I give permission for public access to my thesis and for any copying to be done at the direction of the archives librarian and/or the College librarian.

Melissa A. Snyder

May 2006

Dynamic Indicators of Basic Early Literacy Skills:

An Effective Tool to Assess Adult Literacy Students?

by

Melissa A. Snyder

A Thesis

Presented to the Faculty of Mount Holyoke College

in partial fulfillment of the requirements

for the degree of Bachelor of Arts

with Honor

Department of Psychology and Education

Mount Holyoke College

South Hadley, Massachusetts

ACKNOWLEDGEMENTS

I must first thank my family. Thank you for your love, your support, your devotion. Mark, can you believe it has already been four years? Thank you for always believing in me, for always wanting what is best for me, for sending me to Mount Holyoke College, and for being an all-around amazing father.

Thank you, Kathy Binder, my wonderful advisor. It was your dedication to the study of adult literacy that inspired me to create this project. Thank you for your guidance, for reading my drafts, for letting me drop into your office whenever I needed to, and for always coming up with a plan to help divert disaster.

Thank you to all of my committee members. Becky Packard. Thank you so much for taking me under your wing last year and showing me all that research has to offer. Karen Hollis. Thank you for your attention to detail and your amazing written comments. Janice Gifford. Regression was the among the most time consuming, daunting, and rewarding classes I have taken at MHC. I can not thank you enough.

I owe a huge debt of gratitude to the Adult Basic Education programs, Elementary schools, and students that allowed me to use their valuable time. Thank you to the Ellen P. Reese Fund, Harup Fund, and T. W. Reese Fund for supporting my research.

Janet Crosby, thank you for always having the answers and a smile. Roy, thanks for always having kind and encouraging words. Thank you Dalisa Gomez, Betty Fuentes, and Katie Elmes, my wonderful research assistants. Thanks Dana, for the emotional and academic support. Thank you Amanda, Maggie, Chantal, Mora, Rachel, Caitlin, Kristin, and Scott, for your support, love, and friendship throughout my time here at MHC. You have made my college experience a wonderful one.

TABLE OF CONTENTS

Acknowledgements…………………………………………………………………iii

List of Figures………………………………………………………………………vi

List of Tables…..vii

Abstract………………………………………………………………………...x

Introduction……………………………………………………………………..1

Method…………………………………………………………………...14

Results……………………………………………………………………………21

Discussion……………………………………………………………………..74

References……………………………………………………………………..84

Appendix…………………………………………………………………………90

LIST OF FIGURES

Page

Figure 1. Initial Sound Fluency as a function of Reading-Grade Level and Group Affiliation 53

Figure 2. Phoneme Segmentation Fluency as a function of Reading-Grade Level and Group Affiliation 55

Figure 3. Nonsense Word Fluency as a function of Reading-Grade Level and Group Affiliation 57

Figure 4. Oral Reading Fluency as a function of Reading-Grade Level and Group Affiliation 60

Figure 5. Nonword as a function of Reading-Grade Level and Group Affiliation 63

Figure 6. Nonword Vowel Doublets as a function of Reading-Grade Level and Group Affiliation 65

Figure 7. Nonword Consonant Doublets as a function of Reading-Grade Level and Group Affiliation 67

Figure 8. Atypical Word Fluency as a function of Reading-Grade Level and Group Affiliation 70

Figure 9. Oral Reading Fluency as a function of Reading-Grade Level and Group Affiliation with Outliers Removed 73

LIST OF TABLES

Page

Table 1. Correlation Coefficients between WJ III BR measures for Adults 22

Table 2. Correlation Coefficients between DIBELS measures for Adults 24

Table 3. Correlation Coefficients between Orthographic measures for Adults 26

Table 4. Regression Analysis of DIBELS measures on Reading-Grade Level for Adults 28

Table 5. Regression Analysis of Orthographic measures on Reading-Grade Level for Adults 29

Table 6. Regression Analysis of DIBELS and Orthographic measures on Reading-Grade Level for Adults 31

Table 7. Regression Analysis of DIBELS measures on ORF for Adults 32

Table 8. Regression Analysis of Orthographic measures on ORF for Adults 34

Table 9. Regression Analysis of DIBELS and Orthographic measures on ORF for Adults 35

Table 10. Correlation Coefficients between WJ III BR measures for Children 37

Table 11. Correlation Coefficients between DIBELS measures for Children 39

Table 12. Correlation Coefficients between Orthographic measures for Children 40

Table 13. Regression Analysis of DIBELS measures on Reading-Grade Level for Children 42

Table 14. Regression Analysis of Orthographic measures on Reading-Grade Level for Children 44

Table 15. Regression Analysis of DIBELS and Orthographic measures on Reading-Grade Level for Children 45

Table 16. Regression Analysis of DIBELS measures on ORF for Children 47

Table 17. Regression Analysis of Orthographic measures on ORF for Children 48

Table 18. Regression Analysis of DIBELS and Orthographic measures on ORF for Children 50

Table 19. Regression Analysis of Reading-Grade Level and Group Affiliation on ISF 52

Table 20. Regression Analysis of Reading-Grade Level and Group Affiliation on PSF 54

Table 21. Regression Analysis of Reading-Grade Level and
Group Affiliation on NWF 56

Table 22. Regression Analysis of Reading-Grade Level and
Group Affiliation on ORF 59

Table 23. Regression Analysis of Reading-Grade Level and
Group Affiliation on Nonword 62

Table 24. Regression Analysis of Reading-Grade Level and
Group Affiliation on NVD 64

Table 25. Regression Analysis of Reading-Grade Level and
Group Affiliation on NCD 66

Table 26. Regression Analysis of Reading-Grade Level and
Group Affiliation on AWF 69

Table 27. Regression Analysis of Reading-Grade Level and
Group Affiliation on ORF with Outliers Removed 72

Abstract

This study examined the validity of administering Dynamic Indicators of Basic Early Literacy Skills to monitor and direct the instruction of Adult Basic Education Students. Sixty ABE students and 40 elementary school children were administered the DIBELS pre-reading measures, the Woodcock-Johnson III Broad Reading measures and four additional tests of orthographic ability.

In a regression analysis, a significant portion of the variance in the reading-grade levels of adults on the WJ III BR was explained by the DIBELS and orthographic predictors. For children, a significant portion of the variance in reading-grade level on the WJ III BR was explained by the DIBELS measures, but the orthographic measures did not add significantly to the model. The results of this study indicated that DIBELS have the potential to be an effective set of tests to measure adults' reading abilities; they may, however, require additional measures of orthography, in order to account for compensatory strategies adults employ.

Dynamic Indicators of Basic Early Literacy Skills:

An Effective Tool to Assess Adult Literacy Students?

According to the National Assessment of Adult Literacy (U.S. Department of Education, 2003), 43 percent of adults in the United States, or approximately 130 million Americans, are unable to perform basic reading tasks, such as summarizing passages, recognizing author intent, determining what food items contain certain vitamins, making inferences, determining cause and effect relationships, and identifying a specific location on a map. The percentage of adults who perform at the lowest levels of literacy has not changed significantly in the last ten years (U.S. Department of Education, 1993).

Research indicates that low literacy-level Americans are significantly less likely to be able to function in, and contribute to, society. Low level literacy adults are more likely to be unemployed, impoverished, unhealthy, and civically disengaged (Gottesman, Bennet, Nathan, & Kelly, 1996; Kirsch, Jungeblut, Jenkins, & Kolstad, 1993). Those who score in the lowest level of literacy reported voting only 55 percent of the time, compared to 89 percent of the time for the highest-level literacy group (Kirsch, et al., 1993). The percentage of low level literacy adults in poverty was 41-44 percent, compared to only 4-6 percent of adults in the highest level of literacy (Kirsch, et al., 1993). Employment levels across groups also were significantly different. Within the group of adults scoring in the lowest level of literacy, 30 percent of respondents reported being employed full time, compared to 75 percent of adults in the highest level literacy group (Kirsch, et al., 1993).

Research demonstrates that Adult Basic Education (ABE) programs can help low level literacy adults increase employment and earnings, as well as decrease the percentage of participants receiving welfare benefits (Beder, 1999). These programs help foster a better self-image among their students and help students reach their personal and educational goals, including acquiring a General Equivalency Diploma (GED; Beder, 1999). Additionally, ABE programs improve parents' participation in their children's educations, indicating that intergenerational effects on education and earnings are also possible (Beder, 1999).

Although funding is being directed at assessing the effectiveness of ABE programs through empirically-based research, the quantity of studies is still inadequate to effectively address the issue of adult education (Beder, 1999). A disparity remains between the quantities of research available concerning adult literacy, compared to the research available concerning children's literacy: A large body of literature exists on the best way to instruct children, but much less information is available about how best to instruct adults in literacy (NICHD, 2001). As a result, many of the assessment and intervention materials used at

ABE programs are based upon what is known about children. However, adult learners may not acquire literacy skills in the same way as children.

Adult literacy students differ from children in a number of practical and potentially significant ways, such as: 1) more experience with spoken language and, likely, a better grasp of syntax and grammatical rules, which could aid in text comprehension; 2) greater exposure to text in every day life, such as advertising, road signs, packaging, and many other texts that surround adults each day; 3) possession of higher order cognitive functions, which allow them to strategize, think logically, construct arguments, and support ideas in ways that children are not yet able to do (Hoffman, 1978; Perrin, 1988). Several recent studies indicate that these differences have important implications. Adults and children differ in critical aspects of word-recognition (Greenberg, Ehri, & Perin, 1997; Thompkins & Binder, 2003), indicating that more research is necessary to assess the strengths and weaknesses of adult learners.

Recent analyses and critiques of ABE instruction and evaluation have pinpointed the need to tailor instruction to adult needs by means of assessment (Comings, Garner, & Smith, 2000). Through frequent testing, the progress of adult literacy students can be tracked, and the curriculum modified accordingly. Greater student gains are found in classrooms where teachers use assessment for instructional purposes, compared to classrooms where no assessments of student progress are used (Dochy, Segers, & Buehl, 1999). Teachers who use assessment have a greater understanding of their students' needs, and can focus instruction accordingly (Dochy, et al., 1999). Therefore, an optimal assessment tool for ABE students not only would be able to track student progress, but also would be able to guide instruction. Adult literacy programs should follow the lead of successful interventions with young readers (Sabatini, Venezky, Kharik & Jain, 2000), while also recognizing the differences between adults and children in word recognition (Greenberg, et al., 1997; Thompkins & Binder, 2003).

Other factors, which cannot be ignored when considering an adequate assessment or intervention strategy for ABE students, are the unique and sometimes challenging circumstances that surround adult education. One, adults enrolled in ABE classes are not full-time students. In contrast to elementary school education, ABE programs do not run every day, and run only for a few hours on the days they do run. Additionally, attendance tends to be sporadic throughout the time an adult is enrolled in an ABE program. Adult students' lives are complicated by children, limited transportation, and doctors' appointments. Therefore, total instruction time tends to range from 1-9 hours per week. An optimal assessment tool, then, would have a short administration time. Two, locations are not always fixed for ABE programs. Often, ABE students have to meet tutors at libraries, churches, or schools. An optimal assessment tool, therefore, would be highly portable. Three, many adult literacy sites rely heavily on volunteers to help provide instruction. An optimal assessment tool would be easy to administer and score. Four, the students enrolled in most ABE programs are diverse and include many second language learners and English speakers, high school dropouts and older adults. An optimal assessment tool would maintain its integrity across populations of learners. Finally, ABE programs are constantly at risk of losing funding based on outside economic and political factors. An optimal assessment, therefore, would be inexpensive to administer and score.

Current assessments, which come from the National Reporting System's list of federally approved tests, fall short of the above criteria. These tests, which provide program evaluations, are not intended to guide instruction, and are, therefore, ineffective intervention tools. One such assessment, the Test of Adult Basic Education (TABE; CTB McGraw Hill, 1994), is used to monitor student progress by all sites participating in this study. Each ABE site in Massachusetts is mandated, by the Department of Education, to administer the TABE at least three times a year. Although the total combined administration time of the Reading, Language, and Spelling sections of the TABE is 99 minutes, the test is used by ABE sites predominantly to place students in grade-level-appropriate classes.

The TABE is a multiple-choice examination which asks fill-in-the-blank and vocabulary retrieval questions. Questions tend to revolve around "life skills," such as identifying what road signs mean, or finding information on maps, labels, or forms. The test provides a general indication of individual performance through the assignment of grade-level, percentile, and standardized scores. It does not, however, provide information regarding students' strengths and weaknesses in basic word-decoding skills, and it fails to account for compensatory strategies, such as use of context or orthographic cues, that adults might employ (Stanovich, 1980). The TABE, therefore, cannot provide meaningful information to guide instruction (Shepard, 1991; Wiggins, 1992) in early-literacy skills.

Grade level scores provided by the TABE may not even be an accurate representation of students' abilities. Because the test is calibrated into different difficulty levels, administration of the wrong test level can lead to inaccurate and misleading scores (Beder, 1999). Additionally, the TABE is administered as often as every six weeks, despite the existence of only two versions of the test. Thus, student gains on the test could be attributed more to practice effects than to a real change in reading proficiency. Research indicates also that the TABE lacks construct validity, since students are penalized for reading carefully and are rewarded for guessing (Schierloh, 1993). Levels E and M of the TABE, which are given to students of the lowest literacy levels, do not provide a valid assessment of reading comprehension proficiency for the majority of individuals (Schierloh, 1993).

Grade equivalent scores, in general, are limited, given that adults and children who are matched for grade level perform significantly differently on critical aspects of word recognition: Several recent studies have discovered that ABE students tend to outperform children on tests of orthographic knowledge, while demonstrating deficits in the application of phonological analysis (Greenberg, Ehri, & Perin, 1997; Thompkins & Binder, 2003).

In a study of adult and child word-reading processes, students were given a variety of phonologically and orthographically-based tasks (Greenberg, et al., 1997). Phonological tasks included reading nonwords, to test sound-blending, and phoneme deletion, to test students' ability to manipulate phonemes. Orthographic tasks included reading atypically spelled words, to tests students' knowledge of the spelling of individual words, and a wordlikeness choice task, to test students' knowledge of spelling patterns that can and can not occur. Though matched for grade level, adults outperformed children on orthographic tasks, while children outperformed adults on phonological decoding tasks (Greenberg et al., 1997).

