Phonological Awareness/Literacy Predictors of Spelling Abilities for First-Grade Children

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Phonological awareness has been identified as an important component in children’s literacy development overall, especially in spelling and reading performance. The various levels of phonological awareness (i.e., rhyming, sequencing, separating, and manipulating sounds) all contribute to reading and spelling. Competency in the various levels of phonological awareness enhances children’s academic success (Ball, 1997; Clarke-Klein, 1994; Griffith, 1991; Kamhi & Hinton, 2000; Masterson & Crede, 1999; Nation & Hulme, 1997; Roth & Baden, 2001).

Phonological awareness has been a reported predictor of literacy development in early school grades. A strong correlation exists between phonological awareness and spelling skills because spelling errors are generally phonetically accurate (Kamhi & Hinton, 2000). Emergent literacy consists of the skills, knowledge, and abilities that are prerequisites to the tasks of reading, writing, and spelling (Justice & Pullen, 2003). The development of emergent literacy occurs on a continuum, with its beginnings early in childhood. Preliteracy development typically occurs during the preschool years; however, some children may not fully develop the skills necessary to move beyond the stage of preliteracy development. These children require intervention to establish and strengthen the skills required for later literacy/spelling tasks.

Roth and Baden (2001) described two of the earliest developing phonological awareness skills as rhyme and alliteration, which typically emerge around the ages of 3 to 4 years. It is likely that the earlier children appreciate and understand the spoken forms of rhyme and alliteration, the more they will be able to apply that knowledge when they are learning to read and write. That is, rhyming may allow children to make connections between words that share common sounds and spelling patterns. These two skills (i.e., rhyme and alliteration) indicate an individual’s awareness that speech contains separate units. This allows for the development of higher level phonological awareness...
skills (i.e., blending and segmenting phonemes). When children are able to separate words into parts, they have an understanding of the relationship between the sounds and letters that are included in an alphabetic writing system (Ball, 1997). Further development of phonological awareness skills requires knowledge of alphabet letters as well as skills with phoneme–grapheme correspondence.

Knowledge of the names of alphabet letters correlates with phonological awareness and beginning reading skills, but the actual instruction of letter names does not seem to increase literacy skills overall. However, knowledge of alphabet letters does reflect on memory capabilities, which are important in developing emergent literacy skills. Researchers (Roth & Baden, 2001; Whitehurst & Lonigan, 1998) have identified that phoneme–grapheme correspondence stems from alphabet letter knowledge abilities and is the most complex component of emergent literacy.

Before children can use phoneme–grapheme correspondence, they typically recognize salient characteristics of the printed word and associate those with the word’s pronunciation or meaning. Previous studies (Bowman & Treiman, 2002; Ehri, 1983; Treiman, Tincoff, & Richmond-Welty, 1996; Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998) have illustrated that children use the knowledge of letter names to aid in their reading abilities, even when they are not knowledgeable about phoneme–grapheme correspondence. Treiman and Rodriguez (1999) found results consistent with previous research suggesting that children who were knowledgeable about letter names could use that information to connect written words with their pronunciations, regardless of the children’s reading abilities. These findings support the notion that children systematically attempt to make sense of written text using the knowledge they have. This contradicts the assumption that children merely memorize printed words as if they were random symbols. Once an individual has mastered reading and reached adulthood, these early occurring strategies to associate letter names in reading tasks are not abandoned. Rather, adults continue to use this skill as they encounter reading tasks throughout life (Bowman & Treiman, 2002).

Because simple phonological awareness tasks help facilitate early reading and writing, they are highly relevant to spelling. The task of separating words into individual phonemes has been found to be a strong predictor of spelling ability (Nations & Hulme, 1997). More difficult phonological awareness tasks, such as producing a word without a specific letter, probably depend on the skills and strategies that are used in spelling, such as visualizing a word and moving around the necessary letters (Ball, 1997).

