



Ghent University Hospital

Bimodal listening or bilateral CI: When and why?

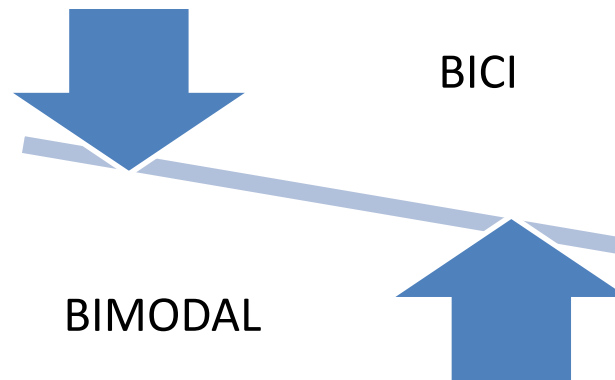
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European Symposium Pediatric Cochlear Implantation
18-21 June 2015, Toulouse

Advantages

- Speech understanding in noise
 - Localisation – spatial hearing
 - Listening effort – quality of life
 - Prevention of neural degeneration
- **In children:**
 - ✓ Speech and language development
 - ✓ Social-behavioural development
 - ✓ Academic skills



BICI



- Ear with best performance is implanted
- Symmetry in binaural auditory input

BIMODAL

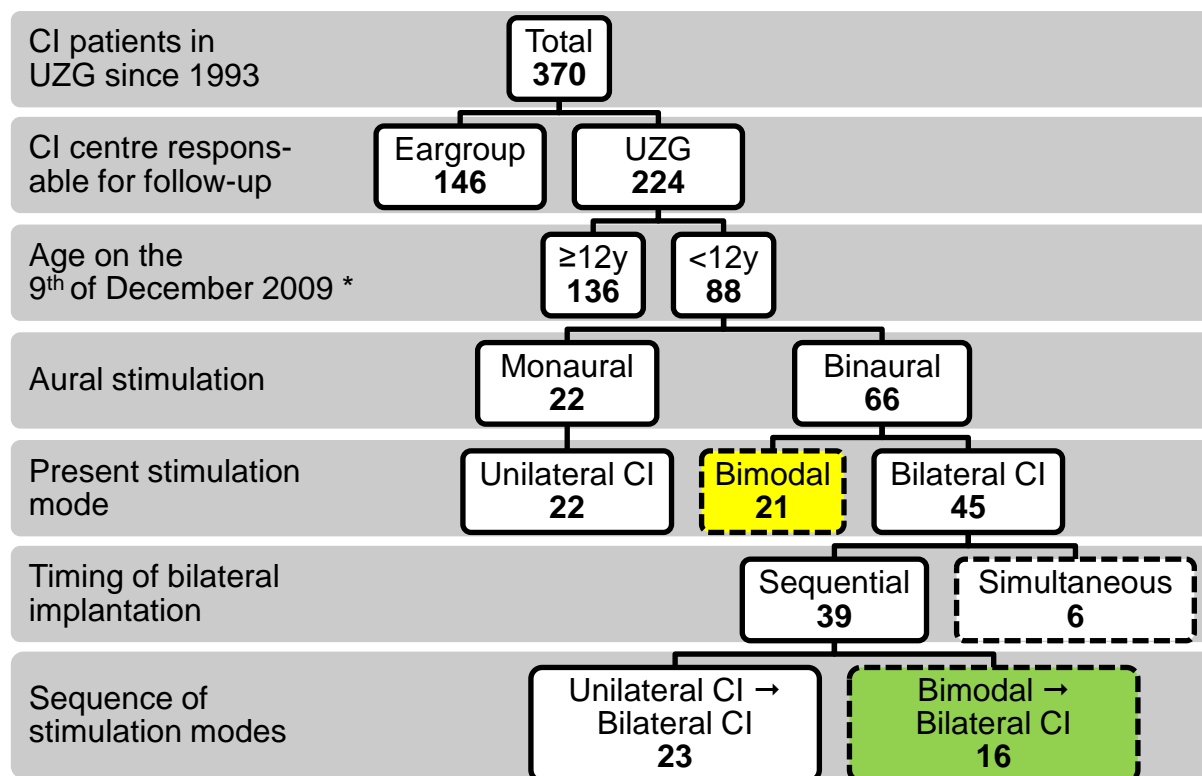