A similar study examined the relationships between phonological awareness, memory, orthographic ability, and context, in both ABE students and children, matched on reading-grade level (Thompkins & Binder, 2003). Phonological tasks included a phoneme recognition task, a phoneme deletion task, and a phonological spelling assessment. Orthographic tasks included a wordlikeness task and an orthographic spelling assessment. Additionally, a digit-span task was included to test memory, and a test of word-picture pairs was used to test context. Adults outperformed children on orthographic tasks, use of context, and memory ability, while children outperformed adults on phonological tasks (Thomkins & Binder, 2003). Using grade-equivalent scores to direct instruction, therefore, is inadequate to fully understand a student's reading proficiency. A more appropriate measure could pinpoint the areas in which ABE students were struggling and direct instruction to meet those needs.

One type of assessment that has the potential to meet the needs of the ABE sites is Curriculum-Based Measurement (CBM). Extensively tested over the last 25 years on elementary-aged students with support from the Office of Special Education, CBM has proven to be a valid and reliable assessment tool that can be used to direct instruction and monitor student progress (Fuchs, Fuchs, & Maxwell, 1988; Madelaine & Wheldall, 2004; Marston, 1989; Shin, Deno, Espin, 2000). CBM assesses students' competency and progress in basic skill areas, including reading fluency, written language, and spelling, using aspects of the students' own curriculum. Its popularity as an assessment continues to grow, and has been used for screening, progress-monitoring, and directing student instruction (Madelaine & Wheldall, 2004). Research demonstrates that student achievement is higher when instructors evaluate the CBM results of their students and make pedagogical changes accordingly (Fuchs, Fuchs, & Hamlett, 1989).

In a study examining the effects of repeated CBM and evaluation, 39 special educators, each with three to four students, were randomly assigned to either an experimental or control condition (Fuchs, Deno, & Mirkin, 1984). In the experimental condition, teachers were required to evaluate their students using CBM. Specifically, students were assessed using the Passage Reading Test (PRT), which asked students to read passages aloud for one minute. In the control condition, teachers employed the Structural Analysis and Reading

Comprehension subtests of the Stanford Diagnostic Reading Test, a conventional special-education evaluation. Over the course of an 18-week treatment, researchers studied pedagogical decisions, students' knowledge about their learning, and reading achievement. Results indicated that teachers who employed CBM increased classroom structure, while teachers in the control condition demonstrated a decrease in classroom structure. Students in the CBM condition appeared to be more knowledgeable about their learning than students in the control condition. Additionally, students in the CBM condition were more likely to say they knew their goals, be able to state them, and accurately predict if they could reach them. Perhaps most importantly, this study indicates that greater student achievement was found in the CBM condition (Fuchs, et al., 1984). Not only was this reading proficiency demonstrated on the PRT, which was practiced during the study, but also on measurements of decoding and comprehension, suggesting that gains on the PRT were not task-specific, but also reflective of more general gains in achievement.

The most commonly used CBM is Oral Reading Fluency (ORF; now synonymous with PRT). ORF is, according to some research, the most valid assessment of reading performance (Madelaine & Wheldall, 2004; Marston, 1989). In this test, a student is asked to read passages aloud for one minute. The examiner records the words read correctly per minute (WRCM), which is the total number of words read, minus the total number of errors. This test requires very little time to administer, because students only read aloud for one minute.

Additionally, ORF is designed for frequent and repeated use. Focusing on long-term instructional goals, rather than short-term goals, ORF measures a student's reading fluency, rather than assessing accuracy alone. Fluency, as a skill, is important, because those who demonstrate fluency on a task are more likely to remember what they have learned and to be able to apply their knowledge in new situations (Binder, 1996). ORF also correlates significantly with standardized measures of comprehension (Fuchs, et al., 1988; Shinn & Good, 1992). Indeed, ORF may be a better predictor of overall reading achievement and comprehension than some norm-referenced achievement tests, using the Woodcock-Johnson III as the criterion measure (Ardoin, Witt, Suldo, Connell, Koenig, Resetar, et al., 2004).

One set of CBM tests and materials, which utilize ORF and have proven to be effective progress monitoring tools for elementary school children, are the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2002). DIBELS evaluate essential early literacy skills, as outlined by the National Reading Panel (2000) and the National Research Counsel (1998). The pre-reading measures of the DIBELS assess students' phonological awareness, alphabetic understanding, and reading fluency. Competence on these pre-reading measures has been shown to be directly related to and facilitative of reading competence: Phonemic awareness, sound-symbol relationships, and knowledge of letter names have been identified as predictors of later literacy (Stahl & Murray, 1994; Torgesen, Morgan, & Davis, 1992). In fact, research indicates that the three most crucial early literacy skills are phonological awareness, language skills, and print awareness (Adams, 1990). In addition to ORF, the DIBELS measures include assessments of initial sound fluency (ISF), phoneme segmentation fluency (PSF), and nonsense word fluency (NWF).

As with ORF alone, research suggests that the DIBELS pre-reading measures also have technical adequacy and can be used to monitor student progress and to direct instruction (Good, Simmons, Kame'enui, Kaminski, & Wallin, 2002). In a study of the reliability and validity of DIBELS, 75 kindergarten children who were at risk of reading failure were tested. The results support the use of DIBELS to (1) identify students who would benefit from further instruction; (2) monitor the progress of these students; and, (3) evaluate the effectiveness of instruction in pre-reading skills (Elliot, Lee, & Tollefson, 2001).

In addition to the technical adequacy and proven effectiveness in monitoring and directing student progress, DIBELS meets the criteria of an effect assessment tool in several other ways. The pre-reading measures of DIBELS have a short administration time; all measures can be given in just 10 minutes. DIBELS are also highly portable, and inexpensive, in that the University of Oregon's DIBELS website provides each measure and scoring information, free of charge. Finally, anyone with basic training can administer and score the measures.

The purpose of this study was to evaluate DIBELS in the context of adult education. Recognizing that adult literacy students and elementary school students differ in their strengths and weaknesses, the validity of using DIBELS as an effective assessment tool in ABE sites was compared to the Woodcock-Johnson III broad reading measures, which have been normed on individuals aged 2 to 90. Additionally, because previous studies have shown that ABE students outperform grade-level matched children on tests of orthography (Greenberg et al., 2002; Thompkins & Binder, 2003), three measures of orthographic ability were added to the DIBELS measures, to account for any outside variance in reading-grade level that may exist from the use of orthographically-based compensatory strategies.

I hypothesized that the DIBELS measures would account for a significant portion of the variance in reading-grade level for the adults. I also hypothesized that the four orthographic measures would add significantly to the predictive power of the DIBELS measures. For children, I hypothesized that the DIBELS measures, specifically Oral Reading Fluency, would account for a significant portion of the variance in reading-grade level. I predicted that the orthographic measures would not add significantly the predictive power. Finally, I hypothesized that significant differences would be found between adult participants and child participants on the DIBELS and orthographic measures. I predicted that children would outperform adults on measures of phonological ability; namely, on the DIBELS pre-reading measures of Initial Sound Fluency, Phoneme Segmentation Fluency, and Nonsense Word Fluency. I predicted that adults would outperform children on measures of orthographic ability, such as Nonword, Nonword Vowel Doublets, Nonword Consonant Doublets, and Atypical Word Fluency.

Method

Participants

Sixty native English-speaking or bilingual adult literacy students and 31 native English-speaking or bilingual children participated in the study. Grade-level equivalency for adults and children was determined through administration of four subsections of the Woodcock-Johnson III Broad Reading test. The average reading-grade level was 5.5 for the adult and 5.2 for the child participants.

ABE participants were selected from non-profit, community-based literacy programs in Springfield, MA. The reading-level control population of children was selected from second, third, and fifth grade classrooms in a public school, also located in Springfield, MA. The control population was selected on the basis of its socioeconomic and ethnic diversity to be an approximate match with the ABE sites.

The mean age of the adult participants was 35 years old, with ages ranging from 18 to 64 years of age. The racial background of the sample was varied: 25 individuals were of Hispanic background, 15 were African American, 10 were Jamaican, 5 were White, and 5 were Other (Russian, French, Arab, Philippino, and Portuguese). 62 % of the participants in the study were unemployed. 11 of the participants reported learning disabilities.

The mean age of the children participants was 9 years old, with ages ranging from 7 to 12 years of age. The racial background of the sample was varied: 11 individuals were of Hispanic background, 5 were African American, 6 were White, 5 were of mixed heritage, and 4 were Other (African, Pakastani, Arab, and Ghanian).

All participants were compensated for their participation. Adults received $5 for their participation, and children received the equivalent of $3 in compensation. For each task a child completed, he or she was rewarded with a sticker, pen, pencil, or eraser.

Materials

The following tests were administered:

Woodcock-Johnson III Broad Reading (WJ III BR). The WJ III achievement test (Woodcock, McGrew, & Mather, 2001) is comprised of 22 subtests measuring five curricular areas and has been normed for children age 2 to adults age 90. The four Broad Reading subtests of the WJ III were used in this study: Letter-Word Identification, Reading Fluency, Passage Comprehension, and Word Attack. The BR measures were used to establish the construct validity of the DIBELS pre-reading measures for ABE participants, as well as to assess grade-level equivalency.

WJ III BR Letter-Word Identification (LWI). Each student was asked to read letters and words of increasing difficultly from a flashcard (see Appendix A). Testing was discontinued after a student answered six total letters or words incorrect. Students' scores were the total number of correctly read letters and words. Each score was equated with a reading-grade level equivalency.

WJ III BR Reading Fluency (RF). Each student was asked to read three pages of sentences and identify whether or not the statements were true or false by circling "Y" or "N" respectively (see Appendix B). Testing was discontinued after three minutes. The student's score was the total number of correctly identified sentences minus the number of incorrectly identified sentences. Each score was equated with a reading-grade level equivalency.

WJ III BR Passage Comprehension (PC). Each student was asked to read a series of sentences of increasing difficulty, each with one missing word, and to supply the missing word (see Appendix C). Testing was discontinued after a student provided six total words incorrectly. The student's score was the total number of correctly supplied words. Each score was equated with a reading-grade level equivalency.

WJ III BR Word Attack (WA). Each student was asked to pronounce a series of nonwords of increasing difficultly (see Appendix D). Testing was discontinued after a student pronounced six total words incorrectly. The student's score was the total number of correctly pronounced words. Each score was equated with a reading-grade level equivalency.

DIBELS CBM Oral Reading Fluency (CBM). Each student was instructed to read aloud passages for one minute, while the examiner recorded the words read correctly per minute (WRCM). If a student hesitated for three seconds, the word was provided to the student. Correctly read words were defined as words read correctly the first time or self-corrected by the student. Words read incorrectly were words the student mispronounced, skipped, substituted, or hesitated on for three seconds. The dependent measure was words read correctly per minute. Passages were calibrated at a 3rd-grade level of difficulty based upon Spache readability measures (Good & Kaminski, 2002).

DIBELS Initial Sound Fluency (ISF). Each student was tested on his or her ability to recognize the initial sound of an orally-presented word. Each participant was shown four sets of four pictures each. For each set, the examiner read the name of each picture. Then, the examiner pronounced a letter-sound. The student was asked to identify which of the four pictures began with the sound that the examiner read. For example, the examiner might have asked, "Which of the pictures begins with the sound /p/?" and the correct answer was "plate." The student was also asked to provide the beginning sound of one of the pictures in a set (see Appendix E). For example, the examiner might have asked, "What sound does mule begin with?" and the student needed to reply "/m/." The examiner recorded the number of correctly identified pictures and sounds produced by the student. This number then was converted into the number of initial sounds given correctly per minute. Total administration time for ISF was approximately three minutes. Testing was discontinued if the student did not identify any of the first five items correctly.

DIBELS Phoneme Segmentation Fluency (PSF). Each student was asked to fragment words of two to five phonemes into their component phonemes. The examiner read a word, such as “mop,” and the student was asked to break the word up into its individual phonemes, “/m/ /o/ /p/” (see Appendix F). After the student completed one word, the examiner read another. This process continued for one minute. The number of correct phonemes provided per minute was the dependent measure. If a student was not able to provide any of the correct phonemes in the first five words, testing was discontinued.

DIBELS Nonsense word fluency (NWF). Each student was evaluated on his or her understanding of letter-sound correspondence and blending. Pronounceable vowel-consonant and consonant-vowel-consonant nonsense words were presented to students on a sheet of paper (see Appendix G). The student read as many of the nonsense words as he or she could in one minute. The dependent measure was the number of correct letter sounds produced per minute.

Atypical word fluency (AWF). Adapted from Adams and Huggins (1985), this test evaluated each student’s ability to read atypically spelled words. The student was given a list of 50 atypically spelled words (see Appendix H), in order of lowest to highest difficulty, and asked to read them aloud. Words read correctly out of the total number of words were the dependent measure. Testing was discontinued if the student read 10 words wrong in a row.

Nonword task (NW). Developed by Siegal, Share, and Geva (1995), this test evaluated each student’s ability to identify which nonwords looked more word-like in the English language. The student was shown two nonwords -- one that could occur in the English language at the end of a word, and one that contains a bigram that could not occur in the English language at the end of a word -- and was asked to identify which “look[ed] more like it could be a word” (see Appendix I). The number of correctly identified nonwords was the dependent measure.

Nonword Consonant Bigram task (NWCB): Developed by Cassar and Treiman (1997), this test evaluated each student’s ability to identify which nonwords were grammatically correct in the English language. The student was shown two nonwords, one that contained a consonant bigram, such as “bb,” that could occur in the English language, and one which contained a bigram that could not occur, such as “jj,” and were asked to identify which “look[ed] more like it could be a word” (see Appendix J) The number of nonwords correctly identified was the dependent measure.

Nonword Vowel Bigram task (NWVB): Developed by Cassar and Treiman (1997), this test evaluated each student’s ability to identify which nonwords were grammatically correct in the English language. The student was shown two nonwords, one that contained a vowel bigram, such as “ee,” that could occur in the English language, and one which contained a bigram, such as “aa,” that could not occur, and were asked to identify which “look[ed] more like it could be a word” (see Appendix J). The number of nonwords correctly identified is the dependent measure.

Procedure

Tests were administered in two 15-20 minute time blocks. On the first test administration day, the examiner read consent forms to the adult participants or asked the child participants if they wanted to participate in some reading activities. All adults who wished to participate in the study signed consent forms. All children who wished to participate had previously returned consent forms, which had been signed by their parents or legal guardians. Each participant completed a brief oral demographics survey and then was given the four WJ III BR measures.

On the second day of test administration, the participants were asked to complete the four DIBELS measures. They also were asked to complete the four orthographic nonword tasks and to read the atypical word list. After completion of all tasks, participants were thanked for their participation and adults were read a debriefing statement. Any questions participants had about the study were answered at this time.

