Addressing the ‘type’ and ‘dose’ in early intervention provided to children using cochlear implants: How much is enough?

Ms Cindy Chu
Ms Dawn Choo
Dr Shani Dettman
Ms Jaime Leigh

Ms Sandra Lettieri
Ms Gabrielle Traeger
Ms Denise Courtenay

1 The University of Melbourne, Dept. of Audiology and Speech Pathology, Australia
2 The HEARing CRC, Australia
3 The Royal Victorian Eye and Ear Hospital, Australia
Factors known to affect language outcomes in paediatric cochlear implant (CI) users:

**Child**
- Age at implantation
- Duration & type of hearing loss
- Device experience
- Cognitive ability
- Additional disabilities

(Boons et al., 2012; Ching & Dillon, 2013; Dettman, et al., 2014; Dettman et al., 2004; Nicholas & Geers, 2007)

**Early Intervention**
- Type
- Dose

(Ching, 2015; Geers, 2002; Jackson & Schatschneider, 2014)

**Family**
- Relative socio-economic advantage
- Maternal education
- Family involvement

(Hoff, 2003; Moeller, 2000; Nicholas & Geers, 2008; Szagun & Stumper, 2012)
• To examine the relationships between:
  1. Early Intervention (type, frequency, total dose)
  2. Age at first implant
  3. Family factors (relative socio-economic advantage, family involvement)
  4. Language outcomes for paediatric CI recipients.
CI Clinic Protocol

165 Families & Children

2008-2014 Routine Communication Evaluation

Family & Educational Characteristics Questionnaire

Language Assessments (e.g., PLS)
• Parent-completed questionnaire
• Key information collected:
  – Early Intervention (EI)
    • Type
    • Dose
      ➢ Frequency
      ➢ Duration
      ➢ Total Dose = hours per week × 40 school weeks
  – Family involvement
    • 9 items
      ➢ E.g., How often does the child read with a family member?
    • Calculated as an overall %score
  – Index of relative socio-economic advantage
    • Postal area codes

(Dettman et al., 2014; Geers & Brenner, 2003; Australian Bureau of Statistics, 2006)
Demographics \((N = 165)\)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age aided</td>
<td>0.78</td>
<td>0.73</td>
<td>0.004 – 3.950</td>
</tr>
<tr>
<td>Age at implant</td>
<td>1.79</td>
<td>1.19</td>
<td>0.53 – 6.82</td>
</tr>
<tr>
<td>Age at language test</td>
<td>3.86</td>
<td>1.66</td>
<td>1.14 – 10.83</td>
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</tbody>
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**Cognitive Ability**
- Average: 73%
- Borderline: 11%
- Mild: 12%
- Moderate: 3%
- Accelerated: 1%

**Type of EI**
- Aural/Oral: 69%
- Speech & Sign: 31%

**Frequency**
- Weekly: 45%
- Fortnightly: 43%
- Monthly: 12%
- Borderline: 11%
Results

1. EI and Language outcomes
   a) Type
   b) Frequency
   c) Total dose

2. Age at implant, EI and language outcomes
   a) Frequency
   b) Total dose

3. Relative socio-economic advantage, EI, and language outcomes

4. Family involvement and Language outcomes
Children who received EI with an **aural/oral** emphasis had significantly better **receptive** & **expressive** language outcomes compared to those who received EI with a **sign** emphasis.
1b) Frequency of EI and Language Outcomes

Less frequent EI was significantly related with better expressive language outcomes.

No relationship was found between EI frequency and receptive language outcomes.
1c) Total Dose of EI and Language Outcomes

Lower doses (frequency and duration) of EI were significantly associated with better **expressive** language outcomes.

No relationship was found between doses of EI and **receptive** language outcomes.

\[(R^2 = .075, \ p < .05, \ \text{weak})\]
Children who were implanted earlier received less frequent and lower doses of EI services compared to those who were implanted later.
2b) Age at Implant, EI Dose and Language

Age at Implant

- <12 months \( (M = 90.33) \)
- 13-18 months \( (M = 71.00) \)
- 19-24 months \( (M = 71.44) \)
- 25-42 months \( (M = 61.75) \)
- 43-84 months \( (M = 67.67) \)

\( (R^2 = .075, p < .05, \text{weak}) \)

↓ Age at implant
↓ Doses of individual EI sessions
↑ Expressive language scores.

↑ Age at implant
↑ Doses of individual EI sessions
↓ Expressive language scores.
3) Relative Socio-economic Advantage, EI and Language outcomes

- Children from families with relatively **greater socio-economic advantage** received **greater frequency and doses** of EI.
- Relative socio-economic advantage was not associated with language outcomes.

\( R^2 = .053, p < .05, \text{ weak} \)
Higher levels of family involvement (as measured by FamEd-Q) were significantly related to better receptive and expressive language outcomes.
Summary of Findings

- **Type of EI**
  - Aural/oral: ↑ Receptive language ↑ Expressive language

- **Frequency and Total Dose of EI**
  - ↓ Frequency ↓ Dose ↑ Expressive language

- **Age at Implantation**
  - ↓ Age at implant ↓ Frequency of EI
  - ↓ Age at implant ↓ Dose of EI
  - ↓ Age at implant ↑ language outcomes

- **Relative Socio-economic Advantage**
  - ↑ SEA ↑ Dose of EI

- **Family Involvement**
  - ↑ Involvement ↑ Receptive language ↑ Expressive language
References


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For further information:
Dr Shani Dettman, dettmans@unimelb.edu.au