- Temporal fine structure
 - Reduced surgery
 - Vestibular organ preservation
 - Future treatment options
- No agreement concerning better speech perception, language development and localisation between BICI versus bimodal listeners (*Ching et al., 2007; Cullington & Zeng, 2011; Litovsky et al., 2006; Nittrouer & Chapman, 2009; Schafer et al., 2007*)
 - Decision based on evaluation of **bimodal benefit**

How to determine bimodal benefit in a pediatric population?

Retrospective study

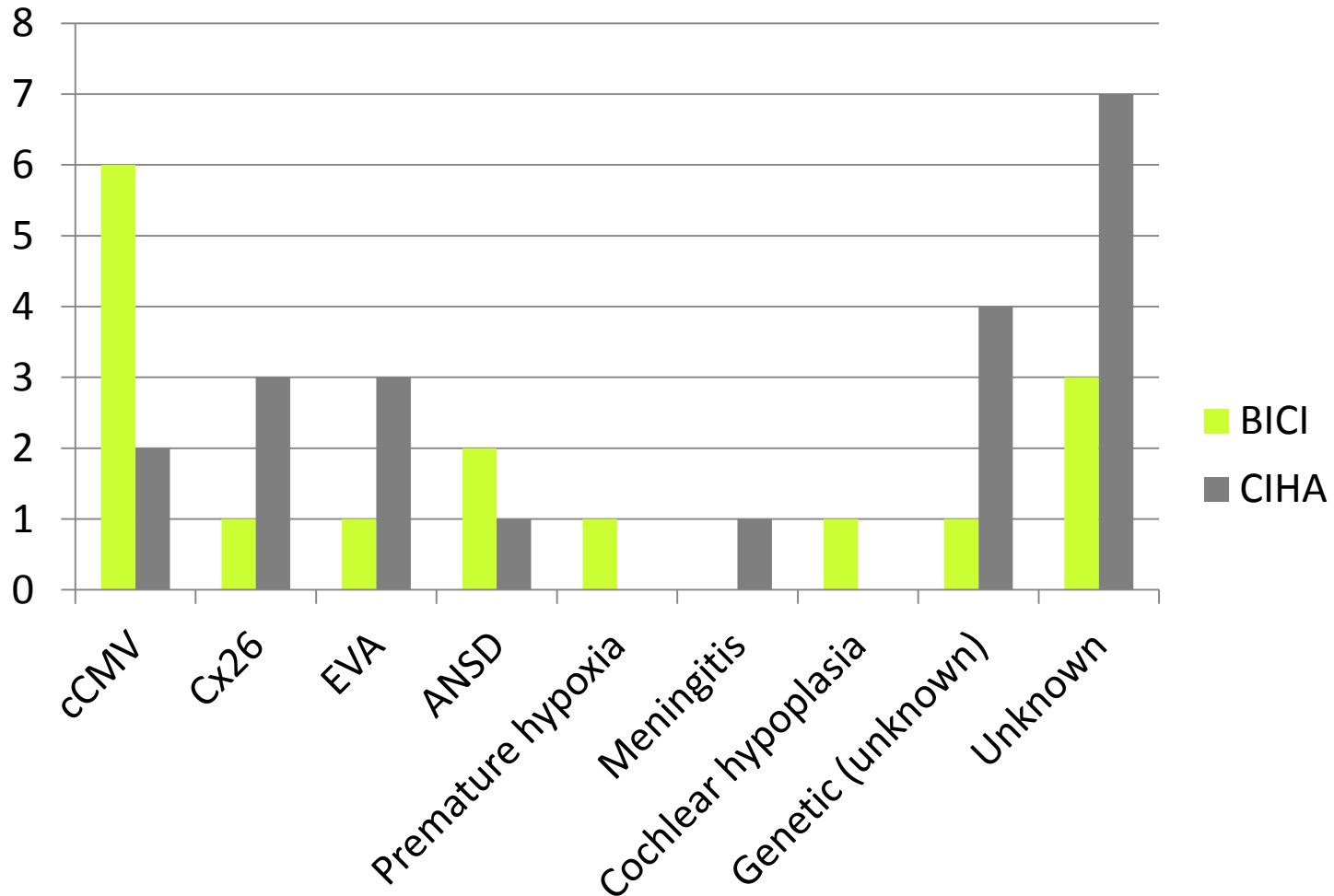
- Influencing factors in the decision process
- Evaluation of the test protocol
- Determination of decisive audiometric values