Results

The four Woodcock-Johnson III Broad Reading measures were used to determine grade-level equivalency for all participants in the study. Because the four measures – Letter-Word Identification, Reading Fluency, Passage Comprehension, and Word Attack – were averaged to find a single reading-grade level score, a positive relationship was expected to exist between each of the measures. Correlations were run to determine if positive relationships existed between the four Woodcock-Johnson III Broad Reading measures. All correlations were significantly positively related (see Table 1). Letter-Word Identification was positively correlated with Reading Fluency, $r(60) = .32$, $p < .05$, Passage Comprehension, $r(60) = .35$, $p < .01$, and Word Attack, $r(60) = .70$, $p < .01$. Reading Fluency also was positively correlated with Passage Comprehension, $r(60) = .79$, $p < .01$, and Word Attack, $r(60) = .37$, $p < .01$. Passage Comprehension was positively correlated with Word Attack, $r(60) = .42$, $p < .05$. Because all four measures were positively correlated, it is reasonable to say that they are measuring the same construct, reading skill, and can be combined into one composite score.

The DIBELS measured an individual's proficiency with word decoding. Because the four measures – Initial Sound Fluency, Phoneme Segmentation

Table 1

Correlation Coefficients between WJ III BR measures for Adults

Tasks	1	2	3	4
1. Letter-Word Identification	--	.32*	.35**	.70**
2. Reading Fluency	--	--	.79**	.37**
3. Passage Comprehension	--	--	--	.42**
4. Word Attack	--	--	--	--

Note. There were 60 participants per cell. *p<.05. **p<.01.

Fluency, Nonsense Word Fluency, and Oral Reading Fluency – were testing elements of the same set of basic literacy skills, each was expected to be positively related to the others. Correlations were run to determine if positive relationships existed between the four DIBELS measures (see Table 2). Initial Sound Fluency was positively correlated with Phoneme Segmentation Fluency, $r(57) = .51$, $p < .01$ and Oral Reading Fluency, $r(57) = .39$, $p < .01$, but did not share a significant relationship with Nonsense Word Fluency, $r(57) = .09$, $p > .05$. Phoneme Segmentation Fluency was also positively correlated with Oral Reading Fluency, $r(57) = .30$, $p < .05$, but shared no relationship with Nonsense Word Fluency, $r(57) = .07$, $p > .05$. Nonsense Word Fluency was only positively correlated with Oral Reading Fluency, $r(57) = .66$, $p < .01$. These analyses indicated that Initial Sound Fluency, Phoneme Segmentation Fluency, and Nonsense Word Fluency all shared positive relationships with reading ability, or Oral Reading Fluency; however, Nonsense Word Fluency, or the ability to decode new words, did not share a significant relationship with Initial Sound Fluency or Phoneme Segmentation Fluency, which tested students' ability to decode words they already knew. It is possible that adults approach decoding tasks differently when they are familiar with a word than they do when the word is unfamiliar.

The four orthographic measures were added to the DIBELS measures to test participants' knowledge of spelling rules. Because each of these tests – Nonword, Nonword Consonant Doublets, Nonword Vowel Doublets, and

Table 2

Correlation Coefficients between DIBELS measures for Adults

Tasks	1	2	3	4
1. Initial Sound Fluency	--	.51**	.09	.39**
2. Phoneme Segmentation Fluency	--	--	.07	.30*
3. Nonsense Word Fluency	--	--	--	.66**
4. Oral Reading Fluency	--	--	--	--

Note. There were 57 participants per cell. *p<.05. **p<.01.

Atypical Word Fluency – examined a participant's knowledge of orthographic patterns, I predicted that a positive relationship would exist among the four measures. Correlations were run to determine if positive relationships existed between the four orthographic measures (see Table 3). Nonwords was positively correlated with Nonword Vowel Doublets, $r(57) = .47$, $p < .01$, but shared no relationship with Nonword Consonant Doublets, $r(57) = .17$, $p > .05$ or with Atypical Word Fluency, $r(57) = .14$, $p > .05$. Nonword Vowel Doublets and Nonword Consonant Doublets were positively correlated, $r(57) = .72$, $p < .01$. Atypical Word Fluency was negatively correlated with the Nonword Consonant Doublets, $r(57) = -.35$, $p < .01$, but shared no correlation with the Nonword Vowel Doublets, $r(57) = -.24$, $p > .05$. These findings indicate that, overall, the nonword tasks were correlated with one another, but that Atypical Word Fluency either did not correlate, or was negatively correlated, with the nonword tasks. It is likely that reading-grade level is a mediating factor between an adult's performance on Atypical Word Fluency, and his or her performance on the nonword tasks. As an adult's reading-grade level increased, so did his or her score on Atypical Word Fluency. Scores on the nonword tasks, however, decreased with increases in reading-grade level. It may be the case that an adult employed a more phonologically-based strategy to the nonword tasks as his or her reading-grade level increased.

A regression analysis was conducted to assess the amount of variance in reading-grade level for adults on the Woodcock-Johnson III Broad Reading test

Table 3

Correlation Coefficients between Orthographic measures for Adults

Tasks	1	2	3	4
1. Nonwords	--	.48**	.17	.14
2. Nonword Vowel Doublets	--	--	.72**	-.24
3. Nonword Consonant Doublets	--	--	--	-.35**
4. Atypical Word Fluency	--	--	--	--

Note. There were 57 participants per cell. *p<.05. **p<.01.

that was explained by the DIBELS measures. I hypothesized that Initial Sound Fluency, Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency would account for a significant portion of the variance in reading-grade level. Analysis confirmed that the four DIBELS pre-reading measures accounted for 58.7% of the variance in reading-grade level, $F(4, 52) = 18.50$, $p < .001$, indicating that they are strong predictors of reading-grade level in an adult population (see Table 4). Nonsense Word Fluency was significant beyond the variance it shared with the other measures, $t = 4.10$, $p < .001$, as was Oral Reading Fluency, $t = 4.00$, $p<.05$.

A second regression analysis was conducted to determine if the four orthographic measures accounted for a significant portion of the variance in reading-grade level for adults. I hypothesized that Nonword, Nonword Consonant Doublets, Nonword Vowel Doublets, and Atypical Word Fluency would account for a significant portion of the variance in reading-grade level. Analysis confirmed that the four orthographic measures accounted for 47.4% of the variance in reading-grade level, F (4, 52) =11.70, $p < .001$, indicating that adults do use orthographic strategies to decode words (see Table 5). Atypical Word Fluency, however, was the only variable which remained significant beyond the variance it shared with the other orthographic variables, $t = 5.68$, $p < .001$.

A third regression analysis was conducted to determine whether or not the combined DIBELS and orthographic measures could account for a significant portion of the variance in reading-grade level. That analysis indicated that the

Table 4

Regression Analysis of DIBELS measures on Reading-Grade Level for Adults

Tasks	B	t
Initial Sound Fluency	.003	.17
Phoneme Segmentation Fluency	.021	.63
Nonword Fluency	.030	4.00**
Oral Reading Fluency	.021	2.52*

Note. There were 57 participants per cell. *p<.05. **p<.01

Table 5

Regression Analysis of Orthographic measures on Reading-Grade Level for Adults

Tasks	B	t
Nonwords	.05	.22
Nonword Vowel Doublets	-.08	-.61
Nonword Consonant Doublets	-.06	-.33
Atypical Word Fluency	.14	5.68**

Note. There were 57 participants per cell. *p<.05. **p<.01

combined DIBELS and orthographic measures accounted for 65.8% of the variance in reading-grade level, $F(8,48) = 11.56$, $p < .001$ (see Table 6). Two individual variables were significant beyond the variance shared with the six other variables. Namely, Nonsense Word Fluency, $t = 4.54$, $p < .001$ and Atypical Word Fluency, $t = 2.60$, $p < .05$ remained significant.

A Sums-of-Squares F-test was conducted to determine if the full model, comprised of DIBELS and orthographic predictors, accounted for significantly more variance in reading-grade level than the reduced model, containing DIBELS measures alone. Analysis revealed a marginally significant difference between models, $F(4,48) = 2.50$, $p = .055$. These results indicate that the addition of orthographic predictors to the DIBELS measures has the potential to add significantly to the predictive power for adults.

Because Oral Reading Fluency also has been shown to be an accurate measure of reading ability (Ardoin, et al., 2004), a regression analysis was conducted to determine whether or not a significant amount of the variance in Oral Reading Fluency for adults was explained by the tests of Initial Sound Fluency, Phoneme Segmentation Fluency, and Nonsense Word fluency. I hypothesized that ISF, PSF, and NWF would account for a significant portion of the variance in adults Oral Reading Fluency. Analysis confirmed that these three pre-reading measures accounted for 55 % of the variance in ORF, $F(3, 53) = 21.62$, $p < .001$, indicating that, for adults, phonetic measures -- ISF, PSF, and NWF -- are good predictors of Oral Reading Fluency (see Table 7). Initial Sound

Table 6

Regression Analysis of DIBELS and Orthographic measures on Reading-Grade Level for Adults

Tasks	B	t
Initial Sound Fluency	.01	.51
Phoneme Segmentation Fluency	.03	.88
Nonword Fluency	.04	4.54**
Oral Reading Fluency	-.00	-.36
Nonword	-.18	-.84
Nonword Vowel Doublets	-.14	-1.20
Nonword Consonant Doublets	.15	.95
Atypical Word Fluency	.09	2.60*

Note. There were 57 participants per cell. *p<.05. **p<.01

Table 7

Regression Analysis of DIBELS measures on ORF for Adults

Tasks	B	t
Initial Sound Fluency	.62	.2.55*
Phoneme Segmentation Fluency	.57	1.07
Nonword Fluency	.60	6.75**

Note. There were 57 participants per cell. *p<.05. **p<.01

Fluency, $t = 2.55$, $p < .05$ and Nonsense Word Fluency, $t = 6.75$, $p < .001$ were significant individual variables, while Phoneme Segmentation Fluency, $t = 1.07$, $p > .05$ was not significant beyond the variance it shared with the other variables. A second regression analysis was conducted to determine if the four orthographic measures accounted for a significant portion of the variance in ORF for adults. I hypothesized that Nonword, Nonword Consonant Doublets, Nonword Vowel Doublets, and Atypical Word Fluency would account for a significant portion of the variance in ORF. Analysis confirmed that the four orthographic measures accounted for 71% of the variance in ORF, $F(4, 52) = 31.89$, $p < .001$, indicating that for adults, a use of orthographic strategies is predictive of ORF (see Table 8). Atypical Word Fluency, however, was the only variable significant beyond the variance it shared with the other orthographic variables, $t = 9.50$, $p < .001$.

A third regression analysis was conducted to determine whether or not a significant portion of the variance in ORF was accounted for by the DIBELS pre-reading measures and orthographic tasks combined. Analysis indicated that the combination of DIBELS and orthographic measures accounted for 79.8% of the variance in ORF, $F(7, 49) = 27.60$, $p < .001$ (see Table 9). Only Nonsense Word Fluency, $t = 3.97$, $p < .001$ and Atypical Word Fluency, $t = 7.02$, $p < .001$ were significant beyond the variance shared with the other six measures.

A Sums-of-Squares F-test was conducted to determine if the full model, comprised of the DIBELS pre-reading measures and orthographic predictors, accounted for significantly more variance in reading-grade level than the reduced

Table 8

Regression Analysis of Orthographic measures on ORF for Adults

Tasks	B	t
Nonwords	3.33	1.19
Nonword Vowel Doublets	-2.13	-1.36
Nonword Consonant Doublets	.28	.14
Atypical Word Fluency	2.66	9.50**

Note. There were 57 participants per cell. *p<.05. **p<.01

Table 9

Regression Analysis of DIBELS and Orthographic measures on ORF for Adults

Tasks	B	t
Initial Sound Fluency	.29	1.53
Phoneme Segmentation Fluency	.48	1.25
Nonsense Word Fluency	.32	3.97**
Nonword	.26	.101
Nonword Vowel Doublets	-2.33	-1.70
Nonword Consonant Doublets	2.00	1.07
Atypical Word Fluency	1.99	7.02**

Note. There were 57 participants per cell. *p<.05. **p<.01

model, containing the DIBELS pre-reading measures alone. Analysis revealed a significant difference between models, $F(4,49) = 14.98$, $p < .001$, indicating that the addition of orthographic predictors to the DIBELS pre-reading measures added significantly to the predictive power of the model for adults.

Analyses were run on the data for a comparison group of children. All analyses were parallel to analyses run on the adult data. Correlations were run to determine if positive relationships existed between the four Woodcock-Johnson III Broad Reading measures. All correlations were significantly positively related (see Table 10). Letter-Word Identification was positively correlated with Reading Fluency, $r(31) = .81$, $p < .001$, Passage Comprehension, $r(31) = .84$, $p < .001$, and Word Attack, $r(31) = .83$, $p < .001$. Reading Fluency also was positively correlated with Passage Comprehension, $r(31) = .70$, $p < .001$, and Word Attack, $r(31) = .62$, $p < .001$. Passage Comprehension was positively correlated with Word Attack, $r(31) = .60$, $p < .001$. Because all four measures were highly positively correlated, it is reasonable to say that they are measuring the same construct, reading skill, and could be combined into one composite score.

The Dynamic Indicators of Basic Early Literacy Skills measured an individual's proficiency with word decoding. For adults, it was expected that Initial Sound Fluency, Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency would be positively related to one another. For children, however, this relationship was not expected. Because the DIBELS pre-reading measures of ISF, PSF, and NSF were intended for use with children in

Table 10

Correlation Coefficients between WJ III BR measures for Children

Tasks	1	2	3	4
1. Letter-Word Identification	--	.81*	.84**	.83**
2. Reading Fluency	--	--	.70**	.62**
3. Passage Comprehension	--	--	--	.60**
4. Word Attack	--	--	--	--

Note. There were 31 participants per cell. *p<.05. **p<.01.

third grade and below, the current sample, with its mean reading-grade level of 5.2, was expected to hit ceiling on these measures. Only ORF was expected to continue to hold predictive power. Therefore, no meaningful relationships were expected between subtests. Correlations were run to determine if positive relationships existed between the four DIBELS measures (see Table 11). Only Nonsense Word Fluency and Oral Reading Fluency were positively correlated, $r(30) = .65$, $p < .001$. Initial Sound Fluency shared no relationship with Phoneme Segmentation Fluency, $r(30) = .25$, $p > .05$, Nonsense Word Fluency, $r(30) = .14$, $p > .05$, or Oral Reading Fluency, $r(30) = .35$, $p > .05$. Phoneme Segmentation Fluency also shared no relationship with Nonsense Word Fluency, $r(30) = -.04$, $p > .05$ or Oral Reading Fluency, $r(30) = -.40$, $p > .05$. These analyses indicated that, for children scoring at 5.2 on reading-grade level, the DIBELS measures do not hang together as cohesive measures of word decoding ability.