**Stage Theories/Orthographic Knowledge in Spelling Development**

Originally, spelling was thought to be a “low-level... mechanical skill” (Scott & Brown, 2001, p. 198) that required only visual–motor skills and rote memorization. Once spelling was recognized as involving linguistic concepts, the process of spelling development began to gain attention. The typical development of spelling was a popular area of interest in the late 1970s and early 1980s. During that time period, theories of spelling development were created in order to better explain how children learn to spell. The creation of these stages of spelling development was originally derived from Piagetian theory and the assumption that cognitive development occurs in qualitatively differing stages. Although these stages represent a sequential pattern of development, it is important to remember that even though spelling ability improves over time, a range of spelling competence should be expected at any age (Gentry, 2000).

The stages of spelling development represent a broad overall glimpse of the process of spelling development, but controversy exists regarding the variance that is seen in different children’s ability to spell. There has also been recent emphasis on children’s use of multiple strategies or stages in spelling tasks (Bourassa & Treiman, 2001). To summarize spelling development in a general sense, Treiman and Bourassa (2000) suggested that spelling develops from syllables to phonemes, with intermediate units between those targets. The developmental pattern of spelling ability shows a similar pattern in children who are typical spellers and in those individuals who have difficulty with spelling (Lewis, Freebairn, & Taylor, 2002).

Past researchers (Bear & Templeton, 1998; Henderson, 1990) presented six stages of spelling development that characterize children’s attempts to spell words: prephonemic spelling, semiphonemic/early letter name spelling, letter name spelling, within-word pattern spelling, syllable juncture spelling, and derivational constancy spelling. Although stage theories (Bear & Templeton, 1998; Gentry, 1982) have been used to categorize the level at which beginning spellers are performing, some researchers (Cassar & Treiman, 1997; Treiman, 1993; Treiman, Berch, & Weatherston, 1993) have suggested that knowledge about the conventional letter patterns that are found in words is also important when analyzing children’s spelling skills. Orthographic knowledge develops early (Cassar & Treiman, 1997). Knowledge about conventional rules in English orthography and the use of those rules appears to emerge sometime between kindergarten and first grade. This suggests that beginning spellers do not rely solely on phoneme–grapheme correspondence to aid in their spelling decisions, but on a variety of knowledge including speech sound awareness and knowledge about basic orthographic rules.

In conjunction with the stage theories of spelling development and orthographic knowledge, it is important to recognize that many factors have been presumed to influence the development of spelling abilities in children. Although stage theories provide an overall description of spelling development, phonological awareness also needs to be considered (Treiman & Bourassa, 2000). Phonological awareness, reading ability, and metalinguistic awareness of semantics, morphology, and syntax are aspects that have been viewed as foundations for the ability to spell (Kamhi & Hinton, 2000).

**Impact of Phonological Awareness on Spelling**

Griffith (1991) noted three functions of phonological awareness that influence spelling development. Phonological
awareness enables children to learn phoneme–grapheme correspondence, which is useful to create accurate spellings. Beginning spellers use phonological awareness skills to segment a word into its phonemes as they spell the word. Moreover, phonological awareness contributes to spelling memorization of specific word patterns, which is beneficial in the later reading process. Research has illustrated that spelling performance affects reading performance, just as reading performance impacts spelling performance (Ball & Blachman, 1991; Bradley & Bryant, 1985; Ehri, 2000; Morris & Perney, 1984).

Children who have unstable phonological foundations find it extremely difficult to comprehend and transfer printed language to existing language knowledge, which means spelling can seem an unachievable task (Clarke-Klein, 1994). Griffith (1991) found that children who had been classified as having high phonemic awareness skills were better spellers than children who had been classified as having low phonemic awareness skills in both first and third grades.

Not all spelling difficulties are based in phonological system deficiencies. Sometimes, the failure of a child to progress through the developmental spelling stages (from prephonemic to derivational constancy phase) can be the basis for a spelling deficiency. Although phonological awareness is an important aspect of spelling development, there are other factors that sometimes interfere with the development of spelling ability (Clarke-Klein, 1994).

