

Understanding Early Communication Outcomes



New Tools and Insights

**MARY PAT MOELLER, SANDIE BASS-RINGDAHL, SOPHIE
AMBROSE AND J. BRUCE TOMBLIN**

SUPPORTED BY NIDCD R01 DC009560

Background



- Reduced body of literature concerning children with mild to severe HL
- NIDCD funded multi-site longitudinal study
 - Five-year project (currently in Year 3)
 - Collaboration of University of Iowa, BTNRH and University of North Carolina-Chapel Hill
 - Multidisciplinary research team
- Outcomes of Children with Hearing Loss (OCHL)

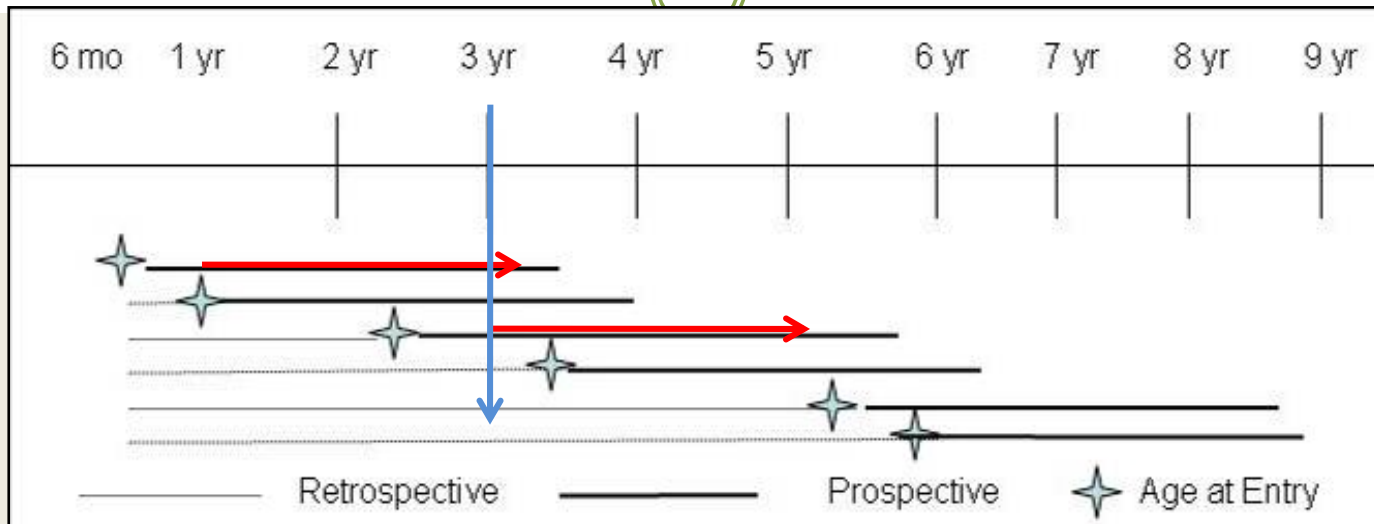


Aims of study



- To describe the characteristics of:
 - children and families
 - intervention services
 - factors associated with service variations
- To characterize:
 - developmental, behavioral and familial outcomes
 - compared to normally-hearing age mates with similar backgrounds
- To explore:
 - how variations in child and family factors and in intervention characteristics relate to functional outcomes

