Infants’ Ability to Learn Phonetically Similar Words: Effects of Age and Vocabulary Size

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Background on Phonetic Distinction

- By first birthday, infants show perceptual sensitivities that are suited for noticing phonetic distinctions

- Infants discriminate phonetic distinctions across all the world’s languages

- By 10-12 months, they selectively discriminate only those phonetic sounds that have significance in their input language

Background on Phonetic Detail

- Prior to mapping words onto meaning, attention to phonetic detail is evident
  - After being familiarized with cup and dog, 7-8 month olds listen to these longer than unfamiliar words like feet and bike
  - They listen longer to cup and dog than to minimally different words such as tup and bog
  - This indicates that their representation of familiar words does contain fine phonetic detail

  Jusczyk and Aslin (1995)

Halle and de Boysson-Bardies
### Werker Steps In

- Werker, Cohen, Lloyd, Cassasola and Stager (1995) developed a task to see whether and when infants’ representations of familiar words contains fine phonetic detail
  - Used the switch task
  - Infants of 14 months rapidly learn to associate two dissimilar sounds *lif* and *neem* with two different objects
  - Infants younger than 14 months fail at this task

### Werker Steps In

- Werker and Stager (1997) used the same switch task and its simpler single word/object association to test if infants at this age use their fine phonetic discrimination capabilities
  - 14 month old infants failed at the same switch task when using minimally different words *bih* and *dih*
  - However, 14 month old infants were able to discriminate the similar words without object association

### A Timetable of Infant Development

- There are studies showing infants 11-15 months do not use speech perception sensitivities in word-learning tasks
- Studies with even older children still show confusion with similar sounding words throughout toddler and preschool ages
- Studies with infants 18 months or older show that infants are able to use fine phonetic detail in word-recognition tasks

### Possible Explanations

- There is something qualitatively different about infants of 18-24 months (such as vocabulary size, community) that allows them but not 14 month olds to represent fine phonetic detail
  - If this is correct, there should be an age difference independent of the task

- It is not age or level of development, but rather something about the task itself that causes a difference in results
  - Task used by Werker and Stager was somehow too difficult for infants to reveal their perhaps present ability to use fine phonetic detail
Experiment 1

- 18 months is the age at which infants become more accomplished word learners
- They usually comprehend more words than they can produce
  - At 18 months, infants understand so many words that it is impossible for a parent to indicate which words the child understands on a paper survey
- Because of this, Experiment 1 tested infants older that 18 months to ensure that they were proficient word learners

Experiment 1 Procedure

- Werker predicts that there’s a change in detail detected and represented once infants reach a critical threshold of vocabulary size
- Tested 20 month old infants
- Tested in the switch task
- Communicative Development Inventory (CDI) on the vocabulary size of the infants was completed by parent for each infant
- Used bih and dih and related them to two different objects, a crown and a molecule

Experiment 1 Procedure

- Bih was associated with the crown
- Dih was associated with the molecule
- A pre-test and post-test was given with the word pok, which was associated with the spinner
  - Looking times were compared to those of the actual test to ensure that the infant was not losing interest and therefore altering the results
- There was a “same” phase where the word is shown with the object it was originally associated with
- There was a “switch” phase where the word is shown with the other object that it was not originally associated with
- Looking time was used to compile results

Figure 1: (a) Crown, (b) Molecule, and (c) Spinner objects.
**Experiment 1 Results**

- Before concluding that there is an age-related shift in an infant’s ability to learn phonetically similar words, a group of 14 month old infants should be tested.

**Experiment 2 Procedure**

- 14 month old infants tested under the same circumstances as the 20 month olds
- CDI was again used

**Experiment 2 Result**

- Found a correlation trend between vocabulary comprehension and production and performance on Experiment 2

**Experiment 3**

- Tested 17 month old infants because they are younger than the age previously reported for successfully learning phonetically similar words in previous studies
- If 17 month olds can succeed in this experiment, it will push down the threshold at which successful performance on this type of task is possible
Experiment 3 Procedure

• 17 month olds
• Same as previous two experiments

Experiment 3 Results

• There was a slight correlation ($r = .408$) between vocabulary comprehension size and performance on Experiment 3

• Much like 20 month olds (and unlike 14 month olds), 17 month olds able to rapidly learn to associate two similar words with different objects

• Thus, by 17 months infants can detect fine phonetic detail while learning new words

• This means that there must be something different between 14 and 17 month olds that is an intermediate between 14 and 20 month olds
  – Vocabulary size!

• Possibility of a threshold of vocabulary size that correlates with success in minimal pair word learning performance?
Experiment 3 Results

- Vocabulary threshold to successfully distinguish between phonetically similar words established to be 25 words (200 word comprehension vocabulary)

Conclusions

- There is a correlation between vocabulary size and performance on word-learning tasks
- There are two possible explanations:
  - Ability to use fine phonetic detail seems to precede an infant’s word-learning spurt (18 months)
  - Children who are better word learners (as signified by reaching the critical vocabulary size threshold) are computationally more agile than other infants, so they can now attend to fine phonetic detail

Conclusions

- It is entirely possible, then, that this increased ability to recognize fine phonetic detail is one of the reasons that vocabulary acquisition increases in rate
- But it’s also possible that being good at word-learning means the infant has more resources to spare and can thus attend to fine phonetic details

The Big Question

- Does attention to fine phonetic detail cause the vocabulary spurt or is it a result of the vocabulary spurt?