Spelling development and performance have implications for a student’s overall success as a learner in the educational process. Identifying specific phonological awareness factors and/or patterns of factors that predict spelling ability can provide educators and interventionists with the ability to target those students who are at risk for becoming poor spellers. The Phonological Awareness Literacy Screening—First Grade (PALS–1; Invernizzi & Meier, 2002) is an assessment measurement for orthographic knowledge (word recognition, spelling inventory); oral reading in context; alphabettics (alphabet recognition, letter sounds); and phonemic awareness (blending, sound-to-letter). The studies mentioned previously all support the notion that phonological awareness/literacy skills are important in developing spelling skills, but none have examined which factors are most important when several factors are compared simultaneously. Therefore, the purpose of this study was to examine several phonological awareness/literacy skills from the PALS–1, both individually and collectively, to determine which skills were significant predictors of spelling abilities in first-grade children.

### METHOD

#### Participants

Participants in this study consisted of 80 first-grade students (37 males, 43 females) who were enrolled in nine classrooms within two small community, public schools from a Midwestern state. Participants ranged in age from 6:0 (years;months) to 7:5, with a mean age of 6:8 (SD = 3.72 months) and had (a) normal hearing, (b) normal receptive/expressive language, (c) English as their primary spoken language with standard American dialect, and (d) no current individualized education program.

#### Procedures and Assessment Tools

Children whose parents had signed informed consents were screened in the early fall for hearing and receptive/expressive language skills. The language screening consisted of two subtests (Linguistic Concepts and Recalling Sentences in Context) of the Clinical Evaluation of Language Fundamentals—Preschool (CELF–Pre; Wiig, Secord, & Semel, 1992). Participants who met eligibility criteria were administered the Test of Written Spelling, Fourth Edition (TWS–4; Larsen, Hammill, & Moats, 1999) and the PALS–1 (Invernizzi & Meier, 2002). The PALS–1 includes the following seven subtests: (a) Word Recognition in Isolation, read individual words in isolation; (b) Reading Passage Level, read a brief paragraph; (c) Alphabet Recognition, identify printed letters of the alphabet; (d) Letter Sounds, produce the individual sounds associated with printed letters; (e) Sound-to-Letter, identify the letter that corresponds with an individual sound in a noted position within a word; (f) Blending, blend a variety of sounds together in order to create a word; and (g) Spelling Inventory, write dictated words. All assessments were administered by 10 second-year, graduate student, speech-pathology majors who were trained and directly supervised by a licensed, certified speech-language pathologist (SLP).

#### Experimental Design

The Word Recognition in Isolation subtest of the PALS–1 (Invernizzi & Meier, 2002) was administered to determine each individual’s reading passage level. Five of the seven PALS–1 subtests (Reading Passage Level \([x_1]\), Alphabet Recognition \([x_2]\), Letter Sounds \([x_3]\), Sound-to-Letter \([x_4]\), and Blending \([x_5]\)) were used as predictor variables; the TWS–4 (Larsen et al., 1999) and the PALS–1 Spelling Inventory subtest (PALSSp; Invernizzi & Meier, 2000) were criterion variables for the study. A Pearson product–moment correlation analysis revealed a strong correlation \((r = 0.81)\) between the two spelling assessment measures that were used as criterion variables. This demonstrated statistical evidence of the association between these two measures.

