DYNAMIC ASSESSMENT OF WORD ATTACK SKILL IN PHONOLOGICALLY DISABLED READERS

by

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A dissertation submitted to the Graduate Faculty in Educational Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy,

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Abstract

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Alan Tener

Advisor: Professor Linnea Ehri

This study involved a dynamic assessment (DA) of word attack (decoding) skills. DA is a form of evaluation in which the tester interacts with the participant to affect change in the skills being evaluated. The purpose of the study was to determine the usefulness of this DA for the evaluation of reading disability and the utility of this DA for teaching students strategies to improve their word attack skills.

Twenty-four students drawn from high school, middle school and an adult literacy program participated in the study. Eligibility for participation was based on below average performance (<25th percentile) on the Word Attack subtest of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1998). Participants were randomly assigned to either the DA or Practice Only groups.

The DA involved teaching students a single syllable and a multi-syllable strategy for decoding unfamiliar words. Both strategies involved instructing participants to segment spellings of pseudowords, to pronounce the segments, and to blend the segments to pronounce each pseudoword. Increasing feedback was provided until the participant was able to read the pseudoword. Participants were evaluated in terms of their ability to read the list of pseudowords and to utilize the two decoding strategies. Practice Only

group participants were given the DA pseudoword list to read, but they were not provided with strategy instruction or feedback.

The results support the value of the DA as an evaluation instrument. Students' performance on the DA was significantly correlated with the pretest pseudoword decoding task, indicating that inclusion of the strategy instruction and feedback did not undermine the test's validity. The DA provided a more comprehensive assessment of participants' strengths and weaknesses than traditional static assessment. It also provided information regarding the type and amount of instruction that was effective for individual participants.

The DA proved to be an effective means of word attack instruction. The DA group decoded significantly more pseudowords on the immediate posttest than the Practice Only group. However, the effectiveness of instruction was not sustained over time as evidenced by no significant difference in decoding performance of the groups on the delayed posttest administered two weeks later.

Acknowledgements

This dissertation is dedicated to individuals with a reading disability and the educators who support them. In particular, I want to thank the adolescents and adults with a reading disability who took part in this study. Their willingness to participate made this dissertation possible. I understand the effort it takes to rise above reading deficits. I also know the ways in which the disability can contribute to defining one's life in both detrimental and fulfilling ways. My own life has included a struggle with a reading disability and my vocation as a school psychologist has enabled me to support students confronted with this challenge. I hope that this study helps educators implement meaningful assessment and instructional support and that it contributes positively to the efforts of individuals to prevail over their reading difficulties.

I wish to thank Dr. Linnea Ehri for her guidance in all aspects of this dissertation process. Her capacity to view problems from multiple angles enriched this experience from the initial design phase through the interpretation and discussion of results. The breadth of knowledge and expertise that she brought to our dialogues were invaluable. She was my guide and mentor in working through the complexities of this process.

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I extend my thanks to the school district in which I work. The support of the administration, board, staff, parents and students made this reading research possible. In

addition, the adult literacy program administrators expanded this research by providing access to adults in their program and encouraging their participation in this study.

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I want to thank my mother, Elizabeth, and my father, Marty, for always having faith in my capacity to succeed. Their acceptance of me for who I am has freed me to strive towards my potential. Without all the rich opportunities they provided throughout my life, this accomplishment would not have been possible. I also thank my "second parents," Aunt Anne and Uncle Howard, who have been a constant source of encouragement. Lastly, I thank all of my friends and family who helped me though this process by always enquiring about my progress and cheering me on.

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Chapter 1 - Introduction

Literacy is the foundation of education. It is often identified as the primary academic concern of parents, politicians, and educators. Over the past few decades there has been extensive federal legislation mandating and funding reading intervention. The most comprehensive legislation in recent years has been the No Child Left Behind Act of 2001 (Public Law 107-110) in which the primary focus is on improvements in reading performance. Over the same period of time considerable research has been conducted that has improved our understanding of the reading process and the causes of reading disability. Despite the increased funding for reading intervention, more intensive requirements of state and federal governments, and greater understanding of reading, there continues to be a large population with inadequate reading skills. According to the National Center for Education Statistics (Kutner, Greenberg, Jin & Paulson, 2006), 14 percent of adults in the United States have below basic reading skills. In addition, 13 percent of students in high school above the age of 16 have below basic reading skills.

One likely reason for the continued failure of our educational system to address the literacy needs of all students is the disconnect between current practice and current knowledge in the field of reading. Traditional diagnosis of a reading disability, still widely used in educational institutions, is inconsistent with current knowledge about reading and reading disability.

Dynamic assessment (DA) presents an alternative to traditional assessment that can be designed to incorporate current knowledge about reading processes. DA can yield detailed information about an individual's level of functioning that is not attainable through traditional assessment (Bednar & Kletzien; 1990, Perkins, 1988; Spector, 1992).

In addition, DA offers the opportunity to embed instruction in the evaluation process. The present dissertation study investigated a DA of word attack skills administered to older individuals with a reading disability, those beyond elementary school. The purpose of the study was to determine the usefulness of DA for the evaluation of reading disability and the utility of DA to teach the individuals strategies to improve their word attack skills.

Most evaluation techniques used in educational institutions are based on a traditional assessment model. The information obtained from these techniques indicates the student's level of attainment of a particular skill. Little information is obtained about the reasons for the student's failure to display the skill or his/her potential to develop the skill (Lidz, 1991). However, the latter information is necessary in order to understand and interpret a student's reading skills. Without this understanding, there is very limited information on which to base instruction. DA offers an alternative to traditional assessment that is advantageous for understanding a student's strengths and weaknesses and the instructional scaffolding that promotes learning. The assessment procedures are referred to as "dynamic" because there is a teaching component to the procedure in addition to the assessment component (Haywood, Brown & Wingenfeld; 1990).

Researchers have used DA procedures to evaluate different types of reading skills including comprehension (Bednar & Kletzien, 1990), oral reading errors (Perkins, 1988), and phonemic awareness skills (Spector, 1992). These studies have included populations ranging in age from preschool to adulthood and have examined a broad range of skill levels from preliteracy skills to mature reading processes. The positive outcomes of these

diverse DA studies show the validity of DA in producing meaningful and applicable information regarding students' reading skills.

Research in the field of reading indicates that serious difficulties in phonological decoding skills characterize many children with a reading disability (Bruck, 1988; Moats & Lyon, 1993; Share, Jorm, Maclean & Matthews, 1984; Siegel, 1989; Snowling, Goulandris & Defty, 1996; Spear-Swerling & Sternberg, 1998; Stanovich, 1991; Stanovich, 1982; Stanovich & Siegel, 1994; Torgesen, 1998; Vellutino, Scanlon & Spearing, 1995). Phonemes are the smallest units of sound in language and, when blended together, comprise words. Phonological reading, also referred to as decoding or word attack, involves the application of knowledge of spelling-sound correspondences in order to read words in isolation (Bruck, 1988). More specifically, processes such as segmenting words, pronouncing segments, and blending segments to form words are the component processes which are necessary in order to decode words. In addition, knowledge of the regularities of the writing system is needed including grapheme-phoneme correspondences, and syllable and sub-syllabic spelling patterns. Individuals with a phonological reading disability typically have difficulty performing these processes (Ehri, 1999).

Studies show that individuals with a reading disability continue to have deficits in phonological awareness through adulthood (Bruck, 1990, 1992; Greenberg, Ehri, & Perin, 1997, 2002; Rack, Snowling & Olson, 1992). They tend not to use phonological strategies to read words but instead use orthographic strategies that involve heavy reliance on the spelling structure in words (Bruck, 1992; Greenberg, Ehri, & Perin, 2002). Adults with a reading disability, therefore, usually have difficulty decoding words.

However, recent research indicates that the decoding skills of individuals with a phonological reading disability can be improved through strategy-based instruction designed to develop word attack skills (Bhattacharya, 2001; Compton, Olinghouse, Elleman, Vining, Appleton, Vail, & Summers, 2005; Lovett and Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach and De Palma, 2000).

The present DA study was designed to apply current knowledge about reading to the evaluation of disabled readers. Older individuals with a reading disability, those beyond elementary school, were administered a DA of pseudoword decoding. The DA included an instructional component that taught participants to segment spellings of pseudowords, to pronounce the segments, and to blend them to pronounce each pseudoword. The purpose of the study was to determine the usefulness of DA for the evaluation of reading disability and the utility of DA for teaching individuals strategies to improve their word attack skills. The DA was expected to provide more precise and detailed information about phonological decoding strengths and weaknesses than traditional assessment. In addition, the DA was anticipated to improve participants' decoding performance.

Chapter 2 - Review of the Literature

Literacy is essential for the acquisition of knowledge. Students who do not develop adequate reading skills face academic failure. This is especially true for students with a reading disability whose reading skills are substantially below average. Without remediation, academic success becomes an unlikely outcome. Effective remediation requires the comprehensive evaluation of the student's reading skills and the development of instruction to address the student's specific needs. Traditional assessment of a reading disability, still commonly used in schools, provides only limited information about a student's reading skills. In addition, the assessment techniques used are inconsistent with current knowledge in reading and reading disability. DA is an alternative to traditional assessment that can be designed to incorporate current knowledge in reading. DA can provide detailed information about an individual's strengths and weaknesses that is not attainable through traditional assessment. In addition, DA offers the opportunity to provide instruction in conjunction with the evaluation process. The present study examined the DA of word attack skills in older students with a reading disability, those beyond elementary school. The purpose of the study was to determine the usefulness of DA for the evaluation of reading disability and the utility of DA to teach the students strategies to improve their word attack skills.

In order to consider the value of DA for the evaluation of the reading skills of students with a phonological reading disability it is helpful to understand both the process of reading and the assessment of reading. This literature review is presented to provide the reader with current knowledge in the field of reading. Information on the reading process will include: a summary of the different ways people read words; the processes

involved in skilled reading; the prerequisite skills necessary for reading; reading acquisition and the developmental phases of reading; phonological reading disability. An overview of assessment will include: traditional assessment practices in evaluating reading disability; the limitations of traditional assessment; DA as an alternative to traditional assessment practices; the application of DA to the evaluation of reading disability. This review is intended to provide a foundation for understanding the limitations of traditional assessment for the evaluation of reading disability. In addition, the review highlights the relevance and importance of DA and its potential contribution to greater understanding and support of individuals with a phonological reading disability.

The Reading Processes

There are two main components of reading, the recognition of words in the text and comprehension of the meaning of the text (Gough & Juel, 1991). Although comprehension is the ultimate goal, the ability to read words rapidly, accurately and automatically is a critical prerequisite to accurate comprehension (Adams, 1990). Words can be read in a number of ways: sight word reading, decoding, analogy, prediction, or a combination of these methods. Sight word reading involves accessing familiar words from memory. Decoding, or word attack, involves converting the graphemic (visual) representation of words into the phonemic (sound) representation (Ehri, 1999). Reading by analogy involves using a familiar word to read an unfamiliar word with letters in common. The graphemic and phonemic patterns of the familiar word can be applied to read the unfamiliar word (Goswami, 1995). Reading by prediction involves the use of context cues, both syntactic and semantic, to guess at unfamiliar words (Reid, 1998).

Syntactic cues are provided by the grammatical structure of the sentence preceding the unfamiliar word as well as components of the unknown word itself (Reid, 1998). Semantic cues include word meanings and relationships between words in the text. Pictures in the text may also provide semantic cues (Reid, 1998). The specific strategies applied when reading a word depend upon the individual's reading skills, his/her familiarity with the word, and the context surrounding the word.

Characteristics of a Skilled Reader

Research conducted with advanced readers provides some insight into the skills necessary for fluent reading. The eye movement research of the 1970's and 1980's (McConkie, 1979, 1982; McConkie & Zola, 1984; McConkie, Kerr, Reddix, Zola & Jacobs, 1989; Rayner, 1978) was important for establishing the significance of word recognition skills. Using computer technology to track eye movement, these researchers studied the forward saccadic eye movements (i.e., jump from one fixation point to another fixation point), fixations and regressions. This research demonstrated that fluent readers read nearly every word in text, they read each word individually, and they read words rapidly.

If fluent readers read every word individually, how are they able to read rapidly and comprehend what they read? Samuels (1998) refers to this ability as ‘automaticity’ in reading, the ability to read words with minimal cognitive attention and effort. All of the methods of reading words are available to fluent readers (i.e., sight word reading, decoding, analogy and prediction) in reading text (Adams, 1990; Ehri, 1995). However, fluent readers utilize sight word reading most frequently because it is quick and automatic (Ehri, 1995). Words become sight words when they have been read accurately

a number of times and become stored in memory. Sight of the word activates information in memory about the word's spelling, pronunciation and meaning (Ehri, 1992, 1995).

