



Bilateral Cochlear Implants

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Parents Meeting, Bilateral Cochlear Implants,
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Bilateral Cochlear Implants





Binaural Hearing - value

- Localization,
 - Where things are in space
 - Ease (effort) of listening
 - Lipreading
- Separating target from background
 - target (e.g. speech, music)
 - background (e.g. noise, voices)



Binaural Hearing - value

- Keeping track of multiple sound sources



Binaural Hearing - value

- Keeping track of multiple sound sources
- Lowers intensity level for sound detection



Binaural Hearing - value

- Keeping track of multiple sound sources
- Lowers intensity level for sound detection
- Feeling of being in 3-dimensions



Binaural hearing : mechanisms

- Distance between ears



Binaural hearing : mechanisms

- Distance between ears
- Head blocking sounds



Binaural hearing : mechanisms

- Distance between ears
- Head blocking sounds
- Movement of head



Binaural hearing : mechanisms

- Distance between ears
- Head blocking sounds
- Movement of head
- Movement of sound sources



Binaural hearing : mechanisms

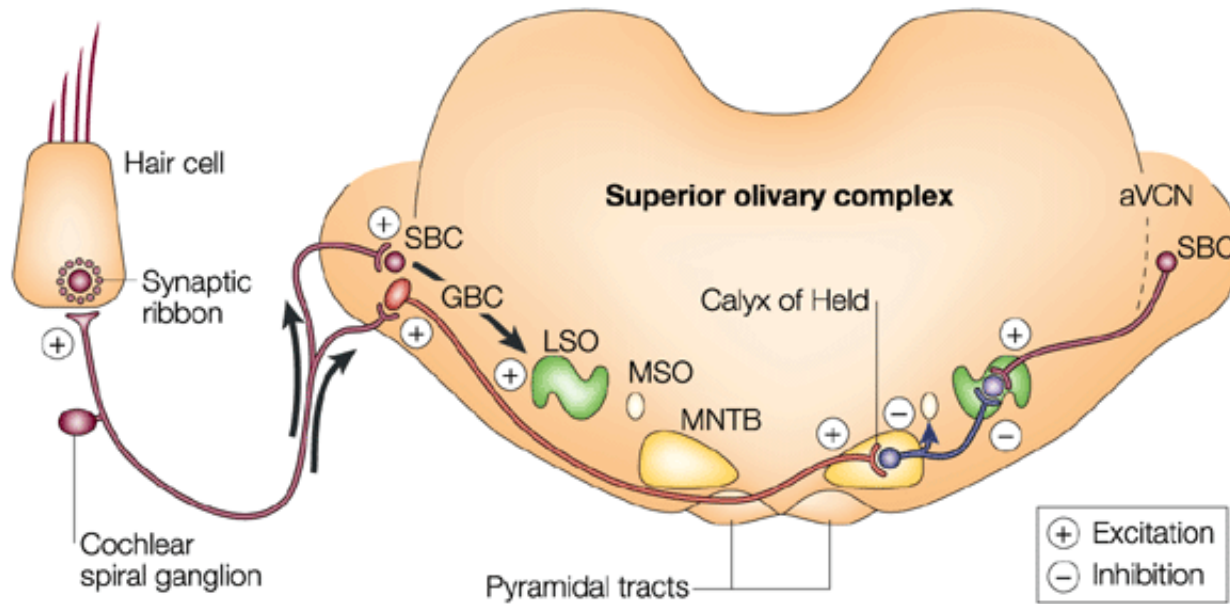
- Distance between ears
- Head blocking sounds
- Movement of head
- Movement of sound sources
- Reflections, reverberations, precedence



Binaural hearing : mechanisms

- Distance between ears
- Head blocking sounds
- Movement of head
- Movement of sound sources
- Reflections, reverberations, precedence
- Brain integrating information

Binaural hearing - basics





What's wrong with one CI?

- Unilateral deafness
- Educational impact
- Poor performance in noise
- Inability to localise sound – accident prone
- Poorer ear may get implanted
- No back-up in event of failure
- Neural substrate remains unstimulated



Limitations Bilateral Implants

- Insufficient timing and level information
- Neuronal survival - distort binaural cues
- Devices might distort binaural cues
- Loss of acoustical hearing - second ear
- Duration of deprivation - differs between ears
- Safety, effectiveness: surgery etc
- Health-economic



NICE Guidance

NHS

*National Institute for
Health and Clinical Excellence*

Issue date: January 2009

Quick reference guide

**Cochlear implants for children and adults with
severe to profound deafness**

NHS

*National Institute for
Health and Clinical Excellence*

NICE Jan 09

- Simultaneous bilateral cochlear implantation
 - children
 - adults who are blind or who have other disabilities that increase their reliance on spatial awareness.

