Early spoken language development following pediatric cochlear implantation: Direct comparison of non-tonal and tonal language development

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Overview

- Pediatric outcome assessment
  - Extended Outcome Study (EOS)
  - Objective assessment of speech/language development
- Practical assessment of language development
  - Simplified Short Forms of Mandarin CDI
  - Normal equivalent age
- Mandarin language development after pediatric CI
  - Study design
  - Normalized vocabulary growth rates
- Direct comparisons of Mandarin and English results

Pediatric outcome assessment

- Extended Outcome Study
  - 5-year follow-up after early CI/HA intervention
  - 250 subjects from West China Hospital
- Norm-referenced outcome measures
  - Early prelingual auditory development (Zheng et al., 2009, A&N)
  - Early speech perception (Zheng et al., 2009, E&H; 2009, IJA; Wong et al., 2007, E&H)
  - Early language development (Soli et al., 2012, IJPO; Bei et al., IJPO in press)

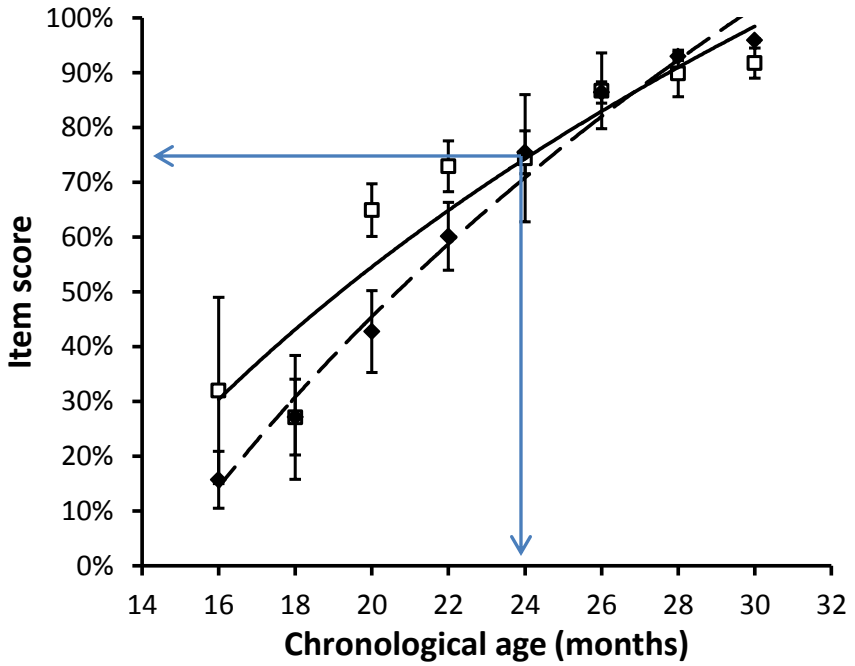
Test software available through Chinese Academy of Audiological Rehabilitation (CAAR)

Practical assessment of language development

- Mandarin CDI (MCDI) (Tardif & Fletcher, 2008, PMU Press)
  - Words & Gestures (411 items)
    - Receptive and expressive vocabulary
    - 8-16 months of age for normals
  - Words & Sentences (799 items)
    - Expressive vocabulary
    - 16-30 months of age for normals
- Simplified Short Form (SSF) MCDI (Soli et al., 2012, IJPO)
  - 50 items for W&G and W&S
  - Assessment of vocabulary growth rates

Practical assessment of language development

- Norms for MCDI (dashed) and SSF MCDI (solid)
  - Vocabulary growth rates are comparable
  - Normal Equivalent Age (NEA) = chronological age for score in norming sample
  - Example:
    75% item score ⇒ 24 months NEA



- Comparable norms for SSF Words & Gestures expressive and receptive vocabulary

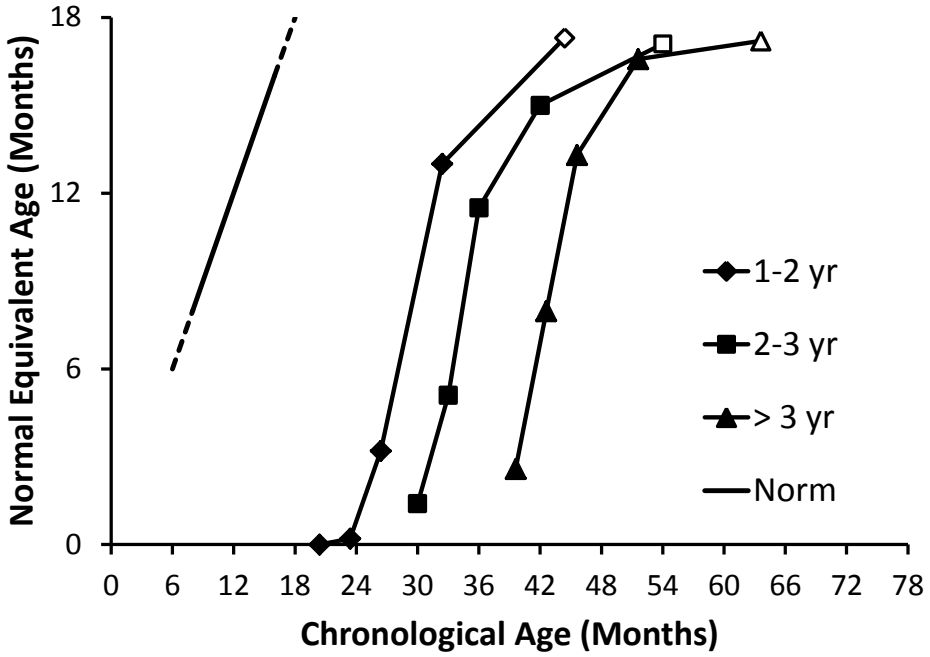
Words & Sentences:
Expressive vocabulary
(Soli et al., 2012, IJPO)

