Predictive Validity of Kindergarten Phonemic Awareness Measures on Second Grade Reading Skills

Sarah Midden
Western Kentucky University

Follow this and additional works at: http://digitalcommons.wku.edu/theses
Part of the Education Commons, and the Psychology Commons

Recommended Citation
http://digitalcommons.wku.edu/theses/555

This Thesis is brought to you for free and open access by TopSCHOLAR. It has been accepted for inclusion in Masters Theses & Specialist Projects by an authorized administrator of TopSCHOLAR. For more information, please contact topscholar@wku.edu.
PREDICTIVE VALIDITY OF KINDERGARTEN PHONEMIC AWARENESS MEASURES ON SECOND GRADE READING SKILLS

A Thesis
Presented to
the Faculty of the Department of Psychology
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
of the Requirements for the Degree
Education Specialist in School Psychology

by
Sarah Page Midden
May 2003
PREDICTIVE VALIDITY OF KINDERGARTEN PHONEMIC AWARENESS MEASURES ON SECOND GRADE READING SKILLS

Date Recommended 4-18-03

Dean, Graduate Studies and Research  5/7/03
Acknowledgements

I would like to thank all of my wonderful family and friends for their continued love and support throughout my work on this thesis and throughout my work as a student. Their guidance and constant motivation have been invaluable and I truly appreciate it. I would especially like to thank my parents for their love, support, and encouragement, without which I would not be the person I am today. I love you all and thank for everything you have done to support me in all my endeavors.

I would also like to thank my committee members for all their assistance and helpfulness with the completion of this thesis project. I truly appreciate their support and valuable constructive criticism. I would especially like to thank Dr. Myers, my committee chairperson, for all his hard work and guidance. I appreciate all that my committee has done to ensure that this thesis was a success.
# Table of Contents

List of Tables ........................................................................... v
Abstract .................................................................................. vi
Introduction ............................................................................. 1
Literature Review ..................................................................... 3
Method ................................................................................... 29
Results .................................................................................... 40
Discussion ............................................................................... 46
References ............................................................................... 52
Appendix A – School District Permission Letter ......................... 57
Appendix B – Human Subjects Review Board Approval Letter ......... 59
List of Tables

Table 1: Demographic Characteristics of Original Sample Per Instrument Administered ....................................................... 30

Table 2: Demographic Characteristics of Current Sample Per Instrument Administered ....................................................... 31

Table 3: Correlations Between Kindergarten Phonemic Awareness Tests and Second Grade Reading Achievement ....................................................... 41

Table 4: A Comparison of Multiple Skill Measures (CTOPP & DIBELS) With Single Skill Measures (Yopp-Singer & TOPA) ....................... 42

Table 5: A Comparison of Subtests’ Correlations on the CTOPP and the DIBELS ........................................................................ 45
PREDICTIVE VALIDITY OF KINDERGARTEN PHONEMIC AWARENESS MEASURES ON SECOND GRADE READING SKILLS

Sarah Page Midden May 2003 60 Pages

Directed by: Carl Myers, Ph.D, Reagan Brown, Ph.D, and Antony Norman, Ph.D

Department of Psychology Western Kentucky University

In order to succeed and progress in the academic domain, a student must possess basic reading skills. One characteristic of poor readers is their lack of understanding of phonological structure and lack of awareness of phonemes. Phonemic awareness tasks are divided into two broad categories: synthetic or analytic. Both have been shown to be accurate indicators of later reading ability. Little research has been conducted on the predictive nature of some of the recently published measures of phonemic awareness.

The purpose of the current study is to examine four published measures to determine which measures are the best predictors of later reading. In this study, 104 students’ second grade reading achievement scores as assessed by the CAT-5 standardized achievement test were compared to their kindergarten phonemic awareness skills. Each of the four measures of phonemic awareness administered to students in the winter of their kindergarten year had a significant correlation with second grade reading achievement. No significant difference between correlations was found for the analytic and synthetic measures. This information is very important for schools when trying to identify a system of screening students who may be at risk for future reading difficulties.
Introduction

Reading is one of the most fundamental and necessary abilities to possess in order to be successful in virtually any aspect of life. Reading skills are especially important as regards academic and school success. In order to succeed and progress in the academic domain, a student must possess basic reading skills. Once these basic reading skills are learned, successful students are able to apply those skills to various academic and scholastic areas. Students that do not possess these basic reading skills are unable to apply their skills and thus fall farther and farther behind (Adams, 1990; Good, Simmons, & Smit, 1998; Stanovich, 1986). If basic reading skills are not acquired, the chance is greater that the child will struggle throughout his or her academic career.

Because of the importance of reading skills for success in school and in life, it is imperative to understand why reading difficulties occur and what can be done to intervene early and prevent reading problems before they begin. Research suggests that one in six children in the primary grades experience some type of reading difficulty and that one characteristic of poor readers is their lack of understanding of phonological structure and lack of awareness of phonemes (Good et al., 1998). As a result, one increasingly suggested way to address reading difficulty is to address phonemic awareness.

Phonemes are the smallest units of speech, and the awareness of these speech units has been shown to be an integral skill to possess when learning to read and spell successfully (Adams, 1990). Early phonemic awareness ability has been shown to play a
role in development of successful literacy skills in pre-readers (Adams, 1990, Adams, Foorman, Lundberg, & Beeler, 1998; Griffith, Klesius, & Kromrey, 1992; Juel, 1988; Lundberg, Olofsson, & Wall, 1980; Snider, 1997). In addition, phonemic awareness training has been shown to demonstrate improvements in reading skills in students with reading difficulties (Ball & Blachman, 1991; Bradley & Bryant, 1983; Bryne, Fielding-Barnsley, & Ashley, 2000; Ehri et al., 2001).

Because reading difficulties negatively impact a student's academics and because this negative impact only compounds over time, identification of reading difficulty and early intervention are essential in ensuring children develop the necessary skills to be successful readers, and in turn successful students. Assisting children in improving the chance for reading success requires finding measures that accurately predict reading difficulty before children learn to read. Since phonemic awareness has been shown to be influential in this reading acquisition success, it is important to determine if published measures of phonemic awareness are good predictors of reading success or failure. The purpose of this study is to examine the predictive validity of four measures of phonemic awareness administered to kindergarten students on subsequent literacy development in second grade. If phonemic awareness measures do predict later reading ability, then use of specific phonemic awareness measures as tools for early identification of potential reading problems will be very helpful to those schools advocating early intervention. Schools would have the potential to address reading problems before they start.
Literature Review

Reading is an essential skill that all successful students must possess. In order to be successful and excel in the academic domain, one must have the basic skills to read print and understand its meaning. Poor readers who do not possess these basic reading skills are likely to struggle throughout their entire school career. Juel (1988) found that if a child was a poor reader at the end of the first grade, the probability that he or she would remain a poor reader by the end of the fourth grade was .88. According to researchers, there is a critical, short period of time in which the path to reading failure can be altered; furthermore, if reading difficulties are not addressed prior to this critical period, the chance of continued difficulties increases (Good et al., 1998).

A phenomenon known as the Matthew Effect illustrates the detriment that poor beginning reading skills can have on school achievement. The term Matthew Effect comes from the Gospel according to Matthew and states the basic idea that the rich get richer and the poor get poorer (Stanovich, 1986). According to Stanovich, because of the importance reading has in all areas of learning, the Matthew Effect occurs when children who possess basic reading skills are able to acquire all academic skills at a faster rate than those children who struggle to acquire basic reading skills. As a result, the children who are good readers acquire skills faster and become high achievers. Conversely, poor readers fall further and further behind because they do not have the basic fundamental reading skills needed to advance academically. They are on an uphill road as they academically strive to catch their peers because of this slower acquisition of reading
skills. Children with poor reading skills do not read as much and do not develop the vocabulary skills as do good readers; thus they fall behind other children who have developed their reading skills (Good et al., 1998).

**Phonological and Phonemic Awareness Defined**

Phonological awareness is an all-encompassing term that involves the ability to hear and manipulate the sound structure of language at the word level, the syllable level, as well as the phoneme level (Big Ideas in Beginning Reading, 2002). Phonemic awareness is included under the “umbrella” term of phonological awareness. Phonemes are the smallest units of speech that correspond to letters in the alphabet and are conceived to be the building blocks of speech (Adams et al., 1998). For example, in the word bat there are three phonemes, /b/ /a/ /t/. Phonemic awareness, therefore, is the ability to hear and manipulate these phonemes or units of sound in spoken words (Big Ideas in Beginning Read, 2002). It is the awareness of sounds in words rather than the awareness of letter names that encompasses phonemic awareness (Wasik, 2001).

According to Wasik, children can actually possess phonemic awareness without knowing the names of letters. Interestingly Adams et al. (1998) believed that even small infants develop awareness of the phonemes of their language at an unconscious level. However, the researchers suggest that phonemic awareness appears when the child can associate sounds with written letters in the alphabet.

Within phonemic awareness, it is thought that there are differing levels of ability, beginning with the most basic fundamental awareness to a more advanced knowledge of phonemes. Adams (1990) describes a hierarchy of five levels of phonemic awareness. According to Adams, the easiest level of phonemic awareness for children is basic
rhyming or being able to hear the sounds of words and determine their similarity or dissimilarity. The next level includes sound oddity tasks that require children to identify and compare and contrast sounds in words attending especially to their beginning and ending sounds. Skills related to sound oddity require the ability to focus attention on the sounds of words that make them different or similar to each other. The third level that Adams identifies is blending and syllable splitting. These skills require children to identify whole words when each phoneme in the word is presented separately and to identify individual syllables in whole words. Tasks at this level require the child’s understanding that words can be divided into small units of sound. The next level is phoneme segmentation, which requires the child to verbally produce each individual phoneme in a word when presented with the word as a whole. Finally, the most difficult type of phonemic awareness is the manipulation of phonemes in which the child must be able to add phonemes, delete phonemes, or move phonemes to create new words or non-words (Adams, 1990).

