OPTIMAL EHDI OUTCOMES: WHAT’S MISSING

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- Molly Dalpes BA (AuD, May 2012)
Outcomes of Children who are deaf or hard of hearing: 3rd to 12th grade & 4 to 7 year longitudinal study
ONE FOR ONE: ONE YEAR OF LIFE
CSAP (Colorado State Assessment Project) Reading Performance Growth 2004 vs 2005

- **ONE FOR ONE: ONE YEAR FOR ONE YEAR**
- Reading grades 3-10
- **N=751 students**
- **Adequate Yearly Progress or 1 years growth in 1 year**
  - 40% made 1 years growth
  - 40.8% made > 1 years growth
  - 18.7% made < 1 years growth
Vocabulary Comprehension (TACL)

![Graph showing mean language age versus chronological age for hearing and d/hoh groups.](image-url)
Comprehension of Grammar (TACL)
Comprehension of Elaborated Sentences (TACL)
Expressive Vocabulary (EOWPVT)
Speech Articulation (GFTA)

![Graph showing the relationship between Mean Artic Age and Chronological Age (months) for hearing and d/hoh groups.](Image)
MCDI-EL and TACL-3 (Baca, 2009)
MCDI-Expressive Language & EOWPVT-2 Language Comprehension

Age Equivalent (months)

Chronological Age (months)

- Mild/Mod
- Severe
- Profound
- Progressive
- Mild
- Severe
- Profound
- Progressive
NECAP:

NATIONAL EARLY CHILDHOOD ASSESSMENT PROJECT: DEAF AND HARD OF HEARING

States collecting outcomes of children identified through UNHS/EHDI programs
Participating States

- Arizona – Arizona School for the Deaf and Blind
- California – Fremont School for the Deaf and Blind, LA Unified Public Schools
- Colorado: Colorado State School for the Deaf and Blind
- Idaho: Idaho State School for the Deaf and Blind
- Indiana: Indiana State School for the Deaf and Blind
- Texas: 5 pilot sites
- Wisconsin: state EHDI program
- Wyoming: state EHDI program
- NOW EXPANDING TO 12 states
Assessments Completed

- 259 assessments completed (not including Colorado)
- 162 children assessed 1 to 4 times each
- Colorado: 225 assessments per year

Doubled this number by December 2011
Participant Characteristics (excluding Colorado)

- Bilateral loss = 249; Unilateral loss = 10
- Auditory Neuropathy = 7
- English-speaking home = 239; Spanish-speaking home = 20
- No additional disabilities = 229; Have additional disabilities = 30
- Boys = 140; girls = 119
Participant Criteria for Language Outcomes Analysis

- Bilateral hearing loss
- English-speaking home
- No other disabilities that would affect speech or language development
States Represented in Current Language Outcomes Analysis

- Arizona
- Colorado
- Idaho
- New Mexico (previous participant)
- Texas
- Utah (previous participant)
- Wisconsin
- Wyoming

Note: CA and IN just initiated NECAP; data now being collected
Median Language Quotients

![Bar chart showing Median Language Quotients for different assessments]

- Minn Exp
- Minn Comp
- Mac Vocab

The chart displays the median language quotients for each assessment category.
Percent of Scores in the Average Range (LQ = 80+)

![Bar chart showing percentage of scores in the average range for different assessments. The chart indicates that Minn Exp has the highest percentage, followed by Minn Comp, and then Mac Vocab.]
Minnesota CDI: Median Language Quotients

![Bar chart showing median language quotients for different states. The states are labeled from 1 to 8 along the x-axis. The y-axis represents language quotient, ranging from 0 to 120. The chart includes two categories: Exp Lang and Lang Comp.](image)
MacArthur-Bates: Median
Vocabulary Production Quotients

![Bar Chart]

- **X-axis (State):** States 1 to 8
- **Y-axis (Language Quotient):** Values from 0 to 120

The chart shows the median vocabulary production quotients for each state.
Conclusions: Celebrating our successes

- Almost 80% of children scored within the average range on the Minnesota Expressive Language subtest.

- On average, children in all states scored more poorly on cognitive-linguistic items (Minn Lang Comp) compared to more superficial language items (Minn Exp Lang).
Conclusions: More work to do!

- Acquiring an age-appropriate lexicon is a challenge for many children with 43% demonstrating significant delays.
- Differences in language outcomes are apparent between some states.
- As more assessments are collected, factors predictive of better language outcomes will be identified.
What predicts optimal outcomes at 7 years - longitudinal study?