* Since 9th of Dec 2009, the Belgian legislation reimburses a 2nd CI until the age of 12y

Influencing factors

- **Etiology** of the hearing loss



Influencing factors



Factor	Classification	Comparison
Etiology	9 groups	NS
Parents hearing status	normal - hearing impaired	NS
Communication mode	oral – sign – total	NS
Education	special – regular	NS
Multiple disorders	Yes-no	NS
Progressive hearing loss	Yes-no	NS

NS: not significant (Fisher's exact test)

Evaluation test protocol



	Bimodal (N=21)		Seq. BICI (N=16)		P
	N (%)	Median	N (%)	Median	
Tests in CI-ear (first implanted ear)					
Pure-tone unaided	19 (90%)	101 dBnHL	15 (94%)	108 dBnHL	NS
Pure-tone aided (with CI)	20 (95%)	26 dBHL	15 (94%)	28 dBHL	NS
Speech audio aided (ICA)	14 (67%)	69 %	9 (56%)	67%	NS
A&E phoneme discr aided	14 (67%)	95%	8 (50%)	100%	NS
Tests in hearing aid ear (HA)					
ABR peak V threshold	21 (100%)	80 dBnHL	16 (100%)	95 dBnHL	< 0.05
Pure-tone unaided	21 (100%)	86 dBHL	15 (94%)	102 dB HL	< 0.01
Pure-tone aided	20 (95%)	41 dBHL	12 (75%)	58 dBHL	< 0.001
Speech audio aided (ICA)	7 (33%)	56%	6 (38%)	23%	< 0.05
A&E phoneme discr aided	9 (43%)	75%	6 (38%)	61%	NS

NS: not significant, Mann-Whitney U test

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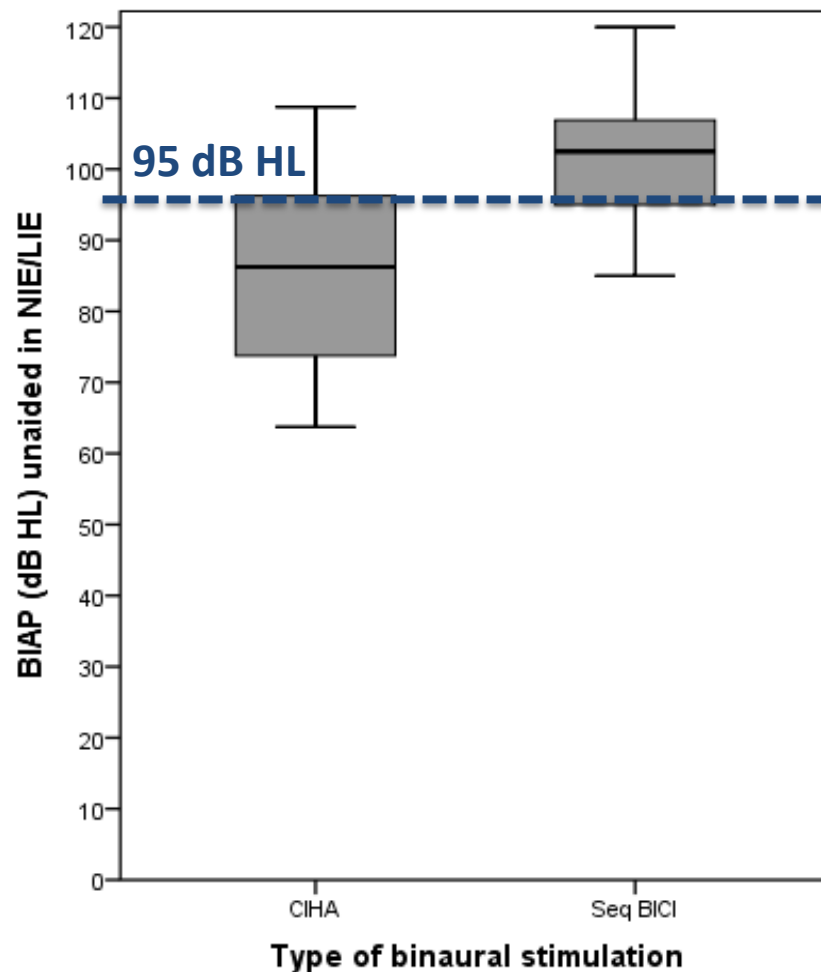


