Speech perception and spoken word recognition

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Jan R. Edwards and Tristan Mahr
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Spoken word recognition

• To take advantage of learning opportunities, children need to recognize words efficiently.
  – Distinguishing familiar words from words to be learned.
  – Parsing and learning syntactic structures.
  – Other aspects of learning.

Cup and saucer

I eat cookies because I like them.

Lions are bigger than dogs!
Spoken word recognition

- Spoken word recognition involves:
  - Encoding the signal
  - Activating a lexical neighborhood
  - Choosing the correct item and inhibiting the others
Spoken word recognition in young children

• Spoken word recognition is similar in children and adults:
  – Incremental (Fernald et al., 2001; Mahr et al., 2015)
  – Neighborhood activation
    • Phonological (Swingley et al., 1999)
    • Semantic (Arias-Trejo & Plunkett, 2010)
Studying spoken word recognition in young children

Looking-While-Listening (LWL) paradigm

- Two images presented on screen:
- Target words presented:
  - See the dog!
  - Find the book!
- Eyetracker records where child looks over time.
Spoken word recognition in young children

• 2-year-olds with larger vocabularies process familiar words more efficiently. (Fernald et al., 2006)

• Processing speed at age 2 predicts language and working memory scores at age 8. (Marchman & Fernald, 2008)

• 2-year-olds from high-SES families process words more efficiently than children from low-SES families (Fernald et. al, 2013)

• Children who hear more linguistic input process words more efficiently than children who receive less input. (Weisleder & Fernald, 2013)
Mispronunciation experiment

• First attempt to unpack role of vocabulary size in spoken word recognition.
• What are the contributions of the following factors to lexical processing efficiency for preschool children?
  – speech perception
  – inhibitory control
  – vocabulary size
Mispronunciation experiment

- Two pictures:
  - Familiar and unfamiliar object.
- Three different conditions:
  - Correct productions (CP)
  - Mispronunciations (MP)
    - Initial consonant differed by a single distinctive feature.
  - Nonwords (NW)

See the dog!  or
See the tog!  or
See the vafe!
Stimuli

- Familiar words/objects
  - Early age-of-acquisition
  - Consonant-vowel-consonant structure (CVC).
- Mispronunciations
  - One feature change on initial consonant.
  - Not a real word.
- Unfamiliar objects/nonwords
  - Object names were unfamiliar to preschool children (*steamer*, *wombat*).
  - Nonwords had CVC structure.
Participants

- 137 children, 28-39 months
- Mean EVT-2 score = 114
- Maternal education level:
  - $n = 106$: high
  - $n = 31$: middle or low
  - (Mahr, Law II, Munson, & Edwards, in preparation)
Subject-level variables

- Fruit stroop: measure of inhibitory control
Subject-level variables

• Fruit stroop: measure of inhibitory control
Subject-level variables

• Minimal pairs: measure of speech perception
Subject-level variables
Results

Proportion of Looks to Familiar Image by Trial Type

Proportion of looks to familiar image

Time from target word onset (ms)

Proportion of looks to familiar image by trial type:
- CP
- MP
- NW

Conditions:
- CP
- MP
- NW

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Edwards and Mahr, 14
Results: CP and MP model

• Speech perception measure:
  – Significant predictor of speed of looking to familiar image in CP condition & to unfamiliar image in MP condition.
Results: CP and MP model

- **Measure of inhibitory control:**
  - Significant predictor of accuracy in CP and MP conditions.

![Graph showing the relationship between time from target word onset and proportion of looks to familiar objects.](image)
Results: NW model

- **Expressive vocabulary size:**
  - Significant predictor *only* of accuracy for NW condition.
## Discussion: Summary

Summary of significant predictors for each condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Speech perception</th>
<th>Inhibitory control</th>
<th>Vocabulary size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct production</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Mispronunciation</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Nonword</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>
Discussion: Spoken word recognition in children

- Spoken word recognition involves:
  - Encoding the signal:
    - role of speech perception
  - Activating a lexical neighborhood
  - Choosing the correct item and inhibiting the others:
    - role of inhibitory control
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