The four orthographic measures – Nonword, Nonword Consonant Doublets, Nonword Vowel Doublets, and Atypical Word Fluency – examined a participant's knowledge of spelling rules, and I predicted that a positive relationship would exist among the four measures. Correlations were run to determine if positive relationships existed between the four orthographic measures (see Table 12). Nonword was positively correlated with Nonword Vowel Doublets, $r(30) = .39$, $p < .05$ and with Atypical Word Fluency, $r(30) = .60$, $p < .01$, but shared no relationship with Nonword Consonant Doublets, $r(30) = .23$, $p > .05$. Nonword Vowel Doublets was positively correlated with Nonword

Table 11

Correlation Coefficients between DIBELS measures for Children

Tasks	1	2	3	4
1. Initial Sound Fluency	--	.23**	.14	.35
2. Phoneme Segmentation Fluency	--	--	-.04	-.04
3. Nonsense Word Fluency	--	--	--	.65**
4. Oral Reading Fluency	--	--	--	--

Note. There were 30 participants per cell. $^{*}p<.05$. $^{**}p<.01$.

Table 12

Correlation Coefficients between Orthographic measures for Children

Tasks	1	2	3	4
1. Nonwords	--	.39*	.23	.60**
2. Nonword Vowel Doublets	--	--	.42*	.47**
3. Nonword Consonant Doublets	--	--	--	.58**
4. Atypical Word Fluency	--	--	--	--

Note. There were 30 participants per cell. *p<.05. **p<.01.

Consonant Doublets, *r*(30) = .42, $p < .05$ and Atypical Word Fluency, *r*(30) = .47, $p<.01$. Nonword Consonant Doublets was also positively correlated with Atypical Word Fluency, *r*(30) = .58, $p<.01$ These findings indicate that, overall, the nonword tasks were correlated with one another.

A regression analysis was conducted to assess the amount of variance in reading-grade level for children on the Woodcock-Johnson III Broad Reading measures explained by the Dynamic Indicators of Basic Early Literacy Skills. I hypothesized that Initial Sound Fluency, Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency would account for a significant portion of the variance in reading-grade level, but that Oral Reading Fluency alone would hold most of the predictive value. Analysis confirmed that the four DIBELS pre-reading measures accounted for 81.6% of the variance in reading-grade level, $F(4, 25) = 27.70$, $p < .001$, indicating that they were strong predictors of reading-grade level for children (see Table 13). As predicted, only Oral Reading Fluency was significant beyond the variance it shared with the other measures, $t = 8.52$, $p < .001$.

A second regression analysis was conducted to determine if the four orthographic measures accounted for a significant portion of the variance in reading-grade level for children. I hypothesized that Nonword, Nonword Consonant Doublets, Nonword Vowel Doublets, and Atypical Word Fluency would not account for a significant portion of the variance in reading-grade level. Analysis indicated that the four orthographic measures accounted for 68.9% of the

Table 13

Regression Analysis of DIBELS measures on Reading-Grade Level for Children

Tasks	B	T
Initial Sound Fluency	-.01	-1.02
Phoneme Segmentation Fluency	.02	.79
Nonword Fluency	-.01	-1.32
Oral Reading Fluency	.06	8.52**

Note. There were 30 participants per cell. *p<.05. **p<.01

variance in reading grade level, F (4, 25) =13.85, $p < .001$, indicating that children may also use some orthographic strategies to decode words (see Table 14). Atypical Word Fluency was the only subtest which remained significant beyond the variance it shared with the other orthographic variables, $t = 4.21$, $p < .001$.

A third regression analysis was conducted to determine whether or not the combined DIBELS and orthographic measures accounted for a significant portion of the variance in reading-grade level for children. That analysis indicated that the combined DIBELS and orthographic measures accounted for 85.4% of the variance in reading-grade level, $F(8,21) =15.34$, $p < .001$ (see Table 15). Two individual variables were significant beyond the variance shared with the six other variables. Namely, Nonsense Word Fluency, $t = 4.63$, $p < .001$ and Atypical Word Fluency, $t = 2.79$, $p < .05$ remained significant.

A Sums-of-Squares F-test was conducted to determine if the full model, comprised of DIBELS and orthographic predictors, accounted for significantly more variance in reading-grade level than the reduced model, containing DIBELS measures alone. Analysis revealed no difference between models, $F(4,21) = 1.36$, $p > .05$. These results indicate that the addition of orthographic predictors to the DIBELS adds no predictive power to the model for children.

A regression analysis was conducted to determine whether or not a significant amount of the variance in Oral Reading Fluency for children on the

Table 14

Regression Analysis of Orthographic measures on Reading-Grade Level for Children

Tasks	B	T
Nonwords	.04	.33
Nonword Vowel Doublets	-.07	-.87
Nonword Consonant Doublets	.18	1.35
Atypical Word Fluency	.16	4.21**

Note. There were 30 participants per cell. *p<.05. **p<.01

Table 15

Regression Analysis of DIBELS and Orthographic measures on Reading-Grade Level for Children

Tasks	B	T
Initial Sound Fluency	-.02	-1.03
Phoneme Segmentation Fluency	.01	.52
Nonword Fluency	-.01	-.97
Oral Reading Fluency	.04	4.00**
Nonword	-.04	-.29
Nonword Vowel Doublets	-.07	-1.18
Nonword Consonant Doublets	.04	.32
Atypical Word Fluency	.07	1.84*

Note. There were 30 participants per cell. *p<.05. **p<.01

DIBELS measures was explained by the tests of Initial Sound Fluency, Phoneme Segmentation Fluency, and Nonsense Word fluency. I hypothesized that ISF, PSF, and NWF would account for a significant portion of the variance in adults Oral Reading Fluency. Analysis confirmed that these three pre-reading measures accounted for 49.1 % of the variance in ORF, $F(3, 26) = 8.37$, $p < .001$, indicating that, for children, phonetic measures -- ISF, PSF, and NWF -- are good predictors of Oral Reading Fluency (see Table 16). Nonsense Word Fluency, $t = 4.27$, $p < .001$ was a significant individual variable, while Phoneme Segmentation Fluency, $t = -.54$, $p > .05$, was not significant beyond the variance it shared with the other variables and Initial Sound Fluency was only marginally significant, $t = 1.92$, $p = .07$.

A second regression analysis was conducted to determine if the four orthographic measures accounted for a significant portion of the variance in ORF for children. I hypothesized that Nonword, Nonword Consonant Doublets, Nonword Vowel Doublets, and Atypical Word Fluency would not account for a significant portion of the variance in ORF. Analysis revealed that the orthographic measures accounted for 65.4% of the variance in ORF, $F(4, 25) = 11.84$, $p < .001$, indicating that for children, use of orthographic strategies is predictive of ORF (see Table 17). Atypical Word Fluency, however, was the only subtest significant beyond the variance it shared with the other orthographic variables, $t = 3.66$, $p < .001$.

Table 16

Regression Analysis of DIBELS measures on ORF for Children

Tasks	B	T
Initial Sound Fluency	.62	1.92
Phoneme Segmentation Fluency	-.33	-.54
Nonword Fluency	.66	4.27**

Note. There were 30 participants per cell. *p<.05. **p<.01

Table 17

Regression Analysis of Orthographic measures on ORF for Children

Tasks	B	t
Nonwords	1.61	.63
Nonword Vowel Doublets	-.25	-.16
Nonword Consonant Doublets	2.56	.98
Atypical Word Fluency	2.65	3.66**

Note. There were 30 participants per cell. *p<.05. **p<.01

A third regression analysis was conducted to determine whether or not a significant portion of the variance in ORF was accounted for by the DIBELS pre-reading measures and orthographic tasks combined. Analysis indicated that the inclusion of all measures accounted for 82.9% of the variance in ORF, $F(7, 22) = 15.29$, $p < .001$ (see Table 18). Only Nonsense Word Fluency, $t = 4.63$, $p < .001$ and Atypical Word Fluency, $t = 2.79$, $p < .001$ were significant beyond the variance shared with the other six measures.

A Sums-of-Squares F-test was conducted to determine if the full model, comprised of the DIBELS pre-reading measures and orthographic predictors, accounted for significantly more variance in reading-grade level than the reduced model, containing the DIBELS pre-reading measures alone. Analysis revealed a significant difference between models, $F(4,22) = 10.91$, $p < .001$, indicating that the addition of orthographic predictors to the DIBELS pre-reading measures added significantly to the predictive power of the model for children.

According to the regression analyses reported thus far, the DIBELS measures and orthographic measures are predictive of reading-grade level for both adults and children. The orthographic measures do not add to the predictive power of the DIBELS measures, when calculating reading-grade level for children. They do, however, add to the predictive power for adults when calculating both reading-grade level and Oral Reading Fluency, and for children when calculating Oral Reading Fluency. This seems inconsistent with past research (Greenberg et al, 1997; Thompkins & Binder, 2003).

Table 18

Regression Analysis of DIBELS and Orthographic measures on ORF for Children

Tasks	B	t
Initial Sound Fluency	-.15	-.53
Phoneme Segmentation Fluency	-.30	-.78
Nonsense Word Fluency	.53	4.63**
Nonword	4.93	2.26
Nonword Vowel Doublets	.31	.26
Nonword Consonant Doublets	.37	.16
Atypical Word Fluency	1.80	2.79**

Note. There were 30 participants per cell. *p<.05. **p<.01

In order to pinpoint the differences between adults and children on tests of phonology and orthography, several more regression analyses were conducted. For each analysis, group affiliation (adult or child) and reading-grade level were entered as predictors, with the individual tasks as the outcome measures. It was necessary, in several cases, to include the interaction between group affiliation and reading-grade level as a predictor as well. Interactions were included in the analysis when a Sums-of-Squares F-test indicated that the inclusion of this third variable added significant predictive power to the model.

Regression analyses were conducted to determine if group affiliation and reading-grade level accounted for significant portions of the variance in Initial Sound Fluency, Phoneme Segmentation Fluency, and Nonsense Word Fluency, respectively. Analyses indicated that group affiliation and reading-grade level accounted for 13.5% of the variance in Initial Sound Fluency, $F(2, 84) = 6.55$, $p < .005$ (see Table 19), with both reading-grade level, $t = 2.21$, $p < .05$, and group affiliation, $t = 2.93$, $p < .005$, as significant variables (see Figure 1); 33.4% of the variance in Phoneme Segmentation Fluency, $F(2, 84) = 21.04$, $p < .001$ (see Table 20), with only group affiliation, $t = 6.40$, $p < .001$ as significant (see Figure 2), and; 44.7% of the variance in Nonsense Word Fluency, $F(2, 84) = 33.94$, $p < .001$ (see Table 21), with both reading-grade level, $t = 7.74$, $p < .001$, and group affiliation, $t = 3.06$, $p < .005$, as significant variables (see Figure 3). These results indicate that, consistent with past research, children outperformed adults on measures of phonological decoding ability.

Table 19

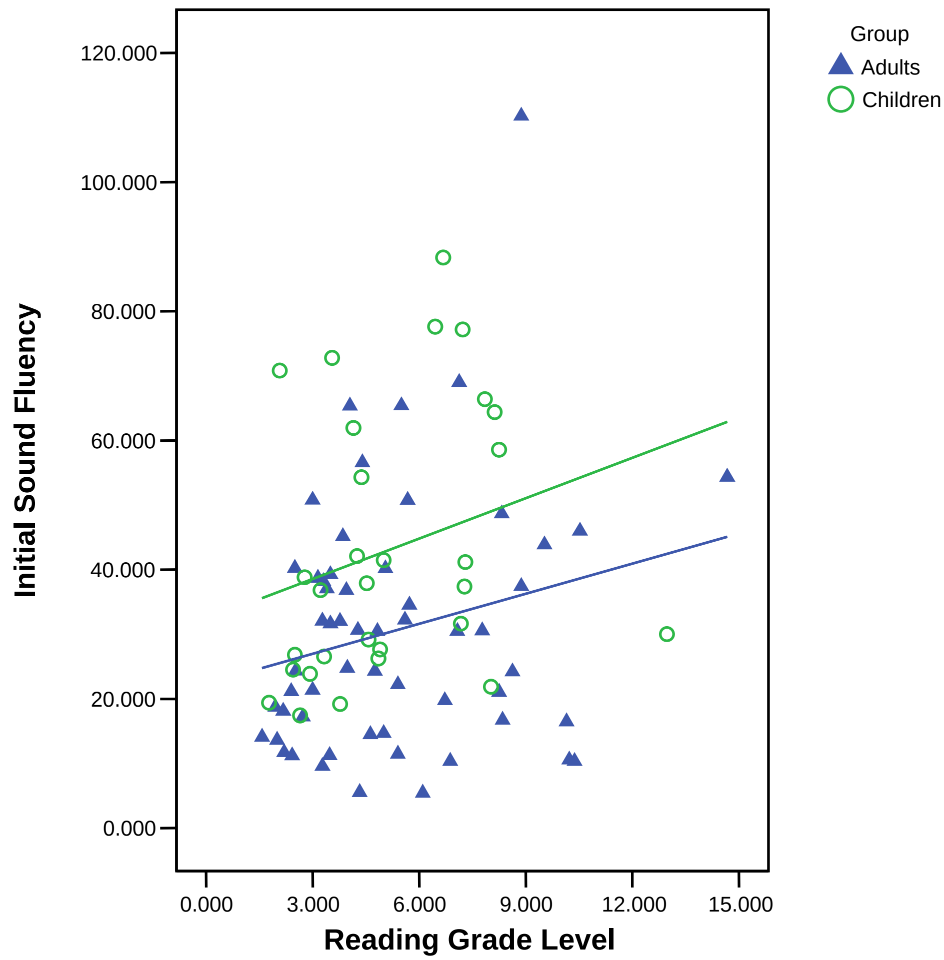
Regression Analysis of Reading-Grade Level and Group Affiliation on ISF

Predictors	B	T
Reading-Grade Level	1.71	2.21*
Group Affiliation	12.78	2.93**

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 1. Initial Sound Fluency as a function of Reading-Grade Level and Group Affiliation



Group
Adults
Children
Initial Sound Fluency
120.000
100.000
80.000
60.000
40.000
20.000
0.000
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level

Table 20

Regression Analysis of Reading-Grade Level and Group Affiliation on PSF

Predictors	B	T
Reading-Grade Level	.476	1.24
Group Affiliation	13.79	6.40**

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 2. Phoneme Segmentation Fluency as a function of Reading-Grade Level and Group Affiliation

