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Predictive Validity of Measures of Phonological Awareness on First Grade Reading Achievement

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Predictive Validity of Measures of Phonological Awareness on First Grade Reading Achievement

BY

Jennifer Hervey

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING THIS PART OF THE GRADUATE DEGREE CITED ABOVE

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Abstract

The purposes of this study were to evaluate the degree to which three measures of phonological awareness (Test of Phonological Awareness (TOPA), Torgesen & Bryant, 1994; Dynamic Indicators of Basic Early Literacy Skills (DIBELS), Kaminski & Good, 1996; Read America Diagnostic Tests, McGuinness & McGuinness, 1998) correlate with each other and with selected measures of reading skills (Brigance Diagnostic Inventory of Basic Skills, Brigance, 1976, 1977; Woodcock Diagnostic Reading Battery (WDRB), Woodcock, 1997). The study also evaluated which of the measures of phonological awareness best predicts reading skills in a first grade population. The current study is an extension of the study conducted by Havey, DeJarnette, and Mulcahy, 2000, which examined these phonological and reading measures among kindergarteners. Analysis revealed that fewer significant correlations were found among phonological awareness measures and between phonological awareness and reading achievement measures than in the Havey et al. (2000) study. Multiple regression analysis revealed that the TOPA accounted for a significant portion of variance in the Brigance Basic Sight Word scores and in the Letter-Word Identification subtest scores of the WDRB, while Onset Fluency of the DIBELS accounted for the significant portion of variance in the Word Attack WDRB reading subtest scores. This study will help readers develop an understanding of phonological awareness subskills that predict first grade reading achievement and how these findings compare to findings among the same participants in their kindergarten year, thereby allowing for more efficient identification of children with potential reading problems and swifter development of interventions for those children.
Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title Page</td>
<td>i.</td>
</tr>
<tr>
<td>Abstract</td>
<td>ii.</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>iii.</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Method</td>
<td>9</td>
</tr>
<tr>
<td>Results</td>
<td>13</td>
</tr>
<tr>
<td>Discussion</td>
<td>15</td>
</tr>
<tr>
<td>References</td>
<td>20</td>
</tr>
<tr>
<td>Table 1</td>
<td>23</td>
</tr>
<tr>
<td>Table 2</td>
<td>24</td>
</tr>
</tbody>
</table>
In recent years, studies of phonological awareness have shown that performance on a variety of individual tasks can predict later reading abilities and achievement (D. McGuinness, C. McGuinness, & Donohue, 1995; Torgesen & Wagner, 1998).

Phonological awareness has been defined as oral language skills of sound manipulation. Specifically, phonological awareness skills are preliminary sound-manipulation skills that lead to other skills involved in reading (International Reading Association, 1998).

Phonological awareness skills include the ability to identify, think about, or manipulate individual phonemes in words (Torgesen & Wagner, 1998) and to discriminate individual or word segments in speech (Busink, 1997; D. McGuinness et al., 1995), including syllables, onsets, and rimes (International Reading Association, 1998). While many publications refer to phonological awareness and phonemic awareness interchangeably, it is important to note that phonemic awareness skills involve manipulation of single sounds, such as the beginning sounds of words, whereas phonological awareness skills encompass phonemic skills and may also involve manipulation of multiple sounds, such as syllable counting (International Reading Association, 1998).

Phonemes are the smallest units of sound within words that affect the meaning of the word, and there are approximately 44 phonemes in the English language (Torgesen & Wagner, 1998). For example, the word “cat” contains three phonemes, /k/ /a/ /t/. If any of these changes, the word and its meaning will change: /b/ /a/ /t/, /k/ /i/ /t/, or /k/ /a/ /p/. The addition of the phoneme /s/ would change the meaning of the quantity, /k/ /a/ /t/ /s/, and so on (Busink, 1997; Torgesen & Wagner, 1998). Phonological awareness involves an understanding of these individual sound units, as well as an understanding of their variations, depending on location within a word or location next to other phonemes. For example, the phoneme /r/ distorts vowel sounds: /k/ /a/ /t/ versus /k/ /a/ /r/, or /f/ /i/ /t/.
versus /f/ /i/ /r/ (Shefelbine, 1990; Torgesen & Wagner, 1998). Each printed letter or letter group representing a phoneme is called a grapheme. "S," "p," and "ch" are a few examples of graphemes (Adams et al., 1998). Understanding the relationship between phonemes and their corresponding graphemes is the important concept in relating phonological awareness to reading skills (Torgesen & Wagner, 1998). However, once graphemes are introduced, the task is one of phonics rather than of phonological awareness (Adams, Treiman, & Pressley, 1998).

