

# Assessing Spoken Language in Toddlers using the Open- & Closed-set Task

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# Disclosures

- ▶ David Ertmer is a salaried full professor in Speech, Language, and Hearing Sciences, Purdue University.
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- ▶ He also has a financial relationship and serves as a consultant for MED-EL Corporation.
- ▶ David occasionally receives an honorarium for continuing education courses and seminars, including this one.
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# Remembering the not so distant past



- ▶ Typical ages of identification of hearing loss
- ▶ Ages of service delivery
- ▶ Limited auditory access to speech at conversational intensity levels –even with hearing aids
- ▶ Separate schools and self-contained classes
- ▶ Very limited outcomes in spoken language and academics

# How we got here

- ▶ Development and advancements in
  - ▶ Cochlear implants
  - ▶ Digital hearing aids
- ▶ Widespread adoption of newborn hearing screening
- ▶ Tremendous growth in
  - ▶ Services for infants and families
  - ▶ Special preschools for children who are D/HH
  - ▶ Growth in well-supported mainstream placements
- ▶ Yet, with these advancements come new challenges for service providers



# Assessing spoken language abilities in very young children



## ▶ Challenges

- ▶ difficulty in attending to and following directions
- ▶ reluctance to participate in unfamiliar tasks, especially with unfamiliar adults
- ▶ relatively small receptive and expressive vocabularies
- ▶ word productions that do not closely approximate adult forms.

# Production and perception ambiguity

- ▶ Two potential perception-production problems:
  - ▶ imitated word productions can be poor matches of the adult form even though the child might have perceived the word accurately.
  - ▶ children's productions can be acceptable matches for the adult form but the meaning of the word might not be understood by the child.

# Strategies to overcome challenges

- ▶ 1) The O&C uses play-like imitation and pointing activities
- ▶ 2) familiar persons engage the child in the activities by using their knowledge of the individual child to facilitate participation.
- ▶ 3) models are demonstrated several times through adult role-play before the child is asked to respond.
- ▶ 4) Early-acquired vocabulary words are used as stimuli. Familiar words also increase the likelihood imitative and pointing responses.

# Strategies (Con't)

- ▶ 5) Photographs of objects represent each stimulus word because they are less ambiguous than line drawings.
- ▶ 6) Tangible reinforcement can be provided during demonstrations and following child responses.
- ▶ 7) Stimulus words can be repeated once during word elicitation and once during word comprehension for each stimulus item.
- ▶ 8) Children are asked to imitate *and* to identify photos of spoken words so that phonological abilities and auditory comprehension are evaluated independently.

# The O&C Task (Ertmer, 2015)

- ▶ Criterion-referenced task to document within-child changes in spoken language ability during the first 2 years of device use
- ▶ Three lists of 10 words for children to imitate and then identify from three photos
  - ▶ All target words are produced by 75% of TD 2 year-olds (Dale & Fenson, 1996)
- ▶ Each list is given only once; at 6, 12, or 18 months post-fitting
- ▶ The word lists are balanced for phonological development and number of syllables, and can be given in any order
- ▶ The child...
  - ▶ Hears the word
  - ▶ Repeats the word
  - ▶ Points to the photo of the word

# O&C subtests and scores



- ▶ Phoneme Accuracy
  - ▶ Measure of child's ability to imitate vowels and consonants
- ▶ Word Acceptability
  - ▶ Measure of the intelligibility of child's word productions
- ▶ Word Comprehension
  - ▶ Measure of understanding of early-emerging vocabulary words

# Video demonstration



# Photo choices for Word Comprehension: "Boat"

Item 1

## List 1



1



2



3

# List 3

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## The Open- and Closed-set Task<sup>®</sup>