Prerequisite Abilities Necessary for the Development of Sight Word Reading Skills

Fluency in letter name knowledge, that is, the accuracy and speed with which children identify letters, is an elemental skill necessary for reading fluency (Adams, 1990). Letter name knowledge is highly predictive of early reading achievement (Chall, 1967; Share, Jorm, Maclean, & Matthews, 1984; Wagner, Torgesen, Rashotte, Hecht, Barker, Burgess, Donahue, & Garon, 1997; Wagner, Torgesen & Rashotte, 1994. Adams (1990) provides four possible reasons for the predictive power of this skill. Prereaders who are fluent in letter name knowledge are likely to find it easier to develop knowledge about letter sounds and word spellings. In terms of older readers, the speed with which letters are recognized affects the automaticity of both letter and word recognition. Since the names of letters are often related to their sounds, letter name knowledge supports the development of letter sound knowledge. Finally, the ability to name any visual stimulus rapidly indicates a cognitive ability that varies among people and is relevant for reading.

Phonological reading, also referred to as decoding or word attack, involves the application of knowledge of spelling (grapheme) - sound (phoneme) correspondences in order to read words (Bruck, 1988). There is broad consensus in the field of reading that phonological decoding skills play a central role in reading acquisition (Adams, 1990; Ehri, 1992; Guthrie & Seifert, 1977; Share & Stanovich, 1995; Spear-Swerling & Sternberg, 1998; Wagner, Torgesen, & Rashotte, 1994). Phonemes are the smallest units of sound in language and, when grouped together, comprise spoken words. Graphemes

are the visual representation of phonemes and consist of individual letters or groups of letters.

Phonemic awareness is an understanding of and ability to detect the individual sounds that make up spoken language. This skill has been widely researched (see Wilson, 1998 for a review). Although there are several phoneme analysis and synthesis tasks that are used to measure phonological awareness, there is evidence that these represent a single construct (Stahl & Murray, 1994). Tasks measuring phonemic awareness include phonemic segmentation, phonemic blending, phonemic deletion, and phonemic substitution. Longitudinal studies following children from kindergarten through elementary school have indicated the critical importance of rudimentary phonemic awareness skills, such as phonemic segmentation and blending, as prerequisite to the development of reading ability (Juel, 1988; Leather & Henry, 1994; O'Connor & Jenkins, 1997; Perfetti, Beck, Bell, & Hughes, 1987; Share, Jorm, Maclean, & Matthews, 1984; Wagner, Torgesen, & Rashotte, 1994; Wagner, Torgesen, Rashotte, Hecht, Barker, Burgess, Donahue, & Garon, 1997).

Graphophonemic knowledge is defined as information about the relationship between the graphic representation of words and the corresponding phonemes (Ehri, 1999). In their study of the development of graphophonemic awareness in elementary school students, Ehri & Soffer (1999) found that accurate identification of graphophonemic units in words was highly correlated with literacy development in beginning spellers, but not in more advanced spellers. Their findings suggest the importance of graphophonemic knowledge at beginning levels in learning to read and spell.

The development of spelling skills is closely linked to the development of reading skills. Spelling development involves many of the same language skills as reading development. These skills include: knowledge of letters; knowledge of grapheme-phoneme relationships; phonological awareness; and lexical knowledge (Ehri, 1989). Spelling development affects sight word reading skills. As spelling skills develop so do phonological recoding skills. The development of phonological recoding skills enables more complete and accurate connections in memory between the spelling and pronunciation of words. This in turn improves sight word reading skills (Ehri, 1989).

Reading Acquisition

The importance of the development of sight word reading skills as a necessary contributor to reading comprehension is indicated in many of the contemporary theories of reading acquisition (Adams, 1990; Chall, 1983; Ehri, 1995, 1999; Frith, 1985, 1986; Gough & Juel, 1991; Share, 1995; Spear-Swerling & Sternberg, 1994, 1998). These models are developmental in that advancement in word recognition skills develops over time in phases or stages depending on the model. Each phase or stage represents a qualitative shift in the information the individual uses to identify unknown words (Juel, 1996).

Ehri's (1999) model of reading acquisition is comprehensive in that it distinguishes several phases in the development of sight word reading skills. Four phases of word reading skills are identified, each distinguished by the type of connections that predominate linking the graphic to the phonological representations of words in memory. The process held to be central to sight word learning is a connection-forming process. Connections are formed that link the graphic representation of a word with its phonemic

pronunciation and its meaning in memory. These connections are stored in the individual's word memory bank or lexicon (Ehri, 1999).

Ehri's research indicates that different types of connections predominate at different phases of reading development (Ehri & Saltmarsh, 1995; Ehri & Soffer, 1999, Ehri & Wilce, 1982, 1985, 1986, 1987; Scott & Ehri, 1990). Each of the four phases of Ehri's (1999) theory is labeled to reflect the predominant type of connection that links the written form of the sight words to their pronunciations and meaning in memory. The pre-alphabetic phase of reading development involves connections between visual cues and the words. Visual cues may include the shape of the word or a distinctive logo such as a "Ford" logo on a car. The partial alphabetic phase marks the beginning of development of alphabetic knowledge. Connections are made between letters in the written word and sounds in their pronunciations. The connections are usually made between the most salient letters, often the first letter, and sounds of the word. At the full alphabetic phase direct connections are formed between graphemes in the spelling and phonemes in the pronunciation of words. At the consolidated alphabetic phase, as sight words are stored in memory in fully analyzed forms, recurring letter patterns become consolidated into units symbolizing phonological blends which are used to form connections in learning sight words.

Similar to Ehri's (1999) model of reading acquisition, Share's (1995) self-teaching model of early reading acquisition emphasizes the importance of the connection between the graphic and the phonological representation of words in memory. According to Share (1995), phonological recoding is the primary means by which words are stored in memory as orthographic representations that can be rapidly and automatically

retrieved. As an individual encounters words in text, phonological recoding functions as a self-teaching mechanism, enabling the individual to develop the word-specific orthographic representations in memory necessary for skilled reading.

Phonological Reading Disability

Research in the field of reading disability has identified weak phonological decoding skills as a critical deficit in many children and adults with a reading disability (Bruck, 1988; Moats & Lyon, 1993; Rack, Snowling, & Olson, 1992; Share, Jorm, Maclean & Matthews, 1984; Siegel, 1989; Spear-Swerling & Sternberg, 1998; Stanovich, 1991, 1982; Stanovich & Siegel, 1994; Torgesen, 1998; Vellutino, Scanlon and Spearing, 1995). Phonological reading, also referred to as decoding or "word attack", involves the application of knowledge of spelling-sound correspondences in order to read words in isolation (Bruck, 1988). More specifically, there are several component processes required in order to decode a word. These processes include the ability to segment words into smaller units, to pronounce these word segments, and blend the word segments into the whole word. All three of these processes pose difficulties for individuals with a phonological reading disability (Ehri, 1999). In addition, knowledge of the regularities of the writing system is needed including grapheme-phoneme correspondences, and syllable and sub-syllabic spelling patterns.

As stated earlier, phonological decoding skills are critical in the development of reading fluency. Phonological reading deficits interfere with the ability to decode unfamiliar words, the ability to store words in memory as sight words and the ability to access these sight words from memory. According to Samuels (1998), even when words can be decoded, phonological reading deficits interfere with the speed at which words can

be decoded. This lack of "automaticity" in decoding also interferes with comprehension processes by requiring more cognitive effort to decode words, therefore, reducing the cognitive resources available for comprehension.

Phonological Reading Disability and the Partial Alphabetic Reading Phase

According to Ehri's phase theory of word reading acquisition, older disabled readers who exhibit poor phonological skills are likely to be at the partial alphabetic phase of reading development (Ehri, 1999). Readers at this stage have knowledge of the shapes, names and some sounds of letters. They also have some sight-word vocabulary. Sight words are read by prediction and by phonetic cue reading (Ehri, 1999). Reading words by prediction involves guessing an unfamiliar word based on partial letters in the word plus contextual cues. Phonetic cue reading involves reliance on partial letter-sound cues stored in memory to read a word. Partial alphabetic readers lack complete knowledge of grapheme-phoneme correspondences. They also have difficulty segmenting words into individual phonemes and blending phonemes to create words. These weaknesses interfere with their ability to decode unfamiliar words and to read words by analogy (Ehri, 1999).

Ehri and Saltmarsh’s (1995) study provides evidence that older disabled readers function at the partial alphabetic reading phase. Beginning and disabled readers were taught to read the simplified spellings of target words. The students were given 10 to 12 learning trials to store these simplified spellings in memory. Three days later, the students were given a list of nonwords including both the simplified spellings they had practiced mixed together with altered simplified spellings in which one letter had been substituted, added or removed. Ehri and Saltmarsh (1995) were interested in measuring

the students' reaction time to determine if they could read the original simplified spellings faster than the newly altered spellings. A faster reaction time to the original simplified spellings would indicate sensitivity to modification in spellings. The extent of sensitivity to the modified spellings would indicate the degree to which the spellings had been stored in memory. The beginning readers' reaction time indicated sensitivity to changes in letters at the beginning, middle and end of words. In contrast, the disabled reader's performance indicated sensitivity to the letters only at the beginning and end of words. Ehri and Saltmarsh (1995) concluded that the beginning readers obtain more complete grapho-phonic connections than disabled readers when storing sight words in lexical memory. In this study the disabled readers functioned like partial alphabetic readers. They relied on partial letter-sound cues stored in memory to read the simplified spellings they had learned.

Persistence of Phonological Reading Disability

Findings of studies indicate that individuals with a reading disability continue to have deficits in phonological awareness through adulthood (Bruck, 1990, 1992; Greenberg, Ehri, & Perin, 1997, 2002; Rack, Snowling & Olson, 1992). Bruck (1992) compared the phonological awareness skills of children diagnosed with dyslexia, adults who were diagnosed with dyslexia when they were children, and children and adults who were good readers. The phonological awareness tasks included measures of syllable, onset-rime and phoneme awareness. This provided a detailed profile of the phonological awareness skills of disabled and non-disabled readers from childhood through adulthood. The results showed that the phoneme awareness deficits of adult dyslexics persist through adulthood with little development as a function of age or reading level. In contrast, their

onset-rime awareness appears to develop along with their reading skills, reaching mastery in adulthood. The profile of good readers is markedly different. Their phoneme awareness increases as they develop reading skills, and their onset-rime awareness tends to be mastered after two or three year of elementary school reading instruction. Bruck's (1992) findings highlight the persistence of phonological awareness deficits for individuals with a reading disability, particularly at the phonemic level.

In another study exploring the reading skills of adults with reading difficulties, Greenberg, Ehri, and Perin (1997) compared the word-reading processes of adult literacy students with elementary school students reading at the same grade level. The dependent measures included both phonologically complex tasks (i.e., phoneme segmentation, phoneme deletion, and pseudoword reading) and orthographically complex tasks (i.e., sight-word reading and spelling). Consistent with Bruck's (1992) findings, Greenberg et al. (1997) found that the adult literacy students were significantly weaker than grade level matched elementary school students on all of the phonologically complex measures, tasks requiring phonological processing at the phonemic level. In contrast, comparison of these groups on orthographically complex measures indicated that the adult literacy students were stronger in sight-word reading and weaker in spelling. In addition, they found that that the orthographic and phonological skills of elementary school students were more highly correlated than those of the adult literacy students. Greenberg et al. (1997) suggest that the lack of consistency in orthographic and phonological skills among the adult literacy students may indicate a weak integration of these processes, particularly in terms of word-reading and word-spelling processes, and that weak integration may be a significant contributor to the reading difficulties of these students.

In addition to the quantitative differences in phonological and orthographic skills found in the study by Greenberg et al. (1997), an extended analysis of the data (Greenberg, Ehri, & Perin, 2002) focusing on error patterns in word reading (sight words and pseudowords), spelling and rhyme word detection revealed qualitative differences between the two groups. Word-reading error analyses showed that the adult literacy students tended to make real word substitutions for pseudowords. In contrast, the elementary school students reading at the same level tended to make errors in decoding. Word spelling error analyses revealed that the adults' misspellings were often semi-phonetic and nonphonetic, whereas the children's misspellings tended to be more phonetic. On the rhyming word detection task, the adults made more mistakes than the children on rhyming word pairs that were spelled differently (e.g., fuel/mule) and on non-rhyming word pairs that were spelled similarly (e.g., have/gave). Results indicated that adults tended to rely on orthographic strategies in reading and spelling words, whereas the children were more likely to use phonological strategies. Greenberg et al. (2002) concluded that the adult literacy students in this study resembled Ehri's (1987, 1989) phonetic cue readers. In attempting to read words, they used partial alphabetic cues and relied on consistencies in spellings rather than decoding words by applying graphophonemic correspondences.