The use of phonological awareness measures as predictors is important because they can be administered to young children, around age 5 or 6, for early detection of potential reading problems (Badian, 1998; MacDonald & Cornwall, 1995; Scarborough, 1989), thereby increasing the possibility of a successful early intervention (Adams, et al., 1998; MacDonald & Cornwall, 1995; D. McGuinness et al., 1995; Torgesen & Wagner, 1998). The phonological awareness measures are usually more quickly administered and are often more predictive of potential reading problems than are more time-consuming measures, including cognitive ability tests (Stanovich, 1993-94). Most children need to be able to consistently identify phonemes in speech so that they can later learn to attach a particular written symbol to an individual sound. Phonological skills are the building blocks to beginning reading skills.

Phonological awareness tasks require children to recognize and manipulate phonemes in many ways, thereby improving those sound-recognition skills within speech. Once they can consistently identify sounds, and eventually the correct sound-symbol connections, children are ready to encounter more complex reading and writing tasks. Many children learn the preliminary phonological skills with little or no explicit instruction (Stanovich, 1993-94). However, some children do not learn these skills on their own. These are the children who experience difficulty and frustration with reading. In the earliest phases of reading, even children with weak phonological awareness skills sometimes appear to be adequate readers with adequate reading comprehension. This is
because early reading often provides context and picture clues to help with word identification. In addition, early reading passages incorporate many vocabulary and sight words that children are taught to recognize without necessarily knowing how to sound those words out. However, as the difficulty of passages increases, the pictures and context clues typically decrease, and the presence of more unfamiliar words increases. Children who have adequate phonological skills are better at decoding unfamiliar words, while children with weak phonological skills often guess words or skip unfamiliar words altogether. In terms of comprehension, "simply" being able to decode words quickly and accurately leads to increased comprehension as long as the child is able to receptively identify the word. Therefore, prior exposure to vocabulary is also an important component in reading comprehension skills (Stanovich, 1993-94).

Phonological awareness testing has been shown to indicate difficulties in a child's abilities to identify and manipulate sounds in words (D. McGuinness, 1997). Children who utilize their phonological skills are more likely to acquire and use higher-level phonics principles when they learn to read. Children who become fluent readers are able to decode words phonologically, where children who struggle with reading cannot (Busink, 1997; Shefelbine, 1998; Stanovich, 1993-94). Fluent readers make fewer errors per line of text because they are able to identify more correct graphemic information. Poor readers, however, tend to use context clues to "guess" unfamiliar words (Adams, et al., 1998; Stanovich, 1993-94) by inserting similar sight words or words with a few similar elements as the unfamiliar words. This increases the chance that incorrect words will be inserted and that reading comprehension will suffer (Shefelbine, 1998). The child who does not have a solid grasp on the phoneme-grapheme connection, in either awareness or application, will not be able to decode difficult or new words fluently or accurately. When a child has repeated difficulty with word decoding, he or she will likely also have problems with reading comprehension. That is, if the child cannot correctly identify the difficult words, he or she may guess incorrectly, thereby changing the
meaning of the passage. The child may also ignore the difficult words and miss valuable information necessary for comprehension (Torgesen & Wagner, 1998). Furthermore, labored or disconnected reading taxes memory and potentially contributes to the child’s forgetting important information.

In looking at the long-term effects of reading difficulty, Stanovich (1993-94) discussed the Matthew effects that take place:

Children who begin school with little phonological awareness have trouble acquiring alphabetic coding skill and thus have difficulty recognizing words. Reading for meaning is greatly hindered when children are having too much trouble with word recognition. When word recognition processes demand too much cognitive capacity, fewer cognitive resources are left to allocate to higher-level processes of text integration and comprehension. Trying to read without the cognitive resources to allocate to understanding the meaning of the text is not a rewarding experience. Such unrewarding early reading experiences lead to less involvement in reading-related activities. Lack of exposure and practice on the part of the less-skilled reader further delays the development of automaticity and speed at the word recognition level. Thus, reading for meaning is hindered, unrewarding reading experiences multiply, practice is avoided or merely tolerated without real cognitive involvement, and the negative spiral of cumulative disadvantage continues. Troublesome emotional side effects begin to be associated with school experiences, and these become a further hindrance to school achievement (p. 281).