- Accounts for 68% of the variability in outcome of expressive vocabulary and 71% of the variance in receptive syntax at the oldest age between 4 and 7

- Unchangeable variables:
  - Non-verbal cognitive Level
  - Age of confirmation
  - Hearing level
  - Maternal level of education

- Variables amenable to early intervention
  - Amount of parent talk – both sign and spoken – language at 36 months
THE MISSING LINK:

PRAGMATIC LANGUAGE DEVELOPMENT
7 Pragmatic Characteristics: Communication Intention

- **Instrumental** – language for getting things, for satisfying needs - requests for action/object

- **Regulatory language**: language for maintaining personal relationships, e.g. commands

- **Interactional**: Social rules, poise, politeness

- **Personal language**: language for expressing personality or individuality or feelings

- **Imaginative language**: language for creating world of one’s own, pretending
Communicative Purpose

- **Informative language**: language for conveying information, for communicating something about the experienced world, cause/effect, compare/contrast, evaluation

- **Heuristic language**: language for finding things out, for wondering, for hypothesizing, questions for obtaining information
# Pragmatics Checklist

<table>
<thead>
<tr>
<th>Pragmatic Objective Instrumental</th>
<th>Not Present</th>
<th>Uses No Words Preverbal</th>
<th>Uses 1-3 Words</th>
<th>More Complex Language</th>
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</thead>
<tbody>
<tr>
<td>States Needs (I want...)</td>
<td></td>
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<tr>
<td>Makes polite requests</td>
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<tr>
<td>Makes choices</td>
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<tr>
<td>Gives description of an object wanted</td>
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<tr>
<td>Expresses a specific personal need</td>
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<tr>
<td>Requests help</td>
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<tr>
<td>Pragmatic Objective Regulatory</td>
<td>Not Present</td>
<td>Uses No Words Preverbal</td>
<td>Uses 1-3 Words</td>
<td>More Complex Language</td>
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<tr>
<td>Gives Commands (Do as I tell you…)</td>
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<tr>
<td>Gives directions to play a game</td>
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<tr>
<td>Gives directions to make something</td>
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<tr>
<td>Changes the style of commands or requests depending on who the child is speaking to and what the child wants.</td>
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<tr>
<td>Pragmatic Objective Personal</td>
<td>Not Present</td>
<td>Uses No Words Preverbal</td>
<td>Uses 1-3 Words</td>
<td>More Complex Language</td>
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<tr>
<td>Personal (Expresses Feelings…)</td>
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<tr>
<td>Identifies feelings (I’m happy.)</td>
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<td>Explains feelings (I’m happy because it’s my birthday.)</td>
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<tr>
<td>Provides excuses or reasons</td>
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<tr>
<td>Offers an opinion with support</td>
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<tr>
<td>Complains</td>
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<tr>
<td>Blames others</td>
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<tr>
<td>Provides pertinent information on request (2 or 3 of the following: name, address, phone number, birth date)</td>
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<tr>
<td>Pragmatic Objective Interactional</td>
<td>Not Present</td>
<td>Uses No Words Preverbal</td>
<td>Uses 1-3 Words</td>
<td>More Complex Language</td>
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<tr>
<td>Interactional</td>
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<tr>
<td>(Me and You…)</td>
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<tr>
<td>Interact with others in a polite manner</td>
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<tr>
<td>Uses appropriate social rules such as greetings, farewells, thank you, getting attention</td>
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<tr>
<td>Attends to the speaker</td>
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<tr>
<td>Revises/repairs an incomplete message</td>
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<tr>
<td>Initiates a topic of conversation (doesn’t just start talking in the middle of a topic)</td>
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<tr>
<td>Maintains a conversation (able to keep it going)</td>
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<tr>
<td>Ends a conversation (doesn’t just walk away)</td>
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<tr>
<td>Action</td>
<td>Column 1</td>
<td>Column 2</td>
<td>Column 3</td>
<td>Column 4</td>
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<tr>
<td>Interjects appropriately into an already established conversation with others</td>
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<td>Makes apologies or gives explanations of behavior</td>
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<tr>
<td>Requests clarification</td>
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<tr>
<td>States a problem</td>
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<tr>
<td>Criticizes others</td>
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<tr>
<td>Disagrees with others</td>
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<tr>
<td>Compliments others</td>
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<tr>
<td>Makes promises</td>
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<tr>
<td>Pragmatic Objective Informative &amp; Heuristic</td>
<td>Not Present</td>
<td>Uses No Words Preverbal</td>
<td>Uses 1-3 Words</td>
<td>More Complex Language</td>
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<tr>
<td>Wants Explanations (Tell me Why…)</td>
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<tr>
<td>Asks questions to get more information</td>
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<tr>
<td>Ask questions to systematically gather information as in “Twenty Questions”)</td>
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<tr>
<td>Asks questions because of curiosity</td>
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<tr>
<td>Asks questions to problem solve (What should I do…?, How do I know…?)</td>
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<tr>
<td>Asks questions to make predictions (What will happen if…?)</td>
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<tr>
<td>Pragmatic Objective Imaginative</td>
<td>Not Present</td>
<td>Uses No Words Preverbal</td>
<td>Uses 1-3 Words</td>
<td>More Complex Language</td>
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<tr>
<td>Shares Knowledge and Imaginations (I’ve got something to tell you…)</td>
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<tr>
<td>Role plays as/with different characters</td>
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<tr>
<td>Role plays with props (banana as a phone)</td>
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<tr>
<td>Provides a description of a situation which describes the main events</td>
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<tr>
<td>Correctly re-tells a story which has been told to them</td>
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<tr>
<td>Activity</td>
<td>Score</td>
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<td>-------------------------------------------------------------------------</td>
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<tr>
<td>Relates the content of a 4-6 frame picture story using correct events for each frame</td>
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<tr>
<td>Creates an original story with a beginning, several logical events, and an end</td>
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<tr>
<td>Explains the relationship between two objects, actions or situations</td>
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<tr>
<td>Compares and contrasts qualities of two objects, actions or situations</td>
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<tr>
<td>Tells a lie</td>
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<tr>
<td>Expresses humor/sarcasm</td>
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Presentation Overview