#### Statistical Analysis

Multiple regression analyses were performed on the data to determine which predictor variables were significant indicators of spelling abilities of first-grade students as measured by the two criterion variables. The form of the regression models was

\[
x_{\text{Crit}} = \beta_0 + \beta_1 z_1 + \beta_2 z_2 + \beta_3 z_3 + \beta_4 z_4 + \beta_5 z_5 + \varepsilon
\]

where \(x_{\text{Crit}}\) is the standardized form of the criterion variable under consideration; \(z_i\) is the standardized form of predictor
variable $x_i$ as defined above ($i = 1, \ldots, 5$); $\beta_i$ is the model intercept term; $\beta_i$ is the mean rate of change in the standardized criterion variable due to a $1$ SD increase in the value of the associated predictor variable $x_i$, holding all other predictors under consideration to be fixed; and $\varepsilon$ is the random error component. Estimated standardized regression coefficients ($\beta_i$, $i = 1, \ldots, 5$) and their standard errors were calculated, and an alpha significance level of 0.05 was used for all significance tests in the regression analysis. Multicollinearity diagnostics were assessed to determine if the predictor variables were interrelated. Residual analysis was used to verify the validity of all significance tests performed in the context of the regression analysis (Schiavetti & Metz, 2002).

**RESULTS**

Descriptive data for the assessment measures (PALS–1, TWS–4) are provided in Table 1. A remarkable difference in participants’ reading ability, from readiness to third-grade level, was observed for the PALS–1 Reading Passage Level subtest. Five children (6.25%) were ranked at the readiness level, 22 (27.5%) were ranked at the preprimer A level, 22 (27.5%) were ranked at the preprimer B level, 22 (27.5%) were ranked at the preprimer C level, 18 (22.5%) were ranked at the primer level, 10 (12.5%) were ranked at the first-grade level, 2 (2.5%) were ranked at the second-grade level, and 5 (6.25%) were ranked at the third-grade level.

For data analysis, all variables (both responses and predictors) were standardized. Therefore, the coefficient values reported in Tables 2 and 3 are standardized regression coefficients, or beta weights. Statistically, beta weights represent the change in response for a change of $1$ SD in a predictor. These quantities are indicative of the effect of each predictor on a specific response. The assumption of normality, independence, and constant variance was verified via investigation of residual analyses. Variance inflation factors were calculated for each predictor in the regression models, and no significant evidence of predictor multicollinearity was found.

A summary of the results of the regression analysis for predictor variables of the PALSSp subtest is presented in Table 2; Table 3 presents a summary of the results of the regression analysis for predictor variables of the TWS–4. The $r^2$ value of PALSSp was 81.5% and the $r^2$ value of TWS–4 was 56.8%, indicating that the five predictor variables under consideration explain a larger proportion of the observed variation in PALSSp than they do for TWS–4. Two of the five predictor variables were found to be significant: (a) PALS–1 Reading Passage Level (TWS–4, $p < 0.001$; PALSSp, $p < 0.001$), and (b) PALS–1 Sound-to-Letter (TWS–4, $p = 0.028$; PALSSp, $p < 0.001$).

**DISCUSSION**

The goal of this study was to examine selected phonological awareness/literacy skills to determine whether any were significant predictors of spelling abilities in first-grade students. The analysis was designed to indicate how relevant each predictor was when it was examined simultaneously with the other predictors. The findings from this investigation indicated that reading level and the ability to identify individual letters corresponding to sounds in given positions in words (sound-to-letter tasks) were significant predictors of spelling ability in these first-grade participants. However, when compared simultaneously, three of the remaining five PALS–1 tasks (identifying printed letters of the alphabet, producing individual sounds associated with printed letters, and blending sounds to create a word) did not reach significance as predictors of spelling ability.

The first-grade participants in this study presented a range of reading abilities that encompassed eight reading levels (readiness to third grade). This wide range of reading abilities provided an opportunity to analyze whether reading was a predictor of spelling ability. The findings of this investigation concur with those of Ehri (2000), who noted high correlations (averaged .83) between reading ability and