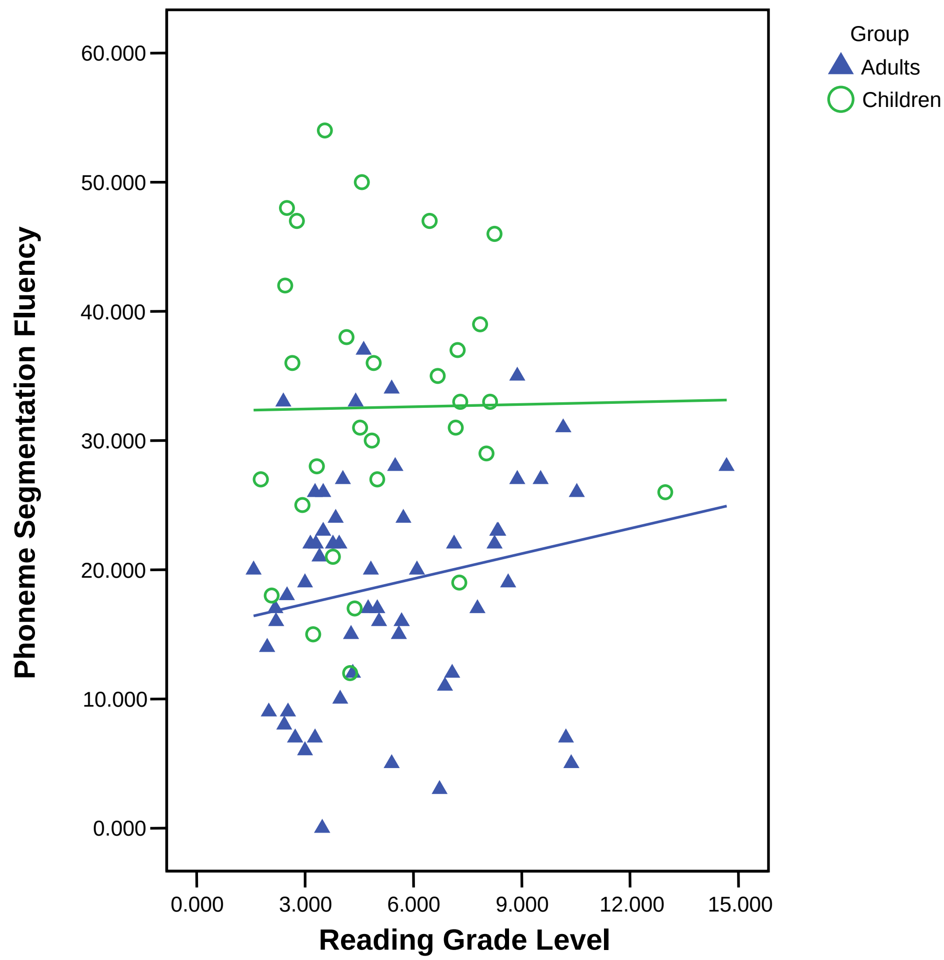

Group
Adults
Children
Phoneme Segmentation Fluency
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level

Table 21

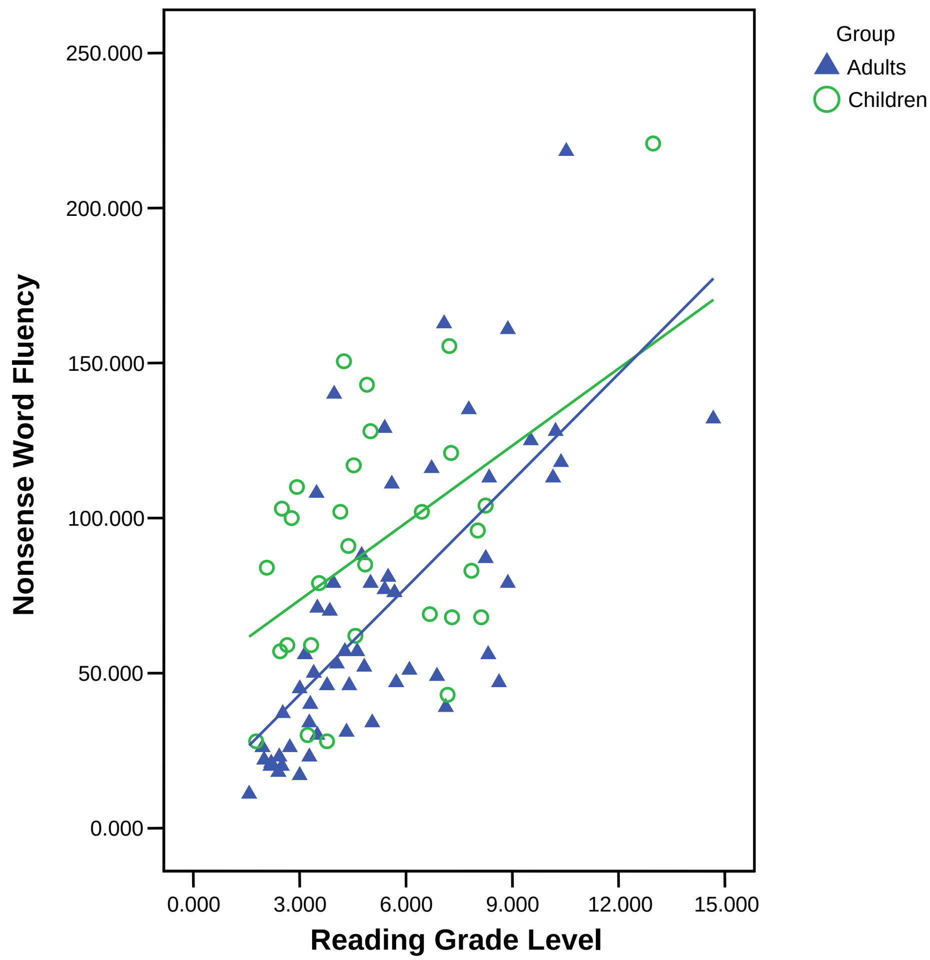
Regression Analysis of Reading-Grade Level and Group Affiliation on NWF

Predictors	B	t
Reading-Grade Level	10.55	7.74**
Group Affiliation	23.45	3.06*

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 3. Nonsense Word Fluency as a function of Reading-Grade Level and Group Affiliation


Group
Adults
Children
250.000
200.000
150.000
100.000
50.000
0.000
Nonsense Word Fluency
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level

For each phonological measure, regressions were also conducted including group affiliation, reading-grade level and an interaction term. A Sums-of-Squares F-test was conducted to determine if the full model, which included the interaction term, was more accurate than the reduced model, which did not. Analyses indicated no difference between models for Initial Sound Fluency, $F(1, 83) = .10$, $p > .05$, Phoneme Segmentation Fluency, $F(1, 83) = .49$, $p > .05$, or Nonsense Word Fluency, $F(1, 83) = 1.20$, $p > .05$. Therefore, only the results of the reduced model were reported.

A regression analysis was conducted to determine if group affiliation, reading-grade level, and an interaction between the two variables accounted for a significant portion of the variance in Oral Reading Fluency. Analysis indicated that the group affiliation, reading-grade level, and the interaction between the two variables accounted for 59.4% of the variance in ORF, $F(2, 84) = 55.84$, $p < .001$ (see Table 22). Reading-grade level, $t = 7.63$, $p < .001$, group affiliation, $t = -2.92$, $p < .005$, and the interaction, $t = 2.20$, $p < .05$, were each significant variables. Results indicated that adults outperformed children on ORF at lower reading-grade levels, and children outperformed adults at higher reading-grade levels (see Figure 4).

A regression which included group affiliation and reading-grade level, but not the interaction term was also run. A Sums-of-Squares F-test was then conducted to determine if the full model, which included the interaction term, was more accurate than the reduced model, which did not. Analyses indicated a

Table 22

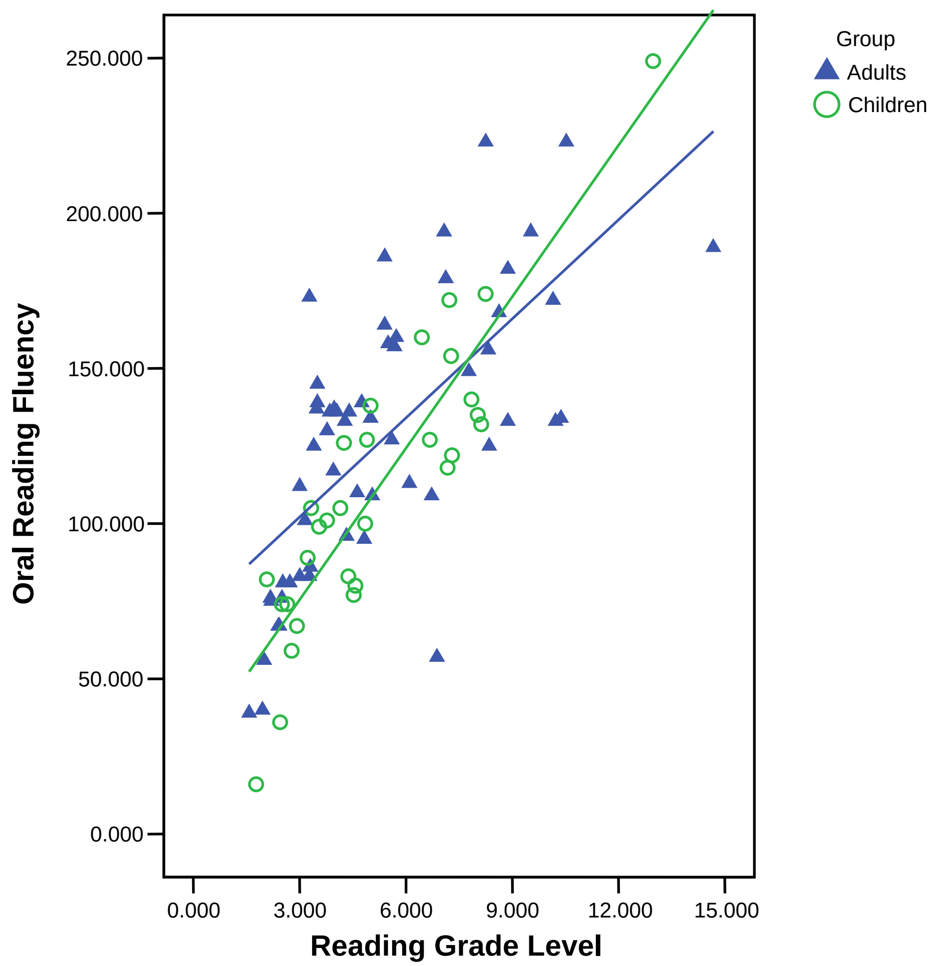
Regression Analysis of Reading-Grade Level and Group Affiliation on ORF

Predictors	B	t
Reading-Grade Level	10.64	7.63**
Group Affiliation	-43.56	-2.92*
RGLxGroup	5.63	2.18*

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 4. Oral Reading Fluency as a function of Reading-Grade Level and Group Affiliation



Oral Reading Fluency
250.000
200.000
150.000
100.000
50.000
0.000
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level
Group
Adults
Children

significant difference between models, $F(1, 83) = 4.83$, $p < .05$. Therefore, only the results of the full model were reported.

Regression analyses were conducted to determine if group affiliation, reading-grade level, and an interaction term accounted for significant portions of the variances for each of the orthographic nonword measures; Nonword, Nonword Vowel Doublets, and Nonword Consonant Doublets, respectively. Analysis indicated that group affiliation, reading-grade level, and the interaction term accounted for 40.2% of the variance in Nonword performance, $F(2, 84) = 5.32$, $p < .005$ (see Table 23), with group affiliation, $t = -3.10$, $p < .005$, and the interaction term, $t = 3.08$, $p < .005$ as significant variables (see Figure 5); 30% of the variance in Nonword Vowel Doublets performance, $F(2, 84) = 2.75$, $p < .05$ (see Table 24), with reading-grade level, $t = -2.06$, $p < .05$, group affiliation, $t = -2.57$, $p < .05$, and the interaction term, $t = 2.795$, $p < .05$, as significant variables (see Figure 6); and 21.9% of the variance in Nonsense Word Fluency, $F(2, 84) = 7.77$, $p < .001$ (see Table 25), with reading-grade level, $t = -2.71$, $p < .05$, group affiliation, $t = -4.78$, $p < .001$, and the interaction term, $t = 4.57$, $p < .001$, as significant variables (see Figure 7). The results of these regressions indicate that adults outperform children on tests of orthography up until around a fifth grade reading level. After adults and children pass a fifth grade level, children outperform adults. These results are consistent with previous studies which only looked at adults and children at a fifth grade level and below, which found that adults outperform children on tests of orthographic ability.

