs. Mosetick report that they have noticed that Rachel does not respond as expected to sounds in the environment. They report that she has been generally very healthy following Mrs. Mosetick normal pregnancy and delivery. They believe that there might have been a change in Rachel's hearing status over the last two months, although she was not otherwise ill.

A Speech Awareness Threshold (SAT) conducted in soundfield just prior to her ABR showed an 80db speech awareness threshold, indicating at least a severe hearing loss in the better ear. Tympanometry conducted at that same time was normal for each ear indicating normal middle ear function. Reflex data could not be obtained as Rachel was crying during testing.

AUDITORY BRAINSTEM RESPONSE (ABR) FINDINGS: Auditory brainstem response to click stimuli in each ear was consistent with a severe to profound hearing loss in both ears. There was evidence of Wave V in both ears at both 95 and 90dB, which disappeared completely at 80dB. This would indicate some residual hearing in the high frequencies above 1000Hz. A tone burst of 500Hz delivered at about 60dB to each ear produced no response in either ear. There was no response to bone conducted clicks at 50 dB. This most likely ruled out a precipitous hearing loss with good hearing in the low frequencies.

RECOMMENDATIONS:

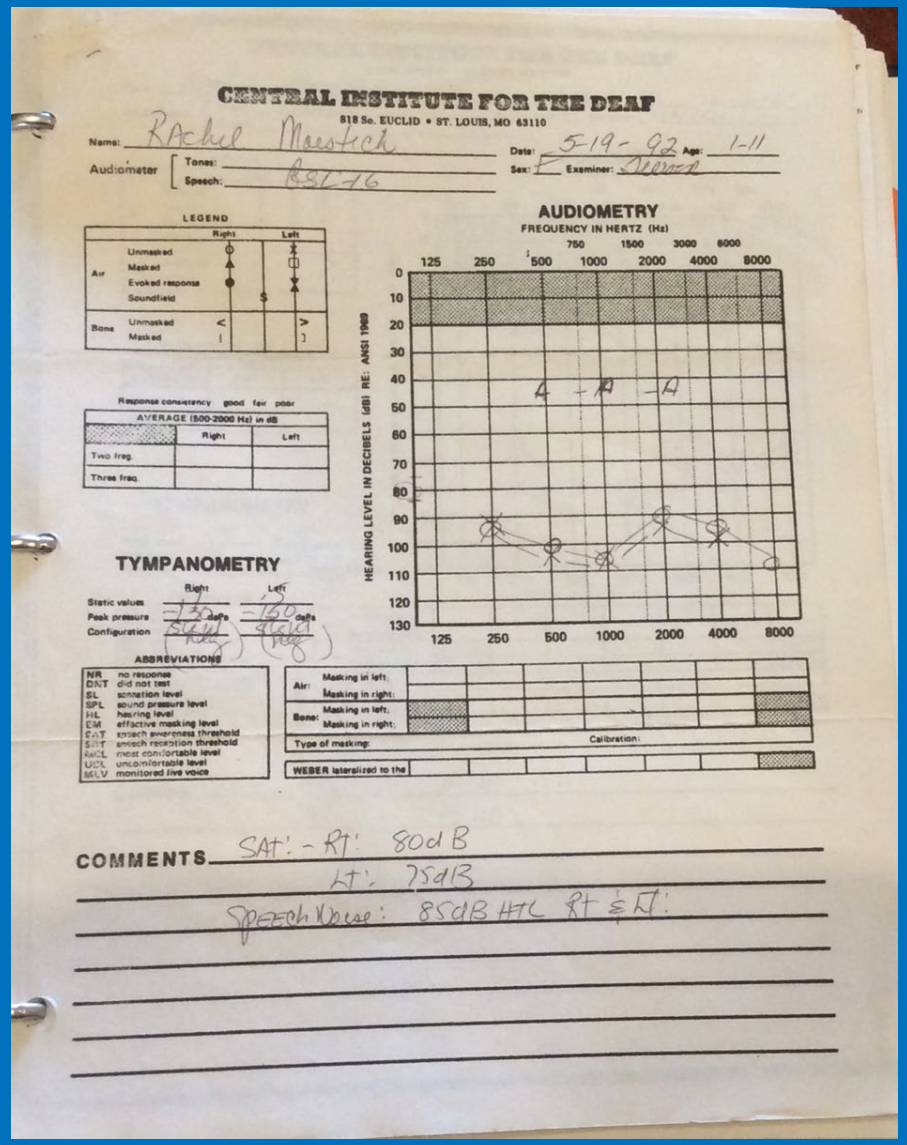
Diagnosed via ABR test at age 12 months: Severe to profound bilateral sensorineural hearing loss across all frequencies. Aided bilaterally at 14 months. [Note: Left ear implanted June 2005, at age 15 years old.]