### Scoring Sheet

Child's Name: \_\_\_\_\_ Date: \_\_\_\_\_ Chronological Age: \_\_\_\_\_

Location: \_\_\_\_\_ Clinician: \_\_\_\_\_ Parent Present:  Yes  No

Amount of Sensory Aid Use (Months): \_\_\_\_\_

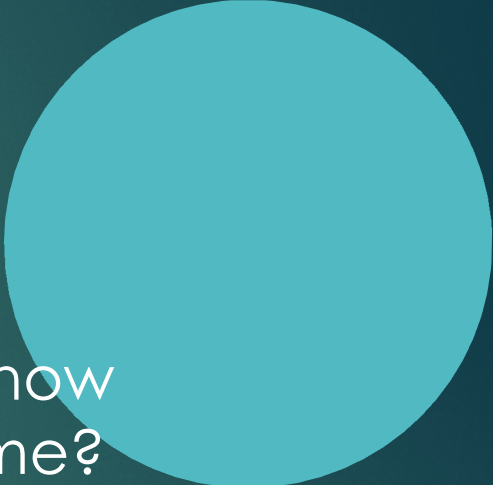
Demo 1: Zebra Completed:  Yes  No Demo 2: Pretzel Completed:  Yes  No Demo 3: Cat Completed:  Yes  No

Stimulus Word (# phonemes) (Phonetic transcription)	Phoneme Accuracy	Word Acceptability	Word Comprehension
	Transcribed Response (# phonemes matched*)  *Ignore consonant voicing errors	Criteria for Word Acceptability: • At least two matching phonemes (consonants or vowels) AND • Correct number of syllables Acceptability: Yes / No	Picture Selected (1, 2, or 3) • 2 pts = correct ID without repetition • 1 pt = correct ID following a repetition • 0 pts = incorrect ID or no response
1. Book (3) [bʊk]	( /3)		1 2 3 NR Rep? Y / N Pts:
2. Balloons (6) [bəlʊnz]	( /6)		1 2 3 NR Rep? Y / N Pts:
3. Pig (3) [pɪg]	( /3)		1 2 3 NR Rep? Y / N Pts:
4. Cup (3) [kʌp]	( /3)		1 2 3 NR Rep? Y / N Pts:
5. Cookies (5) [kʊkiz]	( /5)		1 2 3 NR Rep? Y / N Pts:
6. Doll (3) [dɔl]	( /3)		1 2 3 NR Rep? Y / N Pts:
7. Kitty (4) [kɪti]	( /4)		1 2 3 NR Rep? Y / N Pts:
8. Nose (3) [noz]	( /3)		1 2 3 NR Rep? Y / N Pts:
9. Mommy (4) [mʌm]	( /4)		1 2 3 NR Rep? Y / N Pts:
10. Juice (3) [dʒʊs]	( /3)		1 2 3 NR Rep? Y / N Pts:
(Total 37 phonemes)	% phonemes matched: ( /37) X 100 = %	% acceptable words: ( /10) X 100 = %	Total number of points:

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Development of the O&C



- ▶ Research questions
    - ▶ (a) Do the three O&C word lists yield comparable scores?
    - ▶ (b) Do young children who are D/HH show improvements in O&C scores across time?
- 

# Methods for question about the equivalency of the three O&C lists

- ▶ The three O&C lists are given to
  - ▶ 12 children who use CIs or HAs
  - ▶ Attend oral education programs
  - ▶ No additional disabilities
  - ▶ Lists presented in balanced order across children