Additionally, reading achievement is highly linked to overall academic success because written texts are the primary form of most instructional materials. Therefore, understanding of most school material requires fluent reading abilities (Torgesen & Wagner, 1998).

Following this research, several tests have been developed with varying
combinations of tasks, to be used as general tests of phonological awareness (Kaminski & Good, 1996; C. McGuinness & G. McGuinness, 1998; Torgesen & Bryant, 1994). However, some of the phonological awareness tests lack strong research and data regarding their reliability or generalizability (C. McGuinness & G. McGuinness, 1998). Other tests have adequate statistical research and strength, but use a limited number of phonological awareness tasks to reach a composite score (Torgesen & Bryant, 1994). Research to demonstrate which of these tests are the best predictors of reading achievement, or how well these tests and tasks correlate with each other, has been limited (Torgesen & Wagner, 1998). The present study aims to address these issues by examining recent research, which has shown many of these tests and tasks of phonological awareness to be highly correlated with each other (Havey, DeJarnette, & Mulcahy, 2000).

Tasks of phonological awareness have been shown to be good predictors of reading achievement over the first two or three years of schooling, and perhaps as much as 11 years after initial testing if no formal interventions to improve phonological skills are introduced (MacDonald & Cornwall, 1995). In addition, factors such as general intelligence (Stahl & Murray, 1994; Stanovich, 1993-94) and general verbal ability (Badian, 1998; MacDonald & Cornwall, 1995; Torgesen & Wagner, 1998), age (Stanovich, 1993-94), nonverbal skills, reading habits, television viewing habits, gender (Scarborough, 1989), socioeconomic status (Scarborough, 1989; Stanovich, 1993-94), word recognition, and vocabulary development (MacDonald & Cornwall, 1995) were not more significantly predictive of later reading abilities. Stanovich, Cunningham, and Feeman (1984) examined and conducted meta-analyses of ability-reading achievement studies and found a great deal of information to support these assertions. Furthermore, identifying areas of phonological weakness is useful in developing interventions, whereas the other factors described above would not lead to specific intervention strategies.

Torgesen & Wagner (1998) explained that phonological awareness tasks are good
predictors of reading achievement because, without intervention, phonological skills remain relatively constant \((r = .77\) from kindergarten to 4th grade; \(r = .88\) from 1st grade to 4th grade), while word-level reading skills vary much more \((r = .27\) from kindergarten to 4th grade; \(r = .62\) from 1st grade to 4th grade). It has been shown that phonological weakness areas can be taught and that such instruction can bring about significantly improved reading skills in children of below average to above average ability (Busink, 1997) and that early intervention in these skills is best to minimize Matthew effects (Stanovich, 1993-94). MacDonald and Cornwall (1995) suggest that phonological awareness skills are more stable constructs than are IQ scores among young children, and that more stable constructs should be used with kindergartners when predicting reading problems (International Reading Association, 1998).

Several types of tasks have been identified as demonstrating phonological awareness (Busink, 1997; MacDonald & Cornwall, 1995; Stanovich, 1993-94). One type of task involves identification of like sounds or different sounds in various positions within words (McGuinness et al., 1995). Typically, children first attune to like initial sounds, or onset sounds, of words before they begin to recognize final and medial sounds. Rhyming and phoneme counting activities are also considered phonological awareness skills (McGuinness et al., 1995). Phoneme segmentation requires the individual to separate a spoken word into sequential isolated phonemes (Badian, 1998; D. McGuinness et al., 1995; D. McGuinness, 1997). A related phonological awareness skill is blending, where the child is presented with isolated phonemes and is asked to combine the sounds into a word (D. McGuinness et al., 1995; D. McGuinness, 1997). According to D. McGuinness, although these two skills are closely related, some poor readers may demonstrate one of these skills but not the other. Other tasks may also be identified as phonological tasks, and several of the tasks listed may be measured or practiced in different ways. Although some of these skills appear to develop earlier than others, the exact path or paths of phonological skill development is unclear (International Reading
Given this information about the predictive validity of certain tasks on later reading achievement, researchers have developed several tests that utilize some variety of phonological awareness tasks. The present study will examine the Test of Phonological Awareness - Early Elementary Version (TOPA-1; Torgesen & Bryant, 1994), the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Kaminski & Good, 1996), and the Read America Diagnostic Tests (C. McGuinness & G. McGuinness, 1998). These tests purport to have high predictive validity of reading achievement on the theoretical basis that they are comprised of individual tasks that have high predictive validity. The present study will be an extension of earlier research by Havey et al. (2000), which demonstrated the concurrent and convergent validity of these measures among each other and with other measures of reading, including the Brigance Diagnostic Inventory of Basic Skills (Brigance, 1976, 1977) and the Woodcock Diagnostic Reading Battery (WDRB; Woodcock, 1997).