Mandarin language development after pediatric CI

- Study design (based on Niparko et al., 2010, JAMA)
  - N = 112 pediatric CIs implanted at 1-5 years of age
  - Outcome assessment at baseline and 3, 6, 12, 24 months post-implant
- Outcome measures
  - NEAs for SSF Words & Gestures and Words & Sentences inventories
  - NEAs displayed as a function of chronological age
  - Normalized vocabulary growth rate (NVGR):

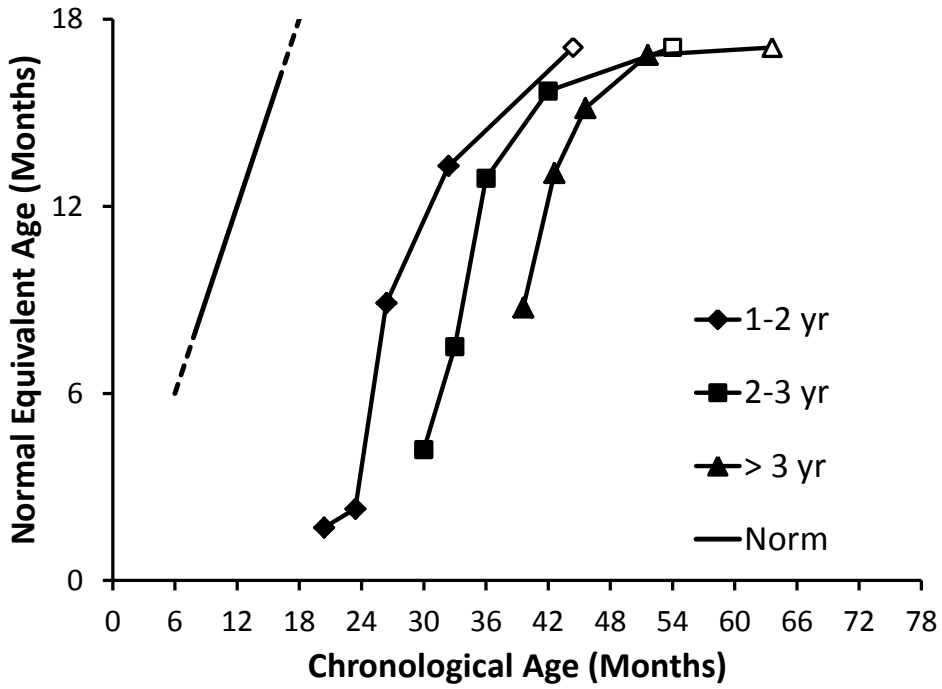
NVGR = Δ NEA/ Δ chronological age

Words & Gestures: Receptive vocabulary



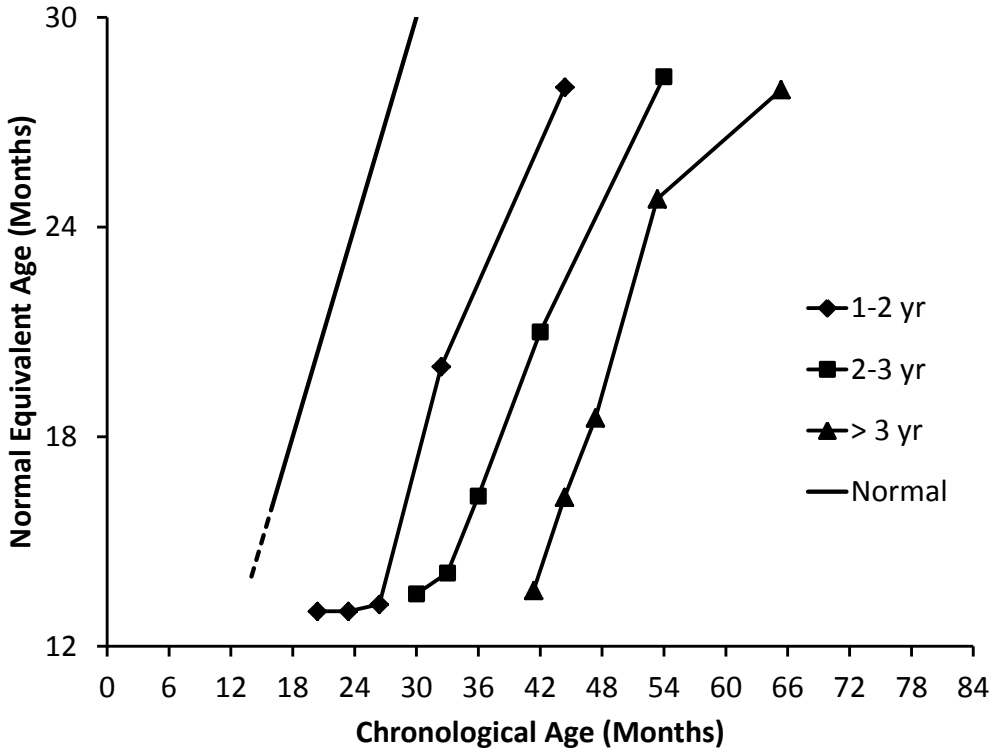
- Results are asymptotic at 24 months
- NVGRs greater than normal
- Vocabulary growth in first 12 months after CI ≅ growth in first 18 months in normals
- NVGRs not dependent on implant age
- W&G not appropriate beyond 12 months after CI