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PALS–1 Reading Passage Level</td>
<td>4.325</td>
<td>1.690</td>
<td>4.0</td>
<td>1.0</td>
<td>8.0</td>
<td>7.0</td>
</tr>
<tr>
<td>PALS–1 Alphabet Recognition</td>
<td>25.287</td>
<td>1.640</td>
<td>26.0</td>
<td>15.0</td>
<td>26.0</td>
<td>11.0</td>
</tr>
<tr>
<td>PALS–1 Letter Sounds</td>
<td>23.550</td>
<td>3.311</td>
<td>24.0</td>
<td>7.0</td>
<td>26.0</td>
<td>19.0</td>
</tr>
<tr>
<td>PALS–1 Sound-to-Letter</td>
<td>37.650</td>
<td>3.457</td>
<td>39.0</td>
<td>20.0</td>
<td>40.0</td>
<td>20.0</td>
</tr>
<tr>
<td>PALS–1 Blending</td>
<td>17.338</td>
<td>3.249</td>
<td>18.5</td>
<td>8.0</td>
<td>20.0</td>
<td>12.0</td>
</tr>
<tr>
<td>PALS–1 Spelling Inventory</td>
<td>22.438</td>
<td>8.811</td>
<td>23.0</td>
<td>5.0</td>
<td>44.0</td>
<td>39.0</td>
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<tr>
<td>TWS–4</td>
<td>4.725</td>
<td>3.975</td>
<td>4.0</td>
<td>0.0</td>
<td>22.0</td>
<td>22.0</td>
</tr>
</tbody>
</table>

*Note.* PALS–1 = Phonological Awareness Literacy Screening—First Grade (Invernizzi & Meier, 2002), TWS–4 = Test of Written Spelling—Fourth Edition (Larsen, Hammill, & Moats, 1999). Reading passage level key: 1 = readiness level; 2 = preprimer A level; 3 = preprimer B level; 4 = preprimer C level; 5 = primer level; 6 = first grade level; 7 = second grade level; 8 = third grade level.
variables of the TWS–4.

explained by the difference in the letter-sound recognition skill of letter-sound recall task. This could be a predictor of spelling ability in our study's participants than developing skill of letter-sound recognition in the study was the same as the PALS–1 Letter Sounds subtest, in that the latter did not provide printed letters to assist in the letter-sound recognition and used sounds in the initial, medial, and final positions in words, as opposed to an isolated sound. This supports the notion that linguistic complexity must be considered when analyzing phonemic awareness skills and their impact on spelling development.

Cassady and Smith (2004) assessed the acquisition of blending skills for 189 kindergarten students. They found that linguistic complexity of the blending task affected skill development. Specifically, children developed the skills to blend a body-coda stimulus (ca-t) before blending onsets (c-at), followed by blending phonemes (c-a-t). The researchers concluded that children were acquiring blending skills through the middle portion of their kindergarten years. The Blending subtest of the PALS–1 required children to blend phonemes to create a word. Although this would be considered a later developing blending skill for kindergarten children, the participants in our study were in the first grade. The fact that our participants were older may account for blending not being a significant predictor of spelling abilities in our study.

Phonemic awareness, particularly sound-to-letter recognition, has been documented as a key component of learning to spell, as word spellings are often constructed from how the word sounds instead of rote memorization (Treiman & Tincoff, 1997; Treiman et al., 1993). Dodd and Carr (2003) studied letter-sound recognition and letter-sound recall in typically developing children between the ages of 4;11 and 6;4. The alphabetic principles of letter recognition and retrieval of phoneme sounds are essential components for accurate performance of these skills. They found that letter-sound recognition preceded letter-sound recall in skill development. The letter-sound recognition tasks in this study required the child to identify printed letters corresponding to a given letter-sound cue. This was a more simplistic form of the Sound-to-Letter subtest of the PALS–1, which required the child to identify letters corresponding to sounds in specified positions in words. The letter-sound recall task in the study was the same as the PALS–1 Letter Sounds subtest. It is interesting to note that the earlier developing skill of letter-sound recognition was a stronger predictor of spelling ability in our study's participants than the later developing letter-sound recall task. This could be explained by the difference in the letter-sound recognition task and the PALS–1 Sound-to-Letter subtest, in that the latter did not provide printed letters to assist in the letter-sound recognition and used sounds in the initial, medial, and final positions in words, as opposed to an isolated sound. This supports the notion that linguistic complexity must be considered when analyzing phonemic awareness skills and their impact on spelling development.