Havey et al. (2000) administered the TOPA - Kindergarten Version (TOPA-K; Torgesen & Bryant, 1994), the DIBELS (Kaminski & Good, 1996), and the Read America Diagnostic Tests (C. McGuinness & G. McGuinness, 1998) to 60 participants enrolled in the public school system in a small Midwestern city. The children were in the second semester of their kindergarten year. Tests were individually administered in counterbalanced order during January and February. Participants were then administered segments of the Brigance Diagnostic Inventory of Basic Skills (Brigance, 1976, 1977) and the WDRB (Woodcock, 1997) during April and May of their kindergarten year. Measures of phonological awareness were correlated among each other, and were also correlated with measures of reading achievement. Similar to results of research by Torgesen & Wagner (1998), results revealed that all measures of phonological awareness were significantly correlated with each other. Correlations ranged from .48 between onset fluency, DIBELS, and segmenting, Read America Diagnostic Tests to .86 between
segmenting, DIBELS and segmenting, Read America Diagnostic Tests. Likewise, all but one of the correlations among the phonological awareness measurements and the reading achievement measurements were significant. Multiple regression analyses demonstrated that together, all phonological awareness variables accounted for 42% of variance in scores on the Brigance Basic Sight Vocabulary list, and 53% of variance in scores on the WDRB Letter-Word Identification subtest. The TOPA-K and the blending task from the Read America Diagnostic Tests were significant short-term predictors of word identification skills. This research demonstrated that these measures of phonological awareness could predict early short-term reading abilities in kindergartners. In addition, results suggest that the phonological measures do measure the same construct, and that all but one phonological task significantly predicted early reading skills (Havey et al., 2000).

The present study seeks to expand upon the research of Havey et al. (2000) by examining the longer-term predictive ability of the measures of phonological awareness on reading achievement, and by examining the stability of these measures of phonological awareness. Research has examined the predictive validity of individual phonological awareness tasks on later reading achievement over the course of two or three years, but has rarely examined data past that period. MacDonald and Cornwall (1995) were able to demonstrate that some phonological awareness skills were predictive of reading achievement as much as 11 years later. Now, as general tests of phonological awareness, which assess various phonological skills together, are becoming available, an important next step is to research the predictive validity of these general measures over a short period of one and perhaps two years. Additionally, it is important to establish the stability of phonological awareness measurements over time. MacDonald and Cornwall (1995) demonstrated that specific phonological skills remain fairly constant over time. However, the stability of the instruments may be impacted by specific item selection as well as the composition of the various types of tasks.

Results of the present study were expected to demonstrate that the TOPA-1 would
be the strongest predictor of reading skills by the end of the first grade year. This test has the most statistical analysis in its development so that error associated with specific items is minimized. The test is comprised of sound matching and sound discrimination skills, which have been shown to be closely related to reading skills. Results of this study were also expected to demonstrate that the Read America Diagnostic Tests would be strong predictors of reading skills at the first grade level. This test utilizes sound blending and sound segmentation tasks that have been shown to be closely related to reading skills, and that are considered to be somewhat later-developing phonological skills. As students near the end of first grade, maturity and exposure to a variety of pre-reading and pre-writing skills likely reduces the reliability of more basic phonological tasks to differentiate students’ reading skills, as more students will likely have mastered those basic skills. Instead, skills that represent more instructional level progress for the age-group would be a more reliable predictor of potential reading problems.

Method

Participants were 35 of the 60 students who had previously participated in the Havey et al. study (2000). Participants were second-semester first grade students tested during April and May. Nineteen girls and 16 boys participated in the present study. Consent forms were obtained prior to participation in the study. Neither children nor their parents or guardians received a reward for participation in the present study.

All children used English as their native language and none were bilingual or suffered hearing impairments requiring corrective aids. No history of hearing concerns or ear infections was obtained, but none of the participants appeared to have difficulty hearing or understanding examiner’s directions. Similarly, no profound speech impairments were noted among participants. Parental demographic information was not obtained for participants in either the original Havey et al. (2000) study or the present study. Minorities comprised less than 5% of the participation sample, which is reflective of the minority composition of the district as a whole, although ethnicity or race did not
affect eligibility for participation in this study. For the present study, participants ranged in age from approximately 6 years, 6 months to 7 years, 11 months.