Cochlear Implant Centres



- ★ Belfast
- ★ Birmingham
- ★ Bristol
- ★ Cambridge
- ★ Cardiff
- ★ Great Ormond St
- ★ Guy's and St Thomas'
- ★ Manchester
- ★ Middlesbrough
- ★ Nottingham
- ★ Oxford
- ★ RNTNE
- ★ Southampton
- ★ St George's



Who was included?

All children who received bilateral CIs before the age of 18 yrs

SIM (simultaneous)- children who received both CIs on the same day

SEQ (sequential)- children who received 2 implants at different times



Timeline

- Data collection over the period of 3 years 2010, 2011, 2012
- Data collected over 4 test intervals

Interval	0 pre CI	1 yr	2 yr	3 yr
SIM	tested with hearing aids	both CI	both CI	both CI
SEQ	tested with one CI or CI & HA	both CI	both CI	both CI



Outcome measures

Four categories

- Performance measures
- Rating scales
- Parental questionnaire
- Surgical Outcomes

Performance Measures

Soundfield Threshold
Speech Perception
Localisation
British Picture
Vocabulary Scale



(Prof. Mark Lutman)



Rating Scales

Speech Intelligibility Rating

Categories of Auditory Perception



Parental Questionnaires

Parent Outcome Profile

(Explores issues important to parents)

Bilateral Listening Skills Profile

(Listening in Complex environments)

Brief Assessment of Parental Perception

(Quality of Life)



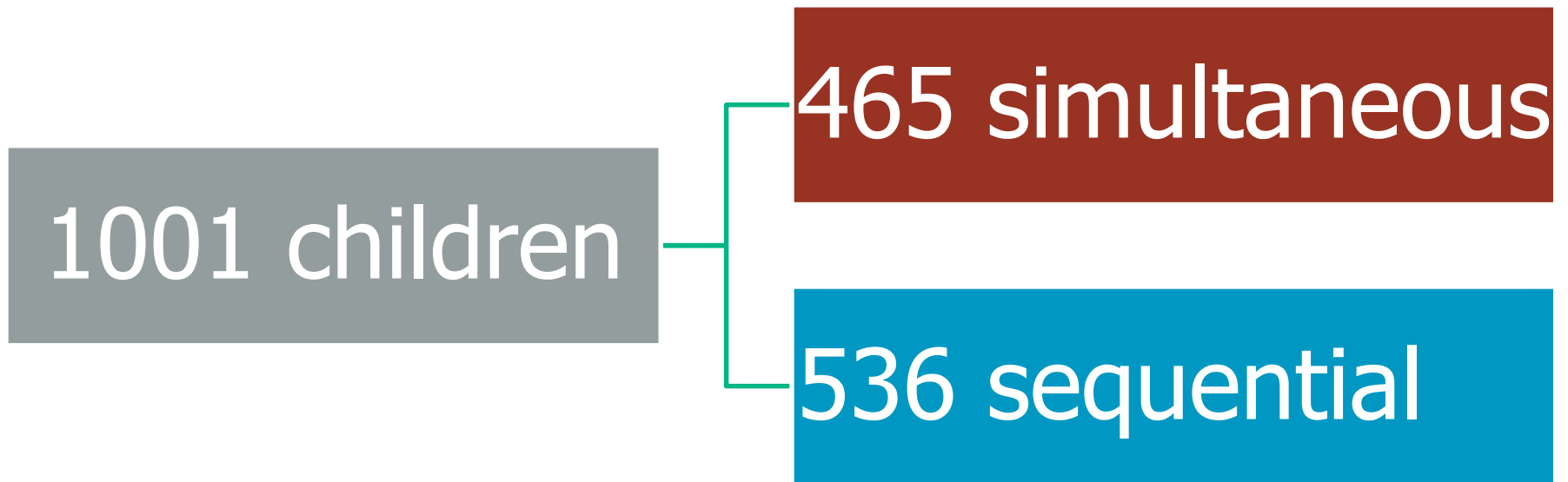
Surgical Audit

Surgical / Anaesthesia Complications
(incl duration of intervention, training etc)

