Unilateral and Bilateral Cochlear Implantation in Adults

Medicare Evidence Development & Coverage Advisory Committee (MedCAC)-Presentation

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Introduction

- Current Guidelines
  - Severe-profound SNHL (PTA>70dB HL)
  - HINTQ score (< 40%) despite appropriately fit HAs (Binaural)
- Clinical Experience
  - 240 cochlear implants/yr at UNC-CH (>1800 total)
    - 50% adult patients
    - All device manufacturers
    - 95% perform above the HINTQ criterion (<40% HINT) using their CI

Data Examining Unilateral Criteria

- Adunka et al (Laryngoscope 2008;118(11):2044-9.)
  - Prospective data collection
  - Retrospective review
  - Adult CI patients (1996-2005)
    - Substantial pre-operative residual hearing:
      - CUNY sentence score >60%
      - HINTQ sentence score >50%
      - or CNC word score >20%
    - Performance @ 3, 6, 12 months post-op.

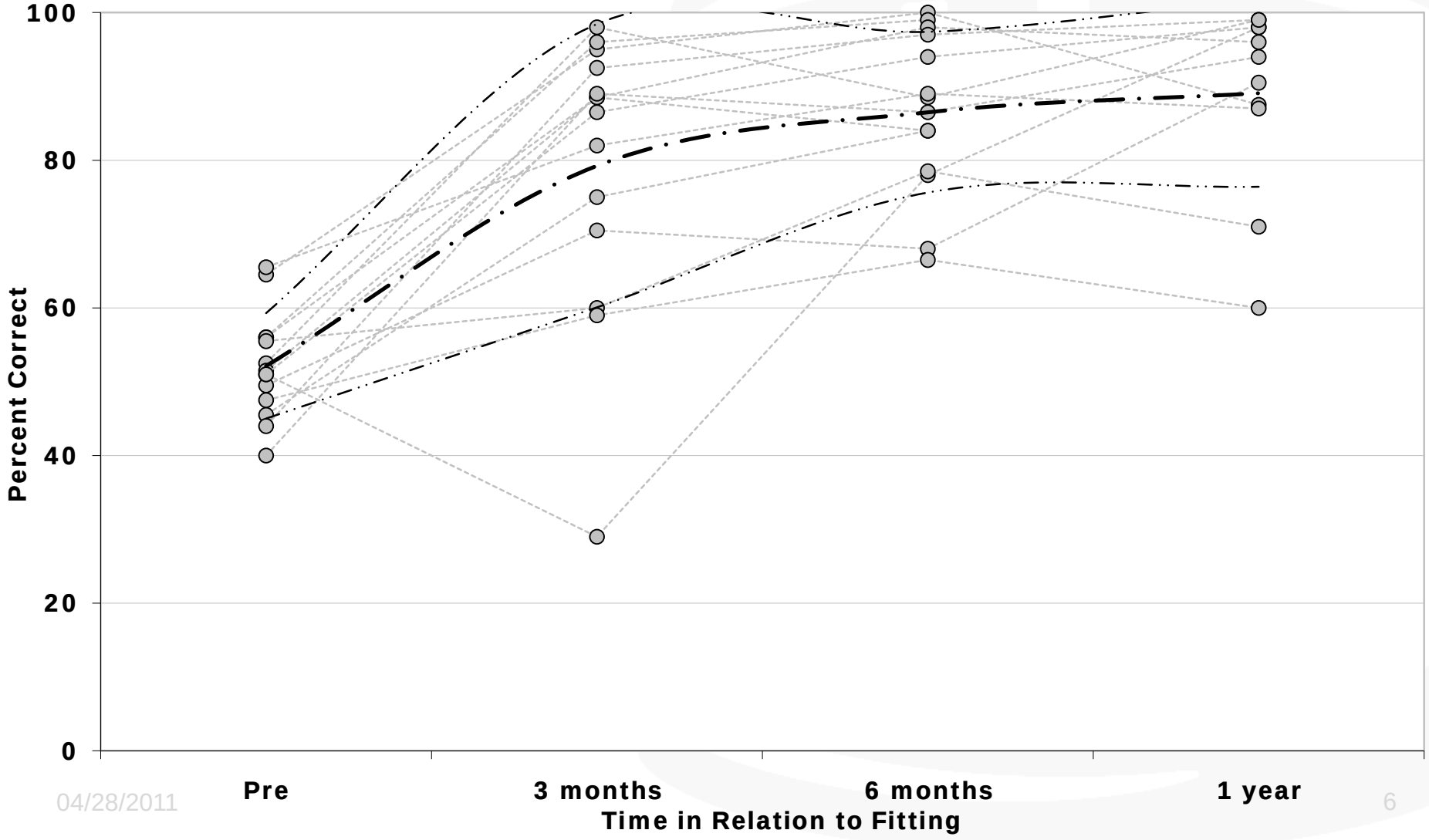
Group Characteristics

- **Selected 15 of 29 patients with HINTQ > 40%**
  - **Average age 56 yrs**
  - **None could use telephone before impl.**
- Severe-profound SNHL
- Significant hearing handicap in best-aided cond.

