LENA: Exploring novel approaches to language assessment and intervention

COLORADO HOME INTERVENTION PROGRAM

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Conflict of Interest Disclosure

- Dr. Jill Gilkerson is the Director of Research at the LENA Foundation
- Dr. Christine Yoshinaga-Itano has no financial relationship with the LENA Foundation
Longitudinal study: Number of children with hearing loss identified between 1997-2003

- 65-70% of all possible participants
  - Infants identified with hearing loss in Colorado
  - Born 1997 through 2003
- All birthing hospitals in Colorado established universal newborn hearing screening programs by 1999
• N= 146 children with longitudinal data (3 or more assessments) from 48 to 87 months of age
  ➢ Children with non-verbal cognitive development within the normal range
  ➢ English-speaking families
  ➢ Hearing parents
- Four assessment occasions: 48, 60, 72, 84 (+/- 3 months)
- Median age of identification: 3 months
- Median age of intervention start: 8 months
<table>
<thead>
<tr>
<th>Description</th>
<th>N=87 had severe to profound HL</th>
<th>N=48 had mild to moderate HL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children with cochlear implants (N=49)</td>
<td>Age of ID by 6 months: 55%</td>
<td>Age of ID by 6 months: 68.4%</td>
</tr>
<tr>
<td></td>
<td>Age of ID by 12 months: 86%</td>
<td>Age of ID by 12 months: 76%</td>
</tr>
</tbody>
</table>
MCDI-Expressive Language & EOWPVT-2-Language Comprehension

Age Equivalent (months)

Chronological Age (months)

- Mild/Mod
- Severe
- Profound
- Progressive
- Mild
- Severe
- Profound
- progressive
Do individual child characteristics systematically differentiate the language trajectories in young children with hearing loss?

ROSALINDA BACA, 2009
UNCHANGEABLE CHARACTERISTICS: Degree of Hearing loss, non-verbal cognitive development, age of identification, maternal level of education

BACA, SEDEY, YOSHINAGA-ITANO, 2013
MODEL PREDICTION OF VARIANCE OF LANGUAGE AT 84 months and rate of language development

- 68% of variance in EOWPVT at 84 mo.
- 71% of the variance in TACL III at 84 mo.
- 46% of rate of language growth for EOWPVT
- 81% of rate of language growth for TACL III (receptive syntax)
<table>
<thead>
<tr>
<th>Mother’s Education- no. (%)</th>
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<tbody>
<tr>
<td>&lt;12 years (No High school)</td>
<td>7 (4.8)</td>
</tr>
<tr>
<td>12 years (High school diploma)</td>
<td>46 (31.7)</td>
</tr>
<tr>
<td>13-15 Some college</td>
<td>23 (15.8)</td>
</tr>
<tr>
<td>16+ College graduate</td>
<td>69 (47.3)</td>
</tr>
<tr>
<td>Age of identification of hearing loss – mos.\textsuperscript{b}</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Median (SD)</td>
<td>1.5 (8.13)</td>
</tr>
<tr>
<td>Range</td>
<td>0-41</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Leiter IQ – full scale score</th>
<th></th>
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<tbody>
<tr>
<td>Mean (SD)</td>
<td>104 (14)</td>
</tr>
<tr>
<td>Range</td>
<td>74-140</td>
</tr>
</tbody>
</table>
EOWPVT III LANGUAGE OUTCOME AT 84 MONTHS AND RATE OF LANGUAGE GROWTH

- **Predictor variables:**
  - Non verbal cognitive development
  - Degree of Hearing Loss
  - Age of Identification
  - Maternal Level of Education

  - Explained intercept 37% (language at 84 months) &
  - 39% in slope (rate of language development)
PREDICTIVE POWER

- Degree of Hearing Loss
- Non-verbal cognitive quotient (Leiter International Performance Scale)
- Maternal Level of Education
- Expressive Language Quotient at 36 months
  - (parent imitation, parent expansion, symbolic play of child, personal-social development of child, emotional availability, parental stress, mastery motivation)
- Frequency of Parent Words (birth through 36 mo.)
  - (9, 15, 21, 27, 36, 48, 60, 72) - about 1000 videotapes 25-30 minutes)
Parent Word Frequency

- 16% of variance in EOWPVT III
- 12% of variance in TACL 3rd ed
- Parents in upper quartile >1515 words – had children with a 29 month advantage in expressive vocabulary at 84 months over the children with parents in the lower quartile <=984 words
- Children with parents in the upper quartile for parent word frequency had a 15 month advantage in receptive syntax over the children with parents in the lower quartile
MATERNAL LEVEL OF EDUCATION

- 5.4% variance of language outcome at 84 months on EOWPVT III
- 3.2% variance of language outcome at 84 months on TACL, 3rd ed.
- 8% of variance in rate of language development on EOWPVT III
- 5.4% of variance in rate of language development on TACL 3rd ed.
• LOW SES: 12 years - High school diploma or lower
• HIGH SES: 16+
<table>
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<th>Parent-word- Frequency – total words ³</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>Lower quartile</td>
<td>984</td>
</tr>
<tr>
<td>Middle quartile</td>
<td>1245</td>
</tr>
<tr>
<td>Upper quartile</td>
<td>1515</td>
</tr>
</tbody>
</table>
PARENT WORD FREQUENCY: EOWPVT III

- **Expressive Vocabulary at 84 months**
  - **Low SES**
  - **High SES**

- **Lower Quartile**
  - Low SES: 48
  - High SES: 108

- **Inter Quartile**
  - Low SES: 72
  - High SES: 96

- **Upper Quartile**
  - Low SES: 108
  - High SES: 108

A
213 infants/toddlers followed longitudinally from age of identification through 3 years of age
Born 1998-2003 (none included in 1998 study)
Included children with additional disabilities
PREDICTIVE VARIABLES:
Age of identification (before 3 months), degree of hearing loss (mild, severe, profound, progressive), non-verbal cognitive status
Maternal level of education did not add additional explanatory power
66% of the variance of language outcome at 36 months
48% of rate of language growth
Non-verbal cognitive level explained 57.6% of the variance of language outcome at 36 months
NV cognitive level accounted for 39.2% of rate of language development
HIGH PERFORMERS

- N= 25 children
- estimated expressive language quotients of 80 or better at 36 months and slopes that followed or exceeded the age equivalent trajectory.
- representation across all levels of maternal education with 20% having 12 years or less.
- All 25 had NVCQ that were within normal limits.
- 68% were identified before three months of age and 80% before six months.
- 76% of this subgroup that had a mild or moderate hearing impairment.
Range:
Child Vocalizations

Number of Child Vocalizations/day

Spanish D/HH
Typically Developing Spanish
Typically Developing English
English D/HH

3rd Quartile
1st Quartile