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Table 2. Summary of regression analyses for the predictor variables of the PALS–1 Spelling Inventory subtest.

<table>
<thead>
<tr>
<th>predictor variables</th>
<th>Coefficient</th>
<th>SE coefficient</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Passage Level</td>
<td>0.680</td>
<td>0.068</td>
<td>10.03</td>
<td>0.000*</td>
</tr>
<tr>
<td>Alphabet Recognition</td>
<td>0.014</td>
<td>0.069</td>
<td>0.834</td>
<td>0.340</td>
</tr>
<tr>
<td>Letter Sounds</td>
<td>0.085</td>
<td>0.086</td>
<td>0.98</td>
<td>0.330</td>
</tr>
<tr>
<td>Sound-to-Letter</td>
<td>0.237</td>
<td>0.060</td>
<td>3.98</td>
<td>0.000*</td>
</tr>
<tr>
<td>Blending</td>
<td>0.048</td>
<td>0.066</td>
<td>0.73</td>
<td>0.468</td>
</tr>
</tbody>
</table>

*p ≤ .05.

Table 3. Summary of regression analyses for the predictor variables of the TWS–4.

<table>
<thead>
<tr>
<th>predictor variables</th>
<th>Coefficient</th>
<th>SE coefficient</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Passage Level</td>
<td>0.747</td>
<td>0.103</td>
<td>7.22</td>
<td>0.000*</td>
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<tr>
<td>Alphabet Recognition</td>
<td>0.093</td>
<td>0.105</td>
<td>0.89</td>
<td>0.378</td>
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<tr>
<td>Letter Sounds</td>
<td>-0.213</td>
<td>0.132</td>
<td>-1.65</td>
<td>0.102</td>
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<tr>
<td>Sound-to-Letter</td>
<td>0.204</td>
<td>0.091</td>
<td>2.24</td>
<td>0.028*</td>
</tr>
<tr>
<td>Blending</td>
<td>-0.010</td>
<td>0.100</td>
<td>-0.10</td>
<td>0.919</td>
</tr>
</tbody>
</table>

*p ≤ .05.

CLINICAL IMPLICATIONS

Children and adults who struggle to spell words accurately are at a disadvantage for creating writing of any kind. The laborious efforts of trying to spell words accurately keep poor spellers from devoting their attention to the overall writing process (Scott & Brown, 2001; Treiman & Cassar, 1996). Children who are poor spellers take longer amounts of time and more concentrated amounts of study to learn to spell words. Furthermore, inaccurate spelling tends to cause frustration for both poor spellers and their teachers and language specialists who attempt to help them improve. Chase (1986) indicated that teacher evaluations of writing were negatively affected by poor spelling, even when the content and structure of the writings were controlled. Catts and Kamhi (1999) noted that poor spellers are potentially poor readers and poor writers. Poor spellers may also have weaknesses in all areas of language, which can even impact spoken language. Overall, poor spellers typically have difficulties in numerous academic areas that impact a variety of their learning abilities and negatively influence their global academic success.

The current investigation further supports the relationships that have previously been stated between phonological awareness, reading, and spelling skills. Apel and Masterson (2001) noted that assessing the various areas of phonological awareness and reading abilities are vital in order to assess a child’s spelling ability. The results of this study confirm that certain measures of phonemic awareness (sound-to-letter tasks) and reading ability should be identified early in children’s academic experiences in order to facilitate development of their spelling skills. Children who are identified as poor spellers need sufficient support with specific phonological awareness and reading tasks in order to diminish potential spelling and reading difficulties.
ACKNOWLEDGMENTS

The authors would like to thank Laura Justice, Marcia Invernizzi, Wayne Secord, Doris Bergen, and Michael Hughes for their valuable contributions. We also appreciate the cooperation from the faculty, staff, and children of the participating elementary schools.

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