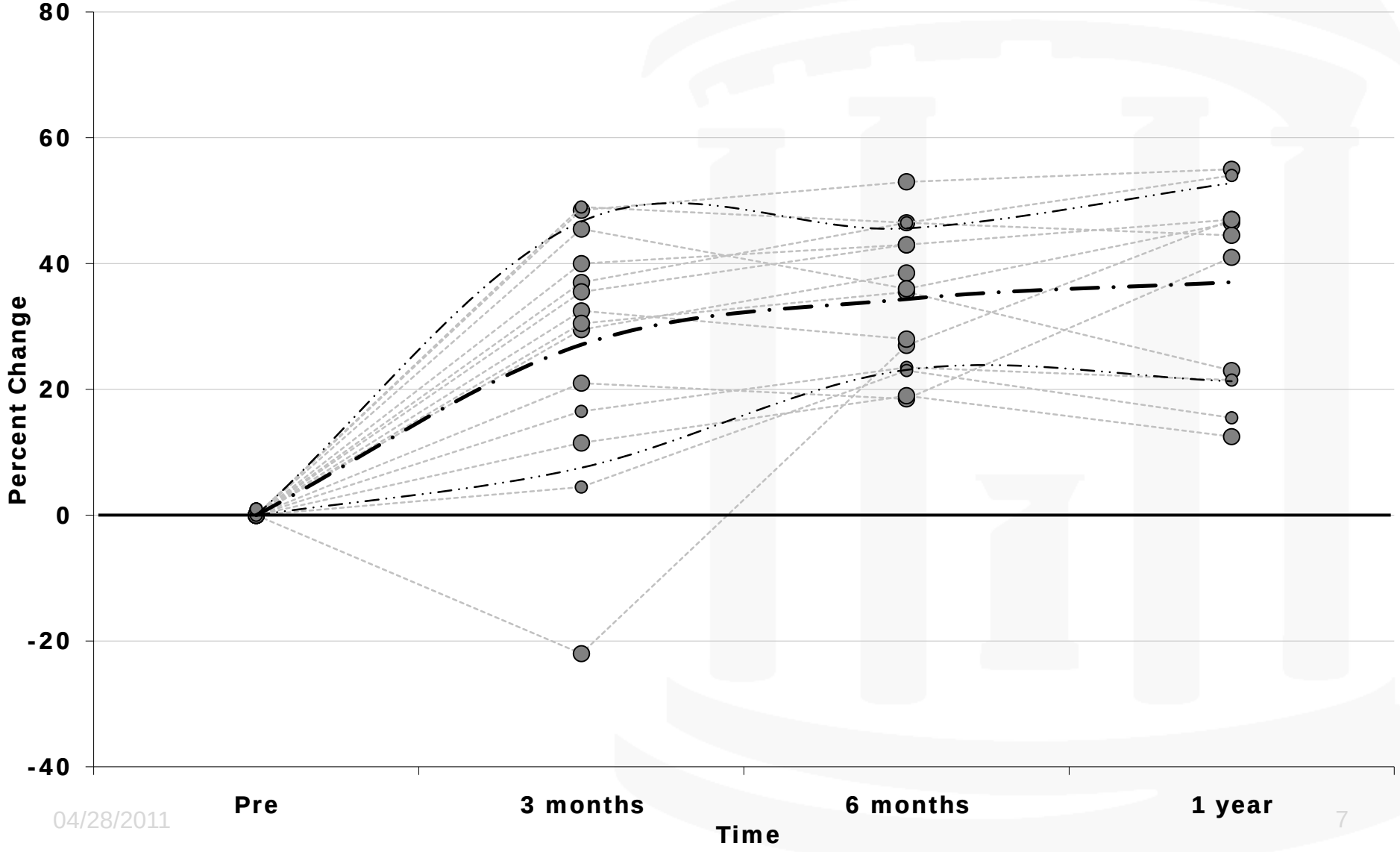
Audiologic Evaluation

- Pre-operative:
  - » Best-aided condition
- Post-operative:
  - » Cochlear implant *only*
  - » Encouraged not to wear hearing aids
  - » No auditory-verbal therapy

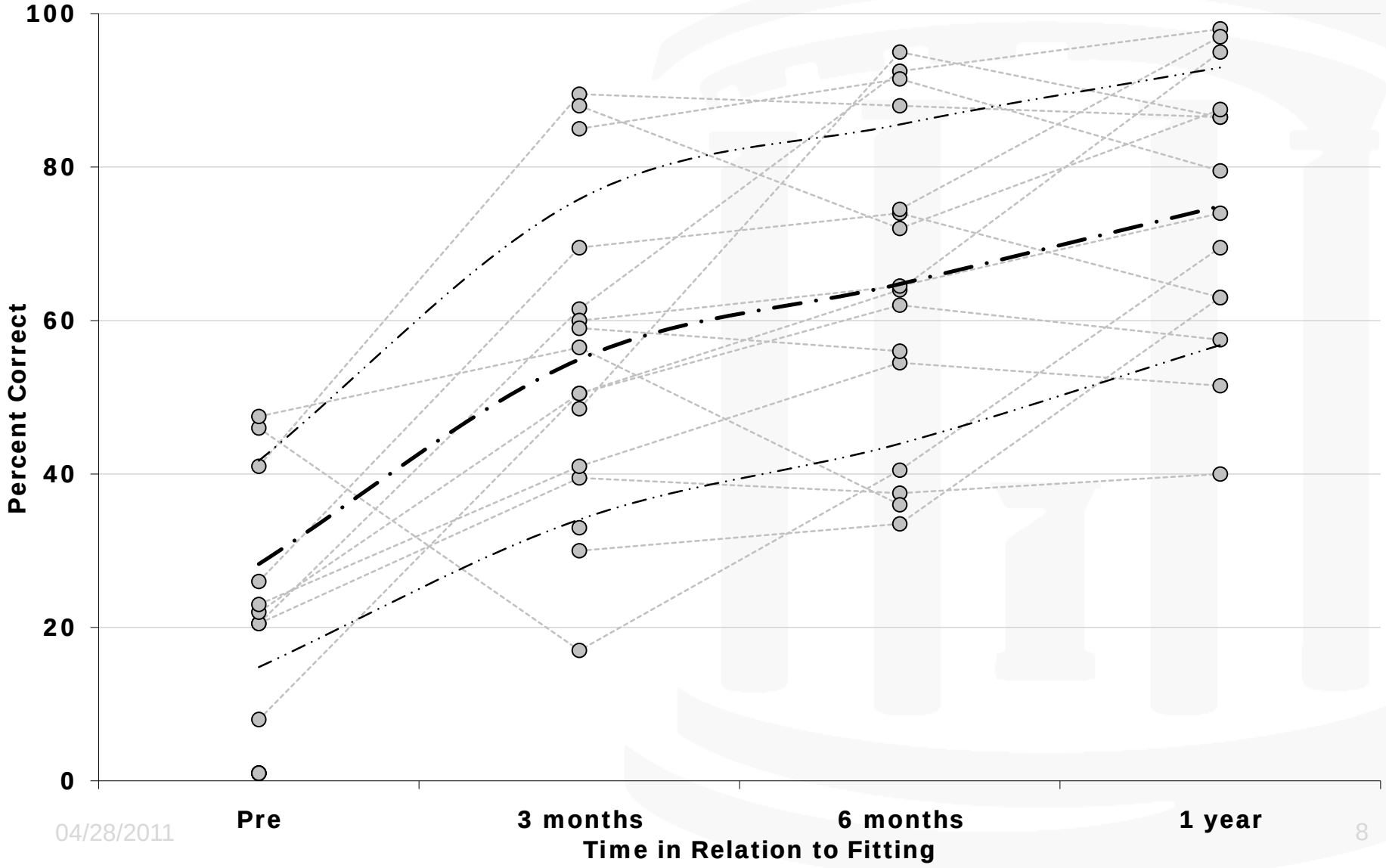
HINT in Quiet-Scores in Subjects with Preoperative Residual Hearing (a Preoperative Score of ≥ 40% Qualifies)