Study design



Accelerated Longitudinal Design

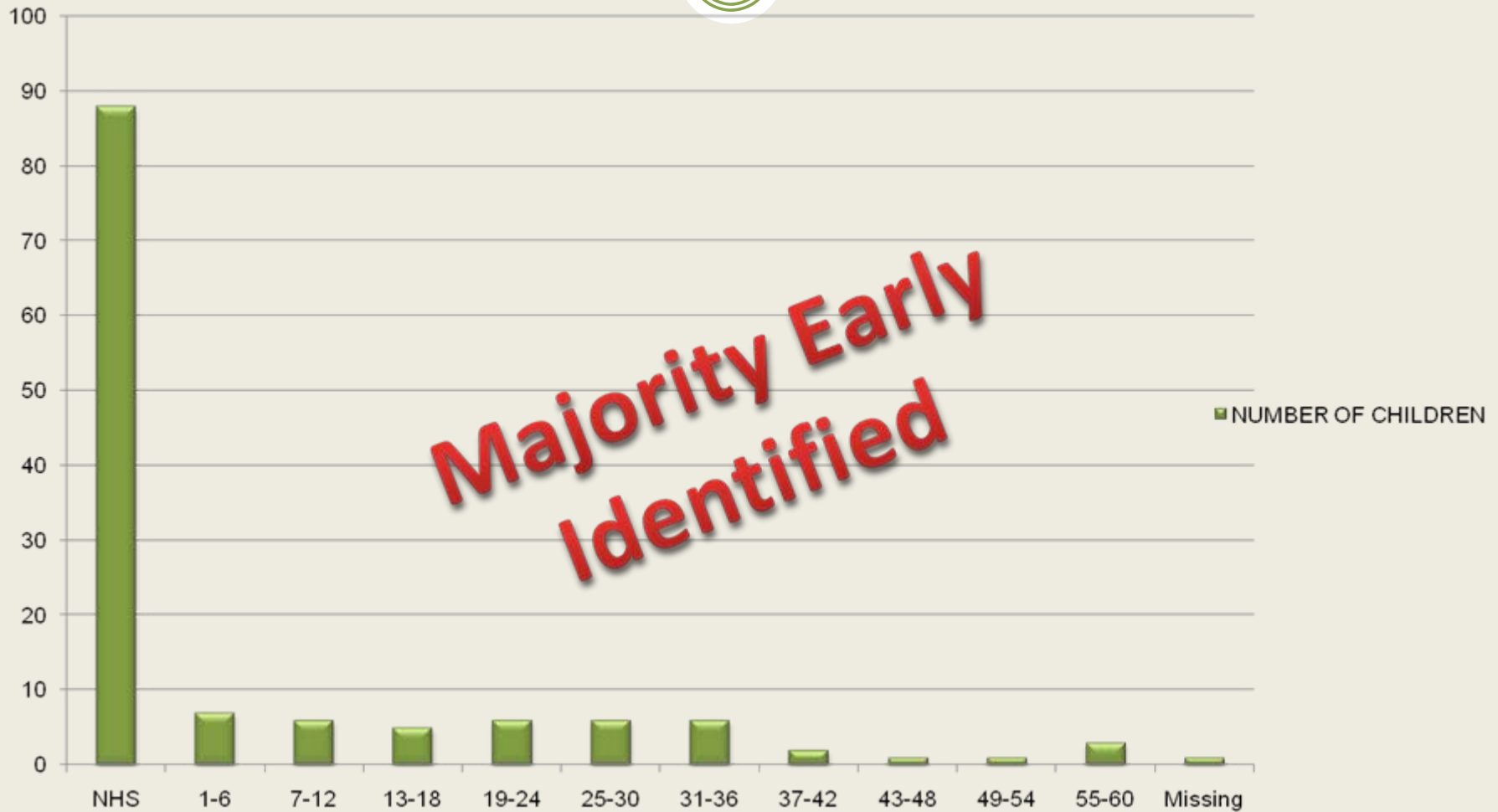
- Each child followed for 3 years+.
- Retrospective data prior to enrollment obtained by medical record history.

Subjects Recruited (to date)



- Children with HL: n = 230 (goal = 300+)
 - Iowa: 47.6 dB HL
 - BTNRH: 47.6 dB HL
 - UNC: 52.2 dB HL
- Age at entry = 6 months to 6 years, 11 months
- Spoken English in the home
- Permanent, bilateral mild to severe hearing loss
 - PTA of 25-75 dB HL (500, 1K, 2K, 4kHz)
- Children with normal hearing: n = 64 (goal = 150)

Age at Identification of Hearing Loss



Developmental Vulnerabilities?