# Question 1: Are lists comparable?

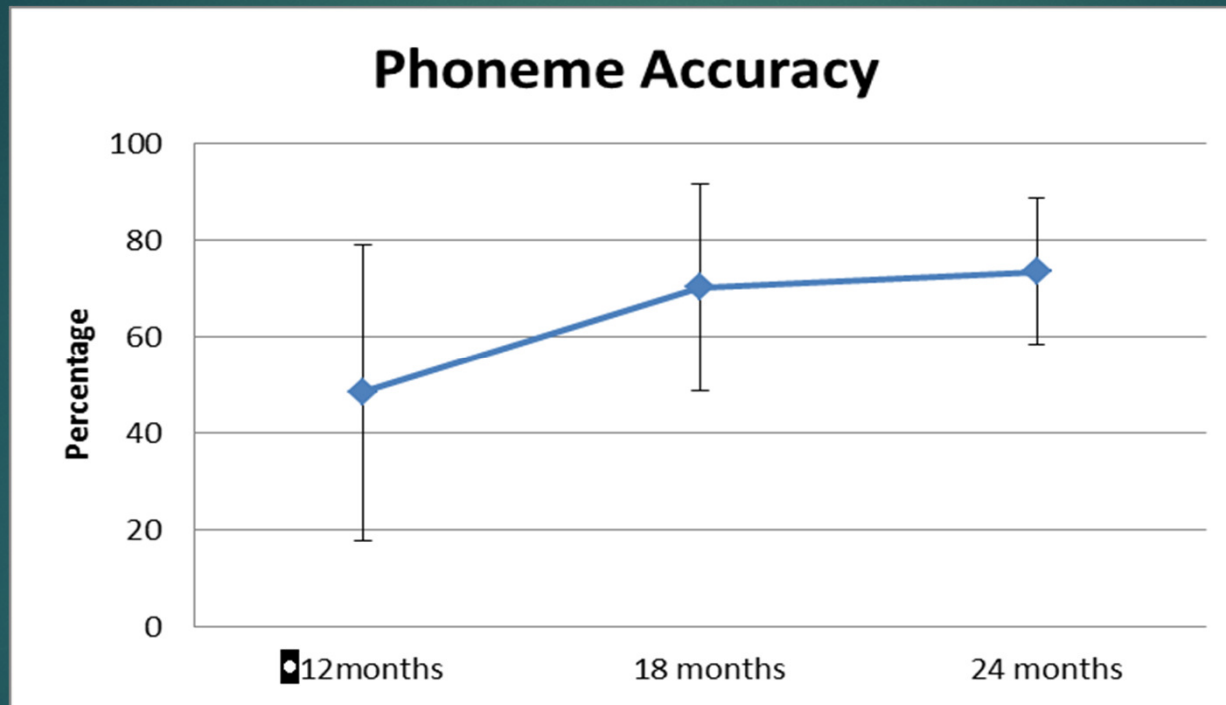
	List 1 vs List 2	List 1 vs List 3	List 2 vs List 3
Phoneme Accuracy (Mean Percent of points earned)	66.58% vs 66.08% $t(11) = .74,$ $p = .470$	66.58% vs 63.58% $t(11) = .434,$ $p = .331$	66.08% vs 63.58% $t(11) = .366$ $p = 0.358$
Word Acceptability (Percent of points earned)	80% vs 73.33% $t(11) = 0.813,$ $p = .212$	80% vs 75% $t(11) = .602,$ $p = .276$	73.33% vs 75% $t(11) = .188,$ $p = .426$
Word Comprehension (Mean number of points earned; Maximum = 20)	17.25 vs 16.25 $t(11) = 0.577,$ $p = .284$	17.25 vs 15.66 $t(11) = 0.856,$ $p = .2$	16.25 vs 15.666 $t(11) = .321,$ $p = .375$