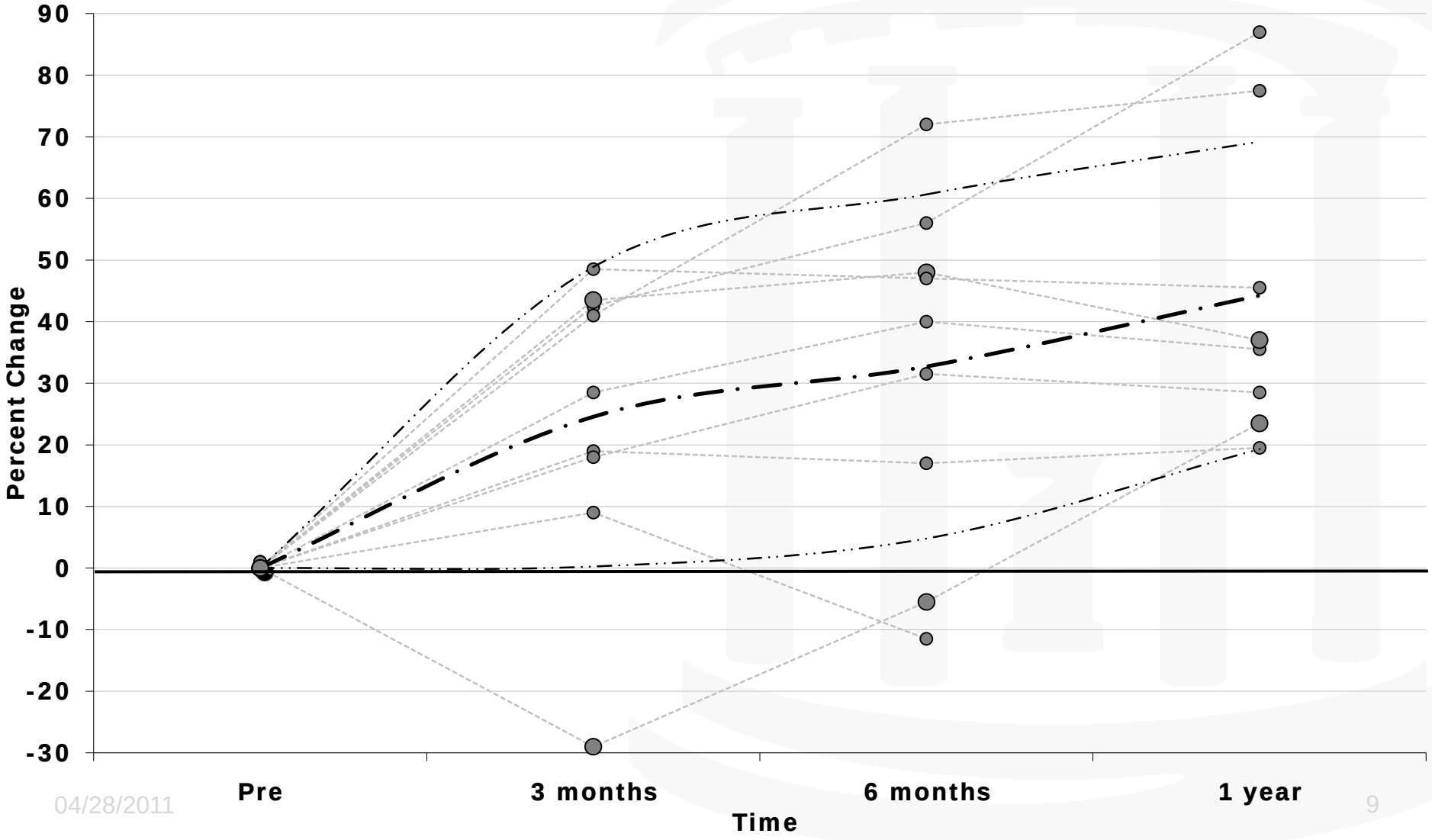
Change in HINTQ Performance based on Preoperative Values over Time (a Preoperative Score of ≥ 40% Qualifies)



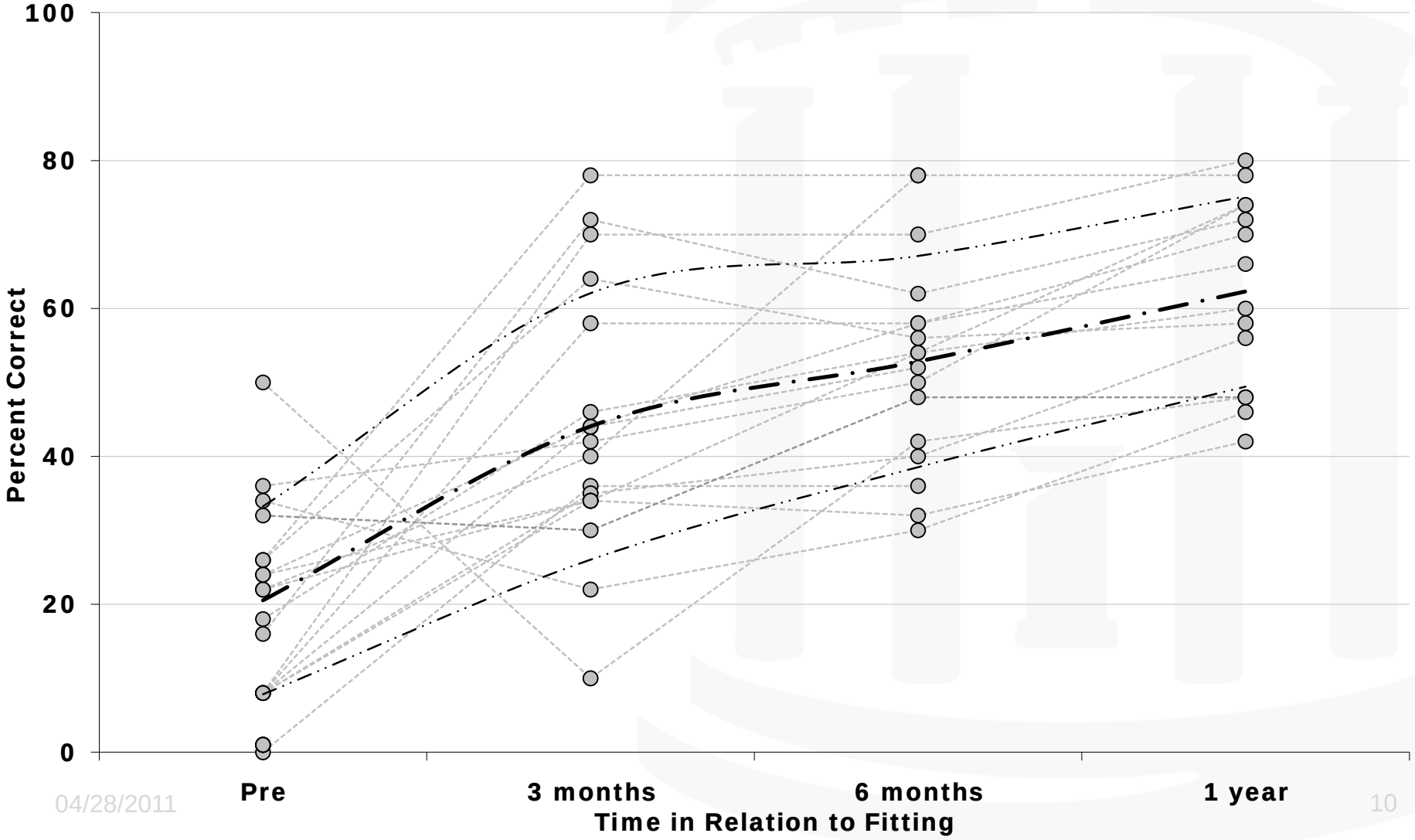
HINT +10 dB SNR-Scores in Subjects with Preoperative Residual Hearing (a Preoperative Score of ≥ 40% Qualifies)