Phonemic awareness tasks are also divided into two broad categories. Phonemic awareness skills can be identified as synthetic or analytic. Synthetic phonemic awareness tasks require the ability to blend together phonemes to make a whole word (Torgesen & Bryant, 1994). As mentioned by Adams (1990), these tasks are easier for children in comparison to analytic tasks, which require more skill and knowledge of phonemes. Analytic phonemic awareness tasks require children to identify and manipulate individual phonemes in whole words by identifying individual sounds in words presented as whole, segmenting individual phonemes in words or deleting or moving initial or ending sounds
to make new words or non-words (Torgesen & Bryant, 1994). These tasks require pronunciation of phonemes separately after hearing the words as wholes.

Evidence suggests phonemic awareness skills should be developed by a particular age in order for a child to be on the path to success in reading (Good, Gruba, & Kaminski, 2001). For example, Good et al. suggest that in order to be on track for reading success, a child should have awareness of initial sounds in words by winter of the kindergarten year. This skill, according to Adams (1990), is one of the easier skills to obtain, but is considered an analytic phonemic awareness skill. In addition, Good et al. (2001) suggest that phonemic segmentation tasks, a more difficult analytic task, should be present no later than the spring of the kindergarten year if the child is in line to have future success in reading. In general, it is the possession of analytic skills in kindergarten that is most powerfully related to reading skills in first grade (Torgesen & Bryant, 1994). However, others believe that phonemic awareness and learning to read develop together and that certain phonemic awareness skills are prerequisites to reading while other skills develop as a child learns to read print. (Perfetti, Beck, Bell, & Hughes, 1987). These authors suggest that synthetic skills are a prerequisite to reading, whereas analytic skills develop while learning to read.

Importance of Phonemic Awareness

In order to develop the skills necessary to read, children must possess an awareness of the phonemes in words and be able to manipulate and understand how they relate to written words. Children who possess phonemic awareness have learned to isolate individual sounds in words in order to understand the alphabetic language (Wasik, 2001). They understand phonetic language and in turn develop the “alphabetic principle,”
or the mapping of print to speech, which helps them decode the written word (Snider, 1995). The alphabetic principle is the understanding that the written word is a means of coding the sounds of the spoken word (Hempenstall, 1997). Because of this alphabetic principle, children must have an understanding of how spoken language correlates with written language in order for them to read and spell (Griffith & Olson, 1992).

Understanding phonemes and having the awareness that sounds form words and that these sounds correspond to printed letters and words is the catalyst that helps children develop the alphabetic principle and, in turn, enables them to read.

Children at the age of four or five should have developed some awareness of phonemes (Waisk, 2001). However, research has indicated that 25% of middle class children and an even greater percentage of children from less enriching environments do not have the conception of phonemic awareness (Adams et al., 1998). While children without phonemic awareness may be able to memorize letter-sound relationships, they will not be able to understand how to actually utilize letter-sound relationships to read and spell unfamiliar words (Griffith & Olson, 1992). Awareness of phonemes enables readers to translate the lines and marks on a page into the spoken language that they already know (Snider, 1997). According to Wagner and Torgesen (1987), children who possess phonemic awareness have an advantage because they are likely to understand letter sound correspondence which is a skill needed to segment letter strings into phonemes and to blend the phonemes into words.

The Predictive Nature of Phonemic Awareness Measures

Possessing phonemic awareness is an essential element for beginning readers. Numerous studies have found direct links between phonemic awareness abilities and the
acquisition of reading skills (Griffith et al., 1992; Juel, 1988; Lundberg et al., 1980; Mutter, 1998; Perfetti et al., 1987; Salonen, Lepola, & Niemi, 1998; Torgesen & Bryant, 1994; Wagner et al., 1997). Research indicates that those children who have phonemic awareness as pre-readers will in most cases be successful readers, whereas those who do not possess phonemic awareness at an early age will face many more reading challenges than their phonemically aware peers (Adams et al., 1998). This phenomenon has been evidenced in various studies of children who show poor phonemic awareness ability. In many of these studies, however, whatever phonemic awareness skill each researcher assesses is often different. In some instances, the researchers themselves design a test of phonemic awareness while others use tests designed by other researchers. As well, some researchers use multiple tasks (both analytic and synthetic) to measure phonemic awareness, and others report that one or two skills (analytic or synthetic) alone predict later achievement. Yet, despite these differences evidence suggests these various skills of phonemic awareness ability do relate to later reading ability. Studies examining synthetic and analytic skills, combined and separately, will now be reviewed.

**Synthetic and analytic tasks combined.** Wagner et al. (1997) examined the predictive power of analytic and synthetic phonemic awareness skills. In this study, 216 children's phonological processing skills, word level reading skills, and vocabulary skills were assessed each year from kindergarten through fourth grade. The phonemic awareness skills that were measured in this study were from the pre-published version of the *Comprehensive Test of Phonological Processing* (Wagner, Torgesen, & Rashotte, 1999). Analytic phonemic awareness skills were assessed through phoneme deletion tasks that asked students to say a word and then say it again after deleting a specified...
phoneme (phoneme elision task), sound categorization tasks that required students to
determine which word from a set of words did not sound like the others, and phoneme
segmentation tasks that required students to listen to a word and then tell each sound that
they heard in that word. Students’ synthetic phonological awareness skills were assessed
with tasks that required students to blend phonemes to make familiar words and the
blending of phonemes to make non-words. The analytic and synthetic tasks were
combined to form one measure of phonemic awareness.

In addition to assessing the students’ phonemic awareness skills, Wagner et al.
(1997) assessed the students’ word level reading using the Word Identification and Word
Analysis subtests of a published standardized individually administered measure of
achievement. The students’ vocabulary skills were assessed using the Vocabulary subtest
of a standardized intelligence test and students’ letter naming knowledge was assessed by
asking students to name all 26 uppercase letters. Results showed that at each year of
testing, the students’ combined scores from the measure of phonemic awareness
significantly correlated individual differences in their word level reading. Students’ letter
naming and vocabulary skills significantly correlated with their word level reading
initially, but failed to significantly correlate as students progressed through their
schooling from grade two through four and obtained higher reading skills. Phonological
awareness was the only measure that consistently correlated with word level reading for
each testing period from kindergarten through fourth grade.

Another longitudinal study demonstrating the predictive strength of phonemic
awareness measures that assess a combination of synthetic and analytic skills was
reported by Juel (1988). Juel’s assessment instrument measured synthetic as well as
analytic phonemic awareness skills of 54 students as they progressed from first through fourth grade. In order to measure phonemic awareness skills, students in the study were given an individually administered a measure originally developed as part a doctoral dissertation. The measure consisted of one test that measured the synthetic skill of blending and five subtests that measured analytic skills. The analytic subtests included phoneme segmentation and four phoneme manipulation tasks including deletion of first phoneme, deletion of last phoneme, substitution of first phoneme, and substitution of last phoneme. All of the subtests combined to form one measure of phonemic awareness ability. The researchers assessed students’ decoding skills and word recognition skills using words taken from the students’ first pre-primer book. In addition, the Wide Range Achievement Test (WRAT) reading subtest along with a standardized achievement measure entitled the Iowa Test of Basic Skills (ITBS) were administered in order to determine students’ reading achievement. The phonemic awareness measures were administered every year except fourth grade, while all other tests were given to the students each year of their schooling from first to fourth grade. When the students had completed their fourth grade year, results indicated that children who were poor readers in fourth grade began first grade with little phonemic awareness. Conversely, the mean score on the phonemic awareness measure in first grade was higher for children who became good readers in the fourth grade. Once again, the predictive strength of phonemic awareness was based on a measure that assessed both synthetic as well as analytic skills.

In a similar study, phonemic awareness ability measured by assessing both synthetic and analytic skills was again shown to predict later reading skill development. Griffith et al. (1992) studied the acquisition of literacy skills of first graders with various
levels (either high or low) of phonemic awareness at the start of their first grade year. They assessed phonemic awareness was assessed at the start of the first grade year again using the unpublished measure used by Juel (1988). The test consisted of one subtest measuring the synthetic skill of blending together strings of phonemes and five subtests that measured analytic skills of phonemic segmentation and phoneme manipulation. At the end of their first grade year, these same students were assessed using three spelling tests (i.e., a spelling features test, a writing sample measure, a test of written spelling), a published measure of decoding skills, and the word recognition subtest of a standardized group achievement test. Reading comprehension was assessed using the CTBS comprehension subtest, and writing fluency was assessed through student writing samples. Throughout the school year, students were instructed in either whole language or basal reading instruction. At the end of the students’ first grade year, results showed that students’ end of the year literacy (i.e., decoding, spelling, and writing fluency) was predicted by beginning year phonemic awareness but not by the method of instruction the students received. Children who were found to have high phonemic awareness at the beginning of the year achieved at a significantly higher level by the end of the year as compared to those students whose phonemic awareness was low at the start of the year (Griffith et al., 1992). Again, the predictive strength of the phonemic awareness measure was based on a measure that assessed both analytic and synthetic skills.