# Methods for question about increasing scores across time

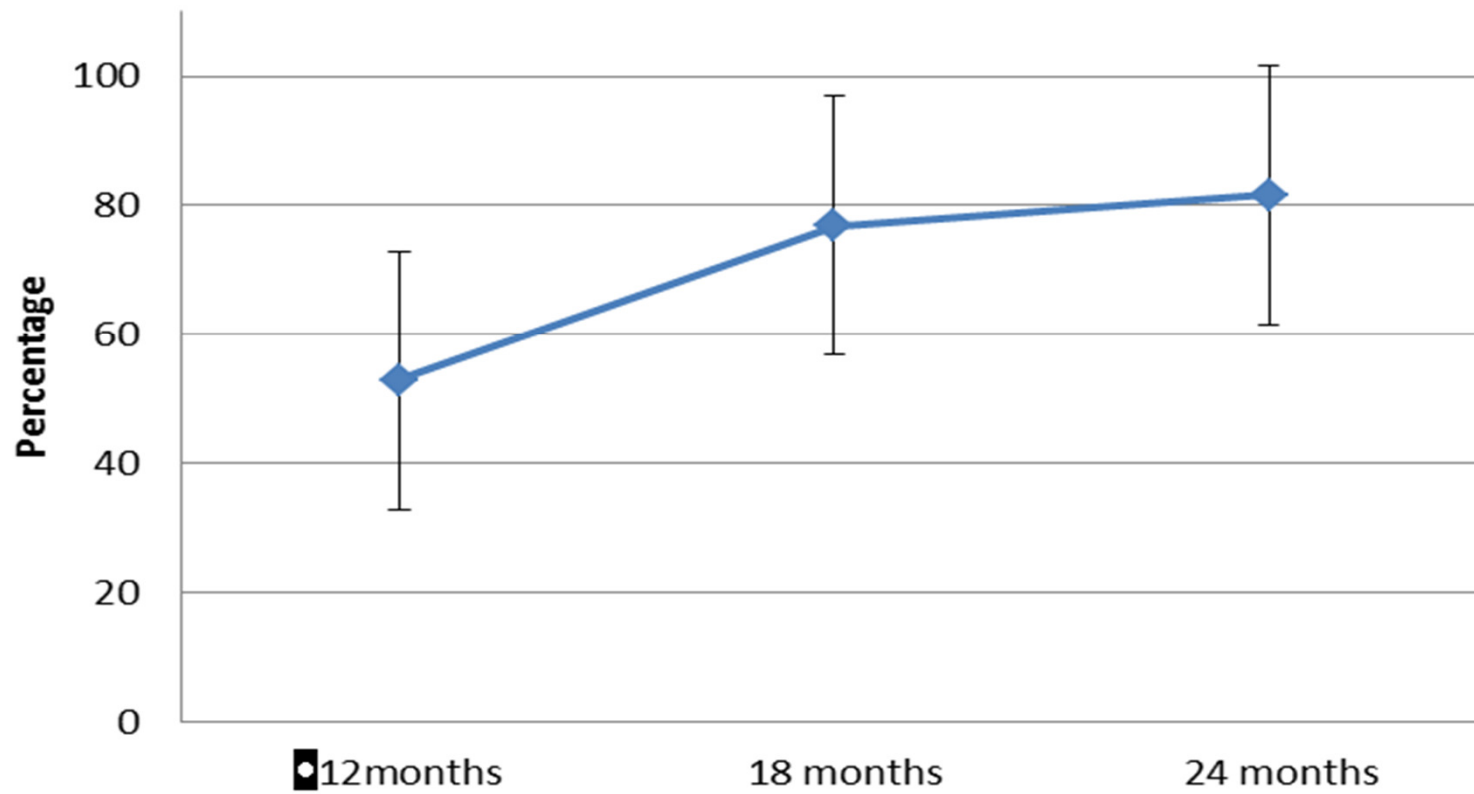
- ▶ 17 children with CIs
- ▶ Mean age at implant = 21.6 months
- ▶ One O&C list given at 12, 18, and 24 months post CI activation