Table 23

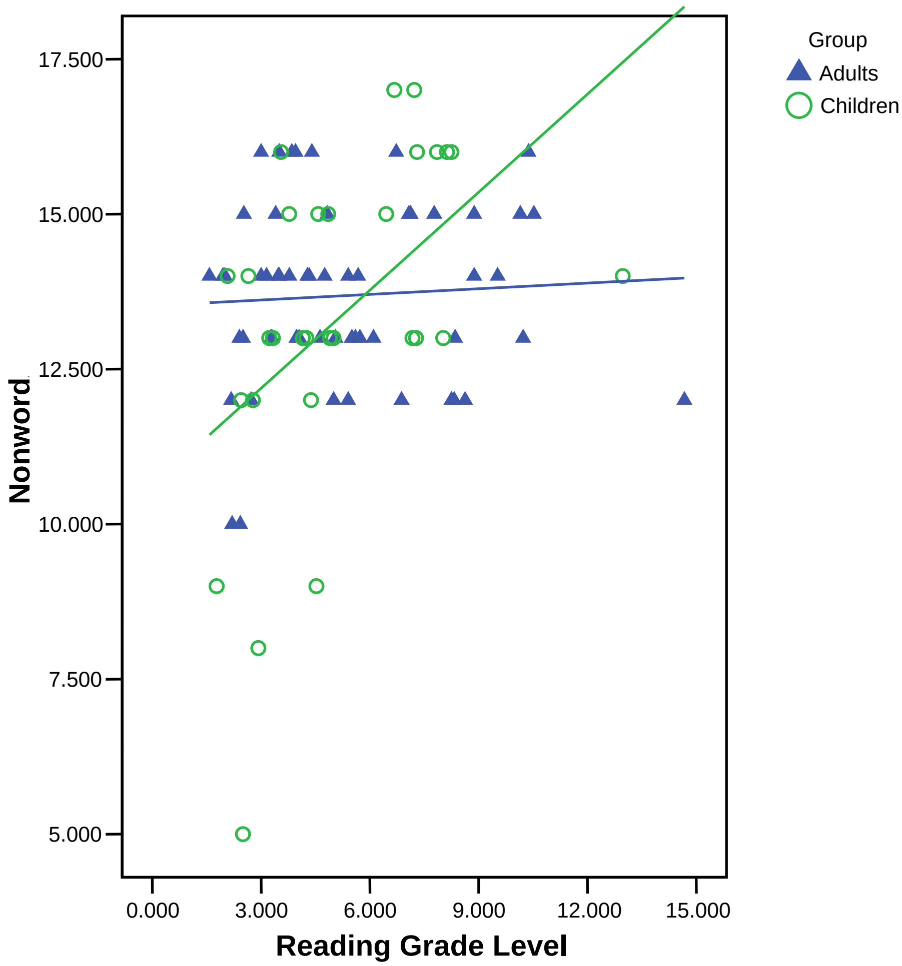
Regression Analysis of Reading-Grade Level and Group Affiliation on Nonword

Predictors	B	t
Reading-Grade Level	.03	.35
Group Affiliation	-2.91	-3.10*
RGLxGroup	.50	3.08*

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 5. Nonword as a function of Reading-Grade Level and Group Affiliation



Group
Adults
Children
17.500
15.000
12.500
10.000
7.500
5.000
Nonword
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level

Table 24

Regression Analysis of Reading-Grade Level and Group Affiliation on NVD

Predictors	B	t
Reading-Grade Level	-.35	-2.06*
Group Affiliation	-4.69	-2.57*
RGLxGroup	.88	2.80*

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 6. Nonword Vowel Doublets as a function of Reading-Grade Level and Group Affiliation

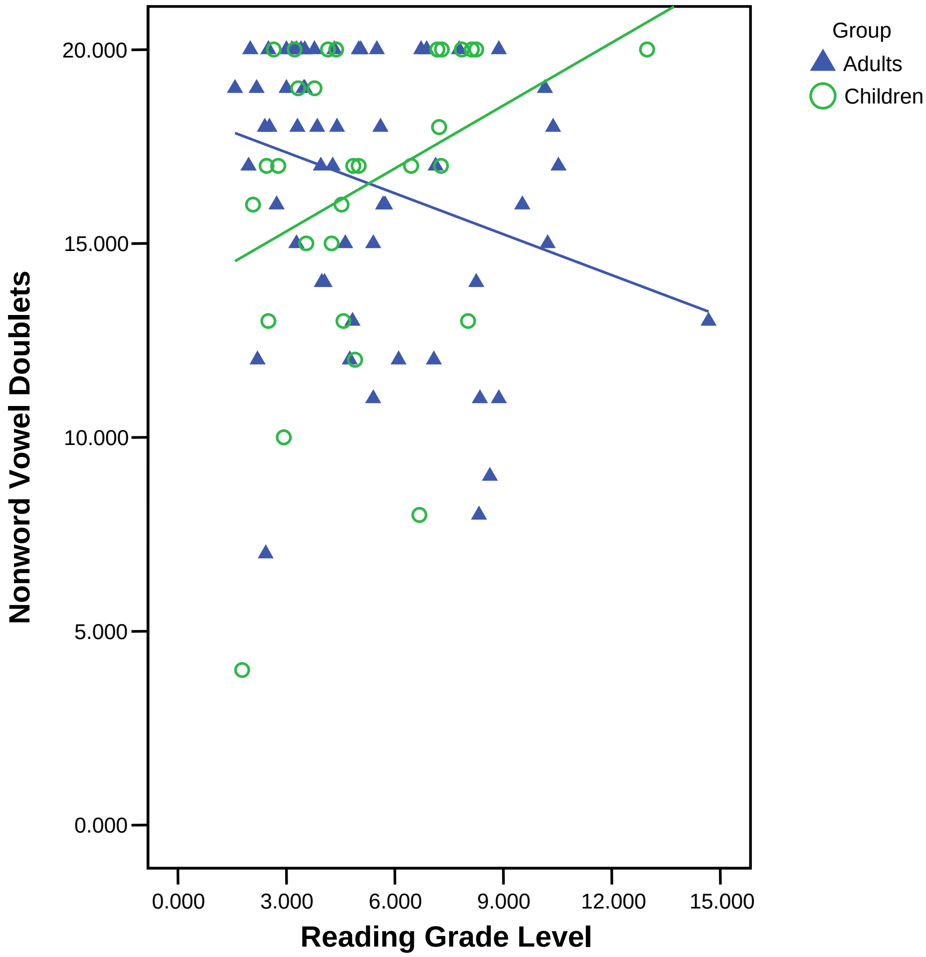

Group
Adults
Children
Nonword Vowel Doublets
20.000
15.000
10.000
5.000
0.000
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level

Table 25

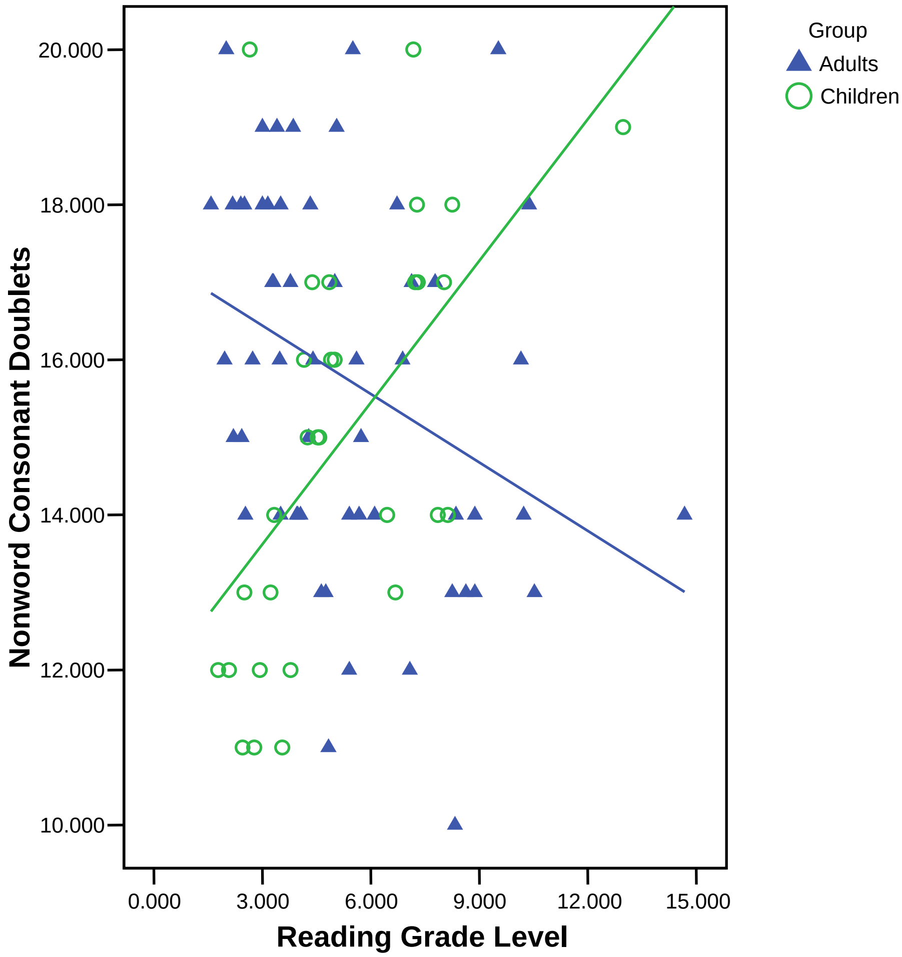
Regression Analysis of Reading-Grade Level and Group Affiliation on NCD

Predictors	B	t
Reading-Grade Level	-.29	-2.71*
Group Affiliation	-5.54	-4.78**
RGLxGroup	.91	4.57**

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 7. Nonword Consonant Doublets as a function of Reading-Grade Level and Group Affiliation


Group
Adults
Children
20.000
18.000
16.000
14.000
12.000
10.000
Nonword Consonant Doublets
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level

For each orthographic nonword measure, a regression was run that included group affiliation and reading-grade level, but not the interaction term. A Sums-of-Squares F-test was then conducted to determine if the full model, which included the interaction term, was more accurate than the reduced model, which did not. Analyses indicated significant differences between models for Nonword, $F(1, 83) = 9.52$, $p <.005$, Nonword Vowel Doublets, $F(1, 83) = 7.83$, $p <.05$, and Nonword Consonant Doublets, $F(1, 83) = 20.86$, $p >.001$. Therefore, only the results from the full models were reported.

Finally, a regression analysis was conducted to determine if group affiliation and reading-grade level accounted for a significant portion of the variance in Atypical Word Fluency. Analysis indicated that the group affiliation and reading-grade level accounted for 72.4% of the variance in AWF, $F(2, 84) = 46.28$, $p < .001$ (see Table 26). However, only reading-grade level, $t = 9.42$, $p < .001$, was significant. Group affiliation was not significant, $t = -1.67$, $p >.05$. Results indicated that no differences existed between adults and children on AWF and that reading-grade level alone was sufficient to predict performance (see Figure 8). These results are inconsistent with past research which determined that, for adults and children performing at a fifth grade level and below, adults outperformed children on tests of orthography.

A regression was run which included group affiliation, reading grade level, and an interaction term. A Sums-of-Squares F-test was run to determine if the full model, which included the interaction term, was more accurate than the

Table 26

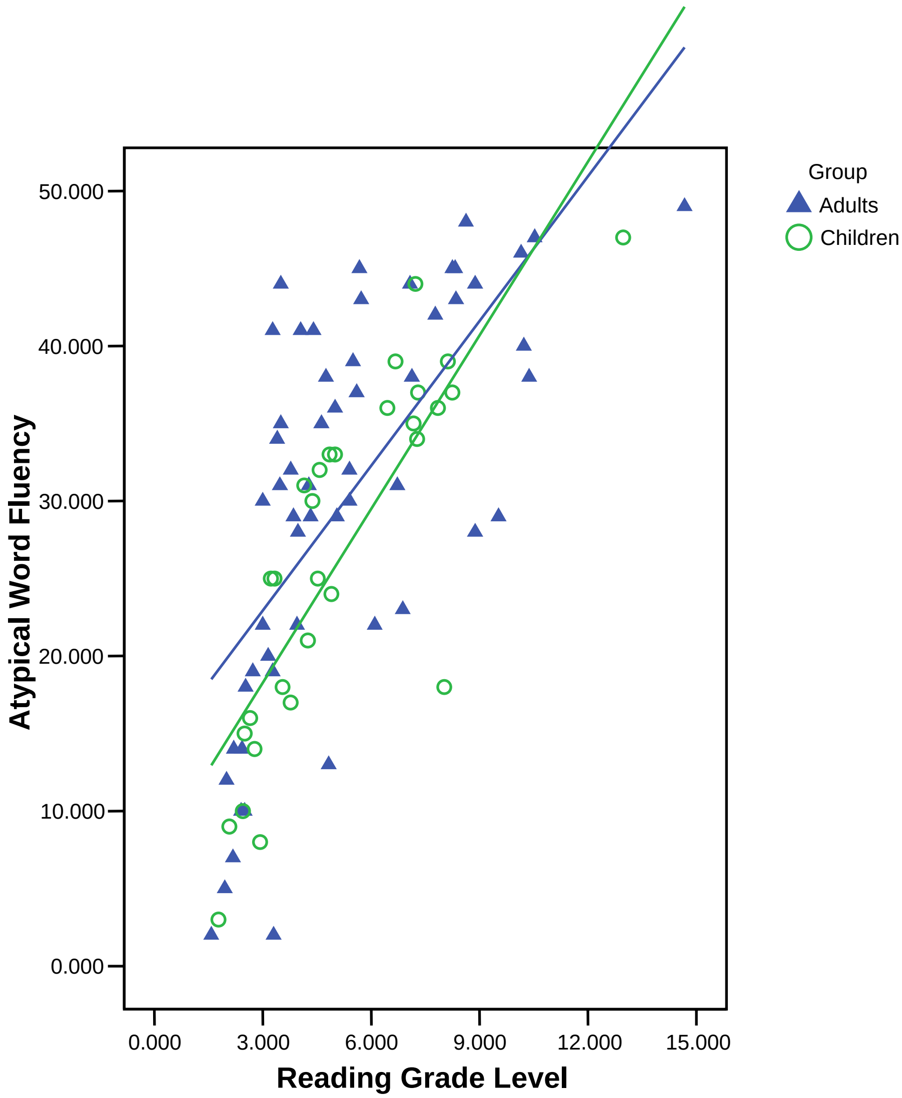
Regression Analysis of Reading-Grade Level and Group Affiliation on AWF

Predictors	B	t
Reading-Grade Level	3.30	9.42**
Group Affiliation	-3.28	-1.67

Note. There were 87 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 8. Atypical Word Fluency as a function of Reading-Grade Level and Group Affiliation


50.000
40.000
30.000
20.000
10.000
0.000
Atypical Word Fluency
0.000
3.000
6.000
9.000
12.000
15.000
Reading Grade Level
Group
Adults
Children

reduced model, which did not. Analyses indicated no significant difference between models, $F(1, 83) = .66$, $p > .05$. Therefore, only the results from the reduced model were reported.

After completion of all regression analyses, all outliers were removed from the data. Outliers were defined as adult and children participants scoring at a 10^{th} grade reading level or above. Having removed six outliers, all analyses were rerun. Each equation remained the same, with the exception of one. When comparing adults and children on Oral Reading Fluency, the removal of outliers also removed the interaction effect that was seen. Group affiliation and reading grade level accounted for 55.8% of the variance in reading-grade level $F(2, 78) = 49.14$, $p < .001$ (see Table 27). Reading-grade level, $t = 9.57$, $p < .001$, and group affiliation, $t = -2.87$, $p < .05$ (see Figure 9), were significant, indicating that adults were outperformed children matched for reading-grade level.

Overall, significant differences existed between adults and children on tests of orthography and phonology. Children consistently outperformed adults on measures of phonological ability, while adults outperformed children on measures of orthographic ability, up until reading-grade level five. After a fifth-grade reading level, children outperformed adults. On tests of Oral Reading Fluency, a similar pattern was observed. However, when outliers (defined as adult and child participants scoring at grade 10 or above) were removed, no differences were seen on ORF between adults and children. On Atypical Word Fluency, there were also no differences were found between adults and children.