- Phonological development
- Morphological development



New Tools for Infants and Young Children



1. **Vocal Development Landmarks Interview**
(6-24 mos)
-Moeller & Bass-Ringdahl, OCHL Project
2. **Open and Closed Set Test** (18 mos +)
-Ertmer, Miller & Quesenberry, 2004
3. **Morphological Elicitation Procedure**
(3yr+)
-Moeller, et al., OCHL Project

Vocal Landmarks

Expansion
(precanonical)
3-8 months

Basic Canonical
5-10 months

Advanced Forms
9-18 months

Vowels, growls,
Ingressives,
High Pitch Squeals
Marginal babble



mbwea

- CV syllable-speech like
- Reduplicated babble
- Squeals, ingressives
- Whispers



ba

- > CV =VC (up, eem),
CVC (mom, tut),
CCVC (stop!)
- Diphthongs (ow)
- Complex variegated
babble
- Jargon



Vocal Development Interview



- Parent interviews about early vocal landmarks
 - Production Infant Scale Evaluation (PRISE) – Kishon-Rabin, et al. (2005)
 - Infant Monitor of Vocal Production (IMP) Robin Cantle Moore (2009)

0	1	2	3	4
Never				7 CV types

Example from PRISE: “Does the infant produce different consonant-vowel combinations?”

For example: when the infant plays with toys or addresses one of the family members, does he produce parts of words, such as: ba, du, pi, etc.,?”

Vocal Development Landmarks Interview



PROVISION OF VOCAL EXAMPLES AND PAIRED COMPARISONS

To avoid use of technical terms


To ensure that parent and clinician “on same page”

To calibrate examiners

USES STANDARD INTERVIEW FORMAT AND PP SLIDES WITH AUDIO FILES

Item 1-2 (pre-canonical)



 creaky



 growl



NEVER

RARELY

SOMETIMES

A LOT

Item 1-4 (pre-canonical)



Breathing in



Breathing out



Item 2-3 (canonical)



ba



mbwea

Scoring of Parental Responses



Example for paired comparison item

Top Row (true syllables) _____				Bottom Row (marginal syllables)  _____			
Never (0)	Rarely (1)	Sometimes (2)	A lot (3)	Never (0)	Rarely (1)	Sometimes (2)	A lot (3)
							

Comments:

Item 2-7 (words)

Orange = aaa:



All done = da da



More toys = more toys

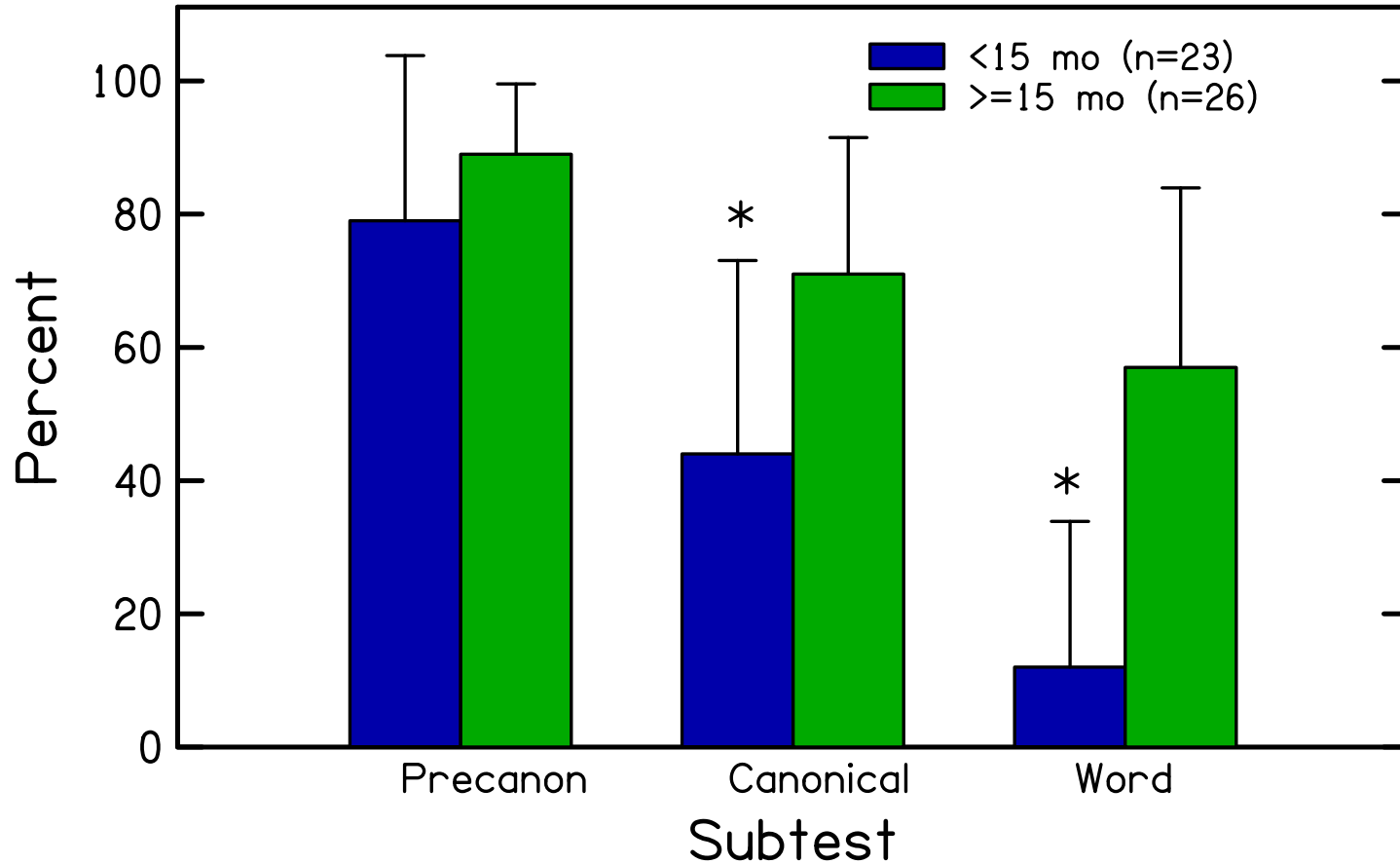


Imitates,
but far off

Getting
closer

Very
close

Vocal Interview: Children with HL



M age younger = 11.0 mos (SD = 2.32); *M* age older = 18.7 months (SD = 1.29)

Validation of the Vocal Development Landmarks Instrument



MOELLER, BASS-RINGDAHL & AMBROSE (2010)

Can parents accurately/adequately report on an array of vocal behaviors, at specific ages, using the Vocal Development Landmarks instrument?

Language ENvironment Analysis (LENA)



Mark Van Dam, Ph.D.
Sophie Ambrose, Ph.D.