Instruction to Remediate Phonological Recoding Deficits

Because individuals with a reading disability rely heavily on orthographic strategies to read words and tend not to utilize phonological strategies, they usually have difficulty decoding unfamiliar words. Recent research indicates that the decoding skills of individuals with a phonological reading disability can improve through strategy-based

instruction designed to develop word attack skills (Bhattacharya, 2001; Bhattacharya and Ehri, 2004; Compton, Olinghouse, Elleman, Vining, Appleton, Vail, & Summers, 2005; Greaney, Tunmer and Chapman, 1997; Lovett and Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach and De Palma, 2000).

Bhattacharya (2001) conducted an intervention study to determine whether graphosyllabic analysis training improved the reading and spelling skills of adolescent students with weak word reading skills. Sixty junior high school and high school students with RD (a reading disability) were randomly assigned to one of three treatment conditions: a syllable instruction group, a whole word instruction group and a control group. The instruction groups received four 30-minute sessions of training. The syllable instruction group was taught to read the multisyllabic words by attaching adjacent consonants to vowel nuclei and segmenting the words into their constituent syllables. Corrective feedback was provided whenever a participant read a word incorrectly and whenever one of the syllable segmentation procedure steps was not attempted. The participants in the whole word condition were asked to read the same word lists as the syllable segmentation participants. However, they were not given the training in syllabication. Corrective feedback was provided whenever a word was read incorrectly. The participants in the no treatment control condition were just given pretests and posttests. The syllable and whole word groups participated in four instructional sessions. Each session was thirty minutes long and consisted of four practice trials. On posttests, the students who received the syllable instruction were able to decode more pseudowords than the control group and were able to recall the spellings of words read during the training better than the control group. In contrast, students who received the whole word

training did not perform better than the control group on the spelling or reading transfer tasks. However, the students in the whole word training group with weaker reading skills (reading at the 3rd grade level) were able to recall the spellings of words read during the training better than the control group. The results of the study reveal the effectiveness of graphosyllabic analysis training in teaching adolescents with weak reading skills to read multisyllabic words.

Greaney, Tunmer and Chapman (1997) conducted an analogy training study to determine the effectiveness of onset-rime segmentation instruction in improving the word reading skills of students with RD. The training was administered individually. There were two steps to the analogy training. The first step of the training involved reading target words aloud and receiving feedback in the form of a check or minus after each word was read. The second step of the training involved spelling words that shared the rime with the target words. During the spelling task, when a student made an error, corrective feedback was provided to prompt the student to identify the common rime between one of the target words and the spelling word. The student was then asked to write the common rime on the worksheet above each word. The control group received an alternate form of training. Although the first step of the training was identical to the experimental group the second step was different. During the second step of the training, each student was asked to read sentences containing the target words. The students received item-specific training focusing on reading each sentence accurately. The experimental group significantly outperformed the control group on posttest measures of individual word reading, reading of words in connected text, pseudoword reading and phoneme segmentation. In a one-year follow-up, the experimental group continued to

significantly outperform the control group on measures of pseudoword reading, rime unit identification, and reading words with common rime units. However, differences in phoneme segmentation and individual word reading were not maintained.

Lovett and her colleagues (Lovett and Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach and De Palma, 2000) have conducted a number of studies evaluating the efficacy of two word identification training programs designed to address phonological processing deficits, a phonological instruction program (PHAB/DI) and a strategy-based instruction program (WIST). The PHAB/DI phonological instruction program was designed to develop basic phonological analysis and blending skills through training in sound analysis and blending, print segmentation and blending, and grapheme-phoneme correspondence. In contrast, the WIST strategy-based instruction program was designed to train students on four word identification strategies: reading by analogy; attempting to read the part of the word that is familiar; trying different vowel pronunciations; removing prefixes and suffixes on a multi-syllabic word. Their research consistently shows that both of these instructional programs are effective in improving the phonological processing skills of disabled readers. In addition, their findings indicate that the skills taught generalize to other reading tasks.

Lovett and Steinbach (1997) compared the effectiveness of the PHAB/DI phonological instruction program, the WIST strategy-based instruction program and a study skills control condition for 122 children in grades 2 through 6 who were severely reading disabled (reading below the 20^{th} percentile). The programs consisted of 35 hours of training. Students were randomly assigned to the PHAB/DI, WIST, or study skills (control) programs. Both the PHAB/DI and the WIST instruction programs produced

significant improvements in students' word attack, word identification, and basic phonological processing skills at all grade levels. The phonological instruction program also resulted in significant improvements in sound segmentation and sound blending skills. The authors conclude that the phonological awareness deficit associated with developmental reading disability is responsive to remediation.

In a similar study, Lovett, Lacerenza, Borden, Frijters, Steinbach and De Palma (2000) studied the effectiveness of the PHAB/DI phonological instruction program and the WIST strategy-based instruction program in remediating reading skills of severely disabled readers. In contrast to the previous study, Lovett et al (2000) compared each instruction program to a control condition and to a combined treatment condition in which the students received both the PHAB/DI and the WIST instruction program. Eighty-five children, 6 to 13 years of age and reading below the 20th percentile, were randomly assigned 1 of 5 conditions: phonological instruction followed by strategy-based instruction; strategy-based instruction followed by phonological instruction; strategy instruction repeated twice; phonological instruction repeated twice; classroom survival skills and math training (control group). Results revealed that both instruction programs, administered separately and in combination, resulted in significant improvements in word attack, word identification and passage comprehension skills. The students that received the combination of the two instruction programs had the largest gains in word attack and word identification skills. Lovett et al (2000) emphasized the importance of explicit training and practice in subsyllabic segmentation in order for children with a reading disability to generalize the skills that they learn.

The studies reviewed above (Bhattacharya, 2001; Bhattacharya and Ehri, 2004; Lovett and Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach and De Palma, 2000) indicate the responsiveness of children and adolescents to phonological and strategy-based instruction designed to teach word analysis skills. In particular, the results of Bhattacharya's (2001) intervention study shows the value of a syllable segmentation strategy for teaching word attack skills to adolescents with weak word reading skills. Bhattacharya's (2001) syllable segmentation strategy provided the basis for the design of the word attack strategies used for the present DA study.

Traditional Assessment of Reading Disability

Assessment is often the initial step in addressing the needs of a child with a disability. It is the means by which functioning is evaluated, and it provides the springboard for development of instructional intervention. When evaluating an individual for the presence or absence of a disability, the assessment instrument should be designed to identify the behavioral/performance characteristics which are primary to a specific disability and which set it apart from other disabilities. Research conducted over the past twenty years has created a clearer understanding of reading disabilities. Unfortunately, common assessment practices have not kept pace with the research and often have little connection to what is currently known about reading disabilities.

Traditional assessment techniques continue to be the primary means by which educators obtain information about a student's skills (Haney & Evans, 1999). The goal of traditional assessment is to provide information about the student's current functioning for the purposes of classification, instruction and remediation (Haywood, Brown and Wingenfeld, 1990). The emphasis is on the product of learning rather than the process

(Jitendra & Kameenui, 1993). The product is usually a number that represents how the student performs in comparison to a normative group or a prescribed criterion.

Procedurally, the examiner's role in traditional assessment is one of objective observer (Haywood & Wingenfeld, 1992). The questions asked are designed to obtain information about the student's cumulative knowledge or skills in a particular domain. The student's performance is evaluated in terms of unaided success or failure. Information obtained about the student's knowledge is intended to be utilized for diagnosis and instructional development. However, due to the decontextualized nature of the assessment process (Carney & Cioffi, 1992), the information obtained through traditional assessment is limited in its usefulness for developing instruction (Jitendra & Kameenui, 1993).

The provision of Special Education Services to students identified as having a reading disability is a legal mandate for schools (Public Law 94-142, 1975). Such a mandate requires a quantitative definition that specifies criteria to include or exclude students for services based on the diagnosis of a reading disability (or other disability specified in educational law). If students are referred for psychoeducational evaluation because of the possibility that they might have a reading disability, the school is required to assess the students' reading skills to determine if they meet the criteria to qualify for Special Education services.

Educational institutions have struggled to develop a quantitative definition of reading disability that reflects the true nature of the disorder. The American Psychiatric Association's (2000) definition of reading disorder provides insight into some of the reasons for the difficulty in developing appropriate quantitative standards:

> The essential feature of Reading Disorder is reading achievement (i.e., reading accuracy, speed, or comprehension as measured by individually administered standardized tests) that falls substantially below that expected given the individual's chronological age, measured intelligence, and age appropriate education (Criterion A). The disturbance in reading significantly interferes with academic achievement or with activities of daily living that require reading skills (Criterion B). If a sensory deficit is present, the reading difficulties are in excess of those usually associated with it (Criterion C)…In individuals with Reading Disorder (which has also been called 'dyslexia), oral reading is characterized by distortions, substitutions, or omissions; both oral and silent reading are characterized by slowness and errors in comprehension.

In essence this definition provides some broad criteria on which to base the identification of a disability, but does not provide specific guidelines for quantifying the student's reading behaviors. Descriptors such as 'substantially below' and 'significantly interferes' leave diagnosis open to interpretation.

The criteria for diagnosis of a reading disability vary from school district to school district. However, the majority of state education departments require the application of a discrepancy formula (Mercer, King-Sears, & Mercer, 1990; Mercer, Jordan, Allsopp, & Mercer, 1996). In other countries, discrepancy formulas are also commonly used as diagnostic criteria for a reading disability (Reid, 1998).

A discrepancy formula involves the comparison of two constructs: the student's 'academic potential' as defined by his/her performance on an intelligence test and the student's current academic functioning as defined by his/her performance on a test of

reading achievement. A significant discrepancy favoring students' IQ score over their reading achievement test score is interpreted as indicative of a learning disability.

Even though most state education departments use discrepancy formulas as the primary criteria for the assessment of a reading disability, there is considerable research evidence that reveals the inadequacy of a discrepancy model. (Aram, Morris & Hall, 1992; Fletcher, Francis, Rourke, Shaywitz, & Shaywitz, 1992; Fletcher, Shaywitz, Shankweiler, Katz, Liberman, Stuebing, Francis, Fowler, & Shaywitz, 1994; Gresham, & Witt, J.C.,1997; Hurford, Schauf, Bunce, Blaich, & Moore, 1994; Pennington, Gilger, Olson, & DeFries, 1992; Shaywitz, Escobar, Shaywitz, Fletcher, & Makuch, 1992; Siegel, 1989, 1992; Stanovich, 1991. This research indicates that children classified as reading disabled form the lower end of a normal distribution of reading skills rather than a hump at the lower end of a bimodal distribution. The primary characteristic which sets apart individuals classified as reading disabled from 'garden variety' poor readers is the discrepancy between their IQ and reading performance, the very criteria used for identification. Otherwise, their performance on various reading tasks looks very similar.

Although state education departments do set the standards for assessment of learning disabilities, the actual assessment practices in educational settings are often inconsistent with state mandates. Large surveys of educational institutions conducted in California (MacMillan, Gresham and Bocian, 1998) and Texas (Hill, 1995) reveal a broad spectrum of assessment practices across institutions. In many educational settings, the assessment process is seen as a necessary evil, required in order to obtain special services for students from schools. Feedback received from educators (MacMillan et. al., 1998) indicates that these assessments often have little influence on classification

decisions and are conducted primarily to comply with state mandates. In addition, researchers found that the criteria that schools applied to the identification of a learning disability were often arbitrary and far removed from what research evidence indicates about learning disabilities (Hill, 1995; MacMillan et. al., 1998). "The public schools are identifying as LD an undifferentiated and nonspecific group of children that subsumes children who would be differentiated as LD, mildly mentally retarded, and conduct disordered were prescribed criteria rigorously applied in efforts to differentially diagnose these cases." (MacMillan et. al., 1998, p. 324).

Evaluation procedures utilizing discrepancy formulas are based on a traditional assessment model. Most of the other assessment instruments used in educational institutions to evaluate students' reading skills are based on a traditional assessment model as well (Haney & Evans, 1999). The focus of traditional assessment is on the already learned product of the evaluation (Lidz, 1991). The information obtained from traditional assessment indicates the student's level of mastery of a particular skill. Little information is obtained about the reason for the student's failure to acquire the skill or his/her potential to develop the skill through instruction (Lidz, 1991). This shows one of the primary weaknesses of traditional assessment. Academic skills, such as reading, are achieved through development of the subskills necessary to perform the skill. In order to understand a student's reading skills on a level that provides insight into the reason for the student's failure to read at an expected level, it is important to obtain information about his/her ability and potential to perform the subskills necessary for reading. Without this understanding, there is very limited information on which to base instruction.

Research indicates that traditional assessment practices used to evaluate students for the presence or absence of a learning disability often do not serve a relevant function in instructional development (Gresham & Witt, 1997). Instead of providing insight into the cognitive and academic strengths and weaknesses of each individual child, assessment procedures for reading and other learning disabilities have become an administrative and legislative requirement, with little connection to what is currently known about these disabilities and often little connection with school-based decisions and classification practices (MacMillan et. al., 1998).

