Phonotactic Probability and Grammatical Class in Word Learning

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Children Rapidly Acquire Words

• Diary/Checklist
  – Add ~2-5 words per day (expressive)
  – Add ~9 words per day (receptive)

• Fast mapping
  – Associate sound sequence with referent with 1 exposure

• Quick Incidental Learning
  – Form associations in discourse
Why so fast?

• Constraint Account
  – Born with innate principles

• Associationistic Account
  – Learn regularities in the environment

• Social-Pragmatic Account
  – Social context narrows interpretations

• Emergentist Coalition Account
Associationistic Account

• Initial word learning is slow

• First words give children a sample of distributional regularities

• Children learn the regularities

• Knowledge of regularities leads to fast word learning
Phonological Regularities

• Phonotactic probability
  – Likelihood of occurrence of a sound sequence
  – Positional segment frequency
  – Biphone frequency

• Common sound sequences
  – e.g., “sit” /sɪt/

• Rare sound sequences
  – e.g., “these” /ðɪz/
Phonotactic Probability

• Learned early in development
  (e.g., Jusczyk, Luce, & Charles-Luce, 1994; Saffran, Aslin, & Newport, 1996)

• Influences nonword repetition in childhood
  (e.g., Beckman & Edwards, 1999; Gathercole et al., 1999)

• Influences word recognition and memory in adults
  (e.g., Frisch, Large, & Pisoni, 2000; Vitevitch & Luce, 1998; 1999)
Overview

• Evidence that children learn phonotactic probability

• Question: Does phonotactic probability influence word learning?
  – Study 1: Noun learning
  – Study 2: Verb learning
Study 1
(Storkel, 2001)

• Do pre-school children learn objects associated with common sound sequences more rapidly than objects associated with rare sound sequences?

• Does this vary across exposures and delays?
Method

• **Participants:** 34 children
  – Age 3 - 6 yrs ($M = 4; 6$)
  – *GFTA* 32\(^{\text{nd}}\) - 99\(^{\text{th}}\) percentile ($M = 70$)
  – *PPVT-R* 30\(^{\text{th}}\) - 99\(^{\text{th}}\) percentile ($M = 74$)

• **Stimuli:** 8 CVC nonwords
  – 4 common vs. 4 rare sound sequences
## Sample Stimuli

<table>
<thead>
<tr>
<th>Form</th>
<th>Referent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common</strong></td>
<td><strong>Rare</strong></td>
</tr>
<tr>
<td>kouf</td>
<td><img src="image1" alt="Kouf Image" /></td>
</tr>
<tr>
<td>jeıp</td>
<td><img src="image5" alt="Jeıp Image" /></td>
</tr>
</tbody>
</table>
Procedure

Story Episode 1
1 exposure
8 nonwords
Referent Identification

Test 1
Form Identification

Story Episode 2
3 exposures
8 nonwords

Test 2

Story Episode 3
3 exposures
8 nonwords

Test 3
Test 4

• Picture Naming

Picture Naming
Results: Object Naming

![Graph showing proportion of correct responses for common and rare objects over cumulative exposures.

- Common objects show an increase in correct responses from 1 to 7 exposures, with a slight decrease post-exposure.
- Rare objects also show an increase in correct responses, but the increase is more pronounced.

Cumulative Exposures: 1, 4, 7, Post

Proportion of Correct Responses: 0.00, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35]
Study 1: Summary

• Preschool children acquired common sound sequences more rapidly than rare

• Effect was consistent over 4-7 exposures and 1-week delay
  – Floor effect at 1 exposure
Noun-Verb Difference

- Nouns predominate early vocabulary
- Nouns learned more rapidly than verbs
- Accounts
  - Conceptual difference
  - Morphology (English)
  - Sentence position (English)
Study 2
Storkel (In Preparation)

• Do preschool children learn actions associated with common sound sequences more rapidly than actions associated with rare sound sequences?
Method

• Participants: 34 children
  – Age 3 - 6 yrs ($M = 4; 3$)
  – GFTA-2 21\textsuperscript{st} - 97\textsuperscript{th} percentile ($M = 68$)
  – PPVT-3 25\textsuperscript{th} - 98\textsuperscript{th} percentile ($M = 75$)

• Stimuli: 8 CVC nonwords
  – 4 common vs. 4 rare sound sequences
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<th>Test 2</th>
<th>Story</th>
<th>Test 3</th>
<th>Test 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode 1</td>
<td>1 exposure</td>
<td>Episode 2</td>
<td>3 exposures</td>
<td>Episode 3</td>
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<td></td>
</tr>
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<td></td>
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- Picture Naming
Results: Verb Naming

![Graph showing proportion of correct responses over cumulative exposures for common and rare verbs. The graph displays an upward trend for both categories, with error bars indicating variability. The x-axis represents cumulative exposures ranging from 1 to Post, and the y-axis shows the proportion of correct responses ranging from 0.00 to 0.35.]
Study 2: Summary

• Common sound sequences learned more rapidly than rare

• Effect of phonotactic probability similar across words differing in grammatical class
Conclusion

• Learn sound based regularities in the environment
• Regularities influence word learning
• Effect is similar across words differing in grammatical class
Thank You

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