…But she CAN’T be deaf!

In January 1992 Rachel and I entered the Parent/Infant program at the Central Institute for the Deaf (CID) at St. Louis. She was 18 months old. Her baseline language levels were around 500 American Sign Language signs and no measurable expressive spoken language.

My first task was to put 10 objects in a box and teach Rachel those words that month. Rachel would return knowing 40 new words instead. After a few months of remarkable progress, they decided to retest her hearing.

In Feb 1993, at age 32 mos., after just over a year of consistent cueing, an evaluation done at CID indicated that Rachel was just about age-appropriate for language and vocabulary.



CENTRAL INSTITUTE FOR THE DEAF

818 So. EUCLID • ST. LOUIS, MO 63110

Name: Rachel Maestrich Date: 5-19-92 Age: 1-11

Audiometer [Tones: Speech: RSL-16] Sex: F Examiner: Deana

LEGEND

		Right	Left
Air	Unmasked	O	X
	Masked	△	□
	Evoked response	●	▲
	Soundfield	S	
Bone	Unmasked	<	>
	Masked	[	]

AUDIOMETRY

FREQUENCY IN HERTZ (Hz)

125 250 500 750 1000 1500 2000 3000 4000 6000 8000

HEARING LEVEL IN DECIBELS (dB) RE: ANSI 1969

0 10 20 30 40 50 60 70 80 90 100 110 120 130

125 250 500 1000 2000 4000 8000

Response consistency good fair poor

AVERAGE (500-2000 Hz) in dB

	Right	Left
Two freq.		
Three freq.		

TYMPANOMETRY

	Right	Left
Static values		
Peak pressure	-130 daPa	-130 daPa
Configuration	flat	flat

ABBREVIATIONS

NR	no response
DNT	did not test
SL	sensation level
SPL	sound pressure level
HL	hearing level
EM	effective masking level
SAT	speech awareness threshold
SRT	speech reception threshold
MCL	most comfortable level
UCL	uncomfortable level
MLV	monitored live voice

Air: Masking in left: Masking in right:

Bone: Masking in left: Masking in right:

Type of masking: Calibration:

WEBER lateralized to the

COMMENTS SAT: - Rt: 80dB

Lt: 75dB

Speech Reuse: 85dB HTL Rt & Lt:

"Well, the bad news is she is just as deaf as her original diagnosis indicated. The good news is she is doing better than 99% of her deaf peers in language and vocabulary."

Teacher of the Deaf, Parent/Infant program at CID, St. Louis, May 1992

INDIANA UNIVERSITY

July 2, 2003 → Age: 13

2453 Seminole Ct.
Riverwoods, IL 60015

SCHOOL OF MEDICINE

Dear Ms. Mosetick,

Enclosed please find a copy of the results from Rachel's hearing aid evaluation on June 18, 2003. Within that report, we have included scores from this evaluation and her previous evaluation so that you can follow changes over time. You also will find a description of the tests administered. Recommendations are provided for further development of functional listening, speech, and language skills in your child's daily environment. We encourage you to share this information with her teachers and speech therapists.

It was a pleasure to evaluate Rachel and to note the progress she has made in her communication abilities. The information we obtain ultimately may allow for improvement in the devices, training, and assessment procedures for many children with hearing impairments. We look forward to assessing Rachel's performance with hearing aids again in twelve months. If you have any questions or comments regarding this report, please do not hesitate to contact Elizabeth Collison, MA, CCC-SLP, CF-A at (317) 278-2663 or Elizabeth Ying, MA, CCC-SLP at (317) 274-4924.

Respectfully,

Beth Collison

Elizabeth A. Collison, CCC-SLP
Speech-Language Pathologist

Report sent to:

Caruso Middle School
1801 Montgomery School
Deerfield, IL 60015

Participant File

Enclosures:

Report
Test Descriptions
Recommendations

DEPARTMENT OF OTOLARYNGOLOGY-HEAD AND NECK SURGERY

DeVault Otologic Research Laboratory
Riley Research Wing
Room 044
699 West Drive
Indianapolis, Indiana
46202-5200

317-274-4915

No Limits on Language and Literacy (including foreign languages!)