A study conducted in Finland with Finish speaking preschool children assessed the impact of phonemic awareness (as assessed by synthetic and analytic skills) on their first grade reading and literacy development and found similar results as the previous studies (Salonen et al., 1998). Phonemic awareness, alphabet knowledge, and word
recognition skills of thirty-two six-year-old preschool children were assessed. Students were administered an unpublished test of phonemic awareness. The measure contained four subtests including a synthetic sound blending task and three analytic tasks (i.e., naming an initial sound in a word task, deleting of an initial sound in a word task, and a syllable deletion task). These four subtests combined to form a measure of phonemic awareness. The students' knowledge of the Finnish alphabet was also assessed along with a test of the students' preschool word recognition of 18 two-syllable words. When these same students were in the first grade, their word reading skills were assessed using the OS-400 reading test (a fifteen minute 400 word reading test developed in Denmark and translated to Finish for this study). This reading test requires students to identify words and select the correct picture from a group of four that corresponds to that word. Each student is asked to match as many word/picture pairs as he or she can in 15 minutes. Scores on this reading test were used to assess reading skill at the end of first grade. Results of the study showed that the children's preschool phonemic awareness scores predicted their word reading skills at the end of their first grade year (Salonen et al., 1998). Once again, synthetic and analytic phonemic awareness skills were used to measure phonemic awareness and it was this combination of phonemic awareness tasks that predicted later reading achievement.

*Single synthetic or single analytic phonemic awareness tasks.* Not only have studies assessed the predictive nature of a combination of phonemic awareness tasks but they have also measured the predictive power of individual phonemic awareness tasks. Lundberg et al. (1980) conducted a study that assessed the predictive nature of individual synthetic and analytic phonemic awareness tasks on later reading and spelling skills.
Two hundred kindergarten students were individually administered four types of synthesis tasks including synthesis of syllables (blending of syllables presented visually), synthesis of phonemes (blending of phonemes presented visually), direct auditory synthesis of syllables (blending of syllables presented orally), and direct auditory synthesis of phonemes (blending of phonemes orally). The students were also administered four analytic tasks including segmentation of syllables in words, segmentation of individual phonemes in words, analysis of phoneme position (assessed knowledge of initial, ending, and middle sounds in words), and reversal of phonemes (assessed the ability to manipulate phonemes and pronounce words when they were presented backward).

Lundberg et al. (1980) also administered two perceptual tests and one screening test of reading to students in their kindergarten year. In the first grade, 143 of the same students were administered a silent word reading test using the OS-400 (a test developed in Demark and translated to Swedish) for this study containing 400 words to be read by the student in a fifteen minute time), a measure of spelling ability of 30 common Swedish words, and a standardized test of matrices reasoning. In addition, the students' teachers rated them on their level of reading ability, spelling ability, writing ability, language comprehension skills, and finally language production skills. In the second grade, 133 of these same students were given the same OS-400 sight word reading test, the same standardized matrices assessment, and a standardized spelling measure.

Results of the Lundberg et al. (1980) study indicated that the most powerful predictor of reading ability in first grade, as measured by the OS-400 and teacher rating of reading skills, was the analytic ability in kindergarten to manipulate phonemes by
reversing phonemes to make new words the student could pronounce. Reading skills in second grade were found to be predicted by the children’s kindergarten ability to analyze and reverse phonemes. Interestingly, the synthetic ability to blend phonemes (that were orally presented) into meaningful words was also a significant predictor of teacher ratings of reading ability. When all the reading measures were combined to form one measure of reading achievement, the analytic ability to reverse phonemes still predicted achievement, while the synthetic ability to blend phonemes presented orally was also a significant predictor. Spelling skills in first grade and second grade along with teachers’ ratings of writing skills were predicted by the children’s ability in kindergarten to perform the analytic skill of reversing and segmenting phonemes. Finally, the overall reading and writing measures were combined across tasks and across years, and again the child’s kindergarten ability to manipulate phonemes by reversing their order and the child’s ability to segment phonemes were the best predictors of these overall later abilities. However, the synthetic skill of phoneme blending failed to yield a significant correlation when the overall reading and writing scores were combined (Lundberg et al., 1980).

A study conducted in England by Mutter (1998) assessed the predictive validity of several synthetic and analytic phonemic awareness tasks to both early reading and spelling ability. Thirty-eight non-reading nursery school children’s phonemic awareness skills were assessed once a year for three years beginning with the students’ nursery school year and continuing for the first two years of primary school. The phonemic awareness measure developed by the researcher consisted, in part, of rhyme detection tasks and rhyme production tasks. These tasks are defined as some of the easiest initial skills children acquire when developing phonemic awareness but are not specifically
defined as neither synthetic nor analytic skills (Adams, 1990). In addition, the researcher assessed the analytic skills of phoneme identification (which required the child to supply the final sound of a single syllable word) and phoneme deletion (which required the child to pronounce single syllable words after deleting the initial sound in the word). Finally, the synthetic phonemic awareness skill of sound blending was assessed using the *Illinois Test of Psycholinguistic Ability*, which required the student to blend together strings of phonemes. This test was given only in the students’ first and second year of primary schooling. In addition to the test that measure phonemic awareness, students were also administered a test of letter knowledge in which the children were asked to name 26 lower case letters of the alphabet presented in random order.

In addition to the phonemic awareness testing, the students reading and spelling achievement was assessed in their first and second year of primary schooling. The students’ single word reading and their continuous passage reading were measured using reading tests from standardized reading assessments. The students’ single word spelling was assessed using a standardized spelling measure.

Results of the Mutter (1998) study indicated that during the students’ first year of learning to read, the analytic skill of segmentation and letter knowledge (considered neither an analytic or synthetic phonemic awareness skill) both significantly contributed to early reading and spelling in the first year of primary school. The children’s rhyming ability, which according to Adams (1990) is one of the first levels of awareness, failed to make a significant contribution to later reading and spelling ability. The synthetic skill of sound blending also failed to significantly correlate with later reading and spelling achievement. In the second year of primary school, letter knowledge predicted reading
skills while segmentation skills failed to correlate with reading. However, segmentation skills did predict spelling ability in the first and second year of primary school.

In a reliability and validity study conducted by Yopp (1988), several measures of phonemic awareness that assessed both analytic and synthetic skills were included to determine their reliability and validity. Ninety-six kindergarten students were administered (in April and May of their kindergarten year) several tests of phonemic awareness that assessed various analytic and synthetic phonemic awareness skills along with an auditory discrimination test. The phonemic awareness tests included a phoneme blending task, a phoneme counting task, two phoneme deletion tasks, a rhyming task, a sound isolation task, a word-to-word matching task, a phoneme reversal task, and a phoneme segmentation test. In addition, a second phoneme segmentation test called the *Yopp-Singer Test of Phoneme Segmentation* (Yopp, 1988) was also given. After all phonemic awareness tests were administered, a novel word-decoding test that assessed the rate at which they learned to decode novel words was administered as an indicator of reading skill. This measure was given at the end of the kindergarten year.

Results indicated that four of the measures of phonemic awareness that assessed analytic phonemic awareness skills significantly correlated with the kindergartners’ ability to decode novel words. The best predictor was the sound isolation test that requires the child to indicate the sound a stimulus word starts with, ends with, or contains in the middle of the word. The next best predictors were the two phoneme segmentation tests that require the child to separate each phoneme of a word when the word is presented as a whole. Finally, the phoneme deletion test that requires the student to tell what word would remain if a certain sound was removed from the stimulus word was
also a significant predictor of reading rate. Further analysis by Yopp (1988) revealed that
two analytic tasks, the phoneme deletion test in combination with the Yopp-Singer
phoneme segmentation test, accounted for the most variance in learning reading skills
and much more than any single test measuring analytic or synthetic skills.

Perfetti et al. (1987) conducted a study that assessed both synthetic skills and
analytic skills and found that both play their own important role in students’ reading skill
development and progress. In the study, 82 first grade and 17 second grade students’
synthetic skills were assessed by administering a phoneme-blending task and their
analytic skills were measured by administering a phoneme deletion and phoneme tapping
test. The tapping test required students to tap out the phonemes in words presented orally.
In addition, students were administered a pseudoword reading task to assess decoding
ability. Students either received basal reading instruction or direct code instruction that
directly taught letter-sound correspondence and blending. Their synthetic and analytic
skills, along with their pseudoword reading, were assessed four times throughout the
school year. Students’ end of the year reading achievement was also assessed using the
Wide Range Achievement Test (WRAT) and by monitoring student progress through the
reading curriculum.

Results of the Perfetti et al. (1987) study showed that, in general, the best
predictor of later reading was how well students performed on the analytic deletion task.
Prior to any formalized reading instruction at the beginning of the school year, the
synthesis task (phoneme blending) was the strongest predictor of end of the year reading
and curriculum progress. However, by the mid-year and end of the year assessments, the
analytic deletion task was the strongest predictor of end of the year reading. Pseudoword
reading predicted later deletion ability, which predicted later reading ability indicating that deletion skills develop along with reading skills. The researchers suggest that these results indicated that, “synthesis tasks tap an essential but primitive knowledge of segmentation. Success at reading depends on it. Deletion taps a nonessential but sophisticated segment analysis ability. Learning to read brings about this success…” (Perfetti et al., 1987, p. 317).