- Background
  - Pragmatic skill development
  - Methods

- Results
  - Normal hearing data
  - Compare pragmatic skills of children with and without hearing loss

- Conclusions

- Future Directions
Research Questions

- When do children with hearing loss master specific pragmatic skills in comparison to their peers with normal hearing?

- How does development differ based on degree of hearing loss?
Pragmatics – Social Language Use

- ASHA Website:
  - Using language for different purposes
  - Changing language according to the needs of a listener or situation
  - Following rules for conversations and storytelling
Pragmatics

- Pragmatic language difficulties increase risk for victimization (Conti-Ramsden & Botting, 2004).
- Pragmatic difficulties increase risk for social and emotional deficits (Ketelaars, et al., 2009)
Children who are deaf or hard of hearing use more directive and less informative communicative functions than their normally hearing age-matched peers (Day, 1986; Nicholas, 2000; Nicholas & Geers, 1997)
Normal Hearing Group: Data Collection

- Pragmatics Checklist
- Online version of Pragmatics Checklist created on SurveyMonkey
- Solicited participants:
  - Posted on Hand and Voices website
  - Through E-mail
Hearing Loss Group: Data Collection

- U.S. Dept. of Education
  - Office of Education #H325D030031A, H324C030074 supported research project on language acquisition of children with hearing loss
  - Parents completed a printed version of the Pragmatics Checklist
  - Children were re-assessed annually
The Pragmatic Checklist (Goberis, D., 1999)

- 45 items
- Parents are asked to indicate whether or not a skill is present by selecting from the following choices:
  - Not present
  - Preverbal
  - 1-3 words
  - Complex language
Study Participants

- Normal Hearing Group
  - N=109
  - Age Range: 2-7 years
  - Normal hearing and cognition

- Hearing Loss Group
  - N=126
  - Age Range: 3-7 years
  - All Levels of hearing loss
  - Normal cognition
Study Participants

- Children in both groups were determined to have normal cognition
  - Normal hearing group: based on parent report
  - Hearing loss group: IQ ≥ 70 on the Leiter non-verbal intelligence test
Demographics: Gender
### Age

<table>
<thead>
<tr>
<th>Years</th>
<th>Age Range (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Years</td>
<td>1;6-2;5 years (18-29 months)</td>
</tr>
<tr>
<td>3 Years</td>
<td>2;6-3;5 years (30-41 months)</td>
</tr>
<tr>
<td>4 years</td>
<td>3;6-4;5 years (42-53 months)</td>
</tr>
<tr>
<td>5 years</td>
<td>4;6-5;5 years (54-65 months)</td>
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<tr>
<td>6 years</td>
<td>5;6-6;5 years (66-77 months)</td>
</tr>
<tr>
<td>7 years</td>
<td>6;6-7;5 years (78-89 months)</td>
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<tr>
<td>8 years</td>
<td>7;6 + years (90+ months)</td>
</tr>
</tbody>
</table>
Demographics: Age

![Bar chart showing age distribution for normal hearing and hearing loss](chart.png)

- Normal Hearing
- Hearing Loss

Age groups: 2 Years, 3 Years, 4 Years, 5 Years, 6 Years, 7 Years, 8 Years
Demographics:
Maternal Level of Education

- Below High School
- High School
- Associates
- Bachelors
- Masters
- Doctorate
- Not Specified

[Bar chart showing the distribution of maternal level of education with two categories: Normal Hearing and Hearing Loss]
Demographics: Ethnicity