Client Manager



LENA Reports



Developmental Snapshot



Digital Language Processor



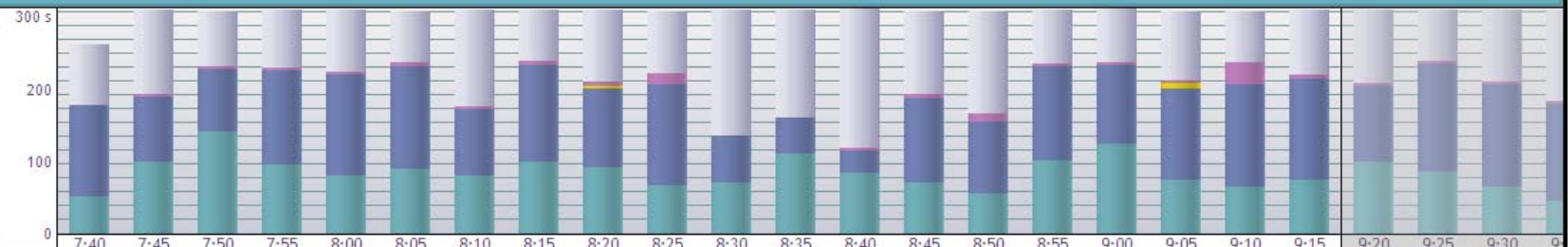
Settings

Composite View

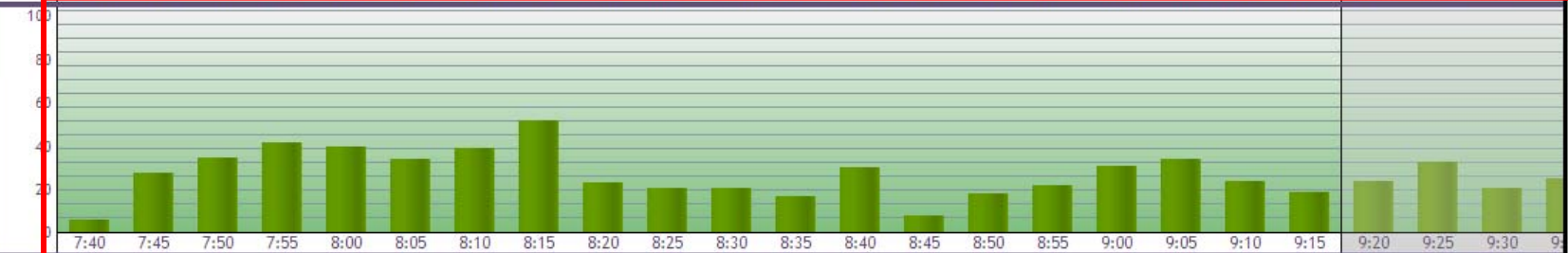
5 MINUTE
February 13, 2010 - 7 AM

K, A

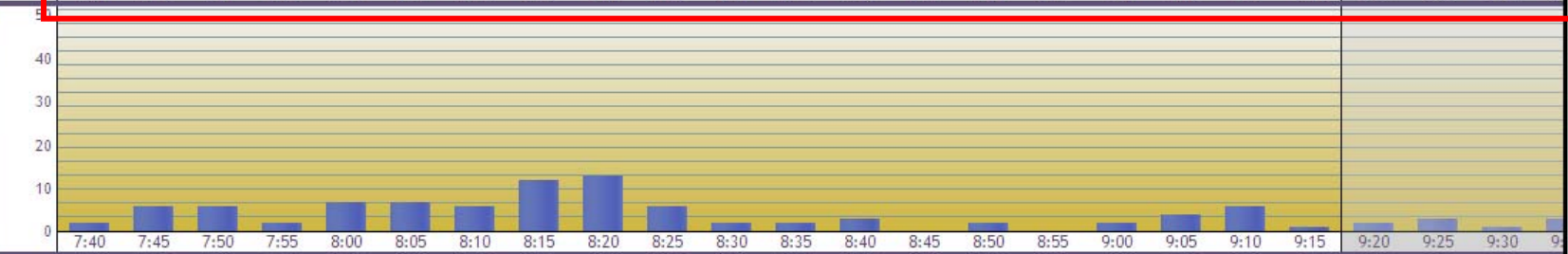
Audio Environment



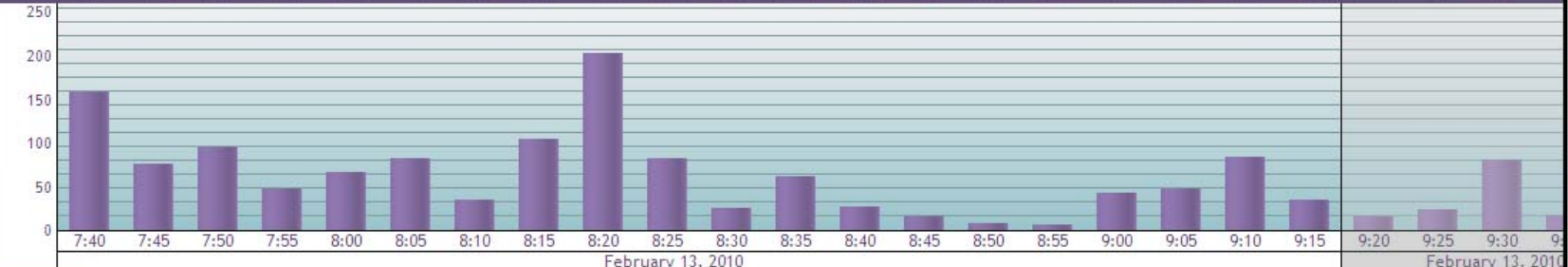
Child Vocalizations