**Analytic skills and letter naming fluency.** In a study conducted by Elliott, Lee, and Tollefson (2001), the impact of analytic phonemic awareness skills coupled with knowledge of letter naming fluency was shown to be predictive of reading achievement. The modified version of the Dynamic Indicators of Basic Early Literacy Skills ([DIBELS] Kaminski & Good, 1996) was administered to 75 kindergarten students. The DIBELS included measures of letter naming fluency and sound naming fluency, along with the analytic skills of repeating initial sounds in words and phoneme segmentation. These scores were correlated with students’ Broad Reading and Reading Skills cluster scores on the a standardized individually administered achievement test, a teacher rating of students’ end of the year pre-reading skills, a standardized intelligence measure, and the Test of Phonological Awareness ([TOPA] Torgesen & Bryant, 1994).

Correlations between the DIBELS and measures of achievement and teacher ratings ranged from .60 to .70. A hierarchical regression showed that the DIBELS accounted for 73% of the variance in reading scores on the Woodcock Johnson Tests of Achievement-Revised (WJ-R). The combined multiple tasks on the DIBELS better predicted later achievement than another measure of phonological awareness or the intelligence measure. Interestingly, the letter naming fluency subtest was the single best
predictor of reading achievement scores on the WJ-R and of teachers' ratings of the children's reading ability. Letter naming is not considered a phonemic awareness skill, yet was shown to significantly predict later reading achievement.

A study conducted by Stage, Sheppard, Davidson, and Browning (2001) assessed the predictive validity of letter naming and letter sound fluency on oral reading fluency. Fifty-nine kindergarten students were administered three letter naming tasks and three letter-sound fluency tasks during May of their kindergarten year. During the students' first grade year, three one-minute oral reading fluency measures were collected four times throughout the year. The researchers found that although knowing letter sounds in kindergarten did predict improvement in reading fluency, kindergarten letter naming fluency was the strongest predictor of first grade improvement in reading fluency.

The Elliot et al. (2001) and the Stage et al. (2001) studies suggest that kindergarten children's letter naming fluency is a better predictor of first grade reading abilities than phonemic awareness measures. However, researchers suggest that some emerging level of phonemic awareness ability must be present in order for students to find reading success (Kaminski & Good, 1996; Mutter, 1998). Kaminski and Good (1996) stated that just teaching letter names to students with poor phonemic awareness would have minimal effect on reading progress. Rather, they suggest teaching letter names along with phonemic awareness would lead to better reading success.

*Phoneme segmentation and manipulation tasks.* The analytic skills of phonemic segmentation and phoneme manipulation have been shown to be as predictive of later reading achievement as overall phonemic awareness. A study conducted by Snider (1997) reveals the predictive nature of phoneme segmentation and manipulation skills. Snider
assessed seventy-nine kindergarten students from public and private schools by individually administering a test of phonemic awareness developed by the researchers. The test assessed rhyming skills and analytic phonemic awareness skills such as sound oddity, phonemic segmentation, and manipulation. In the rhyming task, students were presented a word and then asked to tell a word that rhymed with the stimulus word. In the sound oddity tasks, students were told to listen to the beginning sound of a stimulus word and then decide which word from a list of others had the same beginning sound. In the phoneme segmentation activity, the students were presented a word and then told to break the word apart and give each sound of the word separately. One manipulation task (deletion) required students to listen to a stimulus word and then say that word with the initial sound taken away. Another phoneme manipulation task (substitution) required the students to listen to a stimulus word and then substitute the first sound of that word with one presented by the examiner.

The public school students in the Snider (1997) study were given a group achievement test called the *Iowa Test of Basic Achievement* in the fall of their second grade year. The students in the study who attended private school were given the *California Achievement Test* in the fall of their second grade year. The Word Analysis and Reading Comprehension subtests of both standardized achievement tests were used as indicators of reading achievement in the second grade. Results of the study showed that neither the rhyming task nor the sound oddity task were highly predictive of reading performance in second grade. The phoneme segmentation task, the phoneme manipulation task (deletion and substitution), and the total score of the phonemic awareness measure were all highly predictive of students' later reading achievement.
scores. Interestingly, the phoneme deletion subtest was as good a predictor of reading achievement as was the total phonemic awareness score (Snider, 1997).

Phoneme segmentation skills have also been shown as a strong predictor of success in beginning to read by Vellutino and Scanlon (1987). Vellutino and Scanlon administered a battery of reading readiness assessments to 295 kindergarten students. The battery consisted of seven subtests, including tasks that measured phoneme segmentation. The children’s intellectual ability was assessed when the students were in their kindergarten year. The block design portion of the *Wechsler Preschool and Primary Scale of Intelligence* was used to assess intelligence for the second and third cohort of kindergarten students. At the end of first grade and again at the end of second grade, students were given an oral reading test and a test of pseudoword decoding. Results of the study indicated that the tasks that relied most heavily on phoneme segmentation ability were more highly correlated with oral reading skills than were skills that measured semantic or syntactic development. In addition, phoneme segmentation generally predicted reading success more accurately than did measures of intelligence. The researchers also found that poor readers achieved below normal readers on pseudoword decoding and on phonemic segmentation tasks (Vellutino & Scanlon, 1987).

A study conducted in the United Kingdom by Nation and Hulme (1997) revealed similar results as regards the predictive nature of the analytic phonemic awareness skill of phoneme segmentation. Seventy-five children in grades first, third and fourth were administered four phonological awareness tasks, including two segmentation tasks and two sound categorization tasks. The two segmentation tasks measured the phonemic awareness analytic skill of segmenting spoken non-words into phonemes (pronouncing
each phoneme of the word separately) as well as segmenting spoken non-words into onset and rime units (pronouncing each syllable of the word separately). In the sound categorization tasks, children were required to determine which word in a group of four did not rhyme with the others. The sound categorization portion also measured the phonemic awareness analytic skill of identifying which word begins with a different sound from a group of words (alliteration).

Nation and Hulme (1997) assessed the students' reading and spelling ability by using a standardized test of achievement as well as a standardized spelling assessment. Each student was tested on three occasions. The first session consisted of the spelling and reading testing. In each of the second and third sessions, which were conducted two weeks apart, students were given one segmenting task and one sound categorization test. Results of the study showed that sound categorization and phonemic segmentation scores increased with age and significantly correlated with reading and spelling ability. The phonemic segmentation task significantly correlated with spelling and reading ability, while the onset rime segmentation task failed to show such a significant correlation (Nation & Hulme, 1997).

While several studies have shown phoneme segmentation to significantly correlate with reading achievement, one study examined how segmentation skills might predict improvements in reading for children who have already been identified as having reading difficulty. In a study conducted by Lavelle (2001), the predictive validity of the Yopp-Singer Test of Phoneme Segmentation (Yopp, 1988) was assessed by evaluating the length of time students with reading difficulty would need to stay in a Reading Recovery Program. Eighty-six students in a Reading Recovery program were administered the
In addition, the students were assessed on letter identification skills, a word test, concepts about print test, a writing vocabulary test, a dictation task, and a running record of text reading (test reading level). Also, days in the program were monitored for each child. Results indicated that the students’ scores on the phonemic awareness measure upon entering the program did not correlate with and did not significantly predict the number of days the students stayed in the program. Rather, the running record of text reading or the students’ text reading level was found to be the best predictor of days served in the program. Lavelle’s (2001) study suggests there are limits to the predictive power of phoneme segmentation skills.

**Summary**

In summary, numerous studies have shown that phonemic awareness skills are predictive of later reading achievement. Some research suggests that measures that combine both analytic and synthetic skills are good predictors of later reading achievement (Wagner et al., 1997; Griffith et al., 1992; Salonen et al., 1998). Other research suggests that single analytic skills such as segmentation and deletion skills are predictive of later achievement (Lundberg et al., 1980; Mutter, 1998; Nation & Hulme, 1997; Perfetti et al., 1987; Snider, 1997; Vellutino & Scanlon, 1987). In addition, others suggest the importance of letter naming fluency as an indicator or predictor of reading success (Ehri et al., 2001; Stage et al., 2001). While various measures that assess phonemic awareness skills have been shown to be good predictors of later achievement, it is unclear as to whether multiple measures of phonemic awareness are better at predicting reading ability than any single measure. Similarly, it is unclear as to whether analytic or synthetic tasks are better at predicting later reading ability.
Phonemic Awareness Training

Phonemic awareness intervention and training have been shown to be effective in increasing phonemic awareness and subsequently improving student literacy skill achievement. Ball and Blachman (1992) found that training students in the analytic skill of phoneme segmentation improved phoneme segmentation skills and impacted students’ ability to read words on standardized achievement measures. In their study, children who received phoneme segmentation training along with letter name and letter sound training spelled words significantly better than did the controls. Children who received training were better able to match the written symbol of the letter to the sound that it stood for in the word. It is this crucial skill that is very important in learning to spell and read correctly.

Likewise, early intervention training in analytic and synthetic phonemic awareness skills, including instruction on segmenting phonemes, phoneme articulation, phoneme counting and phoneme blending, along with instruction in the alphabetic principle, word analysis, sight words, and reading connected text, improved students’ reading performance (Lennon & Slesinski, 1999). Research suggests that phonemic awareness training as well as teaching letter sound relationships help improve reading and that the combination of the two makes important contributions to reading improvement and success (Cunningham, 1990). When phonemic awareness skills are taught along with learning the sounds and names of letters, the training is most meaningful and most related to learning to read printed words (Good et al., 1998).