Materials

The TOPA-K, used in the Havey et al. study (2000), contains 20 items and utilizes two types of phonological awareness tasks. All items use picture stimuli and receptive sound identification, but no printed words or letters, and the child marks his or her answer on each item. The first 10 items require the child to match the initial sound of a target word/picture to the initial sound of one of three word/picture choices. The last 10 items require the child to identify which initial sound of four word/picture choices does not match the other three. The first task targets the child’s ability to match initial sounds, while the second task measures the child’s ability to discriminate among initial sounds (Torgesen & Bryant, 1994). Both of these tasks are considered to measure “onset fluency,” or recognition of initial sounds (Havey et al., 2000). In the current study, the TOPA Early Elementary version (Torgesen & Bryant, 1994) is used. This version is comprised of 10 sound-matching and 10 sound discrimination items focusing on the ending sounds of words rather than the initial sounds. Internal consistency reliabilities range from .89 to .91 at different ages (Torgesen & Bryant, 1994).

The DIBELS combines several types of phonological awareness tasks. One task requires the child to segment two- or three-phoneme length words into individual phonemes. For example, given the word “cat,” the child would attempt to identify the three phonemes, /k/, pause, /a/, pause, /t/. Another task measuring onset fluency allows the child to point to pictures in response to questions about specific initial phonemes. For example, when asked which picture begins with the /b/ sound, the child would point to the picture of a boat. Also in this picture task, every fourth item asks the child to produce the initial sound of a word/picture (Kaminski & Good, 1996). Limited research on the DIBELS indicates that the segmenting task has a reliability of .88, and that the onset fluency task has a reliability of .65 (Good, Simmons, & Smith, 1998).
The Read America Diagnostic Tests utilized a sound blending task and a sound segmentation task (D. McGuinness & G. McGuinness, 1998). The phoneme segmentation task requires the child to listen to a word and separate the phonemes in sequence (D. McGuinness, 1997). This task is more complex than the segmentation task of the DIBELS, including words with four phonemes and nonsense words (Havey et al., 2000). The blending task reverses this process, by giving the child a series of individual phonemes in sequence and asking the child to blend these phonemes into a word. This task asks the child to blend as many as five phonemes. Together, these two tasks demonstrate a child’s ability to analyze and manipulate sound sequences in words. Poor readers may demonstrate only one of these skills, while good readers typically demonstrate both skills (D. McGuinness, 1997). The Read America Diagnostic Tests provide no statistical data.

The Brigance Diagnostic Inventory of Basic Skills (Brigance, 1976, 1977) is described by the author as useful for assessing basic readiness and academic skills in subject areas from kindergarten to sixth grade. One purpose of this instrument is to determine the student’s level of achievement through criterion-referenced data rather than norm referenced data (Brigance, 1976, 1977). For the present study, participants were administered the Basic Sight Vocabulary List, which contains 250 basic sight vocabulary words increasing in difficulty. The words were compiled from several previously researched word frequency lists (Brigance, 1976, 1997). Participants discontinued reading words after ten consecutive errors, with errors defined as mispronounced words or words not produced within 15 seconds after the previous word (Brigance, 1976, 1977) or when they reach the end of the list.

The Woodcock Diagnostic Reading Battery is “a comprehensive set of individually administered tests that measures important dimensions of reading achievement and closely related abilities,” (Woodcock, 1997). The subtests used in this study are comprised of selected subtests from the Woodcock-Johnson Psycho-
Educational Battery - Revised (WJ-R) (Woodcock & Johnson, 1989, 1990a; 1989, 1990b). The WDRB was normed on 6,026 individuals ranging in age from 4 to 95 years (Woodcock, 1997). The test is capable of assessing growth over a short or long range of time, and results of school-aged individuals can be assessed throughout the school year using continuous-year norms, rather than fall or spring norms (Woodcock, 1997). The WDRB is appropriate for use in longitudinal research regarding reading and language-related questions (Woodcock, 1997). For the present study, participants were administered the Letter-Word Identification subtest, described by the author as measuring reading identification skills for words he or she may not have seen before. Participants were shown stimuli, including pictures of common objects, letters, and then increasingly difficult words and asked to identify them. This subtest has a median reliability of .94 for ages 5 to 18, with .97 among 7 year-olds (Woodcock, 1997). They were also administered the Word Attack subtest, described by the author as measuring students’ skills in applying phonic and structural analysis to unfamiliar printed low frequency or pseudo words. This subtest has a median reliability of .91 for ages 5 to 18, with .94 for 7 year-olds (Woodcock, 1997).