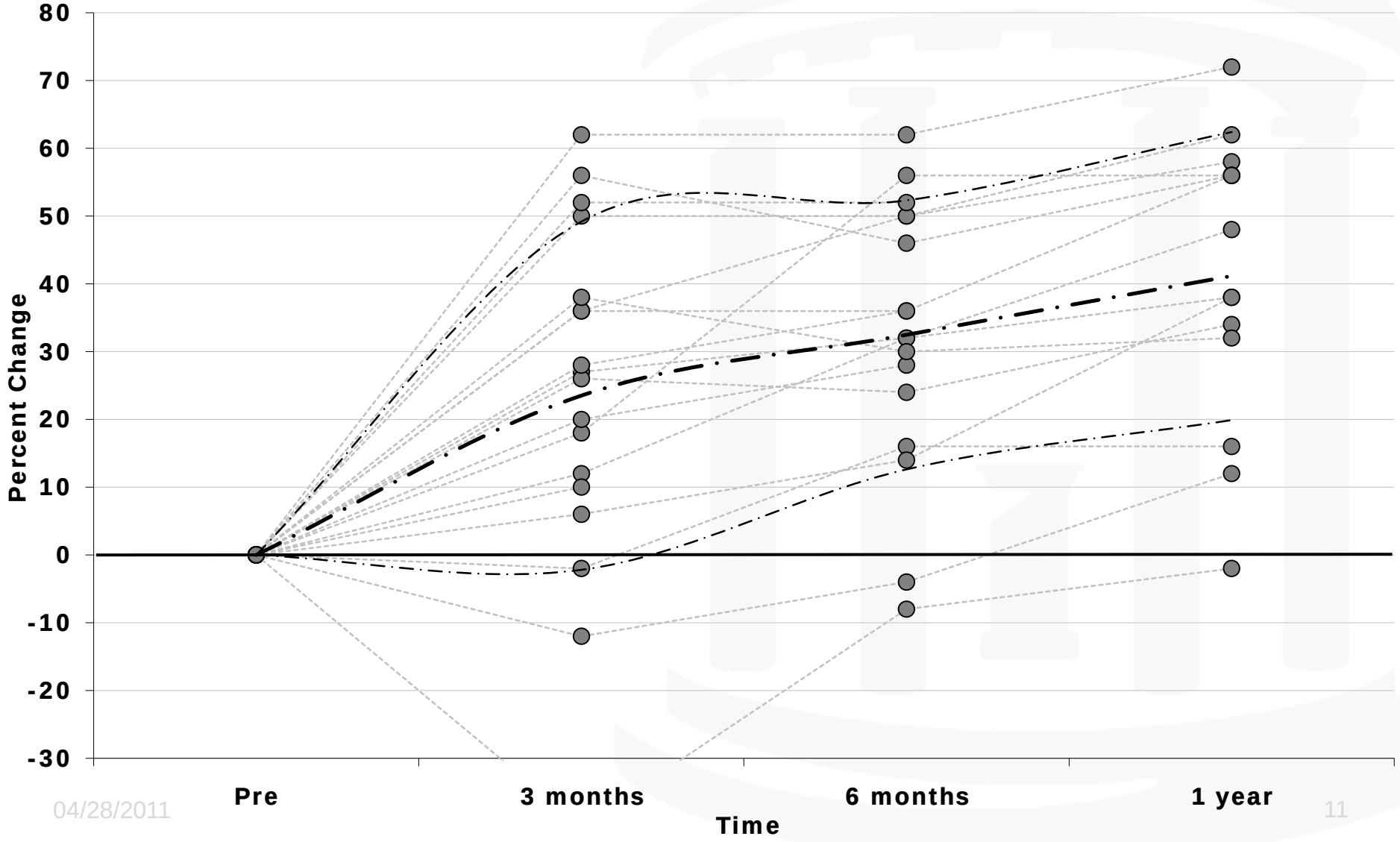
Change in HINT +10 dB SNR Performance based on Preop Values over Time (a Preoperative Score of ≥ 40% HINT Qualifies)



CNC Scores in Subjects with Preoperative Residual Hearing (a Preoperative Score of ≥ 40% HINT Qualifies)



Change in CNC Performance based on Preoperative Values over Time (a Preoperative Score of ≥ 40% HINT Qualifies)



Summary

- Patients *surpassed* preoperative aided level
- Contralateral Hearing aid not used
- HINT-Q represents ceiling for CI performance!