Not only has phonemic awareness training been effective for increasing the acquisition of literacy skills but also the long-term benefits of such training have also
been shown to be quite stable over time. Children trained in phoneme identity (i.e., identifying and manipulating beginning and ending sounds in words and knowing letter sound correspondence) beginning in preschool have outperformed their untrained peers in reading irregular words, non-words, and regular words five years later when the students were in the fifth grade (Bryne et al., 2000). It was found that the poor readers in the fifth grade were the children that made slow progress in achieving phonemic awareness in preschool training (Bryne et al., 2000).

Bradley and Bryant (1983) also found phonemic awareness training with children with low phonemic awareness scores was successful in helping them learn to read. Sixty-five students with low phonemic awareness scores were divided into two groups. One group received training in attending to the sound structure in words, and the other group received training in how to categorize words according to meaning. The students who received training in the sound structure of words were shown to have made significantly more progress in reading than those students who did not receive this phonemic awareness training. Five years later, the benefits of the training were still noted as these students had sustained their high achievement levels in reading and spelling over their peers who were not trained (Bradley & Bryant, 1983). Children who were also exposed to instruction in letter sound correspondence were among the highest performing children in the group.

A meta analysis conducted by the National Reading Panel (Ehri et al., 2001) provided an overview of the research on the effects of phonemic awareness training. The analysis examined the impact of training the analytic skills of identification of initial and ending phonemes in words, the recognition of words in which initial sounds are different
(phoneme categorization), phoneme segmentation, and of the synthetic skill of phoneme blending on literacy skills. The results of the meta-analysis found that phonemic awareness instruction significantly impacted reading acquisition including word reading and reading comprehension as well as spelling. Phonemic awareness instruction, namely in the areas of phoneme blending and segmenting, significantly predicted later reading and spelling. The effect size of treatment was statistically larger for blending and segmenting than for multiple skill tests (identify, categorize, blend, segment, or delete or manipulate phonemes). Teaching blending and segmenting was shown to help reading skills for all level of readers, including average readers, at risk readers and disabled readers, ranging in age from preschool to first grade. The authors suggest that learning to blend phonemes helps children decode novel words and that segmenting words into phonemes helps children to spell words correctly (Ehri et al., 2001). In addition, the National Reading Panel found that teaching phonemic awareness in combination with teaching letters of the alphabet increases reading and spelling performance to a far greater degree than does teaching just the manipulation of phonemes.

Purpose

There is a critical short period of time in which the path to reading failure can be altered (Good et al., 1998). Children on that path to reading failure must be identified early in order for intervention to be effective. Because early detection and early intervention of reading difficulty is so essential in preventing reading problems, determining reliable and valid assessments that can be used accurately as indicators of potential reading difficulty is very important. Research is unclear as to which phonemic awareness skill or combination of skills is best at predicting later reading achievement.
Some research suggests that measures that combine both analytic and synthetic skills are good predictors of later reading achievement (Wagner et al., 1997, Griffith et al., 1992; Salonen et al., 1998). Other research suggests that single analytic skills such as segmentation and deletion skills are also very predictive of later achievement (Lundberg et al., 1980; Mutter, 1998; Nation & Hulme, 1997; Perfetti et al., 1987; Snider; 1997; Vellutino & Scanlon, 1987). Various measures that assess phonemic awareness skills throughout the literature have been shown as good predictors of later achievement. Yet it is unclear as to whether multiple measures of phonemic awareness are better at predicting reading ability than any single measure. Similarly, it is unclear as to whether analytic or synthetic tasks are better at predicting later reading ability.

Most of the studies use assessment techniques developed by the researchers themselves. Such techniques are not readily or commercially available to school districts wishing to assess students’ phonemic awareness skills. A growing number of phonemic awareness measures are currently being published and marketed. However, little research has been conducted on the predictive nature of some of the recently published measures of phonemic awareness. It is important to determine which measures are the most beneficial and effective in predicting future reading abilities for students. Since little research has been conducted in comparing the newly published measures to each other relative to their predictive ability, the purpose of the current study is to examine four published measures, each of which has its own unique combination of phonemic awareness tasks, to determine which measures are the best predictors of later achievement.
Research Hypotheses

1) Each of the four published measures of phonemic awareness administered to kindergarteners will significantly correlate with second grade reading achievement as measured by the CAT-5.

2) The CTOPP and DIBELS, which both consist of multiple tasks, will have higher correlations with CAT-5 reading achievement than the TOPA and Yopp-Singer, which assess single skills.

3) The correlation between the CTOPP analytic subtests and reading achievement will be higher than the correlation for the CTOPP synthetic subtest and reading achievement.

4) The correlation between the analytic DIBELS subtests and reading achievement will be higher than the correlation for the letter naming subtest and reading achievement.
Method

Participants

A sample of 152 kindergarten students from a school district in a mid-sized city of 50,000 people were individually administered two of four published phonemic awareness measures during January of 2000 (Craycroft, 2001). The original participants were randomly assigned to one of three groups in order to lessen the testing time for each individual child. Each group was either administered the CTOPP, TOPA, or Yopp-Singer and all students were administered the DIBELS. A standardized group achievement test, the *California Achievement Test-5* (CAT-5), was administered by the school district in the fall of 2001 when these same students were in the second grade. Permission to obtain achievement test scores and to conduct this study was given by the school district’s board of education (see Appendix A). In addition, permission was also granted by the Western Kentucky University Human Subjects Review Board (see Appendix B).

Of the original 152 students who were administered the phonemic awareness measures, achievement scores were available for 104 students. Table 1 presents the demographic characteristics of the three groups of participants from the original study. In the initial study, participants included 55 percent males and 45 percent females. The majority of students in the sample were Caucasian followed by smaller percentages of Black, Hispanic, and Asian students. Table 2 represents the demographic characteristics of the three groups of participants available for the current study. Despite the decrease in
Table 1

Demographic Characteristics of Original Sample Per Instrument Administered

<table>
<thead>
<tr>
<th></th>
<th>CTOPP</th>
<th>TOPA</th>
<th>Yopp-Singer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>30 (57.7)</td>
<td>32 (60.4)</td>
<td>21 (44.7)</td>
<td>83 (54.6)</td>
</tr>
<tr>
<td>Females</td>
<td>22 (42.3)</td>
<td>21 (39.6)</td>
<td>26 (55.3)</td>
<td>69 (45.4)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>40 (76.9)</td>
<td>34 (64.2)</td>
<td>37 (78.7)</td>
<td>111 (73.0)</td>
</tr>
<tr>
<td>Black</td>
<td>4 (7.7)</td>
<td>15 (28.3)</td>
<td>7 (14.9)</td>
<td>26 (17.1)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2 (3.8)</td>
<td>2 (3.8)</td>
<td>2 (4.3)</td>
<td>6 (3.9)</td>
</tr>
<tr>
<td>Asian</td>
<td>4 (7.7)</td>
<td>1 (1.9)</td>
<td>0 (0.0)</td>
<td>5 (3.3)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (3.8)</td>
<td>1 (1.9)</td>
<td>1 (2.1)</td>
<td>4 (2.6)</td>
</tr>
</tbody>
</table>

Note. All students were also administered the DIBELS.

Sample size from the original study to the current study, the percentages of students in each category of gender and ethnicity have remained remarkably similar. Thus, it can be assumed that the current sample is representative of the original sample.

Materials

In recent years, many measures of phonemic awareness have been developed for young children. Four such measures include the Yopp-Singer Test of Phoneme Segmentation (Yopp, 1988), Test of Phonological Awareness ([TOPA] Torgesen & Bryant, 1994), the Comprehensive Test of Phonological Processing ([CTOPP] Wagner et
Table 2

Demographic Characteristics of Current Sample Per Instrument Administered

<table>
<thead>
<tr>
<th></th>
<th>CTOPP</th>
<th>TOPA</th>
<th>Yopp-Singer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(%)</td>
<td>n</td>
<td>(%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>23</td>
<td>(60.5)</td>
<td>21</td>
<td>(56.8)</td>
</tr>
<tr>
<td>Females</td>
<td>15</td>
<td>(39.5)</td>
<td>16</td>
<td>(43.2)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>29</td>
<td>(76.3)</td>
<td>24</td>
<td>(64.9)</td>
</tr>
<tr>
<td>Black</td>
<td>4</td>
<td>(10.5)</td>
<td>10</td>
<td>(27.0)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>(2.6 )</td>
<td>1</td>
<td>(2.7 )</td>
</tr>
<tr>
<td>Asian</td>
<td>3</td>
<td>(7.9 )</td>
<td>1</td>
<td>(2.7 )</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>(2.6 )</td>
<td>1</td>
<td>(2.7 )</td>
</tr>
</tbody>
</table>

*Note.* All students were also administered the DIBELS.

al., 1999), and the Dynamic Indicators of Basic Early Literacy Skills ([DIBELS]
Kaminski & Good, 1996). Each of these measures assesses phonemic awareness skills in
various ways by measuring skills related to the development of phonemic awareness as

Yopp-Singer. The Yopp-Singer Test of Phoneme Segmentation (Yopp, 1988)
measures the analytic phonemic awareness skill of phoneme segmentation and is
designed for English speaking children. The Yopp-Singer assesses the child’s ability to
"separately articulate sounds of a spoken word" or the ability to articulate sounds that
compose words as opposed to just naming letters (Yopp, 1995, p. 21). For instance, if a child hears the word “cat,” he or she would receive one point of credit if the child could correctly segment (i.e., pronounce) all phonemes, /c/ /a/ /t/, in the word cat. The test consists of 22 words, and students must correctly segment each word in order to get credit for an item. Students who obtain high scores (i.e., segmenting all or nearly all of the words) would be considered as having phonemic awareness. Those students who segment some items would be displaying emerging phonemic awareness skills, and students who were able to segment few or no items would be considered as lacking phonemic awareness (Yopp, 1995).