Spanish Classes 6th – 12th Grade
98th Percentile in State - Level 3 Junior Year
"5" on AP Spanish Language Exam Senior Year

PPVT-III(A/B)	Form IIIB	Form IIIA	
Raw Score	166	180	Rachel continues to demonstrate impressive vocabulary skills, well above average compared to her same-age peers with normal hearing. She achieved a standard score of 127 (a standard score of 100 represents average performance).
Age-Equivalent	16-8	>22	
CELF-3 (9yrs and up)	Standard Score (Average 7-13)	Standard Score (Average 7-13)	
Verbal Comprehension			Rachel scored in the above-average range on all three subtests of this global measure of language comprehension. On two out of three subtests, she achieved perfect scores. Her performance on this measure was quite remarkable.
Concepts and Directions	13	15	
Word Classes	14	14	
Semantic Relationships	16	15	

Beyond Early Intervention

[1999 & 2005]
Deaf Mentor; Religious Education in a Foreign Spoken Language

[2002 & 2007]
Deaf Culture/Arts and ASL (ICODA)

[2007] Cued Speech: Easy for Hearing Peers to Learn for Mainstream Inclusion

High School Achievements

Writing & English Resource Center Tutor
Illinois State Scholar
AP Scholar with Honor
John F. Kennedy Medal of Honor
Presidential Scholarship to RIT

Where is Rachel Now…

2013:
Rochester Institute of Technology
B.S. Environmental Technology
M.S. Environmental, Health and Safety Management
4.0/4.0

Wegmans

Stantec

ThermoFisher SCIENTIFIC

DEFENSE LOGISTICS AGENCY

UTC Aerospace Systems

AIR FORCE SPACE COMMAND

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

2020:
Licensed Professional Engineer
EPA Office of Enforcement and Compliance Assurance

We cue!
(When Dad remembers to prompt the kids…)

And we sign!
(When Mom's hands aren't full…)

And use a hearing aid and cochlear implant!
(When it hasn't been too long of a day…)

Baby #3!

VIDEOS of Rachel – ages 2-6

CLIP 1: Example of reading to a very young deaf child using Cued Speech to increase vocabulary and language and to improve speech production

LOOK FOR:

- ❑Telling the story through pictures if the language is new
- ❑Teaching new vocabulary
- ❑Modeling appropriate language structures
- ❑Modeling correct pronunciation and sometimes asking for child to repeat
- ❑Making it interactive and fun

Rachel clip 1: Age 2

CLIP 2:

Cued Speech is 100% readable and enables accurate identification of words that look identical on the mouth – and even, over time, is perceived as "sound”

CLIP 3:

Rachel reading to Mom, with examples of how to verify and improve comprehension – and how to unobtrusively correct pronunciation

CLIP 4:

Learning novel words (in this case Hebrew words), where Mom cues with voice off and Rachel speaks the words back accurately

Bonus slide: Notes on Benefits of Cued Speech – Backed by Research

When used consistently, Cued Speech creates in the mind of a deaf child an internal phonological (sound-based) model of an entire spoken language, much as would be created if the child were hearing. *(3)*

This, in turn, provides the necessary foundation for development of age-appropriate literacy skills: Prelingually, profoundly deaf children "compete easily with hearing children for rhyming, reading, and spelling acquisition, and phonological short-term memory.“ *(1)*

Knowing the sounds that comprise each word in their language base, provides a basis for development of good speaking and listening skills.

“Cueing has a training effect on speechreading abilities.” *(1)*

CS References

1. Trends in Amplification: "Cued Speech for Enhancing Speech Perception and First Language Development of Children with Cochlear Implants," Jacqueline Leybaert, PhD, and Carol LaSasso, PhD, 2010.

2. Research in Developmental Disabilities, “Effect of age at cochlear implantation and at exposure to Cued Speech on literacy skills in deaf children”, Colin, Ecalle, Truy, Lina-Granade, Magnan (2017)

3. Journal of Deaf Studies, “Cued Speech Enhances Speech-in-Noise Perception”, Bayard, Machart, Straus, Gerber, Aubanel, Schwartz (2019)

4. Journal of Deaf Studies, “Cued Speech and the Development of Reading in English: Examining the Evidence” (Trezek, 2017)

5. Frontiers in Psychology, “The Neural Basis of Speech Perception Through Lipreading and Manual Cues: Evidence from Deaf Native Users of Cued Speech”, Aparicio, Peigneux, Charlier, Baleriaux, Kavec, Leybaert (2017)