Although common assessment methods have not kept pace with current research and knowledge, some changes in government policy and professional recommendations show a greater understanding of reading disabilities. The reissuing of the Individuals with Disabilities Education Act in 2004 (IDEA, 2004) reflected a shift away from the discrepancy model. One of the revisions in the law was that educational institutions are no longer required to use a traditional discrepancy between IQ and achievement in order to determine the presence of a learning disability. The evaluation procedure can now include a process to evaluate a student's response to research-based intervention (20 USC 1414 (b) (6) (A&B)). Similarly, the most recent update of policy on classification of learning disabled students by the New York State Department of Education states that, "In determining whether a student has a learning disability … the school district may use a process that determines if the student responds to scientific, research-based intervention as part of the evaluation procedure … and … is not required to consider whether a student has a severe discrepancy between achievement and intellectual ability…"(New York State Department of Education, 2005, p. 38). Many education departments in other

states have responded to the federal government's new position on assessment in a similar manner. Neither the federal government nor New York State Department of Education have disallowed application of the discrepancy model, but they have opened the door for more research-based interventions.

In other countries, developing knowledge about learning disabilities has had an even greater impact on government policy. For example, in the Netherlands, assessment and intervention policies are driven by review of current research on reading disabilities (Gersons-Wolfensberger & Ruijssenaars, 1997). In addition to government policy changes, professionals in the fields of education and psychology have recommended the use of alternative assessment techniques that provide greater insight into a student's strengths and weaknesses in order to make more informed decisions about diagnosis, placement, and intervention planning (Batsche & Knoff, 1995; Carney & Cioffi, 1992; Frisby & Braden, 1992; Gresham & Witt, 1997; Haney & Evans,1999; Haywood, 1992; Haywood & Wingenfeld, 1992; Jitendra & Kameenui, 1993; Kletzien & Bednar, 1990; Macmann & Barnett, 1997b; Reschly & Ysseldyke, 1995).

Response to Intervention

One of the primary approaches to assessment that has been supported by many educational researchers and government educational agencies has been response-to-intervention (RTI). This method of assessment is designed to differentiate between underachievement that results from poor instruction and underachievement indicating an actual learning disability. Through RTI, students are identified as learning disabled based on failure to succeed in a given academic area despite instruction that is typically effective for students (Fuchs, Fuchs, & Compton, 2004).

According to Fuchs et. al. (2004) there are two primary conceptual approaches to RTI. One approach involves problem solving in a mainstream setting. Through this approach, the development of skills of all students in the class is monitored to rule out poor instruction as the culprit for poor achievement. Students who are performing poorly are identified and a process of problem solving is initiated. This problem solving process involves attempting individualized modifications within the mainstream setting. If a student continues to fail despite these interventions, this is interpreted as indicative of a learning disability. The second approach to RTI involves identifying students who are struggling in the mainstream setting and implementing an intensive (small group or individualized) validated standardized treatment protocol over a set period of trials. Following each trial, students who are responsive to the instruction are sent back to the mainstream setting and another trial is implemented with the remaining students. The process continues until a group of students are identified who do not respond to the instruction. The lack of responsiveness of this group is interpreted to indicate that they have a learning disability.

The RTI approaches outlined above are clearly a movement away from a discrepancy model and towards a more meaningful and research driven approach to the identification of a learning disability. Although these approaches show promise, there are some problems with both of these models. Fuchs et. al. (2004) identified a couple of limitations with problem solving in the mainstream setting. This approach may require sustained individualized adaptations within the mainstream setting for students who respond positively to the intervention. If these adaptations are not sustained, the struggling students may continue to present learning difficulties. In addition, this

approach leads to fast-track LD classification for those who do not respond positively to the intervention. This may result in a high number of false positives, that is, students being classified as learning disabled whose deficits are not that significant. This is a major flaw given that one of the primary ethical and legal responsibilities in deciding on eligibility and placement into special education is determination of the minimal amount of support required for student success. Another challenge with this method of RTI is the extent of demands placed on a mainstream teacher. Most classroom teachers are already overwhelmed with extensive expectations placed on them. In addition, the level of individualized intervention that may be necessary in order to address the unique needs of each struggling student may exceed the expertise of most mainstream teachers. A reading specialist may be better trained to meet the specific instructional needs of the student.

The other model of RTI, the intensive treatment protocol approach, also has drawbacks. As Fuchs et. al. (2004) pointed out, this approach runs the risk of sending students back to mainstream instruction too quickly if they respond positively to the intensive instruction. These students may require more sustained instruction and could regress quickly without additional support. Therefore, this approach may lead to a high number of false negatives, that is, students with a learning disability who are not appropriately identified.

Dynamic Assessment

Despite the shortcomings of the two primary models of RTI, this form of assessment shows potential in addressing the major limitations of the traditional assessment model. One form of RTI, Dynamic Assessment (DA) has captivated many

educational researchers and theorists over the past fifteen years (Abbott, Reed, Abbott, & Berninger, 1997; Bednar & Kletzien; 1990; Carney & Cioffi, 1992; Cioffi & Carney, 1983; Compton, Olinghouse, Elleman, Vining, Appleton, Vail, & Summers, 2005; Haney & Evans, 1999; Haywood, Brown, & Wingenfeld, 1990; Haywood & Wingenfeld, 1992; Jitendra & Kameenui, 1993; Kletzien & Bendnar, 1990; Lidz, 1987, 1991; Pena, Quinn, & Iglesias, 1992; Perkins, 1988; Spector, 1992; Swanson, 1995; Swanson & Howard, 2005; Tzuriel, 1992).

"The focus of dynamic assessment is on the assessor's ability to discover the means of facilitating the learning of the child, not on the child's demonstration of ability to the assessor." (Lidz, 1991, p. 9). The assessment procedures are referred to as "dynamic" for two reasons. First, there is a teaching component to the assessment procedure (Haywood, Brown & Wingenfeld; 1990). In addition, a primary goal of the assessment is the evaluation of the processes of perception, thinking, learning and problem solving (Haywood et. al. ; 1990). Evaluation of these processes often provides information about the reasons for the learner's inability to achieve. Greater insight into these processes can provide relevant and individualized guidelines for intervention (Lidz, 1991). DA differs from traditional assessment in terms of the theoretical orientation; the assessment procedures employed; and the interpretation of results (Carney & Cioffi, 1992).

Although there are a number of models of DA, they are generally based on Vygotsky's (1978) 'Zone of Proximal Development' (ZPD). In the early twentieth century, when Vygotsky developed this theoretical concept, evaluation of children's cognitive skills was based on their independent performance on tests of mental ability.

This evaluation method, still practiced through traditional assessment techniques, identifies children's cognitive levels. In contrast, Vygotsky believed that children's ability to problem solve with the assistance of a skilled partner is more representative of their actual cognitive abilities than how they perform independently (Vygotsky, 1978). When children interact with a more knowledgeable partner, emergent developmental processes become evident. The difference between children's independent functioning and their functioning when interacting with a more knowledgeable partner is called the ZPD (Lidz, 1991). DA provides the opportunity to evaluate a child's ZPD through the interaction between the examiner and the child.

DA challenges the traditional model of assessment of intelligence through the evaluation of the individual's ability to process information in different learning contexts. As discussed earlier, traditional assessment of intelligence involves the application of IQ and achievement tests. These tests are typically designed to be administered in a standardized, inflexible, singular manner. The result of traditional testing is usually a product that represents the individual's level of attainment. DA focuses on the evaluation process as well as the product. This provides the opportunity to explore specific contextual factors and the interaction between these factors (i.e., student, teacher, learning environment, approach to instruction, peers, etc.) (Carney & Cioffi, 1992). The examiner's role is interactive, collaborating with the student to affect change in the skill being assessed (Litz, 1987). Assessment typically is conducted through a test-intervention-retest format. Initially, the student's performance on a given task is observed and recorded. Based on the initial performance, the examiner may introduce modifications of the original task, testing hypotheses about the teaching-learning

sequence. This process enables the examiner to identify factors or strategies that support or interfere with the student's learning of the task. (Carney & Cioffi, 1992).

DA provides the opportunity to make inferences about cognitive functioning, processes that cannot be directly observed. During the intervention stage of a DA, the examiner can systematically scaffold instruction or manipulate contextual variables in order to better understand and evaluate the cognitive processes and strategies that underlie the student's performance. This procedure of observing the student's performance following subtle changes in instruction or contextual variables provides an opportunity to view learning as it takes place (Haywood & Wingenfield, 1992). The examiner is able to evaluate the student's responsiveness to instruction and to modifications in contextual variables. This allows for a more individualized assessment of the student's strengths and weaknesses and a greater understanding of the effectiveness of different components of instruction. Inferences can be made about the cognitive skills that underlie learning. In addition to determining the student's current level of performance, DA can provide insight into the student's potential to develop further the skills being evaluated. Information obtained about the student's cognitive skills, strategy utilization and current performance can be used to tailor instruction to address the specific underlying areas of weakness. DA can also provide an estimation of the amount and type of instruction necessary to affect change (Lidz, 1991).

As with any assessment technique, the suitability of a DA procedure is dependent on the referral questions. DA techniques often involve detailed and comprehensive evaluation procedures as well as individualized administration. These techniques tend to be somewhat more labor intensive and time consuming than other forms of assessment.

However, DA is often the most appropriate evaluation method when the referral question requires a search for the reasons for low performance and the most economical and efficient ways to produce improvements in performance (Feuerstein, Rand, Jensen, Kaniel, & Tzuriel, 1987).

Swanson and Lussier's (2001) meta-analysis of 30 DA studies provided support for the effectiveness of DA. The objectives of their study were to determine whether DA resulted in a more accurate estimate of aptitude, measured distinctively different abilities, and improve mental efficiency compared with static assessment measures. The studies included in the meta-analysis involved 5 ability groups: average achievers, mentally retarded, learning disabled (based on discrepancy), underachievers, and hearing impaired participants. Ability group significantly impacted the magnitude of the effect sizes when the variables of age, number of sessions, type of design and type of measure were controlled. However, when analysis was conducted using a full regression model, ability group did not play a significant role in the study outcomes. Differences between these five ability groups have been well established in both the visual-spatial domain (e.g., visual sequencing, visual-motor sequencing, visual matrices) and the verbal domain (e.g., verbal knowledge, language measures, picture vocabulary). Given that these differences exist, and that ability group did not impact the magnitude of effect sizes of the DA studies, Swanson and Lussier (2001) concluded that some new abilities were being tapped through the DA instruction that cannot be measured through traditional assessment. Therefore, results of the meta-analysis support the possibility that DA procedures resulted in more accurate estimates of aptitude and measured distinctively different abilities than traditional assessment. The results of the meta-analysis also

revealed that DA procedures substantially improved test performance over static assessment procedures.

Dynamic Assessment of Reading Disability

As discussed earlier, traditional assessment techniques focus on evaluation of the student's current skill level. In the case of reading, assessment may include evaluating the decoding, fluency and comprehension skills of the student. Although knowing an individual's current functioning in these areas is useful, this information is often inadequate for the design of appropriate and effective instruction. Traditional assessment provides little information about the amount of support necessary to affect change in the student's skills/functioning. Without this information it is difficult to establish effective individualized instruction that utilizes the student's strengths and addresses the areas of weakness. There is a need to shift from procedures that focus on estimation of current and potential functioning to procedures that assess the conditions under which a student can learn most effectively (Cioffi & Carney, 1983).

DA procedures have been used to evaluate various types of reading skills including decoding (Compton, Olinghouse, Elleman, Vining, Appleton, Vail, & Summers, 2005), comprehension (Bednar & Kletzien, 1990), oral reading errors (Perkins, 1988), and phonemic awareness skills (Spector, 1992). DA studies have included a broad range of skill levels from preliteracy skills (Spector, 1992) to mature reading processes (Bednar & Kletzien, 1990) and have included populations ranging from preschool (Spector, 1992) to adulthood (Bednar & Kletzien, 1990). The evaluation procedures have ranged from individual sessions (Swanson, 1995) to longitudinal assessments (Abbott,

Reed, Abbott & Berninger, 1997; Compton, Olinghouse, Elleman, Vining, Appleton, Vail, & Summers, 2005).

Spector's (1992) evaluation of pre-literacy skills of nonreading kindergarteners comparing traditional and DA measures showed the predictive validity of a DA measure when applied to literacy evaluation. Spector's DA task involved the phonemic segmentation of words. The DA was administered individually and consisted of gradually increasing prompts involving corrective feedback, cues and modeling. Each student was presented with a series of words to segment phonemically. When the student was unsuccessful at correctly segmenting a word, the evaluator provided a series of prompts until the student was able to accurately segment the word. The instructional prompts progressed as follows: (1) the evaluator pronounced the word slowly; (2) the child was instructed to pronounce the first sound in the word; (3) the evaluator pronounced the first sound in the word; (4) the evaluator informed the child of the number of sounds in the word; (5) the evaluator modeled phonemic segmentation using pennies in squares to represent each individual sound in the word; (6) the evaluator repeated step 5 while guiding the child's hand across the pennies while pronouncing each segment of the word; (7) the evaluator repeated step 6. The student's performance on the DA was scored based on the degree of independence with which he/she was able to read each word.