Stephen Broomfield, John Murphy, Steve Emmett

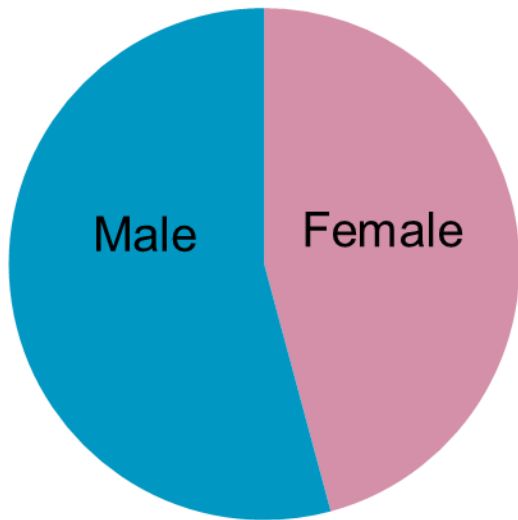
UK National Audit

Bilateral Paediatric Cochlear Implantation

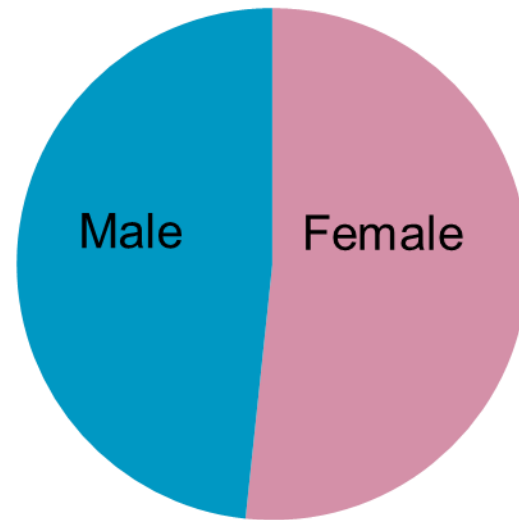


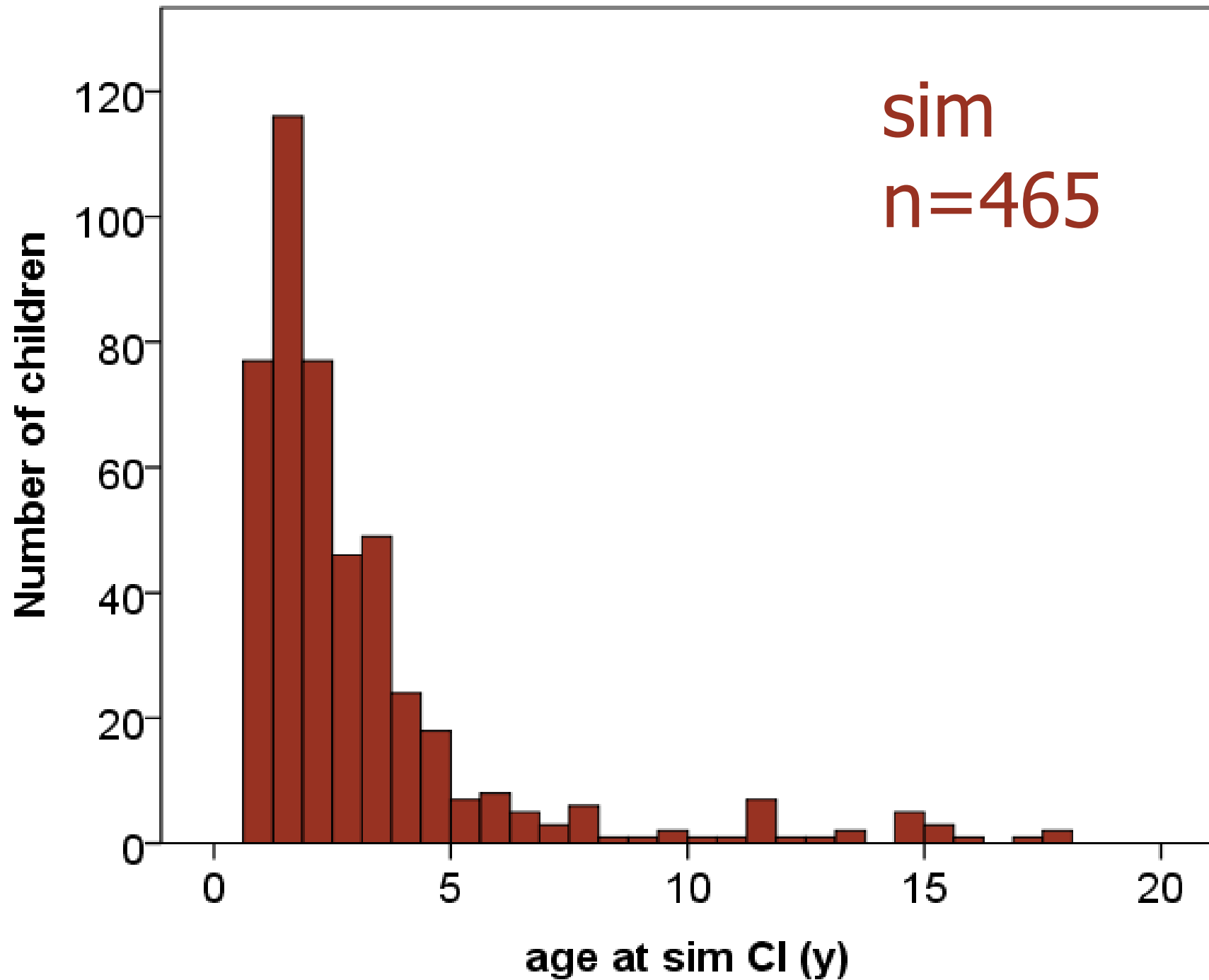