- Testing w/ contralateral HA *may* result in even greater gains
  - » Gifford et al; Ear Hear 2010;31(2):186-94

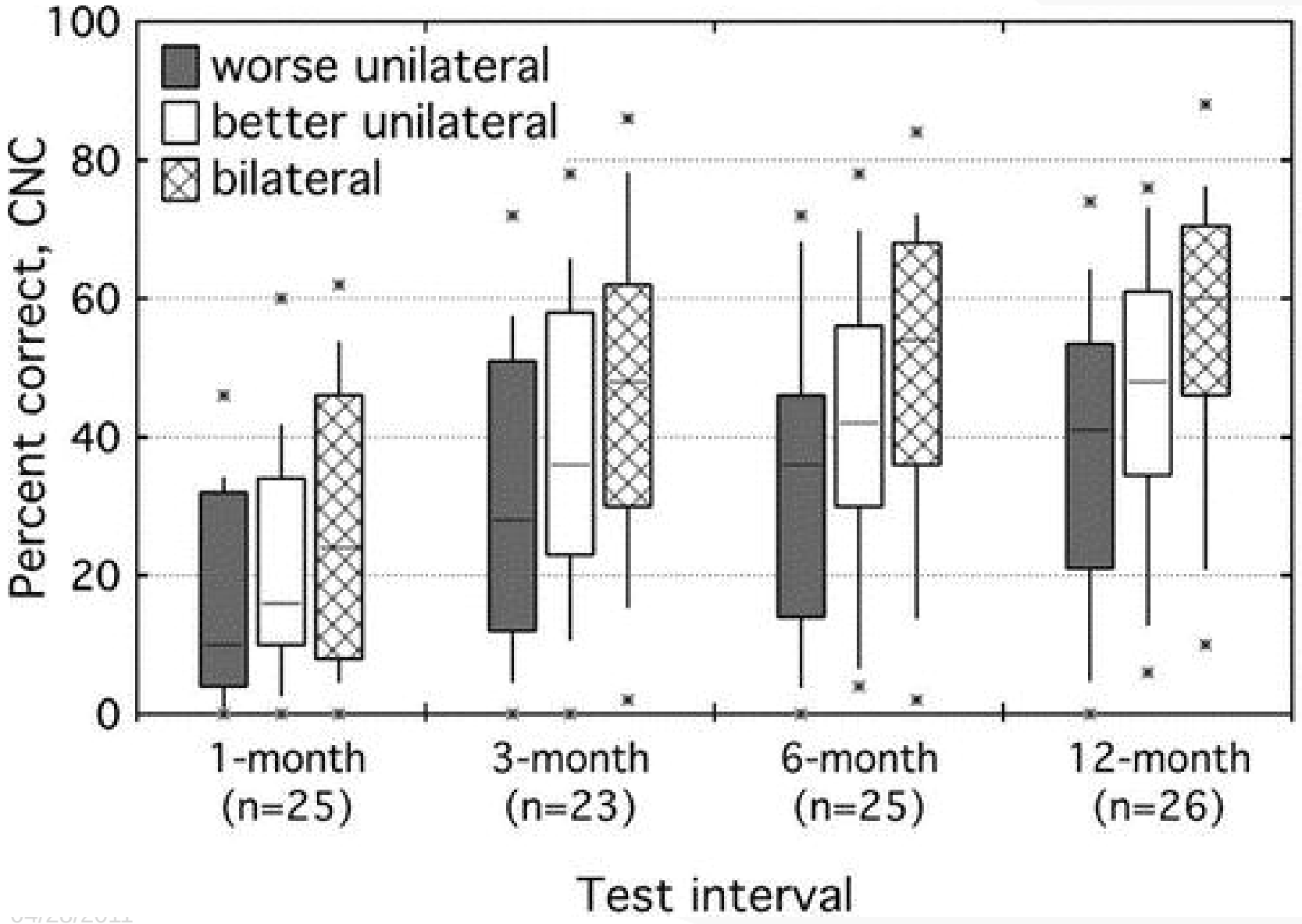
Bilateral CI in Adults

Data Examining Bilateral Criteria

Buss et al (Ear Hear 2008;29(1):20-32.)-*1 yr data*

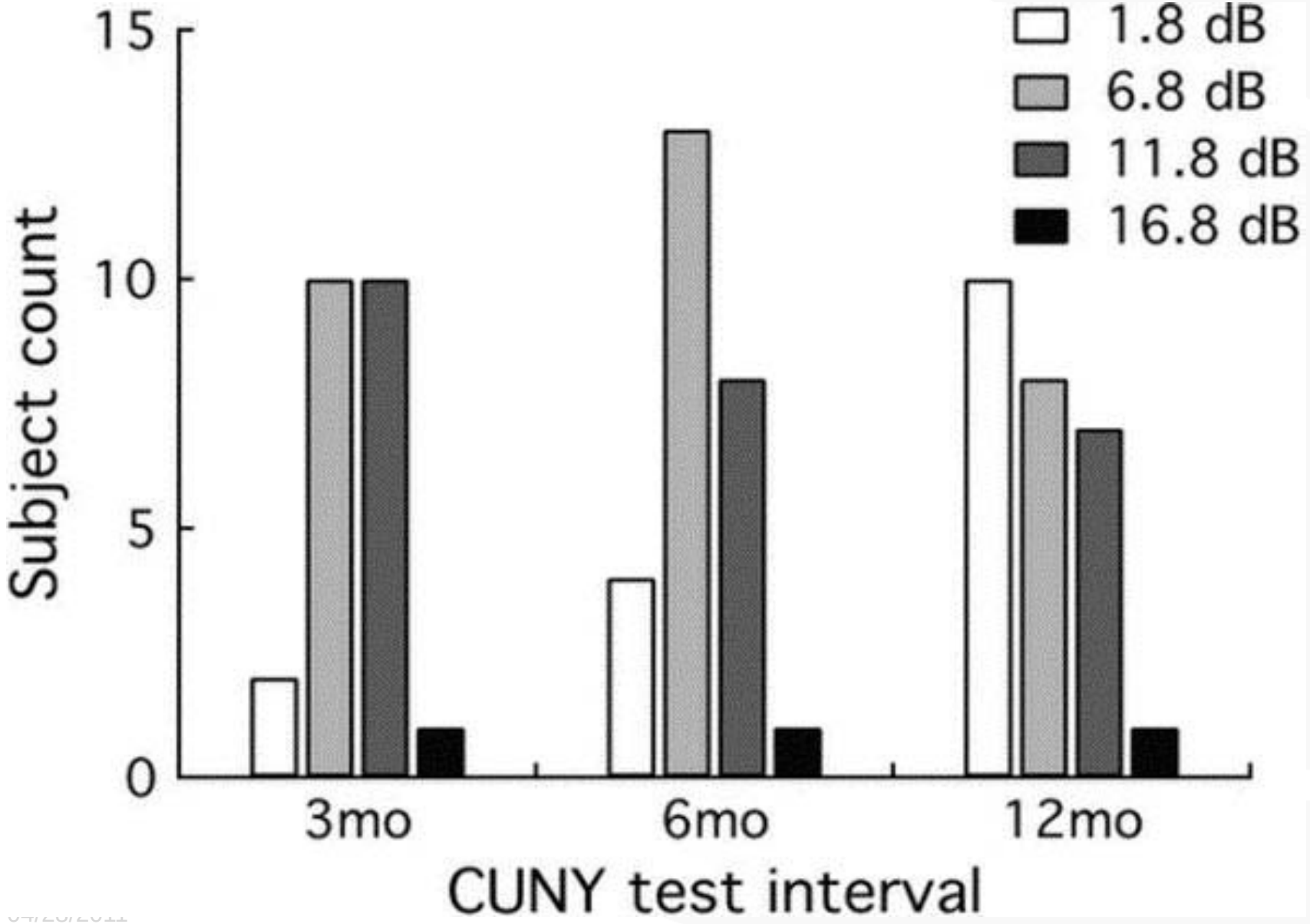
Eapen et al (Otol Neurotol 2009;30(2):153-9.)-*4 year data*