Spector (1992) compared the predictive power of the DA of phonemic segmentation with a number of static measures of pre-reading skills including four other measures of phonemic awareness. She found that, of the assessment measures she employed, the DA of phonemic segmentation was the strongest predictor of progress in

reading and phonemic awareness at the end of the year. Her use of both a static and a dynamic measure of one type of phonemic awareness skill, phonemic segmentation, provides a direct comparison of dynamic versus static assessment of a critical component of reading and shows the usefulness of DA for the evaluation of reading skills.

In DA, feedback provided by the examiner is an important component of the interaction between the examiner and the student. Perkins (1988) studied the effectiveness of different types of feedback on the word attack performance of boys with a learning disability. The boys, in grades 1 through 4, were asked to read nonsense words with a consonant-vowel-consonant structure (e.g., *dat*). There were four types of feedback treatments: no feedback; general feedback that the word was read incorrectly; corrective modeling in which the examiner read the pseudoword trigraphs correctly; and corrective sound-it-out feedback in which the examiner performed segmentation of the pseudoword trigraphs into each phoneme and then blended the segments. When the student made an error in decoding the pseudowords, the examiner provided feedback. Instruction was brief, with each student participating in three training sessions. Results revealed a significant advantage of feedback over no feedback. The type of feedback also made a significant difference. Modeling of the correct pronunciation of the whole pseudoword was the most effective form of feedback, followed by corrective feedback suggesting a sound-it-out strategy, and then general form of encouragement. Results of this study indicate the importance of feedback as part of instruction and the need to consider the quality and type of feedback provided during instruction. This study also indicates the importance of the interaction between the examiner and the student.

Dynamic Assessment of Phonological Reading Disability

From the background provided in this literature review, a number of conclusions can be reached. First, reading skills develop in phases based on the degree of alphabetic knowledge that the child has acquired. In addition, skilled readers primarily use sight word reading to read words. They read rapidly, automatically and accurately, reserving the majority of their cognitive resources for comprehension. In contrast, disabled readers have poor phonological skills, difficulty decoding words and a limited sight word vocabulary. Furthermore, traditional assessment of disabled readers is inconsistent with current knowledge about reading and provides limited information for developing appropriate instruction. Finally, DA is an alternative to traditional assessment that involves the interaction between the examiner and student in the evaluation process. DA has characteristics that show its potential for evaluating reading disability in a way that is consistent with current knowledge in the field of reading. It also can provide information useful for developing individualized reading instruction.

The present study employed a DA of word attack skill to assess pseudoword decoding in older students with a reading disability, those beyond elementary school. The purpose of the study was to determine the usefulness of DA for the evaluation of reading disability and the utility of DA to teach the students strategies to improve their word attack skills. The field study conducted prior to this dissertation study is summarized in the following chapter. Results of the field study supported the usefulness of DA as both an assessment and instructional instrument. The field study formed the basis for the design and implementation of this dissertation study.

Chapter 3 - Report of the Field Study

A field study was conducted prior to the present dissertation study to determine the usefulness of this DA procedure. The purpose of the field study was to evaluate the contribution that DA could make to the understanding and improvement of the reading skills of phonologically disabled readers. The hypothesis tested was that DA would contribute to the decoding skills of phonologically disabled readers. In addition, evidence was sought to determine whether DA would contribute relevant and useful information regarding weaknesses in the reading skills of phonologically disabled readers.

Field Study Method

The participants in this field study consisted of 12 middle school students who were previously identified as having a reading disability. The participants were between the ages of 11 years, 10 months and 13 years, 10 months (grades 6 through 8). Four of participants in the study were female and 8 were male.

Pretest measures consisted of the Word Attack and the Word Identification subtests of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987, 1998). The Word Attack subtest presented pseudowords that conform to the rules of the English language. The Word Identification subtest presented common words in the English language graded by difficulty. The Word Attack pretest served as a means of identifying participants with weak phonological decoding skills (i.e., performance below the 25th percentile). The Word Identification subtest was administered to determine if each participant had stronger sight-word reading skills than word attack skills. Individuals with a phonological reading disability tend to perform worse on word attack tasks than on

word identification tasks (Greenberg, Ehri & Perin, 1997; Spear-Swerling & Sternberg, 1998). Word identification tasks contain familiar words that have been read before and stored in readers' memory. In contrast, word attack tasks require the application of phonological decoding skills to decode unfamiliar pseudowords.

The DA consisted of feedback procedures involving two phonological reading tasks. The tasks required each participant to read pseudoword lists similar to the Word Attack pretest. There were two components to the DA. The first component involved single syllable pseudowords and the second component involved multiple syllable pseudowords. The first component of the DA was administered immediately following the pretest measures. The second component was administered within a few days of the first. Both components of the DA required participants to apply phonemic segmentation, decoding and blending skills, all of which are difficult for phonologically disabled readers (Ehri, 1999).

The first session with the participant involved administration of the pretest measures and the single syllable strategy of the DA. This strategy consisted of dividing each pseudoword into its onset and rime. It was referred to as the 'head and body method'. The onset (head) of a word consists of all of the letters that come before the first vowel. The rime (body) consists of the first vowel and all the letters that succeed it.

Individuals were initially identified as eligible to participate in the study based on previous classification by the school district as reading disabled. Parents were contacted to request informed consent for their child's participation in the study. Students whose parents consented to participation were then asked to participate in the study. Prior to administration of the pretest measures, the examiner obtained informed consent from

each student. If the student agreed to participation he/she was administered the pretest measures, the Word Identification and the Word Attack subtests, of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987, 1998).

Immediately following completion of the pretest measures, the first component of the DA was administered to each participant. The participant was asked to begin reading a list of single syllable pseudowords. The single syllable strategy was modeled and taught the first time the participant failed to read a pseudoword correctly. The single syllable strategy involved the following steps: identifying the break between the onset and rime in the spelling; covering the rime spelling and reading the onset letters; covering the onset letters and reading the rime spelling; blending the onset and rime together to say the word. Once the 'head and body method' was fully introduced and explained to the participant, he/she was asked to continue to read the list of pseudowords.

Throughout the first component of the DA, if the participant was unable to read a pseudoword correctly, he/she was instructed to use the 'head and body method' to read the pseudoword. If the participant was unable to perform a specific step, corrective feedback was provided just at that step. Additional support at each step was provided until the participant was able to perform the skill and read the pseudoword. First, the instructor explained the specific skill to be performed and asked the participant to try it. If the participant required more support, then the instructor modeled the skill using a pseudoword similar in structure to the participant's pseudoword. Finally, if the participant was unable to perform the skill despite the scaffolded support, the instructor performed the skill using the participant's pseudoword.

The second session of the DA was administered a few days after the first part. This session involved a review of the onset-rime strategy and the teaching of the second component of the DA, a multi-syllable strategy. This strategy required segmenting the pseudoword into its constituent syllables. It was referred to as 'surround the vowel to read the beat'. Immediately following the review of the single syllable strategy, the participant was asked to begin reading a list of multi-syllable pseudowords. The strategy was introduced the first time the participant failed to read a pseudoword correctly. The multi-syllable strategy involved the following steps: determining the number of syllables in the pseudoword by counting the number of separate vowels, decoding parts of the pseudoword by separately reading each vowel with the consonants that surround it; blending all of the segments to say the pseudoword.

Once 'surround the vowel to read the beat' was fully introduced to the participant, he/she was asked to continue reading the list of pseudowords. Throughout the second stage of the DA, if the participant was unable to read a pseudoword correctly, he/she was instructed to use 'surround the vowel to read the beat' to read the word. If the participant was unable to perform a specific step, corrective feedback was provided at increased degrees of support in a manner consistent with the single syllable strategy.

Throughout the DA, the participant's performance was scored based on the degree to which he/she required support in order to read a pseudoword correctly. The participant received points based on the degree of independence in achieving a correct response for each step of a strategy. The single syllable strategy was given points based on five steps: identifying the onset; saying the onset; identifying the rime; saying the rime; combining the onset and rime to say the pseudoword. If the participant was not able to perform a

step, he/she received no points for that step. If the participant was able to perform the step only after additional scaffolding that involved the instructor modeling the step using a pseudoword similar in structure to the missed pseudoword, the participant received one point for the step. If the participant was able to perform a step only after the instructor simply reviewed the step verbally, he/she received two points for the step. If the participant was able to perform the step independently without any support from the instructor or was able to read the pseudoword correctly without having to perform the step, he/she received three points for the step. Since there were five steps to the single syllable strategy and a maximum of three points on each step, each single syllable pseudoword was worth a total of fifteen points. If a participant read the pseudoword independently without having to utilize the strategy, he/she received the total fifteen points for the pseudoword.

The multi-syllable strategy involved six steps for two syllable words and eight steps for three syllable pseudowords: determine the number of syllables; identify the first syllable; say the first syllable; identify the second syllable; say the second syllable; identify the third syllable (only for three syllable pseudowords); say the third syllable (only for three syllable pseudowords); combine all of the syllables to say the pseudoword. The scoring system for the multi-syllable strategy was consistent with the single syllable strategy. However, since there were six steps involved in the multi-syllable strategy for two syllable pseudowords and eight steps involved for three syllable pseudowords, a participant could earn a maximum of eighteen points on two syllable pseudowords and twenty-four points on three syllable pseudowords.

The posttest was administered immediately following the second session of the DA. The posttest consisted of an alternate form of the Word Attack subtest of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987, 1998) and was designed to evaluate the effectiveness of the DA in improving the phonological decoding skills of the participants.

Field Study Results

The data were analyzed with two main objectives in mind. The first objective was to determine whether the DA procedure provided a valid measure of the word attack (decoding) skills of participants with a reading disability. The second objective was to determine whether the DA was an effective means of instruction.

Three of the 12 participants in the study were not included in the data analysis due to a change in the procedure following their participation. In addition, two other participants could not be included in the reading disabled group because they scored within the average range on the pretest word attack measure.

In order to determine the validity of this DA procedure for measuring word attack skill, Pearson correlations were calculated between the two pretest scores, the Word Attack and Word Identification subtests of the WRMT-R (Woodcock, 1987, 1998), the posttest measure, the second form of the Word Attack subtest of the WRMT-R (Woodcock, 1987, 1998), and four DA scores: the unprompted pseudoword decoding score (the number of pseudowords read correctly without any prompting or feedback); total scaffolding score (calculated based on the amount of support that the participant required in order to successfully decode each pseudoword); scaffolding score for the single syllable pseudowords; scaffolding score for multi-syllable pseudowords. Strong

positive correlations were obtained between the Word Attack pretest and posttest scores and all of the DA measures (*r*s ranging from .789 to .934, $p < .05$). This indicates that these instruments measured the same skill, namely, phonological decoding skill. In contrast, the correlations between the Word Identification pretest and all of the DA scores were moderate but considerably weaker (*r*s ranging from .587 to .693, $p < .05$), indicating that the DA is not a measure of sight word reading skills. Although these correlations were moderate, they were not significant statistically. This may have been due to the small number of participants ($N = 7$), which limited the statistical power of the correlational analyses.

Further analysis of participants' word attack (decoding) skills was conducted by evaluating scaffolding performance for each component of the word attack strategies taught during the DA. The 'Head and Body' strategy taught participants to decode single syllable pseudowords by dividing the decoding task into smaller, more rudimentary parts: segmentation of each pseudoword into the onset and rime; decoding of the onset and the rime; blending of the onset and the rime into the complete pseudoword. Similarly, the 'Surround the Vowel to Read the Beat' strategy consisted of a number of more basic tasks: segmentation of each pseudoword into syllables; decoding of each syllable; blending of all of the syllables to say the complete pseudoword. The participant's ability to perform the task independently was interpreted as mastery. The participant's ability to perform the task with some scaffolded support (explanation or modeling using a similarly structured word) was interpreted as performance within the participant's 'zone of proximal development' (Vygotsky, 1978). If the participant required the evaluator to directly model the task this represented a failure to execute the task.

At the initial step of the protocol, when the participant misread a pseudoword, the evaluator stopped the participant, redirected him/her back to the erroneously read pseudoword, and encouraged him/her to utilize the strategy taught to reread the pseudoword. At this point the participant would often attempt to reread the pseudoword without proceeding through the various steps of the strategy. This initial prompting of the participant was considered the first step of scaffolding support. Prompting appeared to be a very successful means of providing instructional support to the majority of the participants. Of the pseudowords initially read incorrectly, the participants were able to read an average of 36 percent of the single syllable words and 39 percent of the multi-syllable words simply by attempting to reread them following the initial prompting.

