BACKGROUND

Lexical-Phonological Relationships
Lexical and phonological development tend to be commensurate in typically developing children (Stoel-Gammon, 2010). Vocabulary size predicted 2-year-olds' performance on tasks of phonemic sensitivity (Schwartz, et al., 2006).
• Rates of intra-word variability were more strongly correlated with vocabulary size than with chronological age in typically developing 2-year-olds (Sosa & Stoel-Gammon, 2012).
• Expressive vocabulary was a better predictor of non-word repetition accuracy than chronological age in typically developing 3- to 8-year-olds (Edwards et al., 2004).
• In Spanish English bilingual 2-year-olds, vocabulary size and non-word repetition accuracy were significantly correlated within each language, but not across languages (Parrà et al., et al., 2011).
• This relationship has also been observed in 2-year-olds with language impairment (L. Rescorla & Ratner, 1996) and in lexically precocious 2-year-olds (Smith, et al., 2006), in whom vocabulary size was associated with accuracy of final consonant production.

Types of Phonological Errors Associated with Language Development
A higher rate of atypical sound changes was associated with poor phonemic awareness and lower receptive vocabulary in 4-5-year-olds with SSD (Preston & Edwards, 2010).
• Children aged 3 to 5 ½ years with comorbid SSD and LI exhibited more omission errors than children with SSD only (McCrae & Tyler, 2014). The two populations had similar error rates, but differed in types of errors.
• Children with SSD whose speech did not normalize within one year had a higher rate of omission errors than children whose speech did normalize (Shriberg, et al., 1994).

Goals of the Current Study
1. To investigate whether a relationship exists between lexical and phonological development in typically developing preschool-aged children, and whether such a relationship can be detected using standardized clinical assessments of receptive vocabulary size, articulation, and phonology.

Hypothesis 1: Vocabulary size will be negatively correlated with total number of articulation and phonological errors in children aged 2 to 3.11.

Hypothesis 2: Based on previous findings, it was hypothesized that vocabulary size will be most strongly correlated with deletions and atypical phonological errors.

METHODS

Participants
• 37 children, 16 male, 21 female ages 2.6 to 3.11.
• Residents of Northern Arizona whose primary language is American English
• Typically developing, with no history of speech, language or hearing concerns (based on parent report)
• All participants attained standard scores of 85 or higher (i.e. no more than 1 standard deviation below the mean) on each of the four assessments administered.

Assessments
• Goldman-Fristoe Test of Articulation, 2nd Edition (GFTA-2)
• Khan-Lewis Phonological Analysis, 2nd Edition (KLPA-2)
• Expressive Vocabulary Test, 2nd Edition (EVT-2)
• Peabody Picture Vocabulary Test, 2nd Edition (PPVT-4)

METHODOLOGY (continued)

Procedures
• Children participated in hour-long data collection sessions in a university clinic therapy room or at their preschool. Sessions were audio recorded using a high-quality Zoom microphone.
• The clinician who administered the assessments used the audio recording of the session to produce a broad phonetic transcription of the GFTA-2 stimulus words. All assessments were scored using ASIST software for GFTA-2 and KLPA-2. This software automatically counts individual phonological processes, along with distortions, deletions, additions, substitutions, and atypical phonological errors.

RESULTS (continued)

Correlations by Error Type
The error types that were most strongly associated with lower EVT and PPVT raw scores were deletions (i.e. final consonant deletion, cluster reduction, and syllable reduction) and atypical (phonological errors (e.g. backing, initial consonant deletion). A much weaker but significant relationship was noted in substitution errors and EVT and PPVT raw scores. Addition errors were slightly correlated with lower EVT & PPVT at a = 0.05. All of these error types were more strongly correlated with vocabulary scores than they were with the child's chronological age. There was no significant relationship found between distortions and vocabulary size.

Correlations by Age
Interestingly, when the participants were grouped by age, the correlation between vocabulary scores and phonological accuracy was strongest in children aged 2.6-2.11 (Group 1) and 3.6-3.11 (Group 2), but this relationship was largely absent in 30.3-5 year olds (Group 2). Similarly, the correlation between deletions and atypical errors and vocabulary was weak in the 3.0-5.5 age group.

CONCLUSIONS & DISCUSSION

• Hypothesis 1 was supported: A significant correlation was evident between the raw scores of all 4 assessments, even though these assessments are not designed to be sensitive to this relationship. This indicates a strong, measurable relationship between lexicon size and rate of articulation and phonological errors for children in this age group.
• Hypothesis 2 was supported: Certain error types were more strongly associated with vocabulary size. Specifically, deletions and atypical phonological processes were associated with lower vocabulary scores. These types of errors may suggest weak underlying phonological representations associated with both poor phonological awareness and smaller vocabulary size.
• Current results replicated previous findings indicating that phonological knowledge is more closely related to vocabulary size than chronological age.
• Further research should examine the changes in the lexical-phonological relationship over time, and over a broader age range.
• This study is the first step in a larger project aiming to determine whether the relationship between lexical and phonological development may be used clinically to help predict short-term sound speech norm localization in children with SSD.