- 26 simultaneous bilateral cochlear implantation
- MED-EL COMBI 40+
  - 31mm electrode, full insertion
- Adults 26-76 years (mean=56.8)
- Met criteria for unilateral implantation
- Duration of deafness ≤15 years
- Mismatch ≤10 years
- Literate and fluent in English


worse unilateral
better unilateral
bilateral
Percent correct, CNC
100
80
60
40
20
0
1-month
(n=25)
3-month
(n=23)
6-month
(n=25)
12-month
(n=26)
Test interval

Procedure

- City University of New York (CUNY)
  - » 72 lists 102 keywords
  - » Determine Signal to Noise Ratio (SNR)
    - 2 conditions *noise-left/bilateral* and *noise-right/bilateral*
    - SNR adjusted by 5 dB for performance between 40-80% correct
  - » 9 conditions
    - Signal was presented from the front
    - Noise (-90º, 0º, +90º)
    - *Left-only, Right-only, Bilateral*

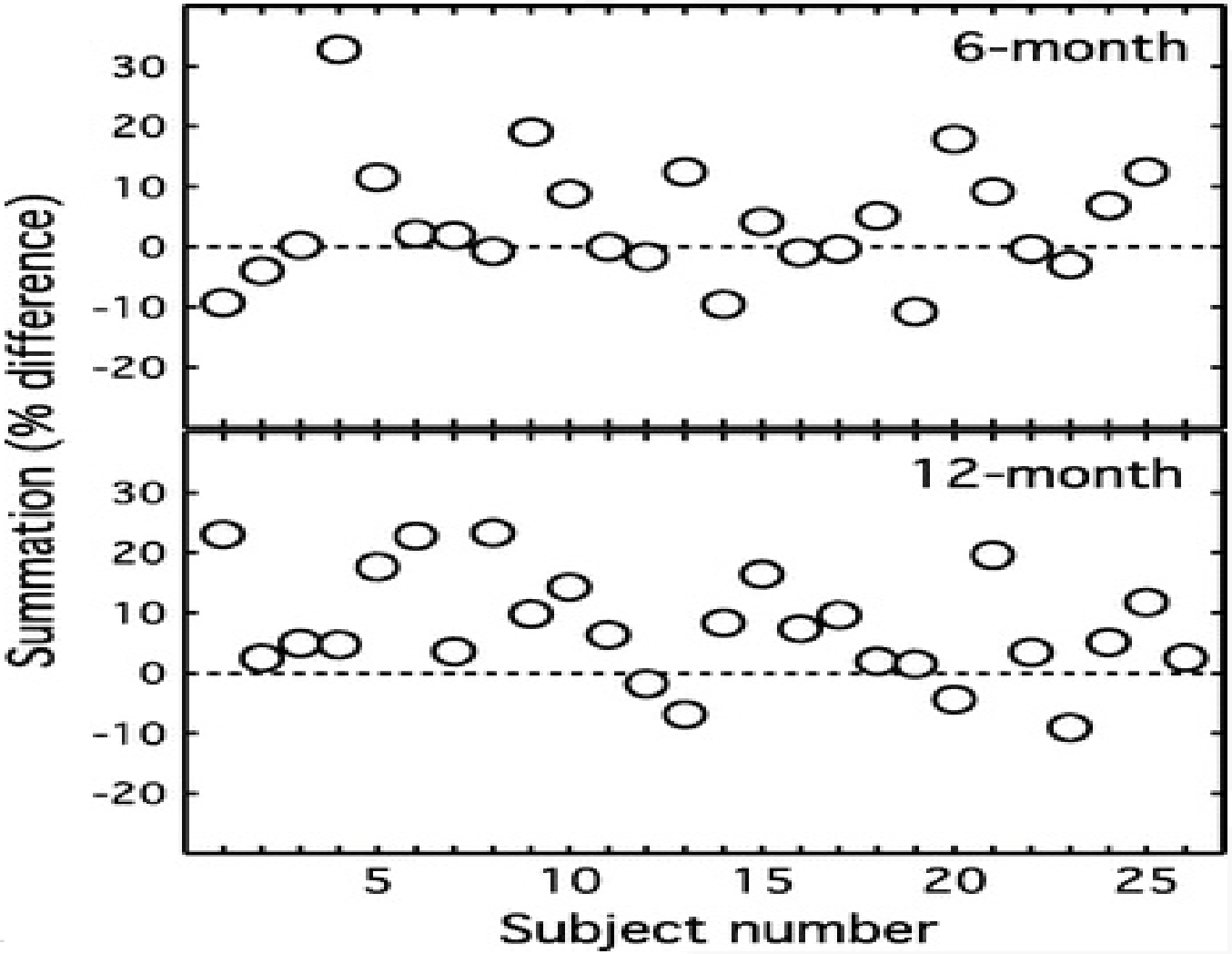

15
10
5
0
Subject count
1.8 dB
6.8 dB
11.8 dB
16.8 dB
3mo
6mo
12mo
CUNY test interval