Participants of the Havey et al. study (2000) were administered the TOPA-K (Torgesen & Bryant, 1994), sections of the DIBELS (Kaminski & Good, 1996), and sections of the Read America Diagnostic Tests, as well as portions of the Brigance (1976, 1977) and the WDRB (Woodcock, 1997).

All participants in the present study were administered the TOPA Early Elementary version (Torgesen & Bryant, 1994), the same selection of subtests from the DIBELS (Kaminski & Good, 1996) as used in the Havey et al. (2000) study, the Read America Diagnostic Test (McGuinness & McGuinness, 1998), the Basic Sight Vocabulary subtest of the Brigance (1976, 1977) and the Letter-Word Identification and Word Attack subtests of the WDRB (Woodcock, 1997).
Design and Procedure

The present study is an extension of the Havey et al. study (2000), and utilized a within-subjects longitudinal design. The study was purely correlational, introducing no experimental treatment. A single test administrator collected data from each participant. The examiner was trained to administer each of the tests according to standardized instructions of each instrument.

Measures of phonological awareness, the TOPA-1 (Torgesen & Bryant, 1994), the DIBELS (Kaminski & Good, 1996) and the Read America Diagnostic Test (McGuinness & McGuinness, 1998) and measures of reading, the Brigance (1976, 1977) and WDRB (1997) selected subtests, were individually administered in a counterbalanced order to participants during April and May of their first grade year.

Using the signed parental consent forms to establish the participant list, the test administrator called each child out of his or her classroom activities. Following the procedures outlined in the test instructions or manuals, testing with each child occurred in a separate testing room with adequate lighting, heating, and other adequate conditions. Three rooms were used for all testing, and all rooms were of similar size and construction. Each room had minimal distractions present during testing.

Participants' names did not appear on any of the test protocols. Identification numbers which had been previously assigned were used for purposes of comparison with earlier phonological measurement scores, while maintaining the anonymity of each participant.

Results

Means and standard deviations were computed for all measures. The Onset Fluency and Segmenting tasks of the DIBELS, the Segmenting and Blending tasks of the Read America Diagnostic Test, and the Brigance word list did not provide standardized scores, so raw scores were examined when necessary. Table 1 provides information about minimum and maximum scores obtained by participants, as well as means and
standard deviations.

A correlation matrix (Table 2) was constructed to provide information about the relationships among variables. Among measures of phonological awareness, the Onset Fluency subtest of the DIBELS correlated significantly (p < .05) with the Segmenting subtest total of the DIBELS (r = .41). Onset Fluency showed a stronger correlation (p < .01) with the TOPA (r = .48). The DIBELS Segmenting total correlated with the Segmenting task of the Read America test (r = .65; p < .01) and with the TOPA-1 (r = .39; p < .05). The Read America Blending and Segmenting tasks were significantly correlated (r = .38; p < .05). Among measures of reading achievement, correlations were significant (p < .01) between the Brigance word list and the Letter-Word Identification task (r = .79) as well as with the Word Attack (r = .74) measures of the Woodcock Diagnostic Reading Battery. Likewise, The Letter-Word Identification and Word Attack subtests of the WDRB were significantly correlated (r = .83; p = .000). Among phonological awareness measures and reading achievement measures, the Onset Fluency subtest of the DIBELS correlated significantly with the Brigance word list (r = .38; p < .05), with the Letter-Word Identification subtest (r = .37, p < .05), and with the Word Attack subtest (r = .46; p < .01). A significant correlation between scores was found with the Read America Blending task and the Letter-Word Identification subtest (r = .35; p < .05). The TOPA-1 showed significant correlations with the Brigance list (r = .50; p < .01), with the Letter-Word Identification subtest (r = .50; p < .01), and with the Word Attack subtest (r = .45; p < .01).

Three separate step-wise multiple regression analyses were conducted to examine how the following factors predicted reading achievement: Onset Fluency subtest of the DIBELS, total on the Segmenting tasks of the DIBELS, TOPA-1, Read America Segmenting task, and Read America Blending task. The first analysis examined the relationship of these factors to the Letter-Word Identification measure of the WDRB. Results show that the TOPA-1 was the only individual variable that significantly
predicted Letter-Word Identification and accounted for 24.8% of the variance in the reading achievement scores, $F(1, 33) = 10.89, p < .01$. The second analysis examined the relationships of the phonological factors to the Word Attack measure of the WDRB. Results show that Onset Fluency from the DIBELS accounted for 21.2% of the variance on the Word Attack subtest, $F(1, 33) = 8.88, p < .01$. The third analysis examined the relationships of the phonological factors to the Brigance word list. Results again show that TOPA-1 accounted for a significant portion of the variance (25.3%) on the Brigance measure, $F(1, 33) = 11.21, p < .01$.

