Word Learning II: Naturalistic Learning by Children with Phonological Delays

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Phonology and Word Learning in Young Children

- Children learn spoken words based on sound regularities.
  - Phonotactic probability
  - Neighborhood density

Phonotactic Probability

- Likelihood of occurrence of sound sequences
  - Common: Sound sequences that occur in the same position frequently (e.g., "coat")
  - Rare: Sound sequences that occur in the same position infrequently (e.g., "watch")

Neighborhood Density

- The number of words (=neighbors) that differ from a target word by one phoneme substitution, deletion, or addition (Luce & Pisoni, 1998)
  - Dense: Words with many neighbors (e.g., "sit")
  - Sparse: Words with few neighbors (e.g., "these")

Word Learning – Previous Studies

- Preschool children with typical development (TD) vs. children with phonological delays (PD)
- Effects of phonotactic probability and neighborhood density
  - TD: common-dense > rare-sparse
  - PD: common-dense < rare-sparse
  (Storkel, 2001, 2003, 2004; Storkel & Rogers, 2000)

Limitations

- Controlled linguistic and environmental factors
- Short-term learning
- Phonotactic probability and neighborhood density highly correlated
Questions

- Do phonotactic probability and neighborhood density influence naturalistic word learning by children with phonological delays?
- Are the influences independent or combined?

Participants

<table>
<thead>
<tr>
<th></th>
<th>PD (n=22)</th>
<th>TD (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in months</td>
<td>60 (41-76)</td>
<td>54 (38-68)</td>
</tr>
<tr>
<td>ROWPVT</td>
<td>59 (33-81)</td>
<td>62 (47-84)</td>
</tr>
<tr>
<td>EOWPVT</td>
<td>56 (34-72)</td>
<td>57 (34-81)</td>
</tr>
<tr>
<td>GFTA-2</td>
<td>35 (20-51)</td>
<td>8 (0-28)</td>
</tr>
</tbody>
</table>

Naturalistic Word Learning Probe: Word Selection

- 121 real word nouns differing in phonotactic probability and neighborhood density
  - Correlated
    - Common-dense
    - Rare-sparse
  - Dissociated
    - Common-sparse
    - Rare-dense

Naturalistic Word Learning Probe: Tasks

- Expressive task
  - Participants name each picture

Matched Variables

<table>
<thead>
<tr>
<th>Matched Variables</th>
<th>correlated</th>
<th>dissociated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>common/dense</td>
<td>rare/sparse</td>
</tr>
<tr>
<td>Early AoA, high freq</td>
<td>car</td>
<td>fish</td>
</tr>
<tr>
<td>Early AoA, mid freq</td>
<td>pants</td>
<td>frog</td>
</tr>
<tr>
<td>Mid AoA, mid freq</td>
<td>ladder</td>
<td>tiger</td>
</tr>
<tr>
<td>Mid AoA, low freq</td>
<td>mitten</td>
<td>beaver</td>
</tr>
<tr>
<td>Late AoA, low freq</td>
<td>toaster</td>
<td>donkey</td>
</tr>
</tbody>
</table>
Naturalistic Word Learning Probe: Tasks

- Receptive task
  - 4 pictures on the screen while participants hear a target word

Target = ‘sheep’

Semantically Related = ‘horse’

Phonologically Related = ‘ship’

Unrelated = ‘rose’
Analysis

- 2 group (PD vs. TD) x 2 task (expressive vs. receptive) x 2 phonotactic probability (common vs. rare) x 2 neighborhood density (dense vs. sparse) repeated measures ANOVA

Result

- Significant main effects of task and neighborhood density
  - Task: $F(1, 35) = 538.35, p < .001$
  - Neighborhood density $F(1, 35) = 20.49, p < .001$
- No main effect of phonotactic probability
- No main effect of group
- No interaction with group

Task

Neighborhood Density

Summary

- Only neighborhood density affected long term word learning
- No group difference between children with and without phonological delays

Conclusion

- Consistent with a study of expressive vocabulary test (Storkel & Giles, in preparation)
  - common/dense > rare/dense
- Inconsistent with another empirical study of nonwords (Hoover & Storkel, 2005)
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