	Bimodal (N=21)		Seq. BICI (N=16)		P
	N (%)	Median	N (%)	Median	
Bimodal tests					
Speech-in-quiet (ICA)	11 (52%)	73%	3 (19%)	63%	NS
Speech-in-noise	2 (10%)	NA	3 (19%)	NA	-
Harmonic/disharmonic intonation test (A&E)	0 (0%)	NA	1 (6%)	NA	-
Localisation	0 (0%)	NA	0 (0%)	NA	-
cVEMP	8 (38%)	8/8	11 (69%)	7/12	-

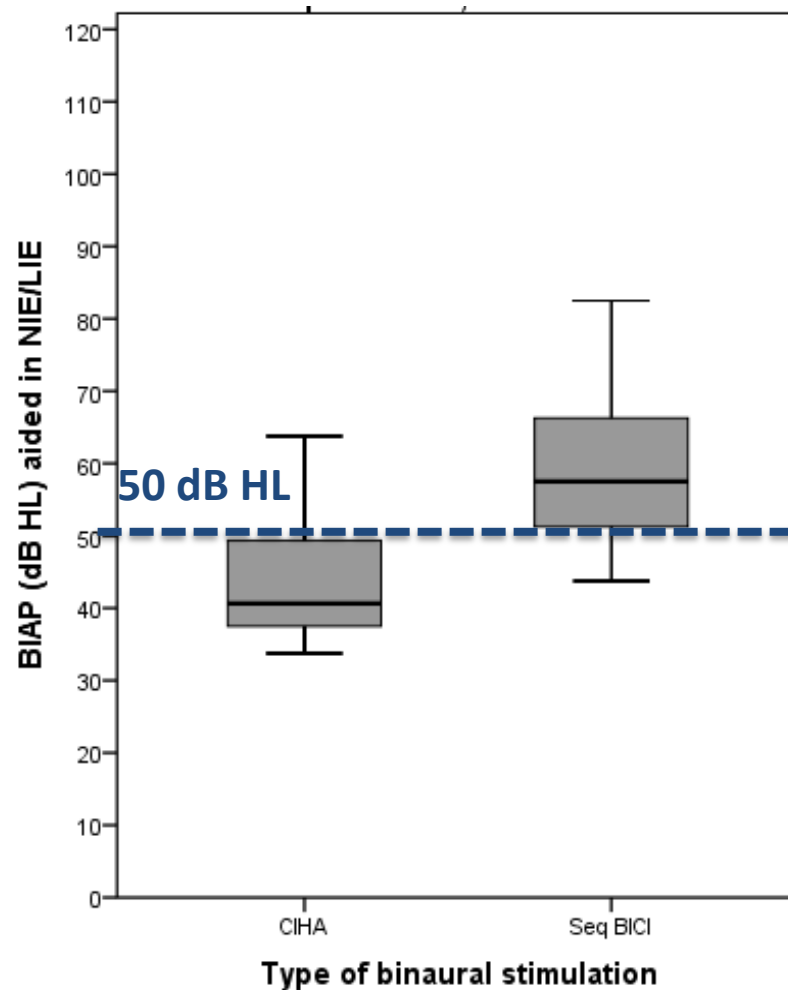
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Decisive values?