Table 27

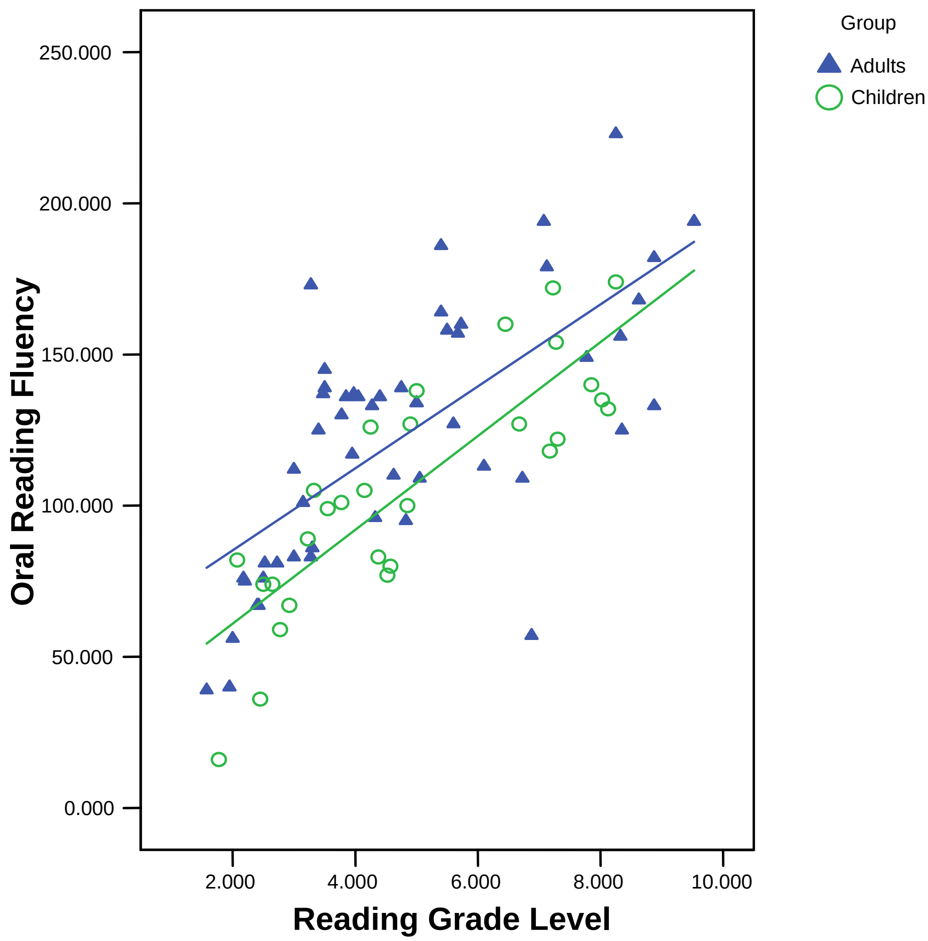
Regression Analysis of Reading-Grade Level and Group Affiliation on ORF with Outliers Removed

Predictors	B	t
Reading-Grade Level	.72	9.57**
Group Affiliation	-.22	-2.87*

Note. There were 81 participants per cell. *p<.05. **p<.01

Figure Caption

Figure 9. Oral Reading Fluency as a function of Reading-Grade Level and Group Affiliation with Outliers Removed


Group
Adults
Children
250.000
200.000
150.000
100.000
50.000
0.000
Oral Reading Fluency
2.000
4.000
6.000
8.000
10.000
Reading Grade Level

Discussion

The purpose of this study was to examine a set of pre-reading measures in an adult population. Specifically, the Dynamic Indicators of Basic Early Literacy skills were examined as possible predictors of reading-grade level based on the Woodcock-Johnson III Broad Reading subscale. Additionally, several orthographic measures were tested as predictors of reading-grade level, since adults have previously demonstrated proficiency with orthographic tests and limitations on tests of phonology when compared to children matched for reading-grade level (Greenberg, et al., 1997; Thompkins & Binder, 2003).

Before a regression analysis could be preformed on the data, it was important to ensure that each of the subtests within a measure was correlated with the others, since each subtest should measure the same general construct. Correlations were run to determine if the four Woodcock-Johnson III Broad Reading measures had positive relationships with each other within an Adult Basic Education population. Although the WJ III was normed on children aged 2 to adults aged 90, it is unlikely that the measures have previously been tested in an adult literacy population. As expected, the WJ III BR measures all correlated with one other, indicating that with an ABE, reading proficiency was still effectively measured.

Correlations were also run to determine if the four DIBELS measures related positively with one another within an adult population. Previous research supports the construct validity of DIBELS with children in kindergarten through third grade, but the test has never been examined for use within an adult population. In general, all measures correlated with one another. Only Nonsense Word Fluency was not correlated with each of the other measures.

Finally, the four orthographic measures were examined to determine if they correlated with one another. Several of the results of this analysis were as expected: Nonword Vowel Doublets and Nonword Consonant Doublets proved to be highly correlated with one another. Additionally, the Nonword task and the NWD task were also correlated, although the Nonword task did not correlated significantly with the NCD task. One finding of this correlation was surprising, however: Atypical Word Fluency actually correlated highly negatively with NCD. There are a few ways to interpret this finding: One the one hand, perhaps these tasks are not measuring the same construct, or the ability to read atypically spelled words might have little to do with recognizing correct orthographic patterns in new words. Another way of looking at these results, however, is that reading-grade level is a moderating factor.

AWF correlates highly with reading-grade level and correlates highly also with ORF. It is possible, therefore, that the students' reading-grade level affected their interpretation of the Nonword tasks. Students were told to choose the nonwords they believed looked most "word-like." Students who interpreted this as an orthographic task, as was intended, chose the nonwords which obeyed orthographic rules. Students who interpreted this task as a phonological task, however, choose the nonwords which sounded best to them. Therefore, students who employed phonological decoding to the Nonword task often picked the wrong answers. Because of this effect, more-skilled readers, who were more adept with the use phonological decoding, chose wrong answers more often on this task.

Once the relationship between the subtests of each measure was determined, regression analyses were run to assess the amount of variance in reading-grade level explained by each set of measurements. The results of the analyses supported the hypothesis that the DIBELS and orthographic measures are predictive of reading performance in an adult population.

As expected, the DIBELS measures accounted for a significant portion of the variance in reading-grade level and ORF scores for the adult participants. These results are consistent with previous research conducted with children which indicates that the DIBELS measures are associated with reading ability (Elliott, et al., 2001), and can be used to monitor student progress and to direct instruction (Good, et al., 2002).

Based on the results of this study, it is possible that DIBELS may actually have greater applications within an adult literacy population than they currently have within an elementary school population. The DIBELS pre-reading measures of Initial Sound Fluency, Phoneme Segmentation Fluency, and Nonsense Word

Fluency were originally designed to monitor progress and direct instruction for children in the third grade and below. Once children pass third grade, they hit ceiling on the pre-reading measures. For adults in this study, a ceiling effect did not occur: The DIBELS measures predicted reading-grade level of adults from and 2^{nd} grade level through 12^{th} grade level. Adult literacy students, it seems, have not mastered fully mastered phonological decoding, since the DIBELS measures of ISF, PSF and NWF are each phonologically-based tests.

Phonological ability has been shown to correlate with reading ability in individuals up to the 12^{th} grade (Adams, 1990). Phonemic awareness also has been identified as a predictor of later literacy (Stahl & Murray, 1994; Torgesen, et al., 1992). It is important, therefore, not to ignore Adult Basic Education students' deficits in phonological ability. This study indicates that there is a direct correlation between reading-grade level and performance on phonological measures: If students are trained in phonological decoding, then, it is likely that their reading scores will improve. Research with adult students has shown that literacy training which emphasizes phonological decoding can significantly boost performance on word-recognition, spelling, phonological awareness, and reading comprehension (Durgunoglu & Oney, 2002).

In addition to phonological decoding ability, orthographic ability also accounted for a marginally significant portion of the variance in reading-grade level and a significant portion of the variance in Oral Reading Fluency for adults. These findings were consistent with past research that demonstrated adults have proficiency with tests of orthography (Greenberg, et al., 1997; Thompkins & Binder, 2003). It also supports the hypothesis that adults use orthographic cues to compensate for deficits in word-decoding ability (Stanovich, 1980). It stands to reason that adults would employ orthographically-based compensatory strategies to recognize and read words: Exposure to text can lead to improved word-recognition (Cunningham, Perry, & Stanovich, 2001), and adults have been exposed to a huge amount of text in their lifetimes. The findings of this study indicate that it may be beneficial to include tests of orthography in assessments of adults' reading ability. It would be beneficial to examine orthographic tests other than the ones used in this study. Perhaps other tests would hold even more predictive value.

Analyses were run on the children's data which corresponded with the analyses run on the adult data. It was first important to determine whether subtests within a group were related to one another. Correlations were run to determine if the four Woodcock-Johnson III Broad Reading measures had positive relationships with each other within the children in this sample. As expected, the WJ III BR measures all correlated with one other, indicating that the measures effectively examine the same construct: reading proficiency.

Correlations were also run to determine if the four DIBELS measures related positively with one another within this population of children. Administration guidelines, outlined in the testing material, indicated that the DIBELS pre-reading measures – Initial Sound Fluency, Phoneme Segmentation

Fluency, and Nonsense Word Fluency – were to be administered to children in kindergarten through third grade, and not beyond. The measures, therefore, were not expected to hold together as a cohesive measure of reading ability within a more-skilled population of children. Only Oral Reading Fluency maintains its validity beyond a third grade level, and is used with children up to the sixth grade. The correlations indicated that only Nonsense Word Fluency and Oral Reading Fluency were positively related. All other subtests shared no relationship, as expected.

Finally, the four orthographic measures were examined to determine if they correlated with one another. The results of this study indicate that, within a population of children, the orthographic tasks are positively correlated with one another. Only Nonword Consonant Doublets and Nonwords were not correlated, and these two measures were approaching significance. The results indicate that, within a child population, the orthographic tasks hang together as a test of spelling ability.

Once the relationship between the subtests of each measure was determined, regression analyses were run to assess the amount of variance in reading-grade level and ORF explained by each set of measurements. The results of the analyses supported the hypothesis that the DIBELS and orthographic measures are predictive of reading performance within a population of children.

The DIBELS pre-reading measures accounted for a significant portion of the variance in reading-grade level and ORF scores for the children participants.

However, this sample of children tested at a reading-grade level higher than third grade, which should mean that DIBELS would not be predictive. Looking at the results, however, it becomes evident that Oral Reading Fluency is the only variable that is significant beyond the variance it shared with the pre-reading measures. It is likely then, that the predictive value comes from ORF, which is used with children up to sixth grade, and not from the DIBELS pre-reading measures.

Contrary to my hypothesis, the orthographic tasks accounted for a significant portion of the variance in reading-grade level and ORF for children. The orthographic tasks did not, however, add significantly to predictions of reading-grade level when paired with the DIBELS measures. Based on those results alone, it seems as though it would not be necessary to add any orthographic tasks to tests for children. Interesting to note, however, is that the orthographic tasks do add significantly to the model which includes pre-reading measures as predictors of Oral Reading Fluency. It is possible, then, that ORF actually tests both phonology and orthography. However, it is hard to say from the analyses of this study, and would need to be investigated further.

A series of regression analyses were run to pinpoint the differences between adults and children on the phonological and orthographic tasks. As expected, children outperformed adults on tests of phonology, while adults outperformed children on the orthographic nonword tasks, up until a fifth grade reading level. These findings are consistent with previous research. These analyses did have some surprising results, however. An interaction between group affiliation and reading-grade level occurred on the orthographic nonword tasks: After grade 5, children began to outperform adults on these tasks. Previous studies did not find an interaction like the one demonstrated here. However, none of the previous studies examined students performing above a fifth-grade level.

Also interesting to note, adults outperformed grade-level matched children on Oral Reading Fluency up until an eighth-grade level, at which point children began to outperform the adults. When six outliers were removed, however, this effect is no longer seen. Instead, adults consistently outperform children on ORF when grade-level is restricted to below 10^{th} grade. It is unclear, then, whether the interaction effect was the result of a real difference, or merely the result of a number of higher-level literacy participants. If adults are, indeed, outperforming grade-level matched children on Oral Reading Fluency, it will be important to try to understand why that is. Perhaps it is related to evidence of the orthographic nature of ORF. Further investigation is necessary.

On Atypical Word Fluency, adults and children performed equally well. The only significant predictor of performance on AWF was reading-grade level. It is likely, then, that this test is more reflective of overall reading ability than it is of spelling knowledge. Familiarity with atypical words may be inextricable from reading-grade level, because adults and children both acquire more vocabulary as they are able to read more difficult texts. In other words, adults and children would not be able to learn complex vocabulary if they were not also reading complex texts.

Overall, the analyses comparing adults and children make one thing clear: Although adults and children may perform equally as well on tests of grade-level equivalency, significant differences still remain in basic word-decoding skills. It is important, therefore, to go beyond assigning a grade, and to examine the phonological and orthographic building blocks of language. By looking only at the surface, educators may fail to pinpoint the specific areas in which Adult Basic Education students may be struggling.

Questions still remain unanswered in this study. For example, could the inclusion of a large number of bilingual students have affected the data? Previous research with Spanish-speaking adults has indicated that tests of phoneme isolation (of Spanish words) are relatively easy tasks for adult literacy students (Jimenez & Venegas, 2004). This might indicate that tests of phonological ability, such as the DIBELS tasks, might not hold the same predictive value among Spanish-speaking individuals as they would among students who speak English only. On the other hand, the findings may not be generalizable to Spanish-speaking adults who are being tested in English. Spanish is an orthographically transparent language: All letters in Spanish are pronounced phonetically. The English language, on the other hand, does not contain all direct spelling to sound patterns. English has nearly as many exceptions to rules as it does rules (Adams, 1990). It contains a large number of words which are atypically spelled and, therefore, don't obey phonological cues. The possibility exists, then, that native English speakers are more likely to employ orthographic compensatory strategies than nonnative English speakers. It would be interesting to see, therefore, if differences exist between native and nonnative English speakers on the DIBELS and orthographic measures.

Research into adult literacy is an important area of study which could benefit the lives of millions of people. The social consequences of inadequate literacy training are huge: unemployment, poor health, and civic disengagement. Therefore, improving adult education should be a priority. It is important that researchers study the most effective strategies to monitor student progress and direct instruction: Targeting instruction to meet adult students' needs could lead to more effective education and faster improvement in reading ability. It is important that adult education be directed and efficient, since adults have so many factors in their lives which limit the amount of instruction time that is available.

References

Adams, M., J. (1990). *Beginning to read: Thinking and learning about print (1st ed.).* Cambridge, MA: MIT Press.

Adams, M. J., & Huggins, A. W. F. (1985). The growth of children's sight vocabulary: A quick test with educational and theoretical implications. *Reading Research Quarterly, 20*, 262-281.

Ardoin, S. P., Witt, J. C., Suldo, S. M., Connell, J. E., Koenig, J. L., Resetar, J. L., Slider, N. J., Williams, K. L. (2004). Examining the incremental benefits of administering a maze and three versus one Curriculum-Based Measurement reading probes when conducting universal screening. *School Psychology Review, 33*, 218-233.