In a comparison study of phonemic awareness measures conducted by the author of the Yopp-Singer, 96-second semester kindergarten students from a southern California school district (lower middle to upper middle class population) were administered the Yopp-Singer Test of Phoneme Segmentation (Yopp, 1988). Analysis of the instrument indicated that the Yopp-Singer had high internal reliability with a Cronbach's alpha of .95. Predictive validity of the instrument indicated that the Yopp Singer was one of four measures of phonemic awareness skills that significantly correlated with the kindergartners' ability to decode novel words (Yopp, 1988). While the reliability and validity of the Yopp-Singer were assessed, it is difficult to determine how these results can be generalized to all students in the United States. Based on the small sample size from one Southern California school district, more information regarding the predictive validity is warranted.

The author of the Yopp-Singer also conducted a seven-year longitudinal study to evaluate the predictive validity of the instrument (Yopp, 1995). The Yopp-Singer was
administered to kindergarten students, and the same students’ reading and spelling achievement were measured using the Comprehensive Test of Basic Skills. Results revealed that kindergarten performance on the Yopp-Singer significantly correlated with the total achievement scores in all grades up to sixth except for fourth grade (Yopp, 1995).

*Test of Phonological Awareness.* The Test of Phonological Awareness (TOPA) is an individually administered test of analytic phonemic awareness skills (Torgesen & Bryant, 1994). The kindergarten version of the TOPA consists of a twenty-item test that measures the ability to identify individual sounds in words. The first ten items of the test require the child to identify which of three presented words has the same initial sound as a stimulus word. The last ten items require the child to choose which word in a group of four begins with a different sound than the stimulus word.

Analyses conducted by the test authors examined the reliability and validity of this instrument (Torgesen & Bryant, 1994). The internal consistency reliability of the TOPA (kindergarten version) was .90. In addition, the test-retest reliability of the kindergarten version was .94 indicating good stability of the test over time. As regards concurrent validity, the TOPA kindergarten version correlated at .66 with a sound isolation task and at .47 with a segmentation task (Torgesen & Bryant, 1994). In addition, the TOPA correlated at .42 with a computer test of phonological awareness published in 1994, which uses five tasks to assess phonological awareness. These analyses were conducted with a sample of only 69 children at the end of their kindergarten year; thus, generalizing these results may be limited (Torgesen & Bryant, 1994).
In a different study, reported by Torgesen and Bryant (1994), the TOPA was administered to 90 kindergarten children (primarily from a low socioeconomic backgrounds and racial minorities) who attended two elementary schools. In first grade these same students’ alphabetic reading skills were measured using the Word Analysis subtest of the Woodcock Reading Mastery Test (WRMT). The TOPA correlated at .62 with alphabetic reading skills. In addition, data on the TOPA indicates the 18 of 23 kindergarten students who scored in the lowest quartile on the TOPA also performed below average in alphabetic reading skills in first grade. In addition to the small sample size, the study failed to assess the predictive nature of the instrument on spelling skills, which are also an important skill related to reading and writing and success in school. The only measure that was used to assess achievement was the word analysis subtest of the Woodcock Reading Mastery Test; thus, this analysis produced a very limited assessment of reading and spelling achievement. Generally speaking, little outside evaluation of the TOPA has been conducted. The authors of the instrument have conducted each of the studies that have assessed the reliability and validity of the TOPA. Therefore, further information regarding this TOPA’s predictive power on later achievement is warranted.

Comprehensive Test of Phonological Processing. The Comprehensive Test of Phonological Processing (CTOPP) is an individually administered measure of phonological processing that assesses phonological awareness, phonological memory, and rapid naming skills (Wagner et al., 1999). The phonological awareness portion of the test measures phonemic awareness skills such as elision, blending of words, and sound matching skills. The elision portion measures the analytic skill of deletion and is a 20-
item subtest that assesses the child's ability to identify and pronounce words after dropping sounds. For instance, the child is asked to pronounce the word "bold" and then pronounce it again without the /b/ sound. The blending subtest, a measure of synthetic phonemic awareness, contains 20 items that assesses the ability to join sounds to form words. In this subtest, the child is required to listen to separate sounds and asked to put the sounds together to form a word. The sound matching subtest, a measure of analytic phonological awareness, is a 20-item test that measures the ability to match the beginning or ending sounds of stimulus words with an alternatives words presented to the examinee.

The phonological awareness composite of the kindergarten version of the CTOPP has a test-retest reliability of .79 and an internal consistency reliability of .96 (Wagner et al., 1999). In addition, the CTOPP was reported by the authors to be a valid measure of phonological awareness skills. The phonological awareness score of the kindergarten version of the CTOPP correlated .70 with a test of sight word efficiency, .65 with phonemic decoding efficiency and .70 with total word reading efficiency (Wagner et al., 1999). The criterion-predictive validity of the CTOPP was assessed by administering the CTOPP to 164 students in a developmental research school in northern Florida of which only 25 of the students were kindergarten students. The Word Identification subtest of the WRMT-R was also administered to the students. The Word Identification subtest correlated of .65 with the elision subtest, .59 with the blending subtest, and .46 with the sound-matching subtest.

The CTOPP manual (Wagner et al., 1999) also reports a study in which seventy-three students ranging from kindergarten to twelfth grade (all but three being European American) and diagnosed with a learning disability were assessed on two occasions.
Students were administered the CTOPP, the test of auditory conceptualization, the Word Attack and Word Identification subtests from the WRMT-R, the spelling subtest from the *Wide Range Achievement Test-Third Edition*, and the Accuracy Rate and Comprehension subtests of the *Gray Oral Reading Test-Third Edition*. Testing was completed on two occasions - once prior to intervention to improve phonological awareness and another testing six months later. The auditory conceptualization test was administered only at the initial testing. Between testing sessions, students received the intervention to improve phonological awareness skills. The CTOPP elision and blending subtest significantly correlated with each of the six above-mentioned subtests indicating concurrent validity with measures of reading achievement. After the second testing six months after the initial testing, the CTOPP correlated with each of the five reference measures of reading indicating predictive validity of the CTOPP with measures of reading achievement.

While these correlations were significant, the results are difficult to generalize because of the small population of kindergarten students and the geographically limited nature of the sample. With these data, it is difficult to determine just how predictive the instrument is with kindergarten students' later academic skills since the achievement tests were given only six months after the initial CTOPP testing. In addition, the small sample size and relatively homogenous population, generalization for all students is limited. More data are needed to determine if the measure is an effective assessment tool for determining later reading difficulties.

*Dynamic Indicators of Basic Early Literacy Skills.* The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) is an individually administered measure of early
literacy skills. The measure includes assessment of phonemic awareness and the alphabetic principle (Good et al., 2001). The phonemic awareness subtests measures initial sound fluency and phonemic segmentation fluency. The initial sound fluency (formerly known as onset recognition fluency) subtest assesses the child’s analytic ability to identify and give initial sounds of orally presented words. For instance the child would be presented with four pictures which the examiner names. The child is then asked to point to or say the name of the picture that begins with the stimulus sound orally presented by the examiner (e.g., /s/). The alternate form reliability of this subtest is .72 in the winter of the kindergarten year (Dynamic Indicators of Basic Early Literacy Skills, 2001). When the assessment is repeated four times, the average alternative form-reliability extends to .91. The predictive validity of the measure of first grade Curriculum Based Measurement (CBM) oral reading fluency is reportedly .45 and .36 with the Woodcock-Johnson Psycho-Educational Battery Total Reading Cluster score (Good et al., 2001).

The phoneme segmentation fluency subtest is an individually administered measure of analytic phonemic awareness skills that assess students’ ability to segment three and four phoneme words (Good et al., 2001). This subtest requires students to verbally state the individual phonemes of orally presented words. The number of correct phonemes produced in one minute culminates in the final score on this subtest. The two-week alternative form-reliability of the phoneme segmentation fluency subtest was shown to be .88 (Dynamic Indicator of Basic Early Literacy Skills, 2001). Concurrent criterion validity of phoneme segmentation fluency is .54 with the Woodcock-Johnson Psycho-Educational Battery Readiness Cluster in spring of the kindergarten year. Predictive
validity of the phoneme segmentation subtest with spring of first grade Woodcock Johnson Psycho-Educational Battery Total Reading Cluster is .68 and .62 with spring of first grade CBM oral reading fluency. An additional analysis indicated that the phoneme segmentation fluency test, administered in kindergarten, had predictive validity correlations ranging from .36 to .82 with CBM reading in first grade (Good et al., 2001). However, the predictive nature of the measure with spelling ability was not reported, suggesting further analysis is warranted to assess this important academic skill.

The letter naming fluency portion of the DIBELS requires children to name rows of upper and lower case letters in a time frame of 60 seconds. The letter-naming subtest was reported to have a test-retest reliability of .90 (Good et al., 2001). In addition, Elliott, Lee, and Tollefson (2001) reported predictive validity coefficients for letter naming fluency with 75 kindergarteners .68 with the Stanford Diagnostic Reading Test and .92 with teacher rating scales of reading ability. These authors also indicated that a combination of four of the DIBELS measures (letter naming, sound naming, initial phoneme ability, and phoneme segmentation ability) accounted for 73% of the variance in scores on the Skills Cluster of the Woodcock-Johnson Psychoeducational Battery-Revised (WJ-R). These results, while they suggest adequate predictive validity of individual measures on the DIBELS as well as a combined DIBELS measure, are difficult to generalize because of the small sample size. More research is needed with this measure across different populations in order to enhance generalization.

