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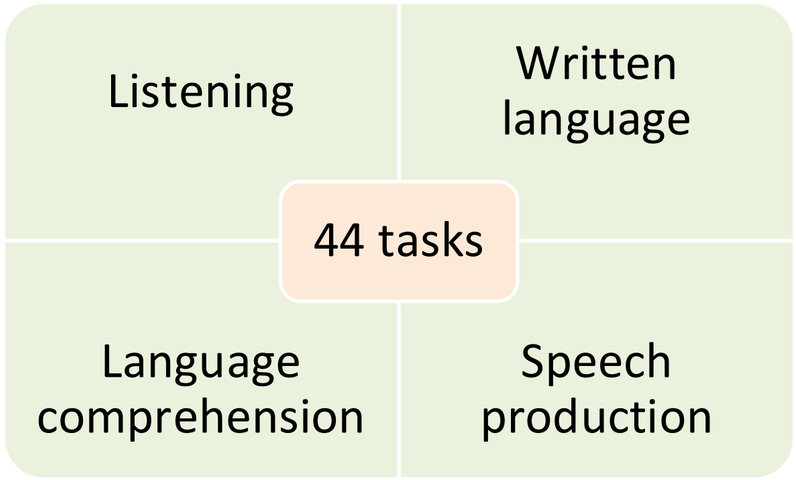
Development of Listening and Communication Skills of a Child with an Auditory Brainstem Implant: A Case Study

Annika Valk-Vaht MSc, Tartu University
Anneli Ojaste MSc, Tartu University
Lagle Lehes PhD, Tartu University

OBJECTIVE(S) AND METHODS

The aim of this study was to assess and describe the development of listening, spoken language, and communication skills in one Estonian child using an Auditory Brainstem Implant (ABI).

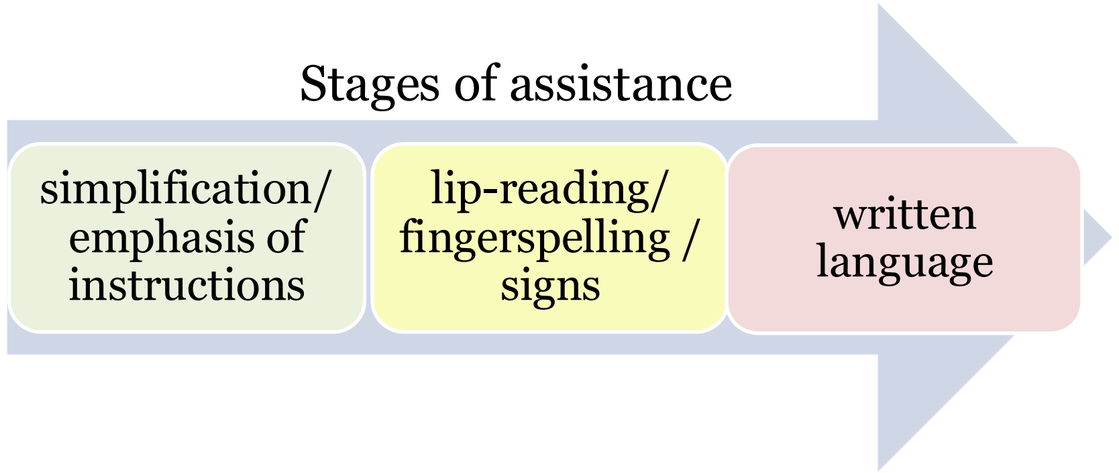
The qualitative study focused on a 7-year-old child with an ABI (hearing age 6 years) and her family. The child's hearing loss was recorded at 40–80 dB within the speech frequencies.