Pure-tone audiometry, unaided

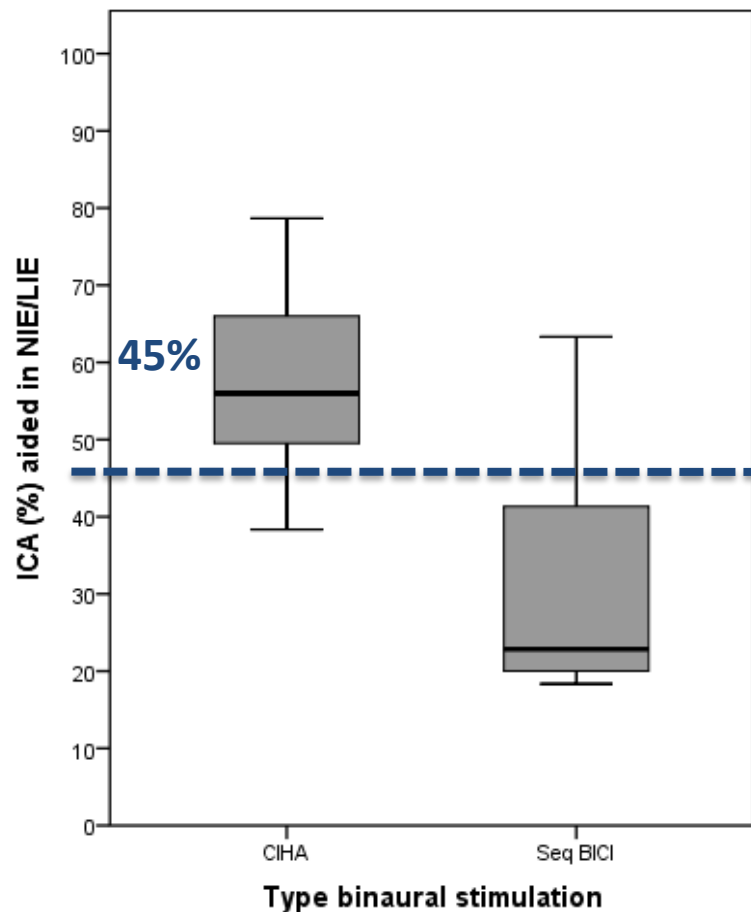


Pure-tone audiometry, HA

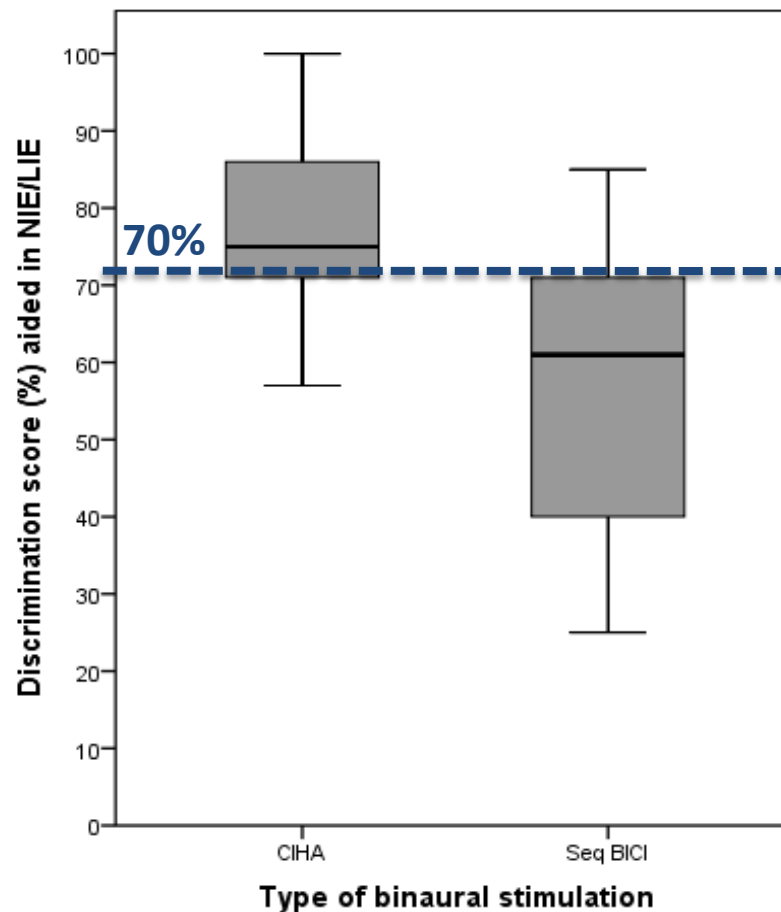


Decisive values?