Summation

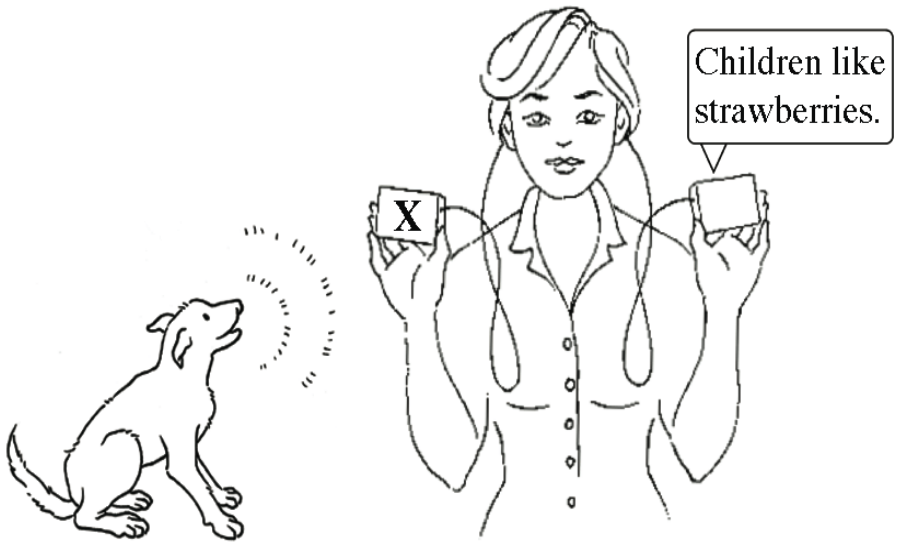

Children like strawberries.
X


Children like strawberries.
Children like strawberries.

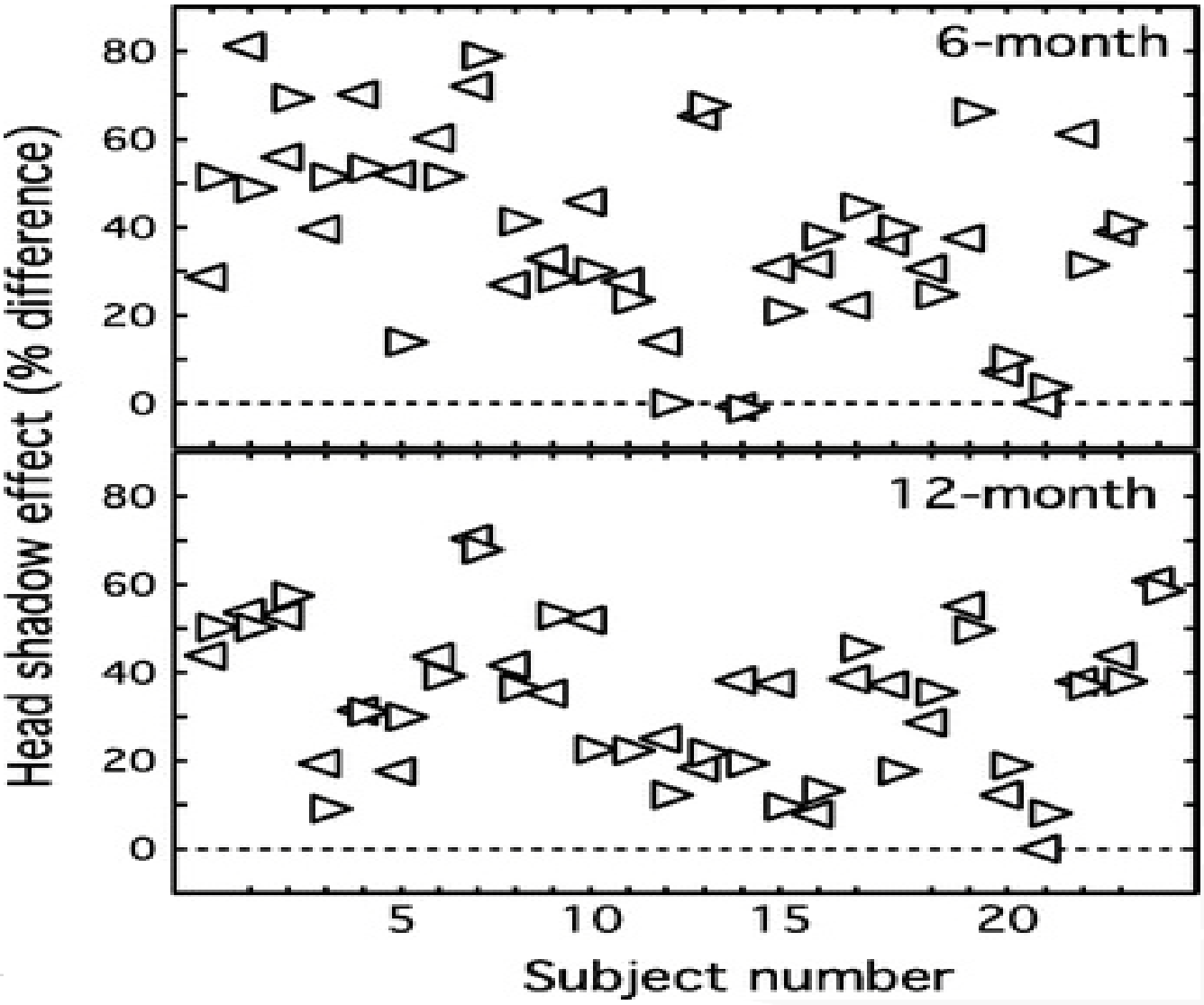
Summation


6-month
12-month
Summation (% difference)
30
20
10
0
-10
-20
5
10
15
20
25
Subject number