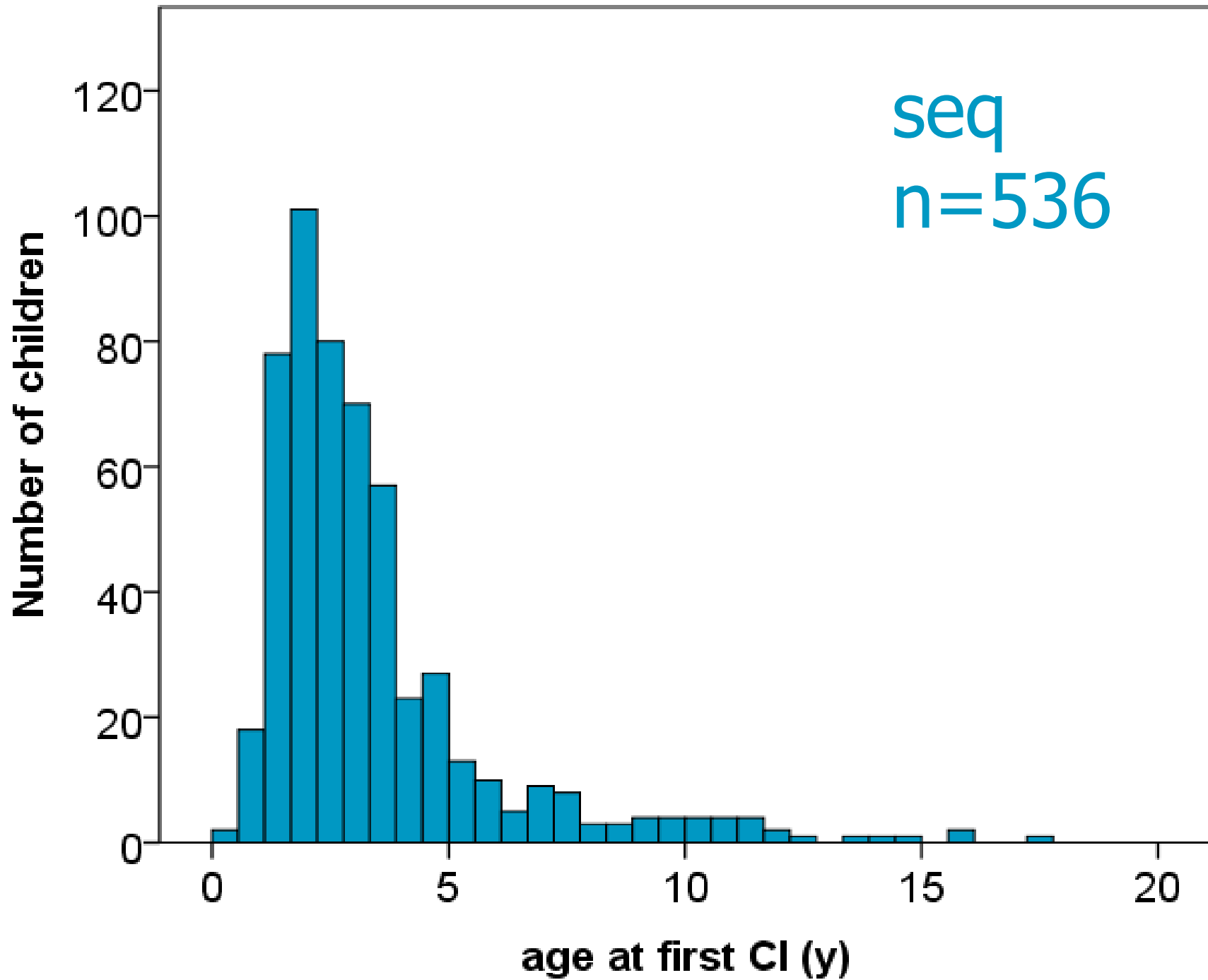
Simultaneous

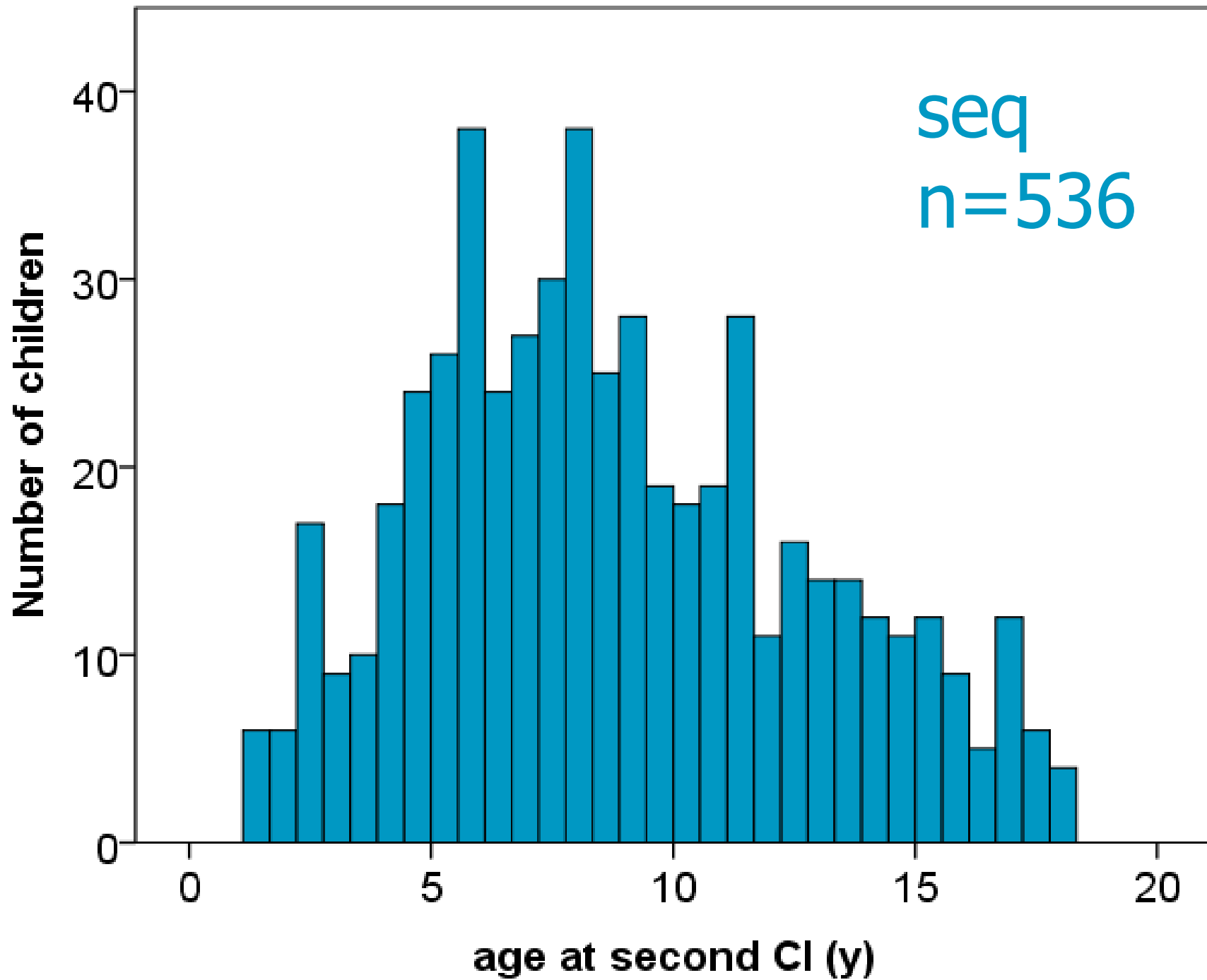


Sequential

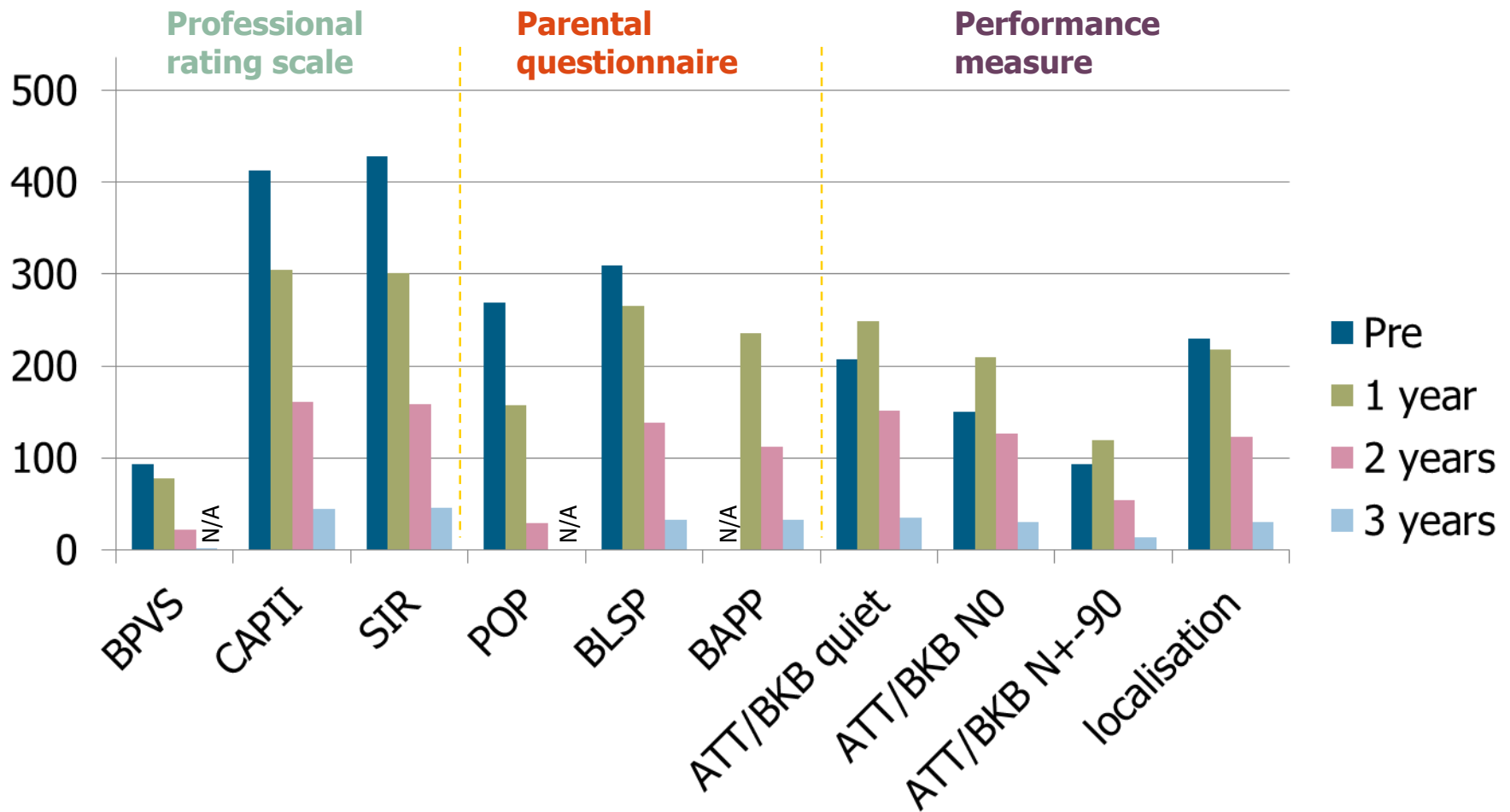




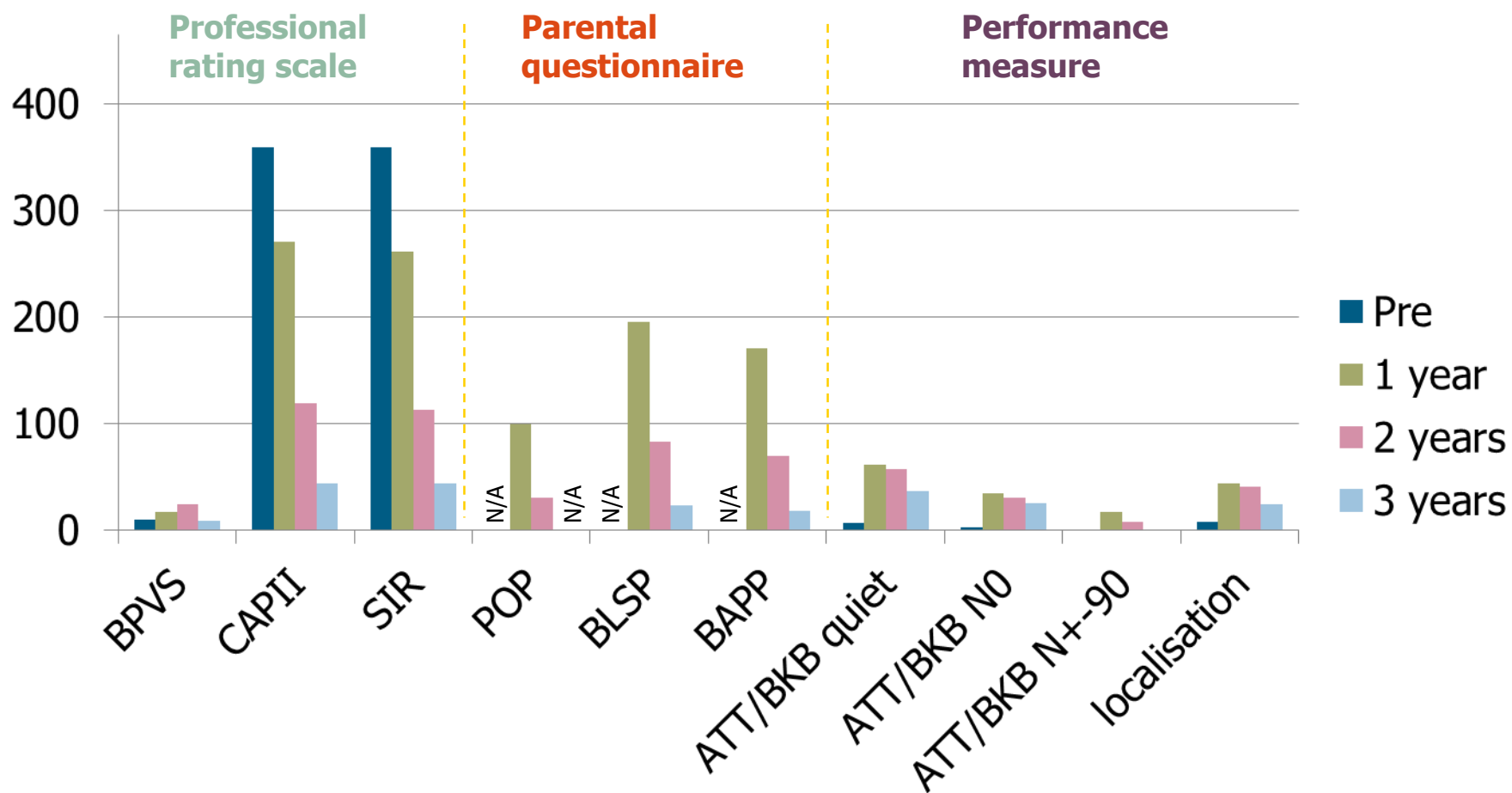




Sequential n=536

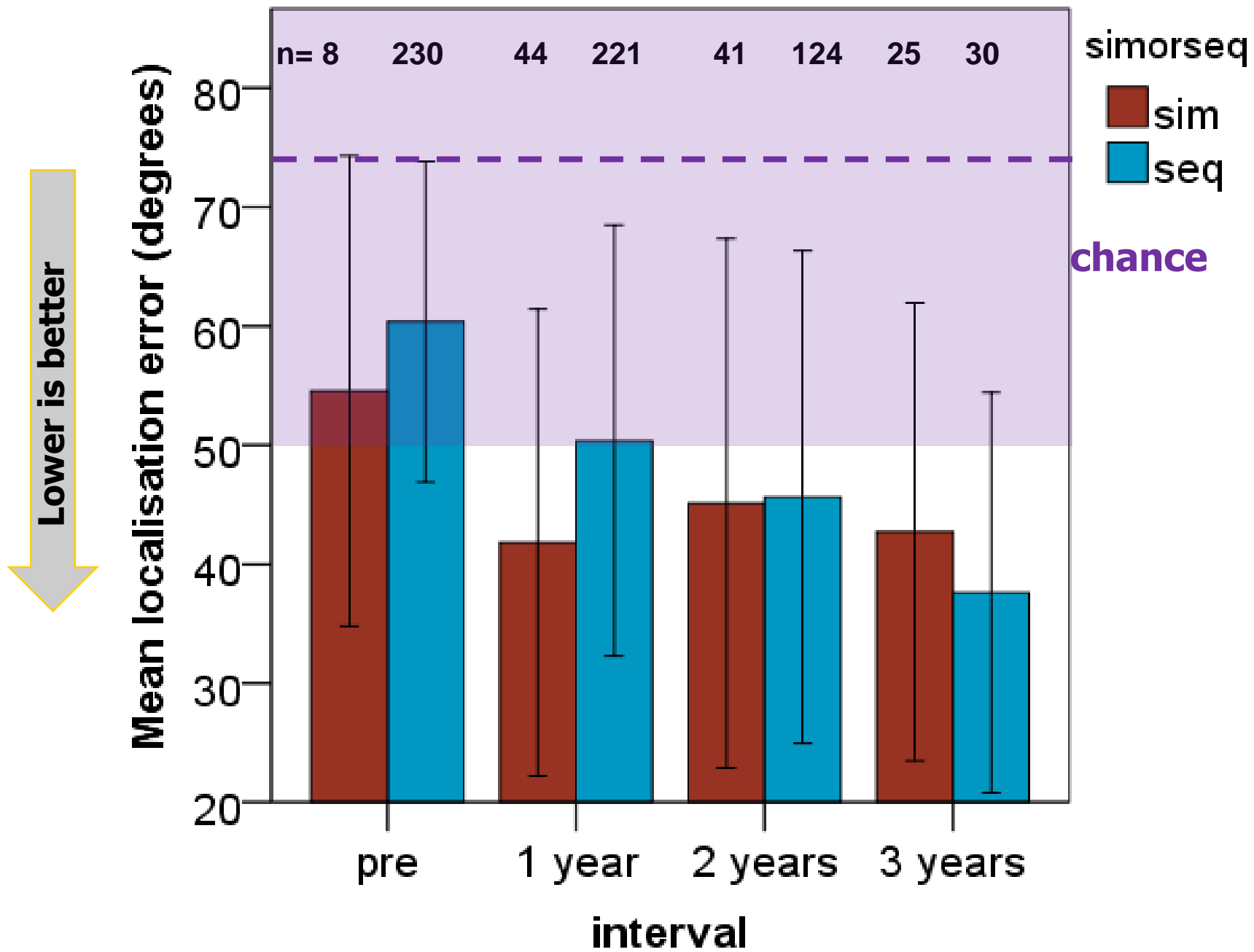