Speech audiometry, HA



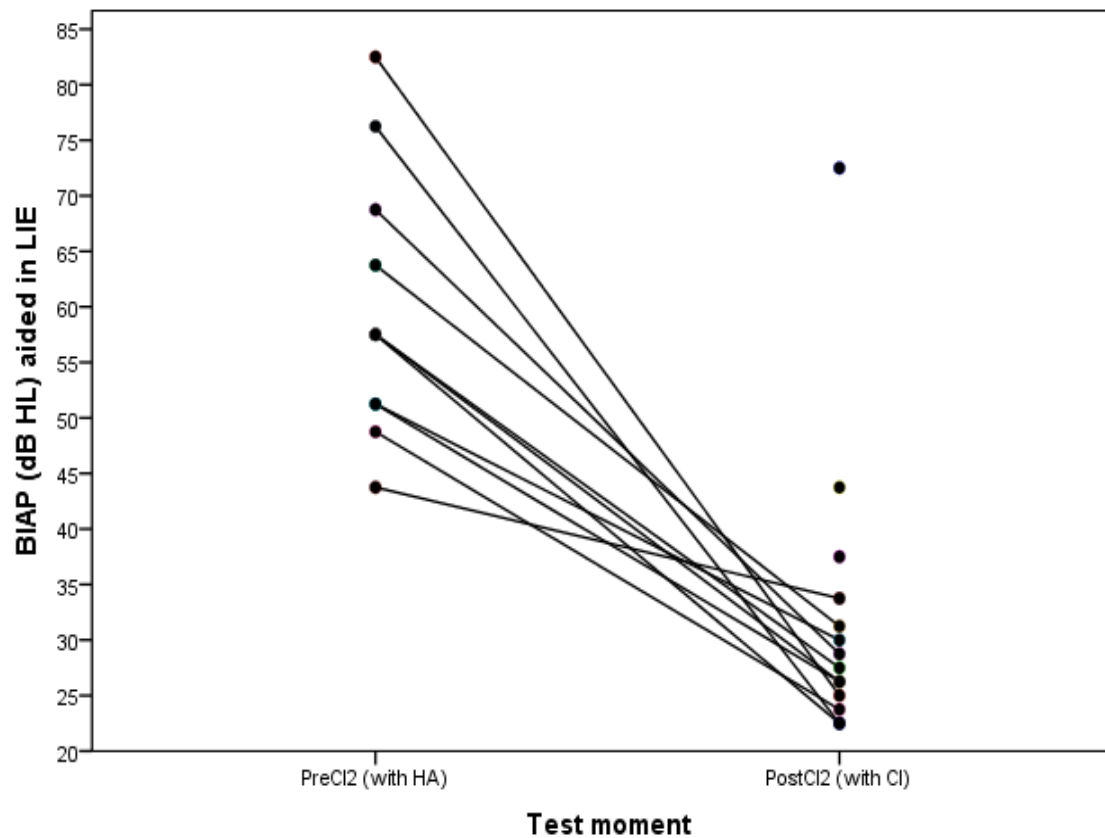
Phoneme discrimination, HA



Outcome after BICI

Individual comparisons bimodal → BICI

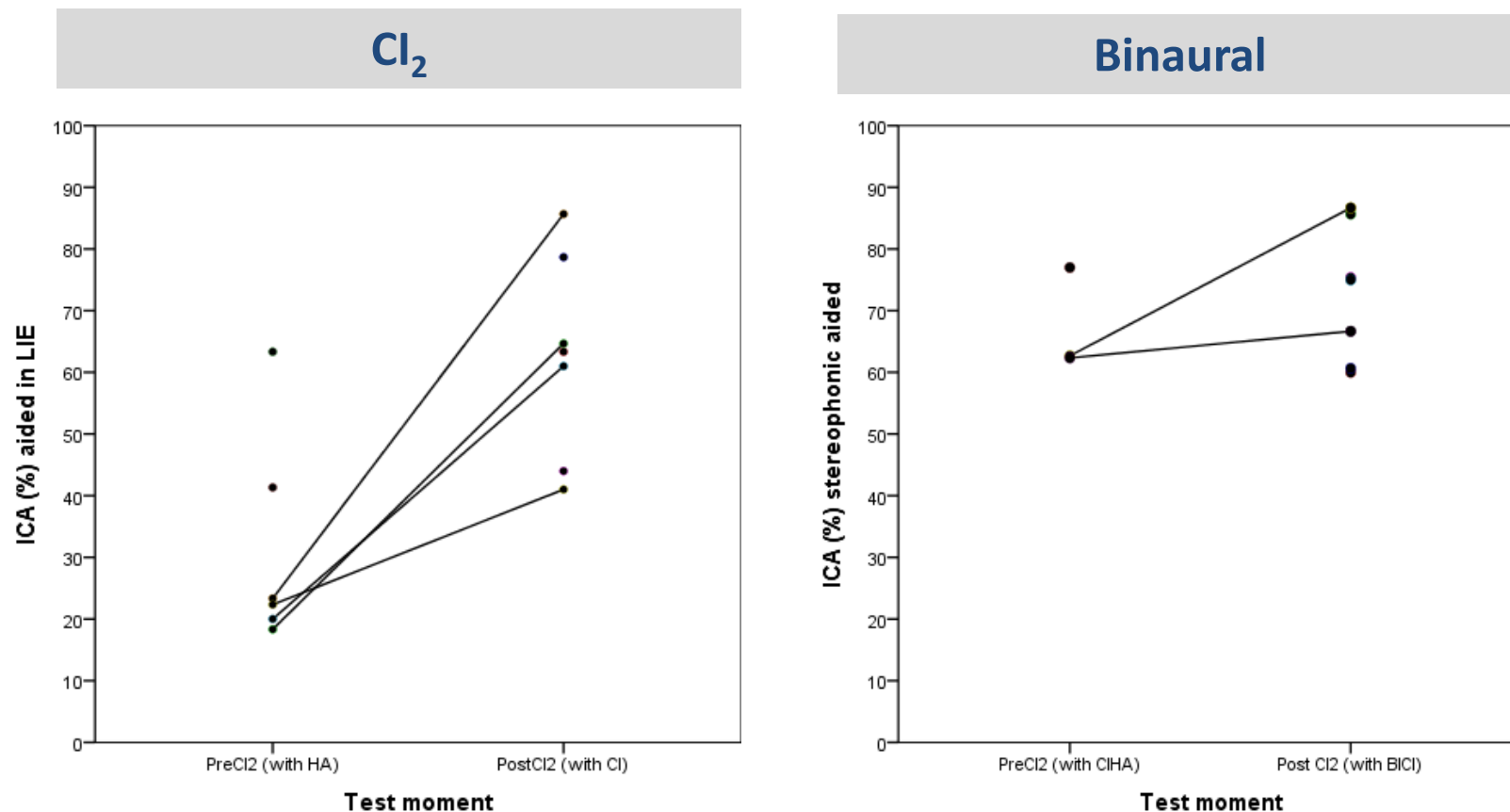
Pure-tone audiometry



Outcome after BICI

Individual comparisons bimodal → BICI

Speech audiometry



- Currently, decision for BICI \leftrightarrow BIMODAL is mainly based on **detection thresholds**
- Need for a **child-friendly protocol** to evaluate **bimodal gain** including at least:
 - In all children:
 - Discrimination tests (Speech audiometry/phoneme discrimination)
 - Vestibular evaluation
 - In children > 5 years old:
 - Speech-in-noise testing
 - Localisation tests
 - Harmonic and disharmonic intonation testing



Comparisons of BIMODAL versus BICI performance
Evidence-based decision at young age



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