Discussion

Results of the current study partially support the findings of previous research by Havey et al. (2000) that some of the measures of phonological awareness were significantly correlated with each other when administered to children during their first grade year. Like previous research, current results indicate that the three reading measures are significantly correlated. Fewer of the measures of phonological awareness were significantly correlated with the measures of reading skills than found in the Havey et al. (2000) study. Furthermore, only the TOPA-1 accounted for a significant portion of the variance in the Letter-Word Identification and Brigance word list, while only the Onset Fluency subtest of the DIBELS accounted for a significant portion of variance in the Word Attack subtest. These results partially support the hypothesis that the TOPA-1, the only standardized measure, would be the strongest predictor of reading skills measured near the end of the first grade year. The hypothesis that the Read America Diagnostic Tests would also be strong predictors of reading achievement at the end of first grade was not supported by the current data. Instead, these two subtests showed generally weak correlations with the reading measures and did not account for any significant variance among scores.

The current findings suggest that as children near the end of the first grade, the types of instruments used to test pre-reading skills need to be more carefully chosen if
examiners are to reliably identify children with potential reading difficulties. Although many tests may appear to measure the same construct, specific item selection or method of measuring the construct may contribute to variations in reliability and validity from one phonological awareness test to the next. Children who might truly benefit from reading interventions may be overidentified with more complex phonological tasks such as sound blending or segmenting tasks, or underidentified with very simple tasks such as letter naming. Although letter naming is not a phonological awareness task, it has been identified as a strong predictor of reading achievement (Havey et al., 2000; McGuinness et al., 1995). At the first grade level, the children's reading skills were best identified with tasks involving initial and final sound discrimination. This may have occurred because of the level of instruction provided in daily classwork at this grade. Kindergarten curriculum often focuses on individual letters and their corresponding sounds along with some sight word instruction. The variety of skills required is more limited at this age, and so the gap between students with well-developed skills and those with less-developed skills is more limited than in a first grade sample. The first grade curriculum incorporates more word decoding and sight word recognition, and tends to emphasize a greater variety of phonological skills, so that the gap between those students with well-developed skills and those with less-developed skills is wider. The phonological awareness tests that measure the earlier developing skills, such as onset fluency, sound matching or sound discrimination, may be more likely to identify children who will struggle with reading. In the current study, the TOPA-1 showed the strongest correlations with reading skills. This measure examined sound discrimination and matching skills for final sounds, which tend to develop after matching and discrimination sounds for onsets, but before skills such as blending and segmenting. More complex phonological tasks such as blending and segmenting may be too novel at the first grade level for many children to perform them successfully. However, blending and segmenting may be more useful and reliable tasks to detect potential reading problems in somewhat older children, as more of the students
will likely catch up to peers on simpler skills.

Data from the current study should be interpreted carefully due to several limitations. The first limitation is the mortality rate of participants by nearly half from the original Havey et al. (2000) study to the current study. The sample size limited comparisons between the two studies by diminishing the validity of comparisons between kindergarten phonological awareness results with first grade reading results of the same students. Similarly, the reasons for some participant dropouts may have been related to educational factors not examined in the current study, such as poor progress in kindergarten resulting in retention or enrollment in other educational settings. While seven of the original participants were not enrolled in the school district in first grade, another 17 participants from the original study were either denied consent to participate or did not have consent forms returned. Data from one participant was not included in the current analysis since the student had not participated in the original Havey et al. (2000) study. Finally, with regard to sample size, the most useful application of phonological tests comes in identifying the students who score within the bottom quartile, as these are the ones most likely to struggle with reading tasks (Torgesen & Wagner, 1998). A much larger sample of participants would yield more valid interpretation of information about this group, but the current participant sample size of 35 is too limited for meaningful interpretation of data about performance in the bottom quartile.