Simultaneous n=465



Localisation





Speech perception

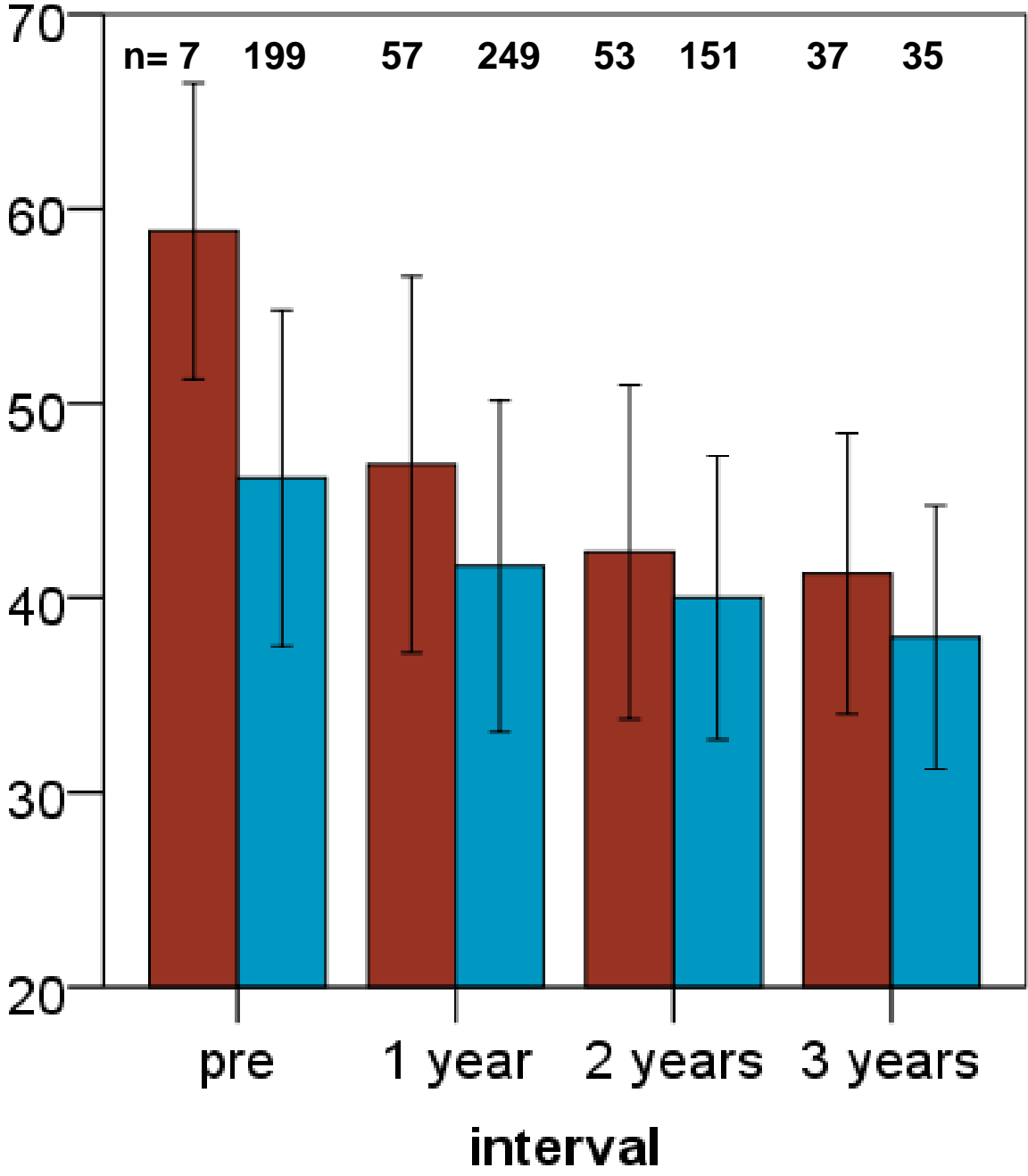


Home language
Arabic
Bengali
British Sign Language
Creole
English
Farsi
Filipino
French
Gujrathi
Hindi
Malayalama
Mirpuri
Nepali
Polish
Portugese
Punjabi
Pushtu
Romanian
Somali
Sylheti
Urdu
Welsh
Yiddish

23 Home Languages

Lower is better

Mean speech perception in quiet (dB)



simorseq

sim
seq

Error Bars: +/- 1 SD



Recent Publications

Sarant et al
2014 (Aus.)

Ear Hear

BiCi: better vocab and language;
faster acquisition



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Bartov 2014 (Israel)	J Speech Lang Hear Res	Bimodals better at song recognition

Summary



- Value of multi-centre data: > 1,000 children
- Emergence of binaural hearing
- Variation
- Surgical outcome: no additional risk
- Acceptable to parents
- Literature: duration of deprivation, parental engagement, other disability: key factors



National Audit Website

<http://bilateralcochlearimplants.co.uk/results>