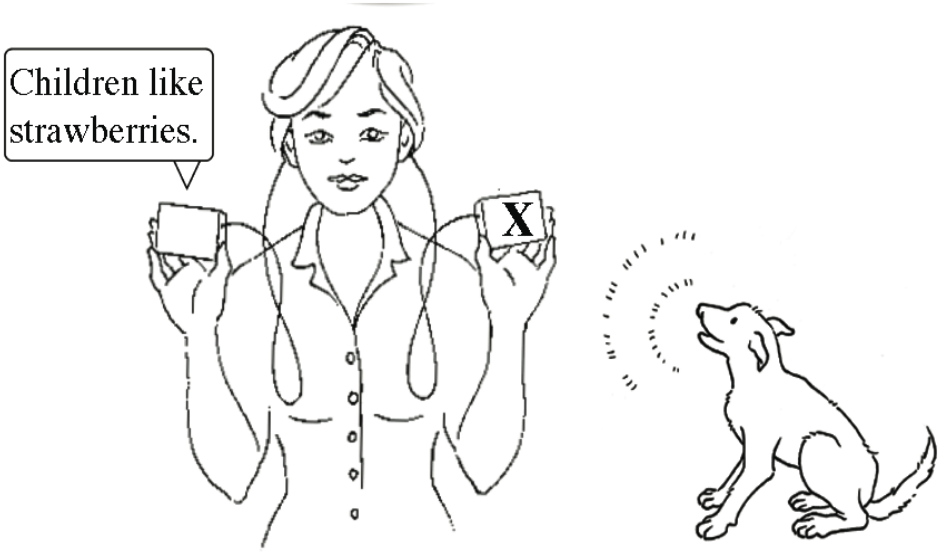
Head Shadow

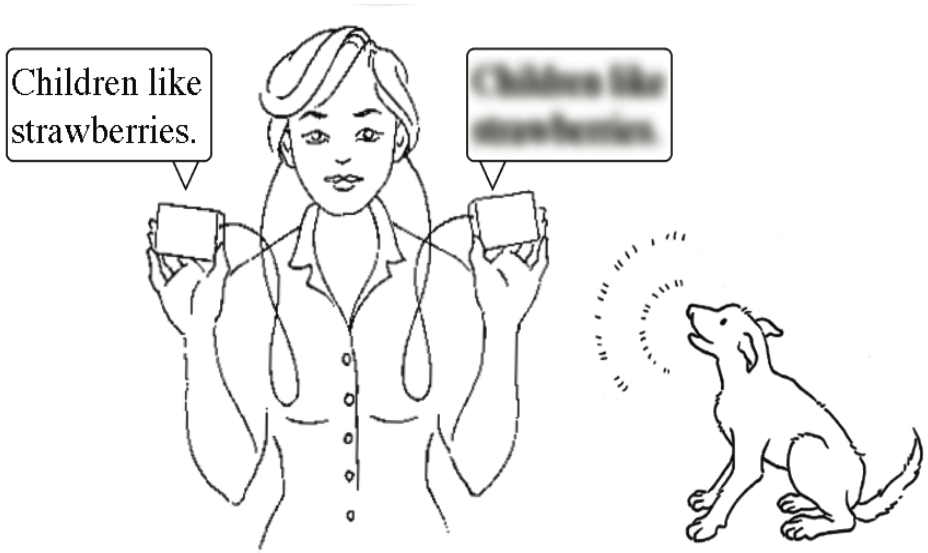


Head Shadow

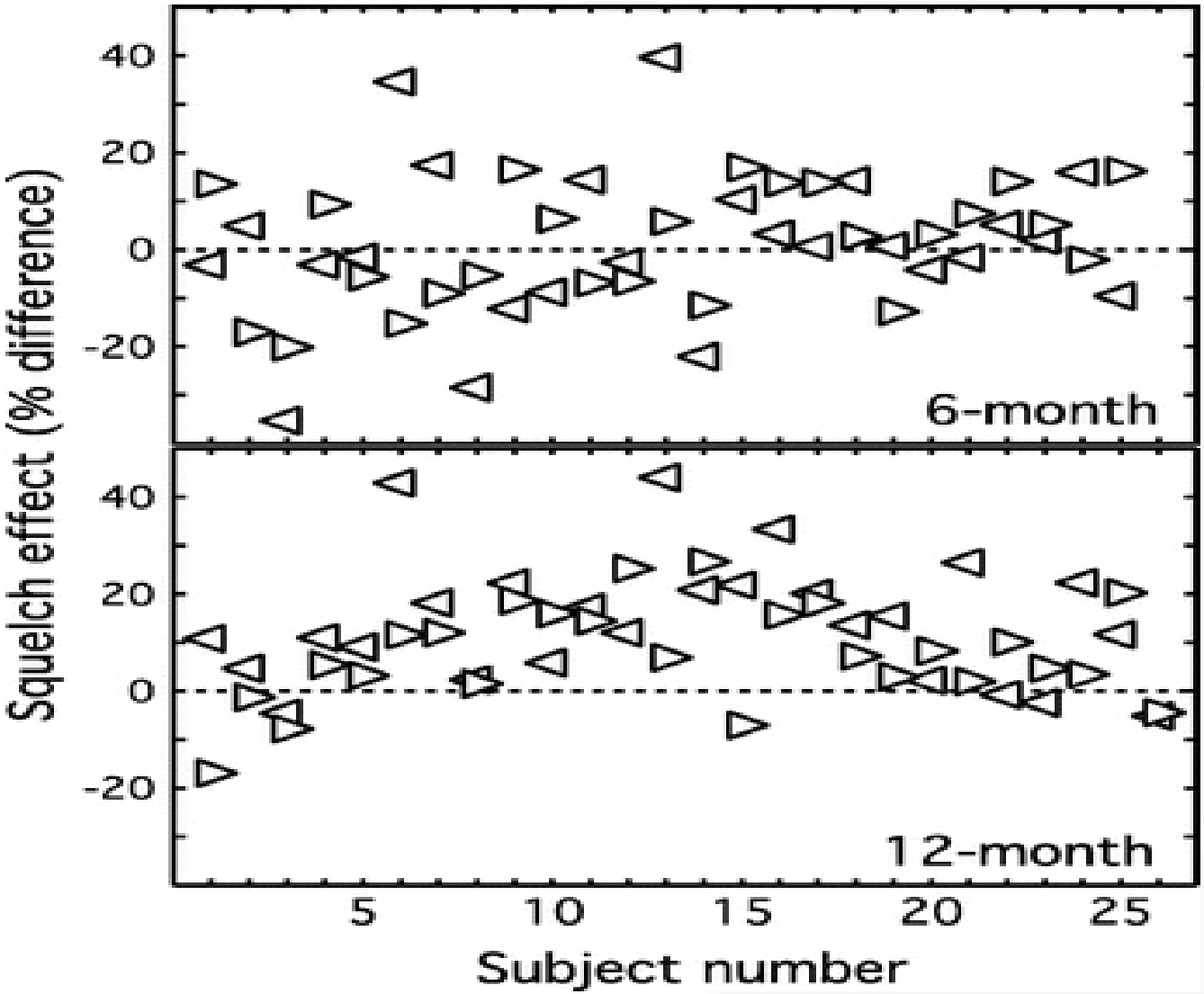

6-month
12-month
Head shadow effect (% difference)
80
60
40
20
0
5
10
15
20
Subject number

Squelch





Squelch


Squelch effect (% difference)
40
20
0
-20
6-month
40
20
0
-20
12-month
5
10
15
20
25
Subject number

Conclusions

- CNC words
  - » Improvement in performance in the worse unilateral condition, better unilateral condition, and bilateral condition
  - » Improvement in the bilateral condition over the better unilateral condition
- SNR
  - » Increased tolerance of noise in seven of eight listeners tested at year 4 (Eapen et al 2009)
- CUNY
  - » Summation and head shadow developed early and remained stable
  - » Squelch developed by 1 year and grew over 4 years (Eapen et al 2009)