Phonological and lexical characteristics of sound productions by preschool children
Su Yeon Lee, M.M.E.
Holly L. Storkel, Ph. D

Phonological Acquisition
- Influenced by phonological and lexical characteristics.
- Phonological variability: an acquired sound used correctly in some words but not others.
- What are the characteristics of the words that are vulnerable to production accuracy?

Phonological Characteristic
- Phonotactic Probability
  - Sound characteristic
  - The likelihood of occurrence of a particular sound or sound sequences in a given language (Vitevitch & Luce, 1999)
    - e.g., “sit” /sɪt/ 
    - High phonotactic probability → “sit” “coat”
    - Low phonotactic probability → “these” “watch”

Lexical characteristics
- Word frequency
  - Characteristic of whole word forms
  - The number of times that a word occurred in a language (Storkel, 2004).
    - High frequency → “these” (1,573 in 1 million of adult written words)
    - Low frequency → “sit” (67 in 1 million of adult written words)

Lexical Characteristic
- Neighborhood density
  - Characteristic of whole word forms
  - The number of words that are phonemically similar to a given word based on a one phoneme substitution, addition, or deletion (Luce & Pisoni, 1998).
    - e.g., “sit” → “sip”, “spit”, “it”
    - High neighborhood density: “sit” (N = 24)
    - Low neighborhood density: “these” (N = 9)

Backgrounds
- TD children recognized and produced high probability sounds more rapidly and accurately in nonwords (Edwards, Beckman, & Munson, 2004)
- TD children produced high frequency and high density in real words more accurately (Newman & German, 2002, 2005).
- No studies of phonotactic probability, word frequency, neighborhood density in real words by children with phonological delays.
Purpose of the study

- To explore influences of phonological and lexical characteristics on sound production by typically developing children and children with phonological delays.

Participants

- Selected from a larger study
- Examined PD kids with 17 – 45% accuracy on a given sound.
- Identified 9 kids for 6 emerging sounds
  - /ð/, /ʃ/, /l/, /ðz/, /f/, /t/
- Matched on accuracy of that sound to a TD child.
- For that sound, examined characteristics of accurate and inaccurate production.

<table>
<thead>
<tr>
<th></th>
<th>TD (n=9)</th>
<th>PD (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months)</td>
<td>M</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>5.2</td>
</tr>
<tr>
<td>GFTA Percentile</td>
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<tr>
<td>PPVT-III Percentile</td>
<td>60</td>
<td>14</td>
</tr>
<tr>
<td>EVT Percentile</td>
<td>44</td>
<td>22</td>
</tr>
</tbody>
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Measures

- Phonotactic probability, frequency, neighborhood density were computed using an on-line child calculator (Jill, Storkel, & Kieweg, 2008).
- Patterns for accurate and inaccurate production were compared across groups.

Criteria for Interpretation of Significance

- Meeting both criteria
  - SEM criterion: Mean difference between accurate versus inaccurate production greater than SEM (Standard Error of Measurement).
  - Subject criterion: 5/9 subjects in the group show the same trend (i.e., low or high advantage for accurate production).

RESULT: Phonotactic Probability
Discussion: Phonotactic Probability

- **High phonotactic probability effect in TD**
  - Consistent with the previous studies in nonword repetition tasks (Edwards, Beckman, & Munson, 2004; Munson, Edwards, & Beckman, 2005).
  - Attributed to the predictability of phonological sequence and frequency (Storkel & Rogers, 2000).
  - Facilitate the creation of association between a new lexical representation and the newly acquired phonological representation.

- **Variability in phon prab effect in PD**
  - ½ group performs similar to TD. (High effect)
    - Attributed to the predictability of phonological sequence and frequency (Storkel & Rogers, 2000).
  - ½ group shows opposite effect. (Low effect)
    - Attributed to uniqueness of sound sequences in low phonotactic probability words.
    - May imply their difficulty distinguishing common sound sequence words from other similar forms.

RESULT: Frequency
TD: Variable Frequency Effect
PD: Low Frequency Effect

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Discussion: Frequency

Variables frequency effect in TD
\( 1/2 \) High frequency advantage
- Attributed to the frequent activation in recognizing, accessing, retrieving, or producing with high frequency words (Gierut, et al., 1999).
- For the sake of communicative message (Macken & Ferguson, 1983)

\( 1/2 \) Low frequency advantage
- Attributed to the flexibility of underlying lexical representation in infrequent words (vulnerable to sound change).

PD: 6/9 Low Frequency Advantage

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Discussion: Frequency

Low frequency effect in PD
- Attributed to the flexibility of underlying lexical representation in infrequent words (vulnerable to sound change).
- More likely to show sound change in less well practiced environments.
- Unwillingness to attempt to new sounds in a variety of phonological and lexical contexts.

RESULT: Neighborhood Density
High Neighborhood Density Effect in both groups

TD: 7/9 High Density Advantage

PD: 5/9 High Density Advantage

Discussion: Neighborhood Density
- High neighborhood density effect in both groups
  - Similar to past study (Stokel & Gierut, 2002).
  - The more phonologically detailed representations in high density neighborhoods.
  - Facilitate association between an existing lexical representations and new lexical representations.
  - A general property of sound acquisition.

SUMMARY
- Phonotactic Probability
  - High phonotactic probability effect in TD
  - Variable phonotactic probability effect in PD

- Frequency
  - Variable frequency effect in TD
  - Low frequency effect in PD

- Neighborhood Density
  - High density effect in both TD and PD groups

CONCLUSION
- The findings from this study suggest that influences of phonological and lexical properties on sound productions may vary across TD and PD children.
Thank You!

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• Contact information:
  Su Yeon Lee
  suyeon@ku.edu