Conversational Turns



Adult Words



February 13, 2010

February 13, 2010

Open & Closed Set Test



A MEASURE OF PERCEPTION-PRODUCTION

~18 MONTHS – 2 YEARS

ERTMER, MILLER & QUESENBERRY, 2004

10 ITEMS, REALISTIC PICTURES

**PROMPTED PRODUCTION FOLLOWED BY PICTURE
IDENTIFICATION**

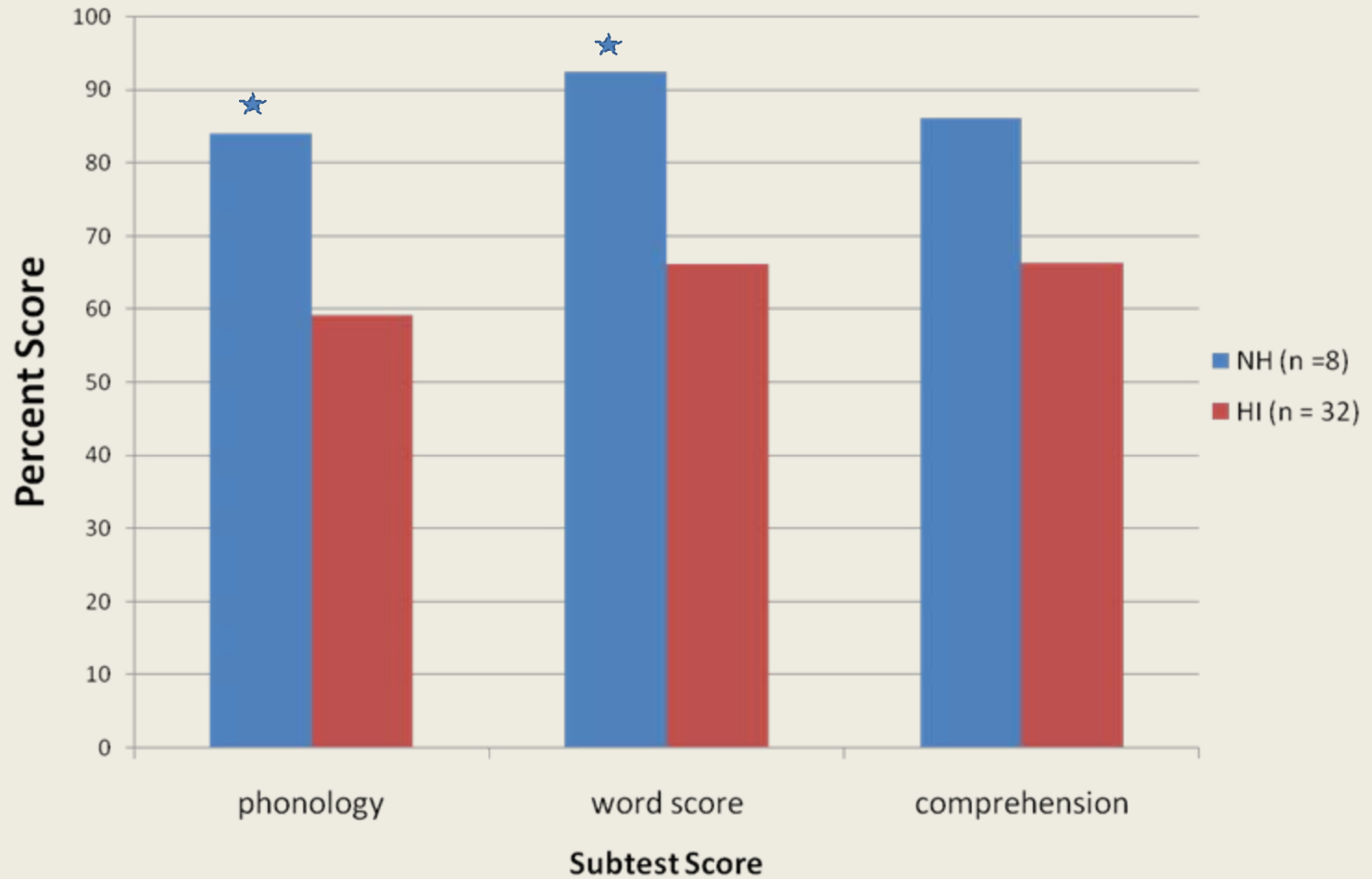
dertmer@purdue.edu

Open and Closed Set Test (Perception-Production)