- ▶ Order of O&C lists varied across children
- ▶ No additional disabilities
- ▶ Oral education programs

Figure 2. Mean percent correct for consonants and vowels.

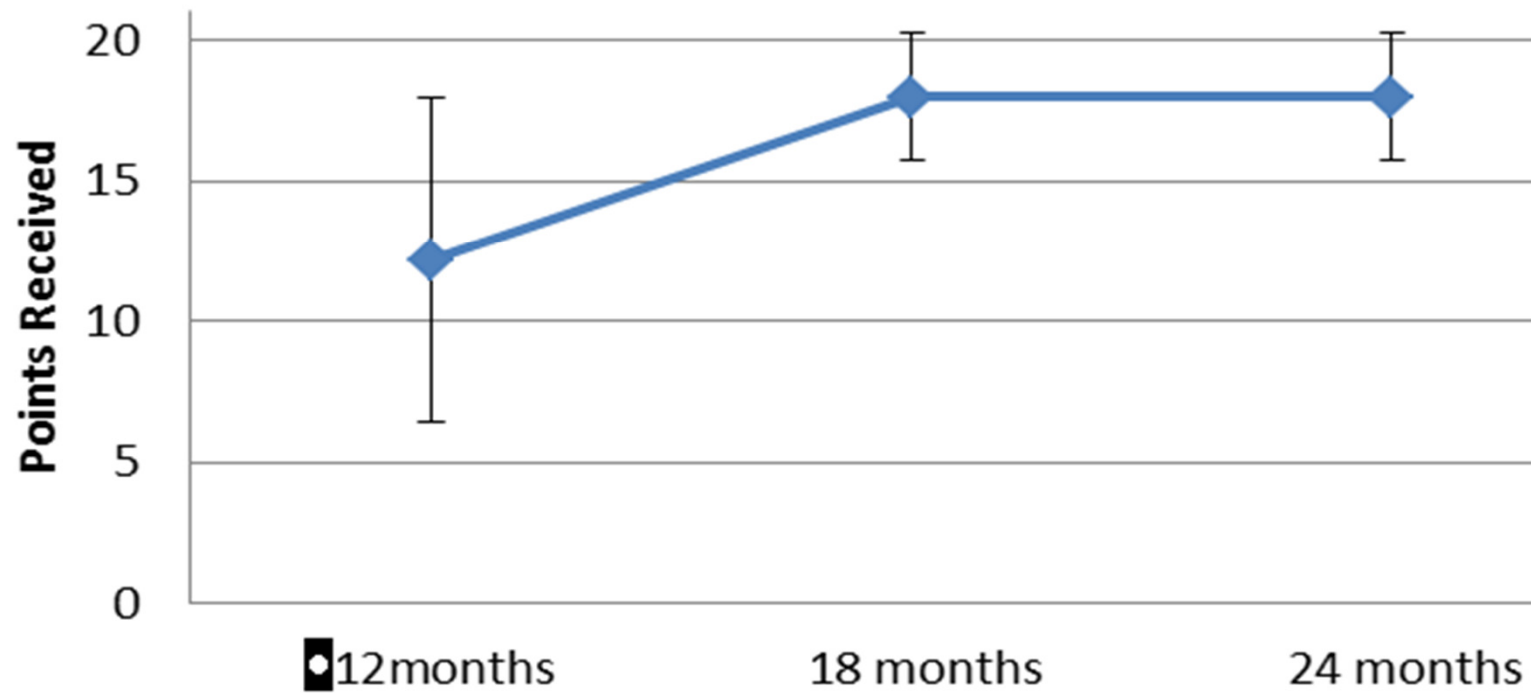
# Question 2: Do children show increases across time?