The second step of scaffolding consisted of the evaluator providing more specific verbal cues to the participant. For single syllable pseudowords, more specific verbal cues appeared to be moderately effective, assisting the participants in reading an average of 15 percent of the pseudowords that required at least this level of scaffolding. In contrast, for multisyllabic pseudowords, more specific verbal cues appeared to be a very effective means of scaffolding support, assisting the participants in reading an average of 47 percent of the pseudowords that required at least this level of scaffolding.

The third and final step of scaffolding consisted of the evaluator indirectly modeling the performance of the task using a similarly structured pseudoword. Indirect modeling appeared to be moderately effective for single syllable pseudowords, assisting the participants in reading an average of 13 percent of the pseudowords that required at least this level of scaffolding. Indirect modeling appeared to be a more effective means of scaffolding support with multi-syllable pseudowords than with single syllable

pseudowords. Receipt of indirect modeling assisted the participants in reading an average of 20 percent of the multi-syllable pseudowords that required at least this level of scaffolding.

If a participant was unsuccessful at performing any of the skills (i.e., spelling segmentation, partial pseudoword decoding, or blending) even after receiving scaffolded support, the evaluator directly modeled the skill using the participant's erroneously read pseudoword, essentially performing the task. Direct modeling was primarily needed for tasks involving the decoding of parts of words (i.e., onset, rime, or syllable). At times, participants also required the evaluator to directly model the procedure of blending the pseudoword. In contrast, direct modeling was rarely necessary for the segmenting tasks.

To determine if the DA was an effective means of word attack instruction, the participants' performance on the Word Attack pretest was compared to their performance on the Word Attack posttest. A paired sample *t*-test was performed which revealed a significant difference between the means of the pretest and posttest, $t\ (6) = 7.875$, $p < .01$. On average, the participants' performance improved from a mean standard score of 77.7 on the pretest measure to a mean of standard score of 86.4 on the posttest measure. In fact, every participant showed improvement, with gains ranging from 3 standard score points to 14 standard score points. Moreover, the size of the gain was related to the participants' performance on the Word Attack pretest. Participants who performed better on the Word Attack pretest showed greater gains from pretest to posttest than participants with weaker performance. Overall, the significant improvement in the participants' performance from pretest to posttest indicates the effectiveness of the DA as a means of word attack instruction. It should be noted, however, that the experimental design of the

field study did not control for a possible practice effect. The repeated exposure and practice with decoding pseudowords may have contributed to the significant improvement in the participants' performance.

The pretest measures consisted of standardized measures of word attack and word identification. Research on reading disabled participants' skills reading real words and pseudowords indicates that they perform significantly better on real word reading tasks (Baddeley, Ellis, Miles, & Lewis, 1982; Greenberg, et. al., 1997; Holligan & Johnston, 1988; Siegel & Ryan, 1988; Snowling, 1981). Consistent with these research findings, it was anticipated that the participants would perform significantly better on the Word Identification pretest than the Word Attack pretest. Five of the seven participants showed higher standard scores on the Word Identification pretest than on the Word Attack pretest. In order to determine if there was a significant difference between the standard score means of the two pretest measures a paired sample *t*-test was performed. No significant difference was observed between the participants' ability to perform the Word Identification pretest and Word Attack pretest, $t\ (6) = -1.536$, $p > .05$. Although results of the *t*-test do not support previous research findings, it should be noted that the small number of subjects in the field study might have limited the statistical power of the *t*-test to detect a significant difference between the two pretest scores.

Discussion of Field Study

The field study was conducted to determine the usefulness of DA to evaluate the pseudoword decoding (word attack) skills of phonologically disabled readers. Phonological decoding skills are often the primary area of weakness in individuals with a reading disability, and pseudoword decoding is an effective method of evaluating these

skills. Standardized tests of pseudoword reading provide a measure of the participant's level of mastery of decoding skills. However, standardized tests provide little information about the individual's ability to perform more elemental processes that support word decoding: segmentation of the word, partial word decoding (onset, rime, or syllable) and blending of the parts of a word into the complete word. In addition, standardized tests do not provide the opportunity to examine the participant's response to instruction, to strategy learning and to strategy application. In contrast, the DA was designed to function as both a detailed assessment instrument and a means of instruction of word attack skills.

The results of the field study support the value of the DA as an evaluation instrument. The participants' performance on the DA was significantly correlated with the Word Attack pretest and posttest (i.e., correlations above .78). These relationships were consistently strong for all of the evaluation procedures conducted during the DA including: general assessment of decoding skills; assessment of scaffolding support needed for onset-rime pseudowords; assessment of scaffolding support needed for multiple syllable pseudowords; and total scaffolding support needed. Furthermore, the DA provided a more comprehensive assessment of the participants' strengths and weaknesses than the traditional assessment Word Attack pretest measure. It also provided information regarding the type and amount of instruction that was effective for each individual participant.

In addition to the value of the DA as an assessment instrument, the results indicate that it is an effective means of word attack instruction. The data analysis revealed a significant difference between the means of the Word Attack pretest and

posttest. On average, the participants' pseudoword decoding performance improved by 8.7 standard score points. The degree of improvement varied widely from 3 standard score points to 14 standard score points. Moreover, participants with a reading disability with stronger pseudoword reading skills showed the greatest degree of improvement in their performance, whereas, participants with the weakest skills showed the least improvement. Interestingly, there were two participants who were excluded from the analysis due to pretest word attack scores within the average range. Both showed modest gains of 8 percentile points. This may suggest that participants with average reading skills can also benefit from the DA as a means of instruction. Overall, the DA appeared to be effective as an instructional procedure for all of the participants in the study regardless of their phonological skill level.

Overall, the results of this field study supported the use of this DA for the evaluation and instruction of word attack skills of individuals with a phonological reading disability. The outcome of the field study supported the development of this dissertation study.

Development of the Dissertation Study

The dissertation study was designed to extend the field study by improving on the design. The dissertation study included a broader range of pretests and posttests, a larger number of participants, and the addition of a practice only (control) group.

In addition to the Word Attack pretest and posttest which were used in the field study, the dissertation study included a delayed Word Attack posttest, administered two weeks after the immediate posttest. This enabled the evaluation of the degree to which

possible gains in word attack skills from pretest to immediate posttest were sustained over a two week period without further word attack instruction.

Two other instruments served as both a pretest and posttest. The Word Identification subtest of the Woodcock Reading Mastery Test – Revised (Woodcock, 1987, 1998), was used to measure change in sight word reading skill. The Spelling of Sounds subtest of the Woodcock-Johnson Tests of Achievement – Third Edition (Woodcock, McGrew & Mather, 2001) was used to measure change in phonological encoding skill.

There were three additional pretests administered. The Peabody Picture Vocabulary Test – Third Edition (Williams & Wang, 1997) was used as a measure cognitive ability. The Auditory Analysis Test (Rosner & Simon, 1971) served as a phonemic awareness pretest measure. The Rapid Automatized Naming (RAN) Task (Denckla & Rudel, 1976) was used as a pretest to measure naming-speed.

The addition of a Practice Only (control) group provided the opportunity to control for the effect of practice reading pseudowords in order to rule out this factor as the cause of any improvement in decoding skill shown by the DA group. Participants in the Practice Only group read the same pseudoword lists as the DA group, but they did not receive any feedback or word attack instruction.

Chapter 4 - Method

Participants

The participants consisted of older students beyond elementary school and adults with a reading disability. Students were identified for possible participation based on previous district classification as learning disabled in the area of reading or participation in an adult literacy program. All adult literacy students were native English speakers. Their participation in the adult literacy program was due to illiteracy that was not adequately remediated during their childhood education

Signed informed consent was obtained from a parent or legal guardian of each of the participants who were minors prior to participation in this study (see Appendix A). In addition, informed written consent was obtained from each of the participants at the initial stage of the procedure (see Appendix B for secondary student consent form and Appendix C for adult literacy student consent form). Ethical standards of the American Psychological Association were followed in the treatment of all participants.

There was a total of 32 participants in the study. Participants came from four different educational settings. Eight participants (five males, three females) were from a library adult literacy program in Suffolk County, Long Island. All other participants were students with a reading disability in a school district on the north shore of Suffolk County, Long Island. Fourteen participants (eight male, six female) were students from the district high school, one of whom had recently graduated. The remaining 10 participants (six male, four female) were students from the two middle schools in the district.

The Word Attack subtest of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987, 1998) was administered in order to distinguish participants who were phonologically disabled from participants who did not have a phonological reading disability. Below average performance (<25th percentile) on the Word Attack subtest was considered to be indicative of a phonological reading disability. Participants who performed below average on the Word Attack subtest, and who volunteered, participated in the study. Participants were randomly assigned within each of the three age groups to the experimental or control groups.

Twenty-four of the 32 participants in the study were included in the data analyses. Four of the participants in the study did not finish the assessment. Two of these participants were high school students who elected to drop out. The other two participants were adult literacy students. They were asked to discontinue the assessment because individual characteristics compromised their ability to adequately participate. One of the adult literacy students suffered from dementia and the other had suffered a traumatic brain injury. In addition, four participants who completed the assessment were not included in the comparative analyses of the DA and control groups. Three of these participants could not be included in the analyses because they scored above the 25th percentile on the pretest word attack measure and therefore did not meet the criteria for a reading disability. The fourth participant was not included in the analyses because of a significant drop in his word attack performance. He was an adult literacy student who participated in the control condition. His word attack performance declined from decoding nine pseudowords on the pretest to not being able to decode a single word on the posttest. This represents a decline of over three standard deviations from pretest to

posttest. His performance was in stark contrast to all other participants in the study in both the DA and control conditions. Only one other participant in the study showed a decline in Word Attack performance from pretest to posttest. He was also a participant in the control condition. His pretest standard score was an 87 and his posttest standard score was an 83. This four-point difference is within the confidence interval (+/- five points) and is therefore not significant. Given the dramatic drop of over three standard deviations, it was concluded that the posttest word attack performance was not an accurate indication of the student's true functioning and therefore he was excluded from the data analyses.

The two treatment conditions consisted of 12 participants in each group. The DA group included five males and seven females. The mean age of participants in the DA group was 22.3 years. The practice only (control) group included eight males and four females. The mean age of participants in the practice only group was 22.0. Participants ranged in age from 12 to 66 years old.

Materials and Procedures

Pretests

The pretests were administered during the first session with each participant. Prior to administration of the pretests, the examiner introduced himself, expressed the goal of the study, requested the consent of the participant, and explained that he would teach the participant strategies to help him/her read words that he/she never saw before. If the participant consented to participation in the study, he/she was administered the various pretests. All of the pretests were individually administered. The pretests were

administered in the order in which they are listed below. The pretests took approximately 45 minutes to administer.

The Word Attack subtest of the Woodcock Reading Mastery Test – Revised (Woodcock, 1987, 1998) is a standardized, 45-item, individually administered, pseudoword reading test which is designed to measure decoding skills. This instrument was used to identify participants who had below average phonological decoding skills (performance below the 25th %ile). In addition, this instrument served as a pretest and immediate posttest (two different forms) to measure change in phonological decoding skill. Since there are two standardized forms of the test, one (Form-G) was administered at the beginning of the protocol and served as a pretest/screening measure and one (Form-H) was administered at the end of the protocol and served as the posttest measure. The mean internal consistency (split-half) reliability coefficient of either form (G or H) of the Word Attack subtest is .97 (Woodcock, 1998).

The Word Attack subtest of the Woodcock-Johnson Tests of Achievement – Third Edition (Woodcock, McGrew & Mather, 2001) is a standardized, 32-item, individually administered, pseudoword reading test which is designed to measure decoding skills. This instrument is very similar to the Word Attack subtest of the Woodcock Reading Mastery Test (Woodcock, 1987, 1998). This instrument was used as a delayed posttest to measure change in phonological decoding skills over time. It was administered two weeks after the Word Attack immediate posttest in order to measure the degree to which possible gains in word attack skills from pretest to immediate posttest were sustained over a two week period without further word attack instruction. The

median internal consistency (split-half) reliability of the Word Attack subtest is .87 (Woodcock, McGrew & Mather, 2001).

The Word Identification subtest of the Woodcock Reading Mastery Test – Revised (Woodcock, 1987, 1998) is a standardized, 106-item, individually administered word reading test which is designed to measure students' accumulated knowledge of words presumably read by sight for the most part. This instrument served as a pretest and posttest (two different forms) to measure change in sight word reading skill. Since there are two standardized forms of the test, one (Form-G) was administered at the beginning of the protocol and served as a pretest/screening measure and one (Form-H) was administered at the end of the protocol and served as the posttest measure. The mean internal consistency (split-half) reliability of either form (G or H) of the Word Identification subtest is .97 (Woodcock, 1998).