Achievement Testing. The California Achievement Test - Fifth Edition (CAT-5) is a norm referenced group administered achievement test developed by CTB Macmillan/McGraw-Hill and published by CTB/McGraw-Hill Assessment Products and
Services (Murphy, Impara, & Plake, 1999). The CAT-5 assesses achievement skills in reading, spelling, mathematics, study skills, science, and social studies for students in grades K-12 (CTB McGraw-Hill, 2002). The reading test consists of a word analysis test for children in grades 1-3. All students in grades K-12 are given a vocabulary and comprehension test. A spelling test assessing vowels sounds, consonants and structural units is also administered to second to twelfth grade students. A language arts assessment is also given and measures a range of language and writing skills necessary for literacy including language mechanics and language expression skills. Mathematics, science, and social studies, and study skills are also assessed although not used in the analysis as a part of this study.

Procedure

In a study conducted by Craycroft (2001), kindergarten students’ phonemic awareness skills were assessed in the winter of their kindergarten year using two of four phonemic awareness instruments. The instruments were administered on two occasions to assess the test-retest reliability of the scales. At each testing, 47 students were administered the Yopp-Singer Test of Phoneme Segmentation, 52 were administered the CTOPP, 53 were administered the TOPA, and all (152) students were administered the DIBELS at the second testing. The present study used this set of data and conducted a follow up study on this same set of subjects. Participants’ reading achievement scores, as determined by the CAT-5 assessment, were provided by school district personnel.
Results

Phonemic awareness has been shown to be influential in this reading acquisition success; therefore, it is important to determine if published measures of phonemic awareness are good predictors of reading success or failure. The purpose of this study was to examine the predictive validity of four measures of phonemic awareness administered to kindergarten students on subsequent literacy development in second grade. Phonemic awareness skills as assessed by four measures of phonemic awareness in this study were correlated with later reading achievement to determine if each significantly correlated with later reading achievement as measured by the CAT-5 achievement test.

Hypothesis 1 predicted that each of the four phonemic awareness measures administered in the kindergarten year would significantly correlate with later reading achievement on the CAT-5 reading achievement test. This hypothesis was supported (see Table 3). The significant correlations indicated that students who had higher levels of phonemic awareness skills in kindergarten, as assessed by any of these phonemic awareness measures, achieved at higher levels on standardized measures of reading achievement.

Hypothesis 2 predicted that the tests with multiple tasks (i.e., CTOPP and DIBELS) would have higher correlations with reading achievement than the tests with single tasks (i.e., TOPA and Yopp-Singer). This hypothesis was only partially supported. In order to determine if the phonemic awareness measures which assess multiple skills
Table 3

*Correlations Between Kindergarten Phonemic Awareness Tests and Second Grade Reading Achievement*

<table>
<thead>
<tr>
<th></th>
<th>CTOPP (n =38)</th>
<th>TOPA (n =37)</th>
<th>Yopp-Singer (n =29)</th>
<th>DIBELS (n =104)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT-5</td>
<td>.74**</td>
<td>.81**</td>
<td>.63**</td>
<td>.77**</td>
</tr>
</tbody>
</table>

**p < .01.

correlate at a higher level with reading achievement than do phonemic awareness measures that assess only one skill, the differences between the tests’ correlations were analyzed (see Table 4). Analysis of the differences between independent sample correlations of reading achievement and the CTOPP and reading achievement and the Yopp-Singer revealed no significant difference, $Z (67) = 0.80, p > .05$. Analysis of the differences between independent sample correlations of reading achievement and phonemic awareness as measured by the CTOPP and between reading achievement and the TOPA revealed no significant difference between the correlations, $Z (75) = 0.75, p > .05$.

Differences in correlations between reading achievement and performance on the DIBELS measure versus the TOPA and Yopp-Singer measures were also analyzed (see Table 4). Because the DIBELS was administered to all students, including those students who were administered the TOPA, the students who were administered the TOPA and the DIBELS were factored out in order to compare the TOPA and DIBELS with no overlap
Table 4

A Comparison of Multiple Skill Measures (CTOPP & DIBELS) With Single Skill Measures (Yopp-Singer & TOPA)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>r</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTOPP vs. Yopp-Singer</td>
<td>38/29</td>
<td>.74/.63</td>
<td>.80</td>
</tr>
<tr>
<td>CTOPP vs. TOPA</td>
<td>38/37</td>
<td>.74/.81</td>
<td>.75</td>
</tr>
<tr>
<td>DIBELS vs. TOPA</td>
<td>67/37</td>
<td>.72/.81</td>
<td>.81</td>
</tr>
<tr>
<td>DIBELS vs. Yopp-Singer</td>
<td>75/29</td>
<td>.82/.63</td>
<td>1.83*</td>
</tr>
</tbody>
</table>

*Note. Z refers to the Z test statistic for the difference between independent sample correlations.

*p < .05.

in subjects (i.e., independent samples). This approach, rather than restricting the samples to 100 percent overlap (i.e., dependent samples), resulted in a smaller sample size. The new DIBELS correlation for this smaller sample was .72 (n = 67). Analysis of the difference between independent sample correlations of reading achievement and phonemic awareness as measured by the DIBELS and the TOPA revealed no significant difference, Z (104) = .81, p > .05. Analysis of differences in correlations between reading achievement and performance on the DIBELS and the Yopp-Singer was conducted. Again, because the DIBELS was administered to all students including those students who were administered to the Yopp-Singer, the students who had both the Yopp-Singer and the DIBELS were factored out in order to compare the Yopp-Singer and
DIBELS without any overlap in subjects (i.e., independent samples). The new DIBELS correlation for this smaller sample was .82 (n = 75). Analysis of differences between independent sample correlations of reading achievement and phonemic awareness revealed that the DIBELS measure correlated significantly higher with reading achievement compared to the Yopp-Singer correlation with reading achievement, Z (104) = 1.83, p < .05.

As another method of analysis, the DIBELS was compared to the TOPA and Yopp-Singer measures using dependent samples; that is, the correlation between the DIBELS and the CAT-5 was compared to the correlation between the TOPA and the CAT-5 using the students who were given both measures (n = 37). Similarly, the correlation between the DIBELS and CAT-5 was compared to the correlation between the Yopp-Singer and CAT-5 using the students who were given both of those measures (n = 29). Like the independent samples test, the analysis of the difference between the DIBELS (r = .86) and the TOPA (r = .81) using the William’s t test for dependent samples revealed no significant difference, t (35) = .86, p > .05. Unlike the independent samples test, however, analysis of the difference between the DIBELS (r = .67) and the Yopp-Singer (r = .63) using the William’s t test for dependent samples revealed no significant differences, t (27) = .50, p > .05. Thus, the first analysis using independent samples suggested the second hypothesis regarding multiple skills resulting in higher correlations with later reading achievement was partially supported. Of the four comparisons, only the correlation on the DIBELS was significantly higher than the correlation on the Yopp-Singer. However, when correlations from dependent samples
were compared, no significant differences were found. Multiple skill tests did not result in higher correlations with later reading achievement than single skill tests.

Hypothesis 3 predicted the analytic subtests on the CTOPP would have higher correlations with reading achievement than the synthetic subtest on the CTOPP. In order to determine if subtests that measure analytic phonemic awareness skills correlate higher with reading achievement than do subtests that measure synthetic phonemic awareness skills, the differences between the subtests’ correlations were analyzed using a Williams $t$ (see Table 5). The two analytic subtests on the CTOPP were combined into one score for the purposes of this analysis. Analysis of the differences between dependent sample correlations of reading achievement and the analytic subtests of the CTOPP and reading achievement and the synthetic subtests on the CTOPP revealed no significant difference, $t \ (36) = .09, p > .05$. Thus, the third hypothesis was not supported.

Hypothesis 4 predicted the correlation between the analytic subtests on the DIBELS and reading achievement would be higher than the correlation for the Letter Naming subtest and reading achievement. Analysis of the differences between dependent sample correlations of the analytic subtests of the DIBELS and the Letter Naming subtest on the DIBELS using the Williams $t$ test revealed no significant difference, $t \ (102) = 1.44, p > .05$ (see Table 5).
Table 5

A Comparison of Subtests' Correlations on the CTOPP and the DIBELS

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>r</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CTOPP</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytic Subtests(^a)</td>
<td>38</td>
<td>.71</td>
<td>0.09</td>
</tr>
<tr>
<td>Synthetic Subtest(^b)</td>
<td>38</td>
<td>.71</td>
<td></td>
</tr>
<tr>
<td><strong>DIBELS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytic Subtests(^c)</td>
<td>104</td>
<td>.63</td>
<td>1.44</td>
</tr>
<tr>
<td>Letter Naming Subtest</td>
<td>104</td>
<td>.71</td>
<td></td>
</tr>
</tbody>
</table>

*Note. The t refers to the William’s t test for dependent sample correlations.*

\(^a\)Elision and Sound Matching combined. \(^b\)Blending. \(^c\)Onset Recognition Fluency and Segmentation Fluency combined.