Mom: And “keys” ...Child: /tis/...Mom: uhhuh, where are they?
Child: /tis/ + point. Mom: very good

2 year olds: O&C



Morphology Elicitation Task



DVD DEVELOPED AT BTNRH

ELICITED PRODUCTION OF 9 TYPES OF MORPHOLOGICAL ENDINGS

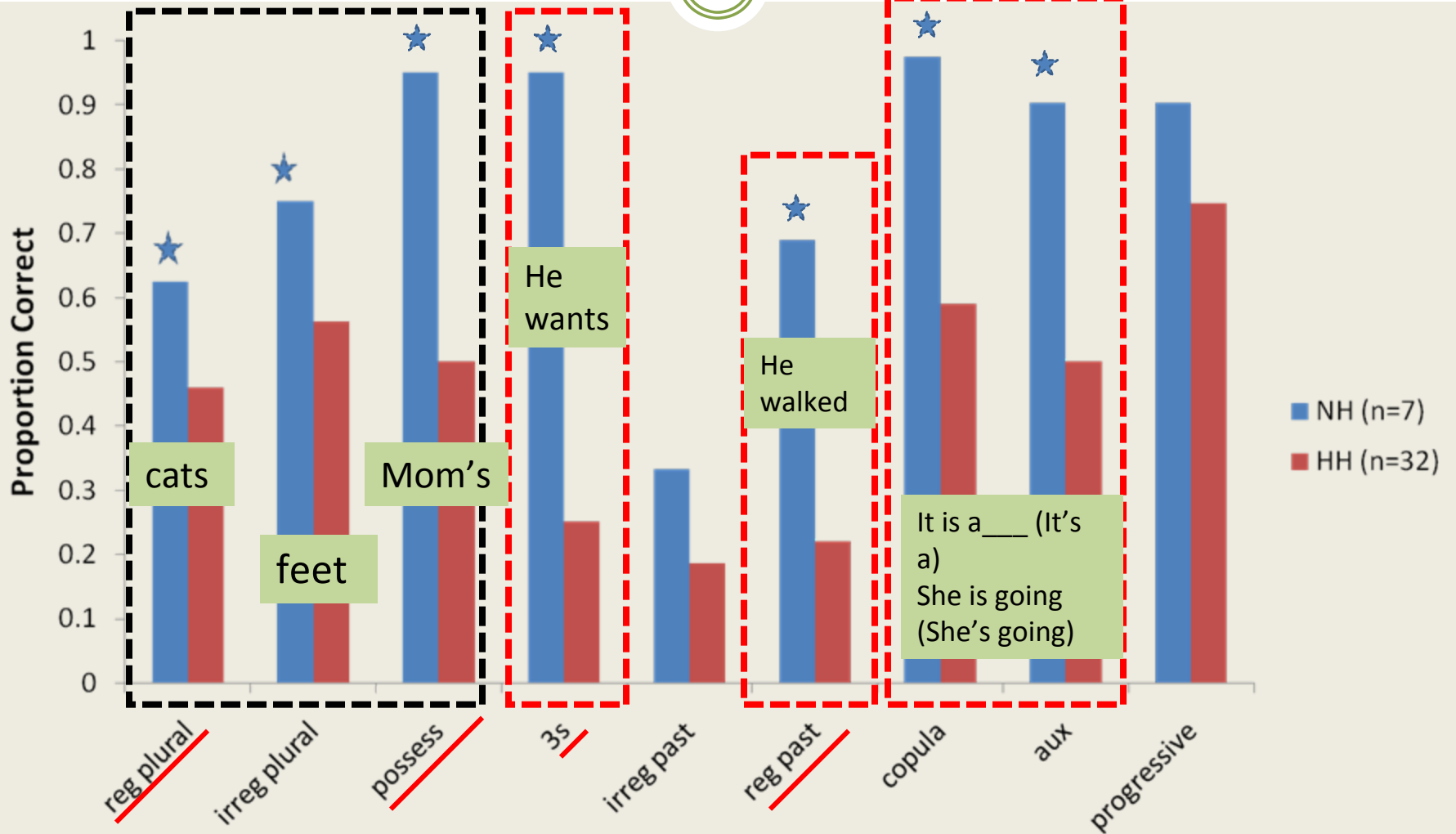
**EXAMPLES: PLURAL (CAT-CATS), VERB TENSE (HE
WALKS/WALKED), POSSESSION (MOM'S PURSE)**