The Spelling of Sounds subtest of the Woodcock-Johnson Tests of Achievement – Third Edition (Woodcock, McGrew & Mather, 2001) is a standardized, 28-item, individually administered, pseudoword spelling test which is designed to measure phonological encoding skills. This instrument served as a pretest and posttest (two different forms) to measure change in phonological encoding skill. Since there are two standardized forms of the test, one (Form-A) was administered at the beginning of the protocol and served as a pretest/screening measure and one (Form-B) was administered at the end of the protocol and served as the posttest measure. The median internal consistency (split-half) reliability of the Spelling of Sounds subtest is .76 (Woodcock, McGrew & Mather, 2001).

The Peabody Picture Vocabulary Test – Third Edition (Williams & Wang, 1997) is a standardized, individually administered receptive vocabulary test. The second edition of this instrument was used as a pretest to measure cognitive ability (Rapala & Brady, 1990). This test consists of a series of pictures that the participant is asked to identify. It was important to assess participants' cognitive functioning to determine whether this was related to their ability to read and to respond to instruction. In addition, this information was important because one of the criteria commonly used to identify students with a reading disability is average to above average cognitive functioning. The median internal consistency (split-half) reliability coefficient of the PPVT-III is .94 (Williams & Wang, 1997).

The Auditory Analysis Test (Rosner & Simon, 1971) is a 40-item phoneme deletion task (see Appendix D). This test served as a phonemic awareness pretest measure. Phonemic awareness has been identified as one of the primary deficits in individuals with a phonological reading disability (Bruck, 1992). On this test the examiner said each word and the participant was instructed to repeat the word. The participant was then instructed to say the word again, but to leave out a specific phoneme or syllable in the word (e.g., say *time* but without the *m*). Phoneme deletion tasks are considered complex phonologically since they require the manipulations of phonemes in words (Greenberg, Ehri & Perin, 1997). In the current study, the Auditory Analysis Test had strong internal consistency reliability with a Cronbach alpha coefficient of .89.

The Rapid Automatized Naming (RAN) Task (Denckla & Rudel, 1976) is an individually administered test (see Appendix E). This task was used as a pretest to measure naming-speed. The test consists of an arrangement of five high-frequency

stimuli (letters, digits, colors, or objects). There are five consecutive rows with 10 stimuli in each row (a total of 50 stimuli). The RAN digits task was used in this study. The participant was asked to name the digits as quickly as possible. The participant was evaluated based on the speed and accuracy of his/her performance. The use of the RAN was based on Bowers and Wolf (1993) double-deficit hypothesis. Their hypothesis postulates that developmental reading disabilities can be caused by one or both types of deficits, a phonological deficit and a naming-speed deficit. There is considerable research evidence which supports Bower and Wolf's double-deficit hypothesis (Bowers & Swanson, 1991; Cornwall, 1992; Lovett, Steinbach & Frijters, 2000; O'Connor & Jenkins, 1997; Yap & van der Leij, 1994). In a study of the relationship of rapid automatized naming and reading conducted by Neuhaus, Foorman, Francis and Carlson (2001), the internal consistency reliability for RAN digits was strong, with Cronbach alpha's of .90 for first grade students and .77 for second grade students.

Dynamic Assessment treatment

The DA for this study was based on the DA conducted during the field study. The DA consisted of feedback procedures incorporated into a phonological reading task. The task required each participant to read pseudoword lists similar to the pretest Word Attack subtest (Woodcock, 1987, 1998). These pseudoword lists were individually administered with feedback provided during the administration. There were two parts to the DA. The first part involved single syllable pseudowords and the second part involved multiple syllable pseudowords. The single syllable pseudoword list consisted of 40 nonwords (see Appendix F), the single syllable pseudoword review list consisted of 5 nonwords (see Appendix G) and the multi-syllable pseudoword list consisted of 17 two-

syllable and 8 three-syllable nonwords (see Appendix H). All of the pseudowords on the lists conformed to the rules of the English writing system. The single syllable DA procedure was administered during the second session with each participant. The single syllable DA review and multi-syllable DA procedure were administered during the third session with each participant. Both parts of the DA required phonological segmentation, decoding and blending skills, all of which are difficult for the phonologically disabled readers (Ehri, 1999).

Single syllable strategy

The first part of the DA, the single syllable strategy (see Appendix I), was completed during the second session with each participant and took approximately forty-five minutes to administer. It involved teaching students to divide pseudowords into their onsets and rimes. This was referred to as the 'head and body method'. The onset of a word consists of all of the letters that precede the first vowel. The rime consists of the first vowel and all the letters that succeed it. The participant was asked to begin reading a list of single syllable pseudowords. The strategy was introduced the first time the participant failed to read a pseudoword correctly. The examiner presented each step of the strategy as follows: the step was explained by the examiner; the step was modeled by the examiner using a sample pseudoword similar in structure to the participant's incorrectly read pseudoword; the participant was asked to perform the step; if the participant was unable perform the step correctly the examiner modeled the step using the participant's pseudoword. For example, the examiner introduced the first step of the single syllable strategy as follows:

"A nonsense word like this is sometimes hard to read because it is not a real word that you have ever seen or heard before. One way to read a word you have never seen before is called the 'Head and Body Method'. First you have to separate the beginning consonants from the first vowel and the rest of the word. You can think of it as separating the head from the body in a word. The consonants that come before the first vowel are the head (the examiner used his thumbs to point out the onset of the sample pseudoword) and the rest of the word is the body (the examiner used his thumbs to point out the rime of the pseudoword). Now use your thumb to cover up the body of your word." (If correct, the examiner proceeded to step two of the routine. If incorrect, the examiner said) "That's not quite right. This is how you cover the body of the word." (The examiner covered the onset of examiner's pseudoword.) "Now you do it just like that." (The examiner had the participant copy with his/her pseudoword. If correct, the examiner proceeded to step two of the routine. If incorrect, the examiner said,) "That's not quite right. This is how you cover the body of the word." (The examiner covered the onset of the participant's pseudoword.)

Following the introduction to the first step of the strategy, the examiner continued to present the remaining steps of the strategy in a consistent manner. The single syllable strategy involved the following processes: identifying the break between the onset and rime in the spelling; covering the rime spelling and reading the onset letters; covering the onset letters and reading the rime spelling; blending the onset and rime together to say the word. Conventional onset-rime instruction includes keywords that share the same rimes as the words to be decoded. This enables the student to utilize analogy in order to decode

pseudowords. In contrast, the 'head and body method' did not include keywords. This was done in order to require participants to use the decoding processes that are typically weak in phonologically disabled readers. This design allowed for the examination of strengths and weaknesses and limited the role of analogy in decoding pseudowords.

Once the 'head and body method' was fully introduced to the participant, he/she was asked to continue to read the list of pseudowords. Throughout the first stage of the DA, if the participant was unable to read a pseudoword correctly, he/she was instructed to use the 'head and body method' to read the word. If the participant was unable to perform a specific step, corrective feedback was provided at increasing degrees of support until the participant was able to perform the skill. First, the instructor explained the specific skill to be performed and asked the participant to try it. If the participant's difficulty involved the incorrect decoding of the vowel in the pseudoword, the instructor explained the specific vowel rule that applied. There were three vowel rules explained. If a participant made a vowel error in a pseudoword with the letter 'e' at the end, the instructor would say, "When there is an 'e' at the end of the word you say the name of this first vowel (instructor pointed to first vowel) and the 'e' at the end is silent. What is the name of this first vowel?" If the vowel error was in a pseudoword with a vowel digraph, the instructor would say, "When two vowels go walking the first one does the talking. Say the name of this first vowel (instructor pointed to the first vowel) and leave this second vowel silent (instructor points to the second vowel)." Finally, when the participant's vowel error was in a pseudoword with a short vowel, the instructor would say, "When there is a single vowel in a word and there is no 'e' at the end of the word,

the vowel sound is short. For this word the vowel sound is (instructor says the vowel sound). Now you say the sound."

If the instructor's explanation was not enough support for the participant to be able to decode the pseudoword, then the instructor modeled the decoding procedure applied to a pseudoword similar in structure to the participant's pseudoword. Finally, if the participant was unable to perform the skill despite the scaffolded support, the instructor performed the skill using the participant's pseudoword.

The second part of the DA was administered during the third session with each participant. The second part involved a review of the onset\rime strategy (see Appendix J) and the teaching of a multi-syllable strategy (see Appendix K). The review consisted of a list of five single syllable pseudowords and took approximately five minutes to administer. The participant was asked to read the list of pseudowords. If the participant had difficulty reading a pseudoword, he/she was instructed to use the strategy taught during the previous session. Scaffolded support was provided as needed, consistent with the protocol for the first instructional part.

Multi-syllable strategy

The multi-syllable strategy involved segmenting the pseudoword into its constituent syllables. It took approximately 45 minutes to administer. Immediately following the review of the single syllable strategy, the participant was asked to begin reading a list of multi-syllable pseudowords. The strategy was introduced the first time the participant failed to read a pseudoword correctly. The examiner presented each step of the strategy as follows: the step was explained by the examiner; the step was modeled by the examiner using a sample pseudoword similar in structure to the participant's

incorrectly read pseudoword; the participant was asked to perform the step; if the participant was unable perform the step correctly the examiner modeled the step using the participant's pseudoword. For example, the examiner introduced the first step of the multi-syllable strategy as follows:

> "A nonsense word like this is sometimes hard to read because it is not a real word that you have ever seen or heard before. Another reason it is hard is because it has more than one syllable, and these have to be put together to read the word. Look at my word. It has ____(# of syllables) syllables. How can I tell? I look for the vowels or vowel clusters that sit between the consonants. I count them. This tells me how many syllables I need to read and put together. The vowels are A, E, I, O, U, and sometimes Y. Vowels sometimes stand alone, surrounded by consonants and sometimes sit together in clusters. I will point to the vowels in my word and count them. There are ___ separate vowels or vowel clusters, so there should be ___ syllables. Now you do that for your word." (If incorrect, the examiner said,) "That's not quite right. Let me show you." (The examiner pointed to the vowels and vowel clusters in the participant's pseudoword and counted them.)

Following the introduction to the first step of the strategy, the examiner continued to present the remaining steps of the strategy through a standard procedure. The multi-syllable strategy involved the following steps: determining the number of syllables in the pseudoword by counting the number of separate vowels or vowel clusters in the pseudoword; segmenting the pseudoword by separately reading each vowel with the consonants that surround it; blending all of the segments and saying the pseudoword.

Once the multi-syllable strategy was fully introduced, the participant was asked to continue to read the list of pseudowords. Throughout the second part of the DA, if the participant was unable to read a pseudoword correctly, he/she was instructed to use the strategy to read the pseudoword. If the participant was unable to perform a specific step, corrective feedback was provided at increasing degrees of support until the participant was able to perform the skill. First, the instructor explained the specific skill to be performed and asked the participant to try it. If the participant's difficulty involved the incorrect use of the vowel in the pseudoword, the instructor explained the specific vowel rule that applied. If the participant required more support, then the instructor modeled the skill using a pseudoword similar in structure to the participant's pseudoword. Finally, if the participant was unable to perform the skill despite the scaffolded support, the instructor performed the skill using the participant's pseudoword.

Scoring

There were two sets of scores obtained from the DA. The Initial Single Syllable DA and Initial Multi-syllable DA scores represented the number of pseudowords on the DA list that participants decoded correctly without scaffolded instruction. The DA Scaffolding Single Syllable and DA Scaffolding Multi-syllable scores indicated the amount of scaffolded support required to successfully decode all of the pseudowords on the DA list.

For the DA Scaffolding scores, participants received points based on the degree of independence in achieving a correct response for each step of a strategy, with higher scores indicating greater independence (see Appendix M for Single Syllable Dynamic Assessment Data Sheets and Appendix N for Multi-Syllable Dynamic Assessment Data

Sheets). The single syllable strategy involved five steps: identifying the onset; saying the onset; identifying the rime; saying the rime; combining the onset and rime to say the word. For each step, if the participant was able to perform independently without any support from the instructor or was able to read the pseudoword correctly without having to perform the step, he/she received three points. If the participant was able to perform a step only after the instructor verbally reviewed the step, he/she received two points for the step. If the participant was able to perform the step only after additional scaffolding that involved the instructor modeling the step using a pseudoword similar in structure to the missed pseudoword, the participant received one point for the step. If the participant was unable to perform a step, he/she received no points for that step. Since there were five steps to the single syllable strategy and a maximum of three points on each step, each single syllable pseudoword was worth a total of 15 points. If a participant read the pseudoword independently without having to utilize the strategy, he/she received the total 15 points for the word. Since there were 45 single syllable words, a maximum of 675 points could be earned on the single syllable DA. Participants' scores ranged from 542 points to 665 points. For data analyses, these scores were transformed by arbitrarily subtracting 525 points from each score. Once the transformation was conducted, participants' scores ranged from 17 points to 140 points.