A second limitation of this study is that the sample of students who were evaluated over-represented average and above average performances on many tasks. Of the three tasks that provided standard scores, mean scores for the present study sample were all above the test means. Minimum scores on two reading subtests fell within or very near the average range. Additionally, the Word Attack subtest did not provide a sufficient floor for this age group, as a raw score of only 2 provided a Standard Score of 91. Therefore, current findings should be applied to general populations with great caution.
Another limitation of the current study is the analysis of the data. Correlations and multiple regressions of scores from all participants were conducted. While this information is helpful to establish reliability and validity of the instruments, it is not as helpful when considering the purpose of the tests as predictors of reading problems. More useful data for this purpose would come from analysis of students with the lowest reading achievement scores. As discussed earlier, however, the limited sample size and lack of representation of below average scores of the current study rendered this type of analysis impractical.

In a practical setting, application of the current data would be limited by the lack of standardized scores or other standards of comparison. Although onset fluency may be significantly correlated with reading achievement, the DIBELS did not provide information about determining an appropriate cutoff score should the instrument be used as a screener for reading tutoring programs. Similarly, the Read America Diagnostic Tests also did not provide this information, although these tests were not determined to be strong predictors at the first grade level.

As with any research, examiner error, slight variations in test factors such as location or time of day, and/or maturation of participants may have contributed to a decrease in the reliability and validity of the current data. Although these factors were attempted to be controlled for, some degree of error was unavoidable.

Future research should aim to correct limitations identified with the current study. A larger sample size would be likely to produce a more typical distribution of test scores. A larger number of participants would also likely allow for in-depth analysis of scores to more closely examine patterns of performance among students whose scores fall within the lowest quartile. Future studies should also aim to examine students who have already been identified for remedial services or special education.

Future research should continue to establish correlations among and reliability of various measures of phonological awareness, along with providing other statistical data.
These instruments will be most useful for diagnostic purposes when they are translated into a scoring system that allows for comparisons among peers or comparisons within an individual’s performance while accounting for maturation. Research that continues to examine developmental stages of phonological skills from basic to complex along with typical age-ranges for development of certain skill levels will aid in more appropriate selection of tests used for diagnostic purposes.

Future research should also aim to relate the increasing numbers of phonological awareness assessment instruments to the developmental stages of phonological awareness, so that professionals are better able to choose appropriate instruments that are most likely to identify weaknesses, rather than choosing tools that might contribute to over- or under-identification of students with potential reading problems.

Finally, future research should continue to examine instruments both in highly controlled clinical settings as well as within more practical settings. The information from both types of research is essential to understanding which instruments maintain the most integrity while still being easily applied in potentially less-ideal environments.
References


Busink, R. (1997). Reading and phonological awareness: what we have learned and how we can use it. Reading Research and Instruction, 36, 199-215.


Publishing.
Table 1

Summary of Means, Standard Deviations, Minimum, and Maximum Scores for Variables

N = 35

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
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<tr>
<td>DIBELS Onset Fluency</td>
<td>12</td>
<td>16</td>
<td>15.46</td>
<td>.98</td>
</tr>
<tr>
<td>DIBELS Segmenting total</td>
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<td>55</td>
<td>46.89</td>
<td>3.39</td>
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<tr>
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<td>41.89</td>
<td>11.08</td>
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<td>116</td>
<td>104.34</td>
<td>11.40</td>
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<tr>
<td>Brigance Word List</td>
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<td>250</td>
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<td>*Letter-Word Identification</td>
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<td>144</td>
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<td>*Word Attack</td>
<td>91</td>
<td>135</td>
<td>109.60</td>
<td>11.30</td>
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*Instruments provide standardized scores.
Table 2
Correlations among Phonological and Reading Measures

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<th>Segment (RA)</th>
<th>Blend (RA)</th>
<th>TOPA</th>
<th>Brigance</th>
<th>Letter-Word WDRB</th>
<th>Word Attack WDRB</th>
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<td>.10</td>
<td>.48**</td>
<td>.38*</td>
<td>.37*</td>
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<td>.65**</td>
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<td>.33</td>
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<td>Segment (RA)</td>
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<td></td>
<td>1.00</td>
<td>.38*</td>
<td>.09</td>
<td>.12</td>
<td>.12</td>
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<tr>
<td>Blend (RA)</td>
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<td></td>
<td></td>
<td>1.00</td>
<td>.24</td>
<td>.15</td>
<td>.35*</td>
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<td>TOPA</td>
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<td></td>
<td></td>
<td>1.00</td>
<td>.50**</td>
<td>.50**</td>
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<td>Brigance</td>
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<td></td>
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<td></td>
<td>.79**</td>
<td>.74**</td>
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<td></td>
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<td>.83**</td>
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*= r > .05
**= r > .01