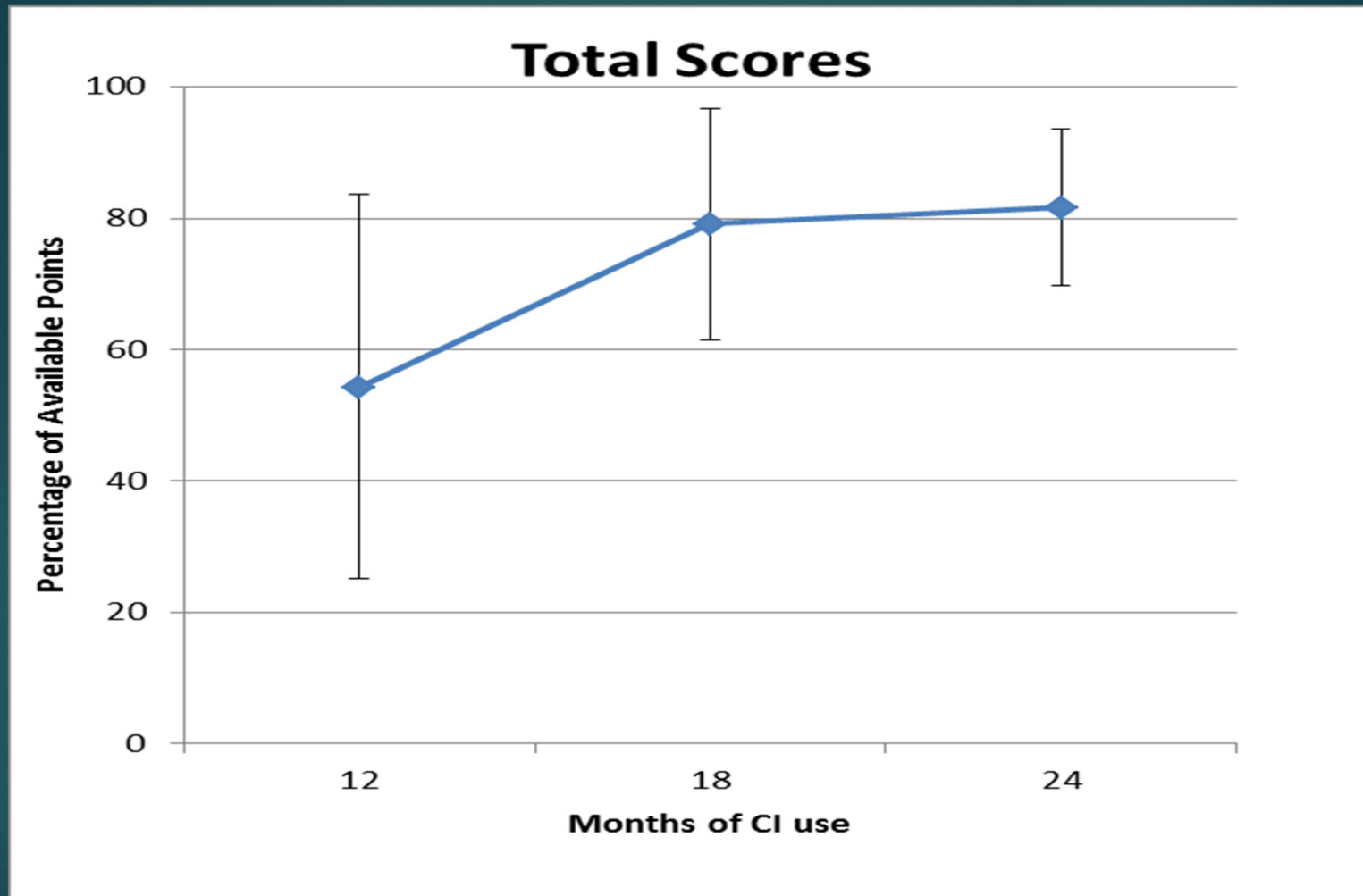


## Word Acceptability



# Word Comprehension





# Inter-tester reliability

- ▶ The following correlations were determined between the original and the second sets of scores:
  - ▶ Phoneme Accuracy,  $r(9) = .887, p = 0.001$ ;
  - ▶ Word Acceptability,  $r(9) = .625, p = 0.5$ ;
  - ▶ Word Comprehension,  $r(9) = .625, p = 0.05$ .

# Support for the Validity of the O&C

- ▶ Ambrose, Unflat Berry, Walker, Harrison, Oleson, and Moeller (2014) examined speech sound production in 37 children who were hard of hearing (HH group) and in typically developing peers who were matched for age- and socio-economic status (TD group).
- ▶ A single list of O&C words was given when the participants were two years-old.
- ▶ Transcriptions of O&C words were then used to calculate five phonological measures including Percent of Vowels Correct-Revised and Percent of Consonants Correct-Revised (Shriberg, 1993; Shriberg, Austin, Lewis, McSweeney, & Wilson, 1997).
- ▶ For the HH group, vowel and consonant measures obtained at 2 years-old were significantly correlated with standard scores on the Goldman-Fristoe Test of Articulation at three years of age (Goldman & Fristoe, 2000).
- ▶ Conclusion: O&C data were useful in predicting later phonological abilities in very young children who had mild-severe hearing losses.

# Further support for validity of O&C

- ▶ Moeller, Bass-Ringdahl, Ambrose, VanDam, and Tomblin (2011) sought to determine whether the O&C could discriminate between children who were Hard of Hearing (HH) and age-peers with NH.
  - ▶ The children were between 26 and 29 months-old at the time of testing.
  - ▶ The results revealed that the HH group scored significantly lower than the NH group on Phoneme Accuracy and Word Acceptability.
  - ▶ The HH group scores were relatively lower than TD scores on Word Comprehension task, but the difference did not reach significance.
- ▶ The authors concluded that the O&C was sensitive to differences in speech production between HH and NH groups and that it was helpful to compare perception and production on the same words.

# Validity of Word Comprehension scores

- ▶ McCreery, Walker, Spratford, Oleson, Bentler, Holte, & Roushin, (2015) included O&C Word Comprehension scores in an analysis to find factors that could predict auditory and spoken language abilities
- ▶ 119 children who were HH.
- ▶ Conclusions
  - ▶ the O&C had a high rate of completion among participants (88%)
  - ▶ the wide range of scores on the Word Comprehension task was useful in differentiating speech recognition abilities in two year-old HH children.

# Summary

- ▶ Newborn Hearing Screening and advances in hearing technologies have provided unique opportunities for listening and spoken language development from a very young age.
- ▶ The O&C fills a need for objective, age-appropriate assessment tools for toddlers who are D/HH
- ▶ The information provided by the O&C helps to reveal how well individual children are making gains in speech perception, speech production, and oral vocabulary during the first 2 years of cochlear implant or hearing aid use.

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