- Caucasian
- Hispanic
- Asian-American
- Other
- Not Specified

Legend:
- Normal Hearing
- Hearing Loss
Demographics: Languages Spoken

- English Only
- Bilingual
- English & Sign Lang
- Bilingual & Sign Lang

[Bar chart showing percentages of normal hearing and hearing loss in each category]
Demographics:
Degree of Hearing Loss

Hearing Loss Group

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Mod &amp; Mod-Sev</th>
<th>Severe</th>
<th>Profound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>20</td>
<td>25</td>
<td>35</td>
<td>20</td>
</tr>
</tbody>
</table>

Hearing Loss Group
Mastery Criterion

- Children in age groups were determined to have “mastered” a skill with use of complex language when 75% of the children achieved the skill.
Children with Normal Hearing

- 44% (20 of 45) of the items were mastered using complex language by 3 years of age
- 95.5% (43 of 45) of the items were mastered by 4 years of age
- 98% by 5 years
- 100% by 6 years
Final Items to Master for NH group

- Provides information on request
  - Name, date of birth, address (2 of 3 items)
- Makes promises
Children with Hearing Loss

- 6.6% (3 of 45) of the items were mastered with complex language by six years of age
- 69% (31 of 45) of the items were mastered by 7 years of age
Earliest Items to Master (HL Group)

- Makes polite requests
  - Uses words: please, thank you.
- Expresses needs
- Role plays with props
Items not Mastered by 7yrs (HL Group)

- Provides information on request
- Repairs incomplete sentences
- Ends conversations
- Interjects
- Apologies
- Request clarification
- Makes promises
- Ask questions to problem solve
- Asks questions to make predictions
- Retells a story
- Tells 4-6 picture story in right order
- Creates original story
- Explains relationships between objects-action-situations
- Compares and contrasts
Percentage of Items Mastered by Age for NH and HL groups
The proportion achieving 50% or more of the items with complex language
Provides Information on Request

Graph shows the percentage of children aged 2 to 7 years who are able to provide information on request, categorized by the presence of words and word complexity.
Provides information on request

- not present
- no words
- 1-3 words
- Complex Lang.
Makes apologies/explanations

[Bar chart showing percentage of not present, no words, few words, and complex for different age groups (2 yrs to 7 yrs)].

Marion Downs Hearing Center
Makes apologies/explanations

![Bar chart showing percentage of age groups making apologies/explanations]

- not present
- no words
- 1-3 words
- Complex Lang.
Makes Promises

- %Not Present
- %No Words
- %Few Words
- %Complex

Marion Downs Hearing Center
Makes promises

| not present | no words | 1-3 words | Complex Lang. |
Questions to problem solve

![Bar chart showing the percentage of questions in different word complexity levels across different age groups (2 to 7 years). The chart includes categories for 'Not Present', 'No Words', 'Few Words', and 'Complex'.]
Ask questions to problem solve

- not present
- no words
- 1-3 words
- Complex Lang.
Questions to make predictions

![Bar chart showing the percentage of responses for different age groups (2 yrs, 3 yrs, 4 yrs, 5 yrs, 6 yrs, 7 yrs) across different categories: %Not Present, %No Words, %Few Words, %Complex. The chart illustrates the trend and distribution of responses over time.]

- %Not Present: The percentage of responses decreases from 90.0% at 2 yrs to 10.0% at 7 yrs.
- %No Words: The percentage remains low throughout the ages, with a slight increase at 7 yrs.
- %Few Words: The percentage increases from 0.0% at 2 yrs to 10.0% at 7 yrs.
- %Complex: The percentage increases from 0.0% at 2 yrs to 10.0% at 7 yrs.

Marion Downs Hearing Center
Asks questions to make predictions
Correctly retells story

Marion Downs
HEARING CENTER
Correctly re-tells a story

- not present
- no words
- 1-3 words
- Complex Lang.
Conclusion

- Children who are deaf or hard of hearing begin to master pragmatic skills at 6 years of age; 3-year-old peers with normal hearing have already mastered nearly half of the checklist skills.
- By age 7, children who are deaf or hard of hearing have mastered approximately $2/3$ of the checklist skills; almost all of the skills are mastered by hearing children by age 4.
Future Directions

- Larger sample of normal hearing with better matched experimental and control groups
  - Maternal level of education
  - Age
- Need to support pragmatic skill development in children with hearing loss to reduce risk for socio-emotional deficits and victimization.
Pragmatics

- Children with hearing loss use a lot of resources to simply access information.

- Using language in a socially appropriate manner is the highest level of language functioning and the most difficult.

- Most of our children require specific instruction in these issues.
Parents

- Don’t forget about the parents
- Parents who have been in infant intervention programs are used to focusing on a specific target
- They are eager to know how they can supplement the educational goals


