Exploring effects of expressive vocabulary size and maternal education on lexical processing by preschoolers using the visual world paradigm

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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!
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)

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

• 2-year-olds from high-SES families process words more efficiently than children from low-SES families (Fernald et al, 2013)
Socioeconomic status and spoken word recognition

• Why are children from low-SES families slower and less accurate to recognize familiar words than children from high-SES families?

• Non-linguistic consequences of poverty (Noble et al., 2005, 2007)
  – Poorer attentional skills
  – Poorer executive function
Socioeconomic status and spoken word recognition

- Why are children from low-SES families slower and less accurate to recognize familiar words than children from high-SES families?
- Linguistic consequences of poverty
  - Decreased linguistic input
  - Smaller vocabulary size
  - Non-mainstream dialect
Dialect mismatch and academic achievement

• Dialect mismatch:
  – Home language (NMAE) ≠ School language (MAE)
  – High levels of non-mainstream dialect at kindergarten entry ➔ Lower literacy scores in first grade (Terry & Connor, 2012)

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Dialect mismatch and spoken word recognition

- **Adults**
  - Less effect of semantic predictability (Clopper, 2012)
  - Greater effect of noise (Adank et al., 2009)
- **Children**
  - 20-month-olds but not 25-month-olds influenced by dialect differences (van Heugten et al., 2015)
Spoken word recognition in preschool children

• What are the contributions of vocabulary size and maternal education level to spoken word recognition of preschool children? (Law, Mahr, Schneeberg, & Edwards, in revision)

• Differences from previous research:
  – Children tested in their native dialect.
  – Individual rather than group differences.
Participants

- 60 children, 28-64 months
- Half spoke AAE and half spoke MAE
- Groups matched by age and sex
African American English vs. Mainstream American English

- Phonological differences
- Morpho-syntactic differences
Procedure

• Visual world paradigm
  – Semantic, phonological, and unrelated foils

• Secondary questions
  – How do children respond to semantic and phonological competitors?
  – Is there an effect of vocabulary size or maternal education level on responses to lexical competitors?
Stimuli

• Stimuli chosen using age of acquisition norms.
  – AOA between 38 and 57 months.
• Pictures normed in two preschool classrooms.
  – Preschool attended by children from high SES families
  – Head Start classroom
• Stimuli recorded in both Mainstream American English (MAE) and African American English (AAE).
Stimulus dialect

- All children tested in their home dialect
- Home dialect determined by a number of factors.
Child-level variables

• Age
• Vocabulary size (EVT-2)
• SES: Maternal education level
  – 24: high
  – 14: middle
  – 22: low
Results

![Graph showing proportion of looks to each AOI over time relative to target onset (ms). The graph includes lines for Target, Semantic foil, Phonological foil, and Unrelated foil.]

**Proportion of Looks to Each AOI**

- **Time from target word onset (ms)**
- **Looks to target (percent)**

<table>
<thead>
<tr>
<th>Target</th>
<th>Semantic foil</th>
<th>Phonological foil</th>
<th>Unrelated foil</th>
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**Legend:**
- Red circle: Target
- Green triangle: Phonological Foil
- Blue square: Semantic Foil
- Purple star: Unrelated Foil
Analytic strategy

• **Growth curve analysis** (Barr, 2008, Mirman et al., 2008, Mirman, 2014)
  
  – Restrict analysis to a meaningful time window.
  – Model how fixations to a target *area of interest* (AOI) change as a function of time.
  – Include random effects for participant.
  – Transform to empirical log-odds so models work.
  – Subject-level variables: age, vocabulary size, , maternal education level,
  – Condition: stimulus dialect
Results: Stimulus dialect

- No main effect of dialect and dialect did not interact with any of the other predictors.
- Combined data across the two stimulus-dialect groups.
- Methodologically feasible to test children in their native dialect.
Results: Expressive vocabulary and maternal education level

• Expressive vocabulary size is significant predictor of both accuracy and speed.
• No significant main effect of maternal education level.
• Interaction between maternal education level and vocabulary size.
Looks to semantic and unrelated foils

- Compare looks to target for trials where children were looking at target onset to:
  - semantic foil
  - unrelated foil
- Children more distracted by semantic foil
- Significant effect of vocabulary size for both trial-types
- No significant effect of maternal education level
Looks to phonological and unrelated foils

- Compare looks to target for trials where children were looking at target onset to:
  - phonological foil
  - unrelated foil
- Children (slightly) more distracted by phonological foil
- Significant effect of vocabulary size for both trial-types
- No significant effect of maternal education level
• Methodologically feasible to test children in native dialect.

• What about dialect mismatch?
  – Not directly addressed in this study because all children received stimuli in their native dialect.
  – Ongoing study with both MAE and AAE speakers.
Discussion

• Spoken word recognition in children
  – Preschool children, like adults, were sensitive to phonological and semantic competitors
  – Vocabulary size did not interact with inhibition of semantic/phonological competitors
  – Results argue for a continuity between children and adults in spoken word recognition (Mayor & Plunkett, 2014)
Discussion

• Why do children from high-SES families process familiar words more quickly and accurately than children from low-SES families?
• Linguistic versus non-linguistic explanations.
  – Vocabulary size explained much of this effect
• Insulating effect of high maternal education level.
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