Shifting Focus: Using Functional Listening Skills to Guide Paediatric Cochlear Implant Evaluation

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Author disclosure information

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Grant and Research Support: Cooperative Research Centres Programme, Business Australia, and Cochlear Limited.
The world is a noisy place

Language is caught not taught

It happens fast
It happens early
It happens differently

Exposure Experience

With everyone Everywhere About everything
What measures listening?

Objective Testing

1SD language scores at 5yrs

Threshold testing

LOCHI Outcomes CI group, model 2

1SD language scores at 5yrs
**FLI-P™ Development**

Tracking the auditory skills that underpin language, literacy, communication development and social competence

- Measure of functional listening development from birth-6yrs
- Develop a child’s individual trajectories over time
- Compare to group data of other children (both HL and typical hearing)
- Auditory skills in natural every day environments (distance, digital signals, group situations) from early ages
- **More than detection**: ‘Using’ listening
- Detailed at each level of listening development (6 phases)
- Evidence and guidance for critical and timely decision making
The Functional Listening Index – Pediatric™

Phase 5: Listening through discourse and narratives

- **Recognise a familiar person on the phone**
  
  **What can this look like**
  They can recognise on the phone someone that they know. They know who is calling from the sound of the person’s voice.

  **How to check**
  Ask someone they know (family member, close friend, teacher) to talk to them on the phone. Can they tell you who it is?

- **Say things that surprise me because I don’t know where they heard it**
  
  **What can this look like**
  They can say words or phrases that you haven’t said or taught them directly. When they say something that surprises you, they have heard it somewhere before.

  **How to check**
  Children learn new words by their exposure to different words and different people talking. Listen for things they say that surprise you.
### The Functional Listening Index – Pediatric™

**Phase 1: Sound awareness**

**Phase 2: Associating sound with meaning**
- Makes sounds back to me when I talk to them

**Phase 3: Comprehending simple spoken language**

**Phase 4: Comprehending language in different listening conditions**

**Phase 5: Listening through discourse and narratives**

**Phase 6: Advanced open set listening**
- Can have a simple conversation with a familiar person on the phone
- Guesses a less familiar item from clues that I give
- Remembers 4 things that happened in a story in the right order after reading a book together
- Easily repeats a sentence of 8 to 10 words after me, even when one or two of the words are new to them
- Understands that the **way** something is said changes the meaning of the sentence
Aims

To determine

1. The *impact* of incorporating a functional listening measure into CI evaluation protocols for professionals and families, through use of group data and individual trajectories

2. *Sensitivity* of the FLI-P to context and situational changes

3. Levels of concurrent, convergent and predictive *validity*
Methodology

- Retrospective analysis
- FLI-P data collected since 2013
- 2520 data points collected
- 548 children in integrated early intervention and cochlear implant program across 3 states in Australia,
  - 178 now with CI
- Analyzed listening outcomes
- Statistical validation

Factors for analysis

<table>
<thead>
<tr>
<th>Age of implant</th>
<th>Profound and residual bilateral hearing loss</th>
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<tbody>
<tr>
<td>(&lt;6mths, 6-11mths,</td>
<td>ANSD, additional needs</td>
</tr>
<tr>
<td>12-17mths, 18mths+)</td>
<td>Language outcomes</td>
</tr>
<tr>
<td>Medical, social and</td>
<td>Medical, social and situational context</td>
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<tr>
<td>situational context</td>
<td>(linguistic, cultural)</td>
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<tr>
<td>(linguistic, cultural)</td>
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</tbody>
</table>
Concurrent validity FLI-P™
Between groups: Additional needs & age of entry to EI
Convergent validity FLI-P™
Similar measures: LittlEars & PEACH

$\beta = 0.94$

$p < 0.01\%$

A 1 unit increase in LittlEars score corresponds to a 0.94 unit increase in FLI

No evidence of a linear relationship
Predictive validity: FLI-P™
Linear regression - FLI predictive of language scores at 4/5yrs?

Moderate – Strong linear relationship
Listening scores at 3yrs predicted language scores at 5yrs
Evidence and guidance

Group data & Individual outcomes
Using clinical evidence to support families
The Functional Listening Index – Pediatric™ (FLI-P)

Number of Observed Listening Skills by Age of Child

- 2520 data points
- n = 538
Listening Outcomes using the Functional Listening Index (FLI-P 1.1)

Children with Cochlear Implants (bilateral HL, refer at UNHS); n = 121 children, 782 data points

- Diagnosed Additional Needs
- ANSD

1. CI1 < 6 months
2. CI1 6 - 11 mths
3. CI1 12 - 17 mths
4. CI1 >= 18 mths

Age in Months
Listening Outcomes using the Functional Listening Index (FLI-P 1.1)

n = 548
2,520 data points
Language outcomes by level of hearing loss

- Profound (CI < 6 mths)
- Profound (CI 6 - 11 mths)
- Profound (CI >= 12 mths)
- Residual (CI 6 - 11 mths)
- Residual (CI 12-17 mths)
- Residual (CI >= 18 mths)
- No CI
Changes in listening – impact on language scores: reaching potential?

n = 5, bilateral profound
CI1 < 6 months
English as Primary Language
No Additional Needs
Decision making

Ongoing middle ear

Access to sound

Sensitivity to context

Varied opinions

Bilingual

Linguistic environment

Giving deaf children a voice
Functional Listening: a core component of implant evaluation & post-op progress

• The opportunity to bring a child’s real world listening skills into candidacy considerations

• Quantify cognitive components of auditory skill development in a meaningful and contextual way for families

• Flexible, dynamic and adaptable to individual context and changing situations

• Responsive to multiple systems necessary for communication development

• Scalable and spreadable across needs and environments
Information that’s responsive & reflective of every day life
Meets short term needs with long term benefits
Compatible with experience and needs
Early insights into later outcomes to guide choices and decisions
Thank you to all the families and team at The Shepherd Centre

Special thanks to Alyshia Hansen, Jim Hungerford, Tracy Hopkins, and the I&A and Research team for supporting the ongoing development of the FLI-P

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