One-on-one sessions

8 meetings

20–60 minutes

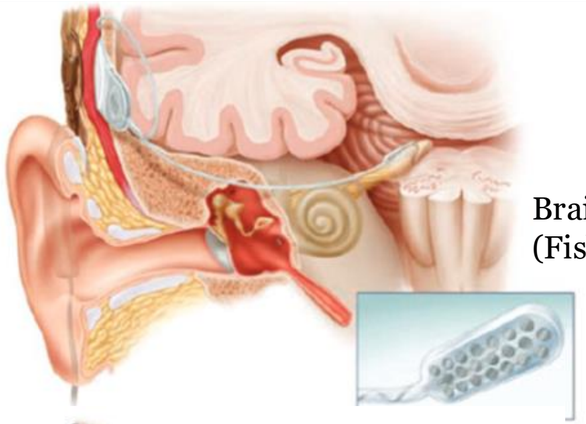


SHORT INTRODUCTION

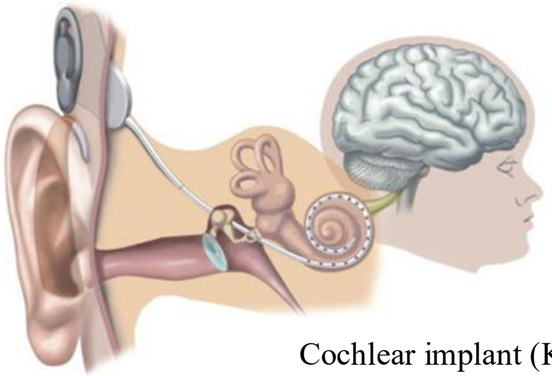
- ABI is a relatively new assistive device in hearing rehabilitation
- There is little data in international literature, and most publications are case reports
- The group of children using ABI is highly heterogeneous
- Sound processing and sound quality differ between the two devices

- ABI is used when CI implantation is not possible, such as in:
  - Cochlear ossification or cochlear aplasia
  - Absent auditory nerve

ABI	First ABI for child: • Italy 2001 • USA 2013	In Estonia 4 children using ABI (2024)	Electrodes are placed on the brainstem	Typically sentence-level speech 3.5–6 years after activation
VS				
CI	First CI for child: • USA 1981	In Estonia 174 children with using CI (2024)	Electrodes are located in the cochlea of the inner ear	Typically sentence-level speech at around 2.5 years after activation



Brainstem implant (Fisher et al., 2015)



Cochlear implant (Kral, 2013)

RESULTS

	ABI user in our study	ABI elsewhere	CI
Sound awareness 	Responds to **loud environmental sounds** (e.g., doorbell, blender). **Responds** to speech but **is unable to differentiate** between individual voices. Is aware of **sound length** but has difficulty perceiving the **quality and resonance of sounds**, succeeding only with support.	Responses to **environmental** sounds and **speech** are **similar**. Responses to **qualitative** and **resonant** features are significantly **lower.**	Outcomes are **better.**
Speech comprehension 	Comprehend words and short phrases primarily through **multiple-choice formats.** Comprehension is enhanced by **visual support**. The child understands morphology and syntax when provided with **visual cues.**	Speech perception **dependent on visual cues**; **auditory-alone** comprehension has **not** been established.	Outcomes are **better.**

RESULTS

	ABI user in our study	ABI elsewhere	CI
Speech production 	**Limited vocabulary**, articulatory **distortions**, **paraphasias**. Developed word **compounding skill.**	**Vocabulary** outcomes **similar. Absence** of word **compounding skills.**	Outcomes are **better.**
	Underdeveloped morphological system, acquired as **rote-learned** forms. **Inconsistent** use of the third-person singular inflection.	**Morphological skills** have **not** developed.	Outcomes are **better.**
	Agrammatical sentences: elliptical, incorrect word order. **Few** agrammatic **complex sentences.**	Limited agrammatic simple sentences. **Complex sentences** have **not** developed.	Outcomes are **better.**
	Articulation errors: **distortions, substitutions, omissions, and additions** The **length** and **complexity** of speech units significantly **impact pronunciation**	**Phonological** errors are **similar.**	Outcomes are **better.**

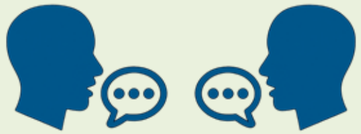
RESULTS

	ABI user in our study	ABI elsewhere	CI
Speech production 	**Narrative macrostructure** is at an **emerging** level. **Narrative microstructure** remains **primitive.**	**Narrative** skills have **not** developed.	Outcomes are **better in microstructure,** but **similar in macrostructure.**
	Voice is hypernasal, high-pitched, hoarse, strained.	Outcomes are **similar.**	Outcomes are **better.**
	Prosody: utterances are **segmented** according to **breath pauses**, **monotonous**, equalized stress patterns, displacement of quantity degrees.	Outcomes are **similar.**	Outcomes are **better.**
	Reading patterns **mirror oral speech.** Omission of grammatical forms, grapheme substitutions, correct marking of some phoneme lenght, **fingerspelling system acquired** and supports writing.	Outcomes are **similar.**	Outcomes are **better.**

RESULTS

Pragmatic skills

- Difficulties with conversational maintenance
- Uses topic redirection as a compensatory strategy



Mode of communication:

Total communication

CONCLUSIONS

Early Intervention

High levels of parental involvement

Positive outcomes

Highly competent multidisciplinary team

No comorbid disabilities

Lip-reading

Signs

Need for non-verbal communication support

Fingerspelling

Written language

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