Words & Gestures: Expressive vocabulary



- Results again asymptotic at 24 months (and at 12 mo. for oldest implant group)
- NVGRs greater than normal
- Vocabulary growth in first 12 months after CI ≅ growth in first 18 months in normals
- NVGRs not dependent on implant age
- Receptive and expressive NEAs comparable
- W&G not appropriate beyond 12 months after CI

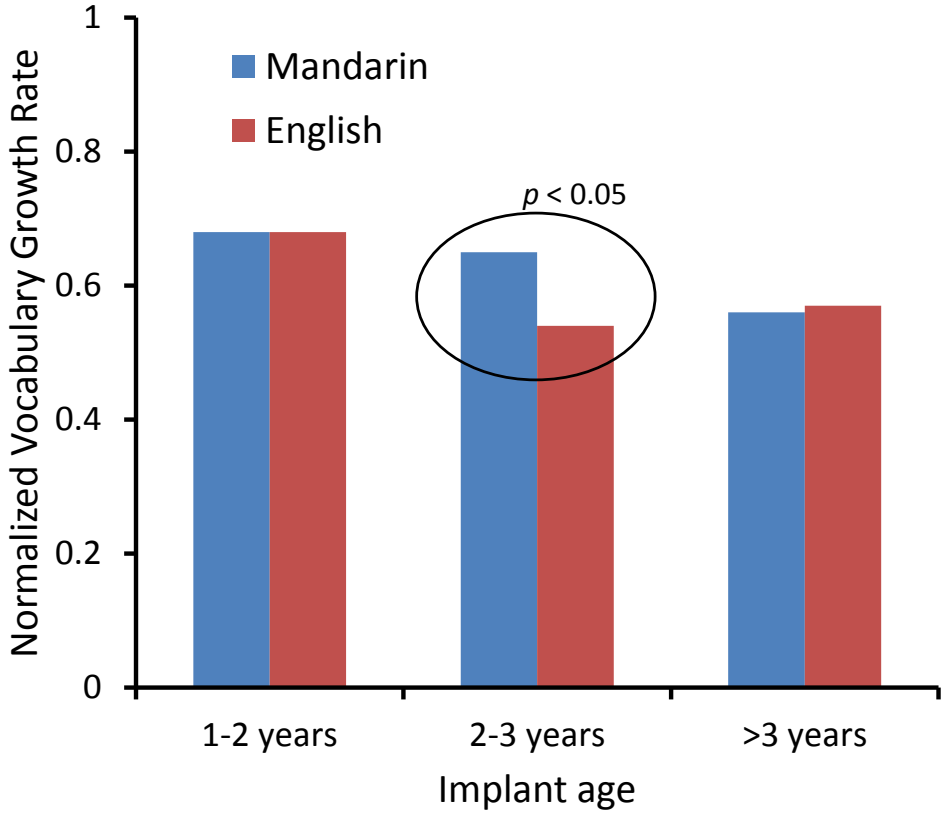
Words & Sentences: Expressive vocabulary



- Results not asymptotic at 24 months
- NVGRs significantly less than normal
  - 1-2 yr: growth after 6 months
  - 2-3 yr: growth after 3 months
  - >3 yr: growth after baseline
- NVGR for oldest implant group significantly lower

Direct comparisons of Mandarin and English vocabulary growth

- Express Niparko et al. (2010) data as NVGRs
  - Reynell Development Language Scales (RDLS)
  - Average of comprehension and expression
- Compare Mandarin and English
  - NS differences for 1-2 year and >3 year implant age groups
  - English NVGR significantly lower for 2-3 year olds
  - NVGR significant lower for >3 year implant age for both Mandarin and English



Conclusions

- Practical assessment of early language development is possible in a clinical setting with SSF version of MCDI
- Normalized vocabulary growth rates allow direct comparisons of language development across languages
- Mandarin and English results suggest that, despite linguistic and cultural diversity, early language development after CI is comparable
- The plasticity of the developing auditory system, as seen in early language development, reveals its universal nature