REFERENCES
### Additional Information

#### Correlations of Assessment Raw Scores: Ages 2;6-2;11 (n = 38)

<table>
<thead>
<tr>
<th></th>
<th>GFTA Raw</th>
<th>KLPA Raw</th>
<th>EVT Raw</th>
<th>PPVT Raw</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation</strong></td>
<td>1</td>
<td><strong>.885</strong></td>
<td><strong>-.495</strong></td>
<td><strong>-.640</strong></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td><strong>.000</strong></td>
<td><strong>.002</strong></td>
<td><strong>.000</strong></td>
<td><strong>.000</strong></td>
</tr>
</tbody>
</table>

- **Correlation is significant at the 0.01 level** (2-tailed).
- *Correlation is significant at the 0.05 level* (2-tailed).

#### Correlations of Assessment Raw Scores: Ages 3;0-3;5 (n = 26)

<table>
<thead>
<tr>
<th></th>
<th>GFTA Raw</th>
<th>KLPA Raw</th>
<th>EVT Raw</th>
<th>PPVT Raw</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation</strong></td>
<td>1</td>
<td><strong>.941</strong></td>
<td><strong>-.366</strong></td>
<td><strong>-.126</strong></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td><strong>.000</strong></td>
<td><strong>.036</strong></td>
<td><strong>.539</strong></td>
<td><strong>.000</strong></td>
</tr>
</tbody>
</table>

- **Correlation is significant at the 0.01 level** (2-tailed).
- *Correlation is significant at the 0.05 level* (2-tailed).

#### Correlations of Assessment Raw Scores: Ages 3;6-3;11 (n = 22)

<table>
<thead>
<tr>
<th></th>
<th>GFTA Raw</th>
<th>KLPA Raw</th>
<th>EVT Raw</th>
<th>PPVT Raw</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation</strong></td>
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<td><strong>.855</strong></td>
<td><strong>-.489</strong></td>
<td><strong>-.663</strong></td>
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<tr>
<td>Sig. (2-tailed)</td>
<td><strong>.000</strong></td>
<td><strong>.021</strong></td>
<td><strong>.001</strong></td>
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</table>

- **Correlation is significant at the 0.01 level** (2-tailed).
- *Correlation is significant at the 0.05 level* (2-tailed).

#### Vocabulary / Speech Sound Error Correlations: Age 2;6-2;11 (n = 38)

<table>
<thead>
<tr>
<th></th>
<th>Distortions</th>
<th>Substitutions</th>
<th>Additions</th>
<th>Deletions</th>
<th>Atypical Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation</strong></td>
<td>-1.155</td>
<td>-.377</td>
<td>-.070</td>
<td>-.702</td>
<td><strong>-.570</strong></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td><strong>.352</strong></td>
<td><strong>.019</strong></td>
<td><strong>.675</strong></td>
<td><strong>.000</strong></td>
<td><strong>.000</strong></td>
</tr>
</tbody>
</table>

- **Correlation is significant at the 0.01 level** (2-tailed).
- *Correlation is significant at the 0.05 level* (2-tailed).

#### Vocabulary / Speech Sound Error Correlations: Age 3;0-3;5 (n = 26)

<table>
<thead>
<tr>
<th></th>
<th>Distortions</th>
<th>Substitutions</th>
<th>Additions</th>
<th>Deletions</th>
<th>Atypical Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation</strong></td>
<td>-.110</td>
<td>-.059</td>
<td>-.398</td>
<td>-.249</td>
<td>-.249</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td><strong>.594</strong></td>
<td><strong>.774</strong></td>
<td><strong>.044</strong></td>
<td><strong>.220</strong></td>
<td><strong>.219</strong></td>
</tr>
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</table>

- **Correlation is significant at the 0.01 level** (2-tailed).
- *Correlation is significant at the 0.05 level* (2-tailed).

#### Vocabulary / Speech Sound Error Correlations: Age 36-3;11 (n = 22)

<table>
<thead>
<tr>
<th></th>
<th>Distortions</th>
<th>Substitutions</th>
<th>Additions</th>
<th>Deletions</th>
<th>Atypical Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation</strong></td>
<td>-1.111</td>
<td>-.594</td>
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<td>-.566</td>
<td>-.521</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td><strong>.624</strong></td>
<td><strong>.004</strong></td>
<td><strong>.559</strong></td>
<td><strong>.006</strong></td>
<td><strong>.013</strong></td>
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</tbody>
</table>

- **Correlation is significant at the 0.01 level** (2-tailed).
- *Correlation is significant at the 0.05 level* (2-tailed).

### ADDITIONAL REFERENCES


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