Beder, H. (1999). The outcomes and impact of adult literacy education in the United States. *National Center for the Study of Adults Leaning and Literacy*. Boston, MA: NCSAL/World Education.

Binder, C. (1996). Behavioral fluency: Evolution of a new paradigm. *The Behavior Analyst, 19*, 163-197.

Cassar, M., & Treiman, R. (1997). The beginnings of orthographic knowledge: Children's knowledge of double letters in words. *Journal of Educational Psychology, 89,* 631-644.

Comings, J., Garner, B., & Smith, C. (2000). *Annual review of adult learning and literacy. Volume 1. The Jossey-Bass Higher and Adult Education Series.* Boston, MA: National Center for the Study of Adult Learning and Literacy.

CTB McGraw Hill. (1994). Test of Adult Basic Education. Monteray: CA.

Cunningham, A. E., Perry, K. E., & Stanovich, K. E. (2001). Converging evidence for the concept of orthographic processing. *Reading and Writing: An Interdisciplinary Journal, 14,* 549-568.

Dochy, F., Segers, M., & Buehl, M. M. (1999). The relation between assessment practices and outcomes of studies: The case of research on prior knowledge. *Review of Educational Research, 69*, 145-186.

Durgunoglu, A. Y., & Oney, B. (2002). Phonological awareness in literacy acquisition: It's not only for children. *Scientific Studies of Reading, 6,* 245-266.

Elliot, J., Lee, S. W., & Tollefson, N. (2001). A reliability and validity study of the Dynamic Indicators of Basic Early Literacy Skills – Modified. *School Psychology Review, 30*, 33-49.

Fuchs, L. S., Fuchs, D., & Hamlett, C. L. (1989). Effects of instrumental use of curriculum-based measurement to enhance instructional programs. *Remedial and Special Education, 10*(2), 43-52.

Fuchs, L. S., Fuchs, D., & Maxwell, L. (1988). The validity of informal reading comprehension measures. *Remedial and Special Education, 9*(2), 20-28.

Good, R.H., & Kaminski, R.A. (Eds.). (2002). Dynamic Indicators of Basic Early Literacy Skills (6th ed.) Eugene, OR: Institute for the Development of Educational Achievement. Available: http://dibels.uoregon.edu/.

Good, R. H., Simmons, D. S., Kame'enui, E. J., Kaminski, R. A., & Wallin, J. (2002). *Summary of decision rules for intensive, strategic, and benchmark instructional recommendations in kindergarten through third grade* (Technical Report No. 11). Eugene, OR: University of Oregon.

Gottesman, R. L., Bennett, R. E., Nathan, R. G., & Kelly, M. S. (1996). Inner-city adults with severe reading difficulties: A closer look. *Journal of Learning Disabilities, 29*, 589-597.

Greenberg, D., Ehri, L.C., & Perrin, D. (1997). Are word-reading processes the same or different in adult literacy students and third-fifth graders matched for reading level? *Journal of Educational Psychology, 89*, 262-275.

Greenberg, D., Ehri, L.C., Perrin, D. (2002). Do adult literacy students make the same word-reading and spelling errors as children matched for word -reading age? *Scientific Studies of Reading, 6*, 221-243.

Hoffman, L. (1978). Reading errors among skilled and unskilled adult readers. *Community/Junior College Research Quarterly, 2*, 151-162.

Jimenez, J. E., & Venegas, E. (2004). Defining phonological awareness and its relationship to reading skills in low literacy adults. *Journal of Educational Psychology, 96*, 798-810.

Kirsch, Jungeblut, Jenkins, & Kolstad (1993). *Adult literacy in America: A first look at the results of the National Adult Literacy Survey.* Princeton, NJ : Educational Testing Services.

Marston, D. B. (1989). A curriculum-based measurement approach to assessing academic performance: What it is and why do it? In M. R. Shinn (Ed.), *Curriculum-Based Measurement: Assessing Special Children* (pp. 18-78). New York: Guilford.

Madelaine, A., & Wheldall, K. (2004). Curriculum-based measurement of reading: Recent advances. *International Journal of Disability, Development and Education, 51*, 57-82.

National Institutes of Child Health and Human Development. (2001). Adult and family literacy: Current research and future directions – A workshop summary (Informal survey report). Bethesda, MD:Author. Retrieved September 21, 2005, from http://www.nichd.nih.gov.crmc_cdb/AFL_workshop.htm.

National Research Council (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

National Reading Panel. (2000). Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction (NIH Publication No. 00-4754). Washington, DC: U.S. Government Printing Office.

Perin, D. (1988). Combining schema activation and cooperative learning to promote reading comprehension in adult literacy students. *Journal of Reading*, *32*, 54-68.

Sabatini, J.P., Venezky, R.L., Kharik, P., & Jain, R. (2000). *Cognitive reading assessments for low literate adults: An analytic review and new framework*. Philedelphia, PA, National Center on Adult Literacy.

Schierloh, J. M., (1993, December). *The test-taking behaviors, knowledge and perceptions of adult basic education students on a standardized reading comprehension test.* Paper presented at the Annual National Reading Conference, Charleston, WV.

Shin, J., Deno, S. L., Espin, C. (2000). Technical adequacy of the maze task for curriculum-based measurement of reading growth. *The Journal of Special Education*, *34*, 164-172.

Shinn, M. R., & Good, R. H., III (1992). Curriculum-based measurement of oral reading fluency: A confirmatory analysis of its relation to reading. *School Psychology Review, 21*, 459-479.

Shepard, L. (1991). Interview on assessment issues with Lorrie Shepard. *Educational Researcher, 20,* 21-23, 27.

Siegal, L. S., Share, D., & Geva, E. (1995). Evidence for superior orthographic skills in dyslexics. *American Psychological Society, 6*, 250-254.

Stahl, S.A., & Murray, B.A. (1994). Defining phonological awareness and its relationship to early reading. *Journal of Educational Psychology*, *86,* 221-34.

Stanovich, K.E. (1980). Toward an interactive-compensatory model of individual differences in the development of reading fluency. *Reading Research Quarterly*, *16*, 32-71.

Thompkins, A.C., & Binder, K.S. (2003). A comparison of the factors affecting reading performance of functionally illiterate adults and children matched by reading level. *Reading Research Quarterly, 38,* 236-258.

Torgesen, J.K., Morgan, S.T., & Davis, C. (1992). Effects of two types of phonological awareness training on word learning in kindergarten children. *Journal of Educational Psychology, 84,* 364-370.

National Adult Literacy Survey (1993). [On-line]. Educational Testing Service for The US Department of Education. Available: http://www.nifl.gov/nifl/facts/facts_overview.htm

National Adult Literacy Survey (20033). [On-line]. Educational Testing Service for The US Department of Education. Available: http://nces.ed.gov/naal/

Wiggins, G. (1992). Creating tests worth taking. *Educational Leadership, 49(8),* 26-34.

Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock-Johnson III Test of Achievement*. Itasca, IL: Riverside Publishing.

Appendix A

Letter-Word Identification

i k r m u y

Say: **Here are some letters.** Run your finger across letters on subject's page. **I want you to point to the letter I say. Point to the "K."**

Correct: points to K

cat my on red

Run your fingers across words on a subject's page and say: **Point to the word "cat."**

Correct: points to cat

Appendix B

Reading Fluency

Give subject a sharp pencil and say: **Now look at the next four sentences. Draw a circle around the correct answer for each sentence. Work as fast as you can without making mistakes. Go ahead.**

An apple is blue.	Y	N
The moon is in the sky.	Y	N
A man has two legs.	Y	N
Ice is hot.	Y	N

Appendix C

Passage Comprehension

Point to first item on subject's page and say: **Read this to yourself and tell me one word that goes in the blank space** (point to the blank). Do *not* read items or tell subject any words during the test.

Ducks like to swim in the ___.

Correct: pond, lake, water

The bird ___ flying.

Correct: is, likes, was

Incorrect: bird, can

When you go to the library, you will find many things to ___.

Correct: read, explore, get, do, check out

Query (ask participant to provide another word): see, look at

Appendix D

Word Attack

Say: **I want you to pronounce some words that are not real words. I want you to tell me how they sound.** Point to "tat." **How does this word sound?**

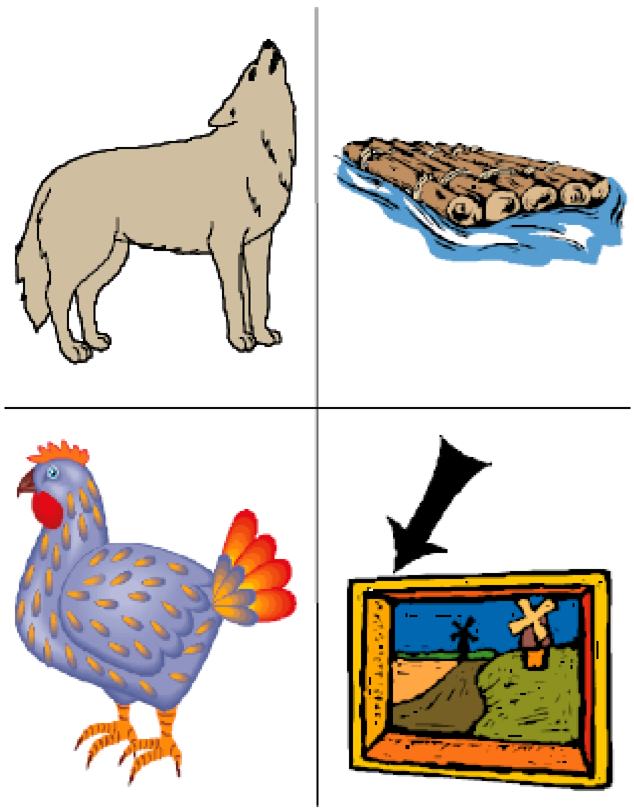
tat

How do these words sound? Point to each word if necessary. If the subject fails to respond in a few seconds, encourage a response. If the subject still fails to respond, continue the test by pointing to the next word.

tiff	**zoop**	**nan**	**rox**	**lish**	**ep**

Appendix E

Initial Sound Fluency



This is wolf, raft, hen, frame (point to pictures).

1. Which picture begins with /h/?	0 1
2. Which picture begins with /fr/?	0 1
3. Which picture begins with /r/?	0 1
4. What sound does “wolf” begin with?	0 1

Appendix F

Phoneme Segmentation Fluency

leaned /l/ /ea/ /n/ /d/	shine /sh/ /ie/ /n/	____/7
worm /w/ /ir/ /m/	smiled /s/ /m/ /ie/ /l/ /d/	____/8
porch /p/ /or/ /ch/	creek /k/ /r/ /ea/ /k/	____/7
lit /l/ /i/ /t/	kissed /k/ /i/ /s/ /t/	____/7
get /g/ /e/ /t/	pouch /p/ /ow/ /ch/	____/6
roared /r/ /or/ /d/	whale /w/ /ai/ /l/	____/6
broke /b/ /r/ /oa/ /k/	meet /m/ /ea/ /t/	____/7
raise /r/ /ai/ /z/	note /n/ /oa/ /t/	____/6
worth /w/ /ir/ /th/	points /p/ /oi/ /n/ /t/ /s/	____/8
that /TH/ /a/ /t/	cold /k/ /oa/ /l/ /d/	____/7
worked /w/ /ir/ /k/ /t/	fight /f/ /ie/ /t/	____/7

Appendix G

Nonsense Word Fluency

u m	j a c	z o j	o c	k o m	__/13
k i c	r a j	l o n	z e b	i g	__/14
m e s	j u k	e t	n o j	v i n	__/14
j i c	w u j	o m	h u l	m i d	__/14
b e s	p e k	m o z	u m	u t	__/13
p e j	w a j	r e j	j u l	n e j	__/15
l a t	p u z	d e s	u d	n a m	__/14
m i d	t u f	n u m	y a z	d o d	__/15
b o k	f e g	y u d	h a j	u v	__/14

Appendix H

Atypical word list (ordered by difficulty)

1) **ocean**
2) **iron**
3) **island**
4) **break**
5) **busy**
6) **sugar**
7) **touch**
8) **none**
9) **heights**
10) **whom**
11) **tongue**
12) **lose**
13) **prove**
14) **rhythm**
15) **truth**
16) **stomach**
17) **blind**
18) **wounded**
19) **calf**
20) **sweat**
21) **sword**
22) **anchor**
23) **echo**
24) **guitar**
25) **veins**
26) **chorus**
27) **scent**
28) **deaf**
29) **mechanic**
30) **dough**
31) **rely**
32) **ninth**
33) **react**
34) **recipe**
35) **pint**
36) **deny**
37) **vague**
38) **tomb**
39) **drought**
40) **trough**
41) **depot**
42) **bough**
43) **bouquet**
44) **aisle**
45) **ache**
46) **yacht**
47) **chauffeur**
48) **ukelele**
49) **suede**
50) **fiancé**

Appendix I

Nonword task

Nonwords		**Correct answers**
filv	**filk**	**filk**
tolz	**tolb**	**tolb**
powl	**lowp**	**powl**
dlun	**lund**	**lund**
fant	**tanf**	**fant**
miln	**milg**	**miln**
togd	**togn**	**togn**
wolg	**wolt**	**wolt**
moke	**moje**	**moke**
jofy	**fojy**	**jofy**
cnif	**crif**	**crif**
bnad	**blad**	**blad**
hift	**hifl**	**hift**
gwup	**gnup**	**gnup**
nitl	**nilt**	**nilt**
clid	**cdil**	**clid**
vism	**visn**	**vism**

Appendix J

Nonword Bigram Task

Nonwords – vowel doublets		**Nonwords – consonant doublets**	
heek	**haak**	**affe**	**ahhe**
geed	**gaad**	**ossa**	**ovva**
feep	**fiip**	**illo**	**ihho**
meer	**miir**	**udda**	**uhha**
jeet	**jaat**	**abbe**	**akke**
sook	**saak**	**etti**	**evvi**
bood	**biid**	**onne**	**owwe**
noop	**niip**	**imma**	**izza**
woor	**wiir**	**eppi**	**ejji**
goot	**gaat**	**ullo**	**ukko**
stee	**staa**	**baff**	**bah**
chee	**chii**	**noss**	**novv**
dree	**draa**	**yill**	**yihh**
gree	**grii**	**tudd**	**tuhh**
bree	**brii**	**wabb**	**wakk**
sloo	**slaa**	**dett**	**devv**
spoo	**spaa**	**fonn**	**foww**
froo	**fraa**	**viss**	**viww**
ploo	**plii**	**cepp**	**cejj**
swoo	**swii**	**jull**	**jukk**