\(p > .05\) for all analyses.
Discussion

The results of the present study support the hypothesis that published measures of phonemic awareness significantly correlate with later reading achievement. Each of the four published measures of phonemic awareness administered to students in the spring of their kindergarten year had a significant positive correlation with second grade reading achievement. These findings are in accordance with research that suggests that students who possess phonemic awareness skills at an early age have more success in reading compared to children who do not possess or understand sound-symbol relationships. Early phonemic awareness ability has been shown to play a role in development of successful literacy skills in pre readers (Adams, 1990; Adams et al., 1998; Griffith et al., 1992; Juel, 1988; Lundberg et al., 1980; Snider, 1997). The current research results demonstrated that the measures used in this study could be useful in helping to identify future reading problems in kindergarten students. Any of these four measures, therefore, could be used as a screening tool for possible future learning problems as regards reading and literacy development. Early identification can lead to early intervention.

Past research regarding the predictive validity of phonemic awareness measures that assess single or multiple skills has been inconclusive. Various types of phonemic awareness contribute to a child’s ability to read; measures that assess multiple skills were predicted by this researcher to correlate higher with later reading achievement. For instance, decoding words requires the ability to blend phonemes in words (a synthetic and easier phonemic awareness skill), while reading words by “analogy” (reading brick.
knowing the word *rick*) requires analytic deletion and initial sound knowledge skills, and reading words by sight requires phonemic segmentation skills (Ehri et al., 2001). The hypothesis that phonemic awareness measures that assess multiple skills would correlate at a higher level with later reading achievement than single skill measures was not supported by the current study.

The CTOPP, which assesses multiple skills, did not correlate higher with reading achievement than did the TOPA or the Yopp-Singer, which assess only single skills. The DIBELS, which assesses multiple skills, initially appeared to correlate significantly higher with later reading achievement than the Yopp-Singer, which assesses only segmentation skills. However, the additional analysis comparing the DIBELS and the Yopp-Singer measures using dependent samples did not support the initial findings.

The results of present study failed to support the hypothesis that tasks that measure analytic phonemic awareness skills are better predictors of reading achievement than synthetic phonemic awareness tasks. No significant difference between correlations was found for the analytic and synthetic subtests on the CTOPP. Both types of tasks significantly correlated with later reading achievement at the same level. These results suggest that synthetic skills predict later reading achievement just as well as analytic skills, at least when measured in the middle of the kindergarten year. Although analytic skills such as segmenting and deleting phonemes are thought to be more difficult phonemic awareness skills, the ability to complete these tasks and have this higher understanding of phonemic awareness did not result in a better determination of future reading success.
The present results are consistent with research by Wagner and Torgesen (1987) who found that both segmenting (analytic) and blending (synthetic) tasks are highly correlated with literacy development. Others suggest those synthetic tasks are better predictors of reading achievement initially and that phonemic analytic skills develop with learning to read (Perfetti et al., 1987). If this is the case, then perhaps instruments that assess synthetic skills or incorporate both synthetic and analytic skills would be useful at an even earlier age (e.g., beginning of kindergarten) than used in this sample. However, the current results indicate that having a test with both synthetic and analytic skills does not result in a higher correlation for middle of the school year kindergartners than single skill analytic tests.

Letter naming is not considered an analytic, nor a synthetic, phonemic awareness skill. The DIBELS contains a subtest where the number of letters named by the student in one minute is used as a measure of the child's early literacy skills. It is difficult to perceive that such a short, simplistic measure could accurately predict later reading achievement. The results of this study, however, failed to support the hypothesis that analytic phonemic skills would correlate significantly higher with reading achievement than letter naming fluency skills. Letter naming fluency skills predicted later reading achievement just as well as did analytic phonemic awareness skills. These results are consistent with previous research that suggests the importance of letter naming knowledge to reading acquisition (Ehri et al., 2001; Stage et al., 2001).

Despite such a strong correlation between letter naming and reading achievement, the ability to name letters is not all students need possess in order to be on target for reading success. Researchers indicate that some emerging level of phonemic awareness
ability must also be present in order for students to find reading success (Kaminski & Good, 1996; Mutter, 1998). Kaminski and Good (1996) stated that just teaching letter names to students with poor phonemic awareness would have minimal effect on reading progress. Rather, they recommend teaching letter names along with teaching phonemic awareness in order to lead to better reading success. A meta analysis from the National Reading Panel also supports such a recommendation (Ehri et al., 2001). Previous research indicated that kindergarten phonemic awareness skills as well as letter knowledge were top predictors of reading skills at the end of first grade (Ehri et al., 2001). The current research results are consistent with that finding.

Because both phonemic awareness and letter naming skills are so critical, the DIBELS may be considered a more advantageous measure because it does assess both skills. Another advantage of the DIBELS is that there are multiple forms (18-20) of each assessment probe. Thus, the DIBELS is the only instrument that could be used for progress monitoring (e.g., re-assessed on a weekly basis) after an intervention is implemented.

Limitations

This study has produced some interesting findings, but as with all studies this research as its limitations. One limitation is the small sample size of each group of participants and the limited geographic sample. It would have been even more beneficial if the original sample of kindergarten students were all administered each of the four measures. Then, more direct comparisons between measures would have been possible. Because of the independent samples, interpreting differences between tests becomes more difficult. If the sample of students were administered each of the tests in
kindergarten, then it is possible that other differences in instruments and individual subtests could have been revealed.

A second possible limitation is that no information is available as to the phonemic awareness instruction students might have received. Although all students in this study were in the same school district, the participants attended six different schools and many more classrooms. Some students may have received instruction in phonemic awareness skills while others may not have received such specific instruction. Students were randomly assigned to groups and the random assignment partially addresses this concern. It is unknown, however, what effect varying instruction might have had on the results.

**Future Research**

Future research in the area of literacy development might further explore the extent to which the combination of letter naming fluency skills and phonemic awareness skills impact success in reading. In particular, determining the extent to which the two skills overlap or if their combination provides the best indicator of reading success would add even more knowledge about the importance of these skills. In addition, future research might also focus on the predictive nature of analytic phonemic awareness skills versus synthetic phonemic awareness skills at different age levels as regards later reading acquisition. This study did not produce any findings that suggest that one skill is a better predictor of reading success than the other for children in the middle of their kindergarten year. There may be a difference at the beginning of the kindergarten year or even prior to a child entering kindergarten.

Additional research is needed on the effectiveness of early literacy interventions; that is, if a child is identified in kindergarten to be at-risk for later reading difficulties,
what needs to be taught that will have an impact? The best ways to provide early literacy
intervention (e.g., strategies, frequency or duration of instruction) needs to be identified.
Furthermore, in order to make early identification decisions, specific cutoff scores would
need to be determined. The present study indicated that scores from phonemic awareness
measures and later reading scores were highly correlated, but it is unknown as to what
cutoff score on any of the measures should result in early intervention efforts.

Conclusion

This study has shown that published instruments that measure various skills of
phonemic awareness are all significantly correlated with later reading achievement. This
information is tremendously important for schools when trying to identify a system of
screening students who may be at risk for future reading difficulties. Each instrument
can be administered quickly and easily, although the CTOPP and TOPA can take a few
minutes longer per child to administer than the Yopp-Singer and the DIBELS. The
CTOPP and TOPA must be purchased, thus adding a financial burden to school districts.
The DIBELS and the Yopp-Singer are available free of charge. One analysis
(independent samples) suggested the DIBELS correlated at a significantly higher level
with reading achievement compared to the Yopp-Singer, but a second analysis using
dependent samples did not support such a finding. Perhaps the important edge the
DIBELS has over the other instruments is its potential to be used as a progress
monitoring instrument to evaluate student performance and improvement during the
process of developing these early literacy skills. Early identification and intervention of
reading difficulties can have a tremendous impact in our educational system and society.
References


Appendix A

School District Permission Letter
March 6, 2002

Ms. Sarah Midden
959 Morgantown Road
Apt. 6
Bowling Green, KY 42101

Dear Ms. Midden:

At their regular March Board meeting, the members of the Bowling Green Board of Education approved your request to utilize primary students in the Bowling Green Independent School District in a research project that examines the correlation between each of the 4 phonemic awareness tests conducted in Kindergarten to the students' current reading performance to determine which of the phonemic awareness instruments is a better predictor of later reading ability.

If I may be of further assistance, please do not hesitate to contact me.

Sincerely,

John C. Settle
Superintendent

JCS:rc

The Bowling Green Independent School District provides equal educational and employment opportunities.
Appendix B

Human Subjects Review Board Approval Letter
In future correspondence please refer to HS02-084, March 21, 2002

Sarah Midden
959 Morgantown Road Apt. #6
Bowling Green, KY 42101

Dear Sarah:

Your research project, "Predictive Validity of Kindergarten Phonemic Awareness Measures on Second Grade Reading Achievement," was reviewed by the HSRB and it has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects' welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that: (1) signed informed consent will be waived because data has been collected and will analyzed without identifiers. (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data. (3) Appropriate safeguards are included to protect the rights and welfare of the subjects.

   a. Your research therefore meets the criteria of Expedited Review and is Approved.

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Sponsored Programs at the above address. Please report any changes to this approved protocol to this office. A Continuing Review protocol will be sent to you in the future to determine the status of the project.

Sincerely,

Phillip E. Myers, Ph.D.
Director, OSP and
Human Protections Administrator

c: Human Subjects File Hamilton02-084
Dr. Carl Myers, Department of Psychology

HSApprovalMiddenHS02-084