Morphology Elicitation Task: Rationale



- Delays in morphosyntax (McGukian & Henry, 2007; Brown, 1984; Norbury, et al, 2001; Moeller, et al, 2010)
- What may influence development in HH?
 - Access/audibility issues (HA bandwidth, noise, reverberation, distance) (Stelmachowicz, et al, 2001, 2002)
 - Position in the sentence (He want+s the car; He got two bike+s) (Song, Sundara & Demuth, 2009)
 - Frequency in the input (McGukian & Henry, 2007)
 - Phonological production (fricatives, blends –**bows** vs **parks**) (Song, et al, 2009)

Morphology — 4 year olds



Take home messages



- Children with mild to severe hearing loss may show developmental vulnerabilities related to issues of language experience/access
- Suggests the need to examine early outcomes in areas like:
 - Vocal development landmarks
 - Transitions to advanced syllables and words
- Use of morphological endings in English could be compromised by several issues
 - Elicitation procedures may help us understand role of audibility vs. other factors

OCHL Team Members



University of Iowa

J. Bruce Tomblin, Ph.D. (Co-PI)

Marlea O'Brien, Program Coordinator

Rick Arenas (IT)

John Knutson, Ph.D.

Sandie Bass-Ringdahl, Ph.D.

Ruth Bentler, Ph.D.

Lenore Holte, Ph.D.

Elizabeth Walker, Ph.D., CCC-A/SLP

Connie Ferguson, M.S., CCC-SLP

Marcia St. Clair, SLP Examiner

Wendy Fick (data entry)

Amanda Murray, M.A.

Jacob Oleson, Ph.D. (biostatistics)

Jane Pendergast, Ph.D. (biostatistics)

BTNRH

Mary Pat Moeller, Ph.D. (Co-PI)

Patricia Stelmachowicz, Ph.D.

Meredith Spratford, Au.D.

Lauren Berry, M.S., CCC-SLP

Emilie Sweet, M.S., CCC-SLP

Laura Kriegshauser, M.A.

Amelia Shuster, B.S.

Lisa Burton, M.S.

Mark VanDam, Ph.D. (LENA)

Sophie Ambrose, Ph.D. (LENA)

University of North Carolina-Chapel Hill

Melody Harrison, Ph.D.

Patricia A. Roush, Au.D.

Shana Jacobs, Au.D.

M. Thomas Page, M.S., CCC-SLP