Predicting Word Learning:
The Role of Lexical and Phonological Characteristics

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Standardized Vocabulary Tests

- Reportedly insensitive to word learning differences (e.g., Gray, Plante, Vance, & Henrichsen, 1999)

- Examine the *products*, not the *process* of learning (e.g., Dollaghan & Campbell, 1998)

- Improve if items selected to reflect process?
Phonotactic Probability

- Likelihood of occurrence of a sound sequence
  - Common (e.g., “coat”)
  - Rare (e.g., “watch”)

- Influences word learning
  (e.g., Storkel & Rogers, 2000; Storkel, 2001; Storkel, in press)
  - Common > rare
Overview

- Phonotactic probability tutorial
- Examine words on vocabulary tests
- Create common and rare subscales
- Compare subscale performance to word learning performance
Measuring Phonotactic Probability

- Positional segment frequency
  \[ \Sigma \text{Log frequency of words with target sound in target position} \]
  \[ \Sigma \text{Log frequency of words with any sound in target position} \]

- Biphone frequency
  \[ \Sigma \text{Log frequency of words target biphone in target position} \]
  \[ \Sigma \text{Log frequency of words any biphone in target position} \]

- Summed across the entire word
## Positional Segment Frequency Example

<table>
<thead>
<tr>
<th>Position</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>h</td>
<td>1</td>
<td>28649</td>
<td>0.0395</td>
</tr>
<tr>
<td>i</td>
<td>2</td>
<td>28631</td>
<td>0.0957</td>
</tr>
<tr>
<td>s</td>
<td>3</td>
<td>28119</td>
<td>0.0789</td>
</tr>
</tbody>
</table>

**Sum of the Positional Segment Frequencies** = 0.2141
Biphone Frequency Example

<table>
<thead>
<tr>
<th>Position</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>hI</td>
<td>1</td>
<td>115</td>
<td>28649</td>
</tr>
<tr>
<td>IS</td>
<td>2</td>
<td>477</td>
<td>28631</td>
</tr>
</tbody>
</table>

Sum of the Biphone Frequencies = 0.0207
Problem with Calculation

- Sum of frequencies

- Values increase as word length increases

- Unable to compare values for words differing in length
Solution = Average?
Solution = Average?
Solution = Average?

- Average increases with word length

- Greater predictability at end of word?

- Denominator decreasing X position

- Derivational morphology
Solution = Transformation

Segment Median Transformation

Word Length
Solution = Transformation
Examine Vocabulary Test

- Peabody Picture Vocabulary Test – 3
- Compute phonotactic probability
- Code as common (+) or rare (-)
PPVT-3A Item Analysis

- Positional segment frequency:
  Common (88) < rare (116)
  Not correlated with: item number, word frequency
  Correlated with: length

- Biphone frequency:
  Common (99) = rare (105)
  Not correlated with: item number
  Correlated with: length, word frequency
PPVT-3B Item Analysis

- Positional segment frequency:
  Common (93) = rare (111)
  Not correlated with: item number, length, word frequency

- Biphone frequency:
  Common (99) = rare (105)
  Correlated with: item number, length, word frequency
PPVT Subscale Analysis

- Data from Storkel (submitted)
  - 68 preschool children, 3 groups
  - Participated in word learning study
    - Phonotactic probability manipulated

PPVT-3A Subscale Scores

- % Common correct
- % Rare correct
PPVT-3A Subscale Results
(Storkel & Perdue, in progress)

- Overall PPVT score:
  All children scored within normal limits

- Subscale PPVT scores:
  No difference between groups
  Common > Rare
Word Learning Results
(Storkel, submitted)

- Age-matched children
  - Common > rare

- Phonology-matched children
  - Common > rare

- Phonologically delayed children
  - Common < rare
Summary

- Typically developing children: Test and word learning performance *converge*

- Phonologically delayed children: Test and word learning performance *diverge*

- Why discrepancy?
  - Long term vs. short term learning
  - Products of learning vs. process of learning
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