The multi-syllable strategy involved six steps for two-syllable words and eight steps for three-syllable words as follows: determine the number of syllables; identify the first syllable; say the first syllable; identify the second syllable; say the second syllable; identify the third syllable (only for three syllable words); say the third syllable (only for three syllable words); combine all of the syllables to say the word. The scoring system

for the multi-syllable strategy was consistent with the single syllable strategy. However, since there were six steps involved in the multi-syllable strategy for two syllable words and eight steps involved for three syllable words, a participant could earn a maximum of 18 points on two syllable words and 21 points on three syllable words. Since there were 17 two-syllable words and 8 three-syllable words, a maximum of 474 points could be earned on the multi-syllable DA. Participants' scores ranged from 388 points to 467 points. For the data analyses, these scores were transformed by arbitrarily subtracting 374 points from each score. Once the transformation was conducted, participants' scores ranged from 14 points to 93 points.

The DA scores reflected the number of pseudowords the participant read correctly without feedback. The single syllable Dynamic Assessment measure had strong internal consistency reliability, with a Cronbach alpha coefficient of .91. The internal consistency reliability for the multi-syllable Dynamic Assessment measure was also strong, with a Cronbach alpha coefficient of .78.

Practice only treatment

The participants in the Practice Only (control) group participated in four sessions. The initial session took approximately 45 minutes and involved administration of the pretest measures. The second session took place one week after the first session and lasted approximately 10 minutes. It involved asking the control group participants to read the single syllable DA pseudoword list. However, unlike the experimental group, the control group did not receive any feedback regarding the accuracy of their performance reading the DA pseudoword list. In addition, the control group participants were not taught any word attack strategies. The third session was administered one week

after the second session. During this session the control group was asked to read the single syllable DA pseudoword review list and the multi-syllable DA pseudoword list. Consistent with the second session, no feedback or instruction were provided to the control group participants when reading the pseudoword lists. Following the independent reading of these pseudoword lists, the control group participants were administered the posttests. The third session took approximately twenty-five minutes. Two weeks after the third session the control group participants were administered the delayed Word Attack posttest. This final session took approximately ten minutes. This Practice Only design was intended to control for the effect of practice reading pseudowords in order to rule out this factor as the cause of any improvement in decoding skill shown by the DA group.

Posttests

Three posttests were administered immediately following the second stage of the DA. All three of these immediate posttests were alternative forms of three of the pretest measures. Two of the immediate posttests were the second form (Form H) of the Word Attack and Word Identification subtests of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987, 1998). The third immediate posttest was the second form (Form B) of the Spelling of Sounds subtest of the Woodcock-Johnson Tests of Achievement – Third Edition (Woodcock, McGrew & Mather, 2001). Descriptions of these three measures are in the Pretests section of this chapter. The posttests were intended to evaluate the effectiveness of the DA in improving the participants' phonological decoding skills and to determine whether taught skills transferred to sight-word reading and pseudoword encoding (spelling).

In addition to the three immediate posttests, the Word Attack subtest of the Woodcock-Johnson Tests of Achievement – Third Edition (Woodcock, McGrew & Mather, 2001) was administered two weeks after the DA was completed. This delayed test enabled the examination of the sustained effect of the DA instruction on word attack performance.

Design, Statistical Analyses, and Hypotheses

The present study utilized a pretest-posttest control group design to assess the usefulness of DA to evaluate the decoding skills of participants with a phonological reading disability. The independent variable was treatment type. The two levels of treatment type were the DA and the pseudoword reading practice.

The first set of analyses was conducted to compare the two treatment groups prior to the treatments. One-way ANOVAs were conducted to determine if the treatment groups differed significantly in terms of participant characteristics of age, gender, cognitive functioning (Peabody Picture Vocabulary Test-Third Edition, Williams, K.T. & Wang, J., 1997) and phonological reading ability (Word Attack pretest). One-way ANOVAs were also conducted to determine if the treatment groups differed significantly in terms of pretest measures related to phonological decoding skill. The independent variable was the treatment group (DA vs. Practice Only) and the dependent variables were age in years, gender (male = 1, female = 2), and standard score on pretest measures. Since participants were randomly assigned to the two treatment conditions, it was anticipated that they would not differ significantly on any pretest measures.

The second set of analyses was conducted to evaluate the instructional value of the DA. MANOVAs for repeated measures were conducted in order to compare the

participants' performance on the Word Attack, Word Identification and Spelling of Sounds pretests with their immediate posttest performance. These analyses helped to determine if there was a significant improvement from pretest to posttest and if the improvement was limited to the experimental condition, the DA, or occurred in the practice condition as well. The independent variables were treatment group (DA vs. Practice Only) and time of test (pretest vs. immediate posttest) and the dependent variables were the standard scores on the pretest and posttest measures. It was anticipated that, consistent with the field study, participants who received the DA would show a significant improvement in word attack skills from pretest to posttest. Similarly, since the DA was designed to help these participants with phonological decoding, and since real word reading and phonological encoding require many of the same skills, it was anticipated that participants who received the DA would show a significant improvement from pretest to posttest on the transfer tasks. In contrast, it was anticipated that the participants who simply practiced reading the DA pseudoword list without receiving scaffolded support would not show a significant improvement in word attack, word identification or pseudoword spelling skills. Such outcomes would support the utility of the DA as an effective instruction tool for phonologically disabled readers.

A MANOVA for repeated measures was conducted to compare the word attack performance of the treatment groups two weeks after the treatment was completed. The independent variables were treatment group (DA vs. Practice Only) and time of word attack test (pretest vs. delayed posttest). The dependent measure was the standard score on the word attack test. It was anticipated that improvement in word attack performance of the DA group over the Practice Only group would be sustained over time.

The third set of analyses involved evaluating the validity of the present DA as a measure of word attack reading skill. There were two sets of scores obtained from the DA: the Initial DA scores (single and multi-syllable) and the DA Scaffolding scores (single and multi-syllable). The Initial DA scores represented the number of pseudowords on the DA list that participants decoded correctly without scaffolded instruction. The DA Scaffolding scores indicated the amount of scaffolded support required to successfully decode all of the pseudowords on the DA list. Pearson correlations were calculated between each of the two DA Scores and all of the pretest measures. Since the DA was designed to measure word attack skills, participants' Word Attack pretest performance was expected to be highly predictive of their performance on both of the DA measures. Consistent with the field study results, it was anticipated that there would be very high positive correlations, above +0.80, between the Word Attack pretest and both DA measures. Furthermore, since the DA was designed to measure word attack skills, which are associated with sight word reading, phonological encoding and phonological awareness skills, it was anticipated that the Word Identification, Spelling of Sounds, and Auditory Analysis pretest performance would be predictive of performance on both DA measures, but not as predictive as performance on the Word Attack pretest.

The strength of the correlations between the four DA measures and the Peabody Picture Vocabulary Test (PPVT) were expected to provide greater understanding of the relationship between cognitive functioning and phonological decoding skills. Strong correlations were anticipated between the PPVT and the DA measures since cognitive skills are likely to influence student's ability to successfully respond to instruction.

Strong correlations between the Rapid Automatized Naming task and the four DA measures would provide support for a double-deficit hypothesis (see Rapid Automatized Naming task in Apparatus section of this chapter).

In addition to the validity of DA as a measure of word attack performance, the present study attempted to determine if the DA procedure provided meaningful information about pseudoword reading performance above and beyond the information available through traditional assessment, as exemplified by the Woodcock Word Attack subtest. Answering this question required a more in-depth analysis of performance during the DA task. Analyses of participants' performance on the Onset – Rime instruction and Syllable Segmentation instruction were conducted separately. Analyses of participant performance were conducted on both the individual participant level and on the DA group as a whole.

Analysis of the performance of each individual participant in the DA involved an evaluation of the rate of success on each component of the decoding process. This analysis was conducted separately for the Onset-Rime and Syllable Segmentation strategies. Success rates were calculated for each participant on all of the components of decoding. It was anticipated that any component of decoding in which an individual participant had a success rate below 80 percent would reflect an area of weakness which would require further instruction.

For the Dynamic Assessment group as a whole, there were two different areas of analysis for each type of instruction: identifying specific areas of difficulty in segmenting and blending pseudowords; and determining the level of scaffolded support required to enable participants to read the pseudowords successfully. These analyses were conducted

separately for the Onset-Rime and Syllable Segmentation strategies. One-way ANOVAs were conducted to determine if any components of decoding were more difficult than others. Additional one-way ANOVAs were conducted to determine if any level of scaffolding was required more frequently than the others. Bonferroni's correction for multiple comparisons was used in order to lower the *p* value to safeguard against a Type 1 error.

This comprehensive analysis of performance during the DA was anticipated to yield meaningful information about the participants' word attack skills that were not attainable through traditional assessment alone. Such an outcome would provide further support for the usefulness and validity of DA as an evaluation instrument.

In summary, the objectives of this dissertation study were to determine the usefulness of DA for the evaluation of reading disability and the utility of DA to teach the participants strategies to improve their word attack skills. The results of this study were anticipated to support the validity of DA for the evaluation of word attack skills. The results were also expected to indicate that DA provides meaningful information about the participants' word attack skills that cannot be attained through traditional assessment methods. In addition, the results were anticipated to support the use of DA for instruction in word attack skills.

Chapter 5 - Results

The data were analyzed with two main objectives in mind. The first objective was to determine whether the dynamic assessment (DA) was an effective means of word attack (decoding) instruction for individuals who are reading disabled. The second objective was to determine whether the DA procedure provided a valid measure of the word attack skills of individuals with RD.

Characteristics of Participants

The DA and Practice Only groups were compared on several characteristics including age, gender, cognitive functioning (vocabulary test) and phonological decoding skill (word attack test). The Word Attack pretest was used to limit participation to those who performed below average (< 25^{th} percentile) and thus were considered to have a phonological reading disability. One-way ANOVAs were conducted to determine if the treatment groups differed significantly on these characteristics. The independent variable was the treatment group (DA vs. Practice Only). The dependent variables were age in years, gender (male = 1, female = 2), and standard score on both the Peabody Picture Vocabulary Test (PPVT) and the Word Attack pretest. Mean values and test statistics are given in Table 1.

Results of the one-way ANOVAs showed that the treatment groups did not differ significantly on any of these measures. Although the mean age and standard deviation were similar between the groups, the age of participants spanned from 12 to 66. Cognitive functioning also varied as indicated by performance on the PPVT, with scores ranging from a standard score of 75 to a standard score of 111. Low PPVT scores were not a function of age or English as a second language. Participants' phonological reading

Table 1

Participant Characteristics and Performance on Pretests as a Function of Treatment Group

	Dynamic Assessment Group	Practice Only Group	F - stat
Characteristic/Pretest	Mean (*SD*)	Mean (*SD*)	*df* (1,22)
Age in Years	22.3 (16.9)	22.0 (13.3)	0.003 (ns)
Gender M/F	5M/7F	8M/4F	1.478 (ns)
Peabody Picture Vocabulary Test (ss)	92.0 (9.1)	89.0 (10.4)	0.567 (ns)
Word Attack Pretest (ss)	75.8 (10.7)	74.5 (13.5)	0.063 (ns)
Word Identification Pretest (ss)	75.7 (17.7)	71.0 (16.5)	0.448 (ns)
Spelling of Sounds Pretest (ss)	84.8 (10.7)	81.3 (10.5)	0.654 (ns)
Rapid Automatized Naming (seconds)	24.5 (7.9)	23.5 (5.1)	0.136 (ns)
Auditory Analysis (40 max rs)	21.7 (6.0)	22.8 (9.7)	0.125 (ns)

Note: $N = 12$ participants in each group. The ages ranged from 12 to 66 years; ss = standard score with a mean of 100 and a standard deviation of 10; rs = raw score; *$p < .05$; **$p < .01$; ns = not significant at $p < .05$

ability ranged from a standard score of 46 to a standard score of 88 on the Word Attack pretest. Although standard scores provide a basis to observe participant functioning relative to a standardized sample of same aged peers, raw scores provide information about the specific number of pseudowords read correctly. Comparing raw scores of participants provides information about their relative phonological skills. The wide range of ages affected the conversion from raw score to standard score. This had more of an impact on standard score differences when comparing middle school students with high school and adult participants. For example, a 12-year-old with a raw score of 19 obtained a standard score of 87. In contrast, an 18- year-old with a raw score of 19 obtained a standard score of 73. The raw scores of participants on the Word Attack pretest ranged from 2 to 30 pseudowords read correctly. The raw scores of the middle school students ranged from 10 to 22 pseudowords read correctly. The high school students' raw scores ranged from 7 to 30 pseudowords read correctly. The raw scores of the adult literacy students ranged from 2 to 17 pseudowords read correctly.

In addition to participant characteristics, four other capabilities were assessed with pretests to compare the two groups. These pretests were included because they measure skills associated with phonological decoding skills. The Word Identification subtest of the Woodcock Reading Mastery Test – Revised (Woodcock, 1987, 1998) was administered as a measure of students' accumulated knowledge of words presumably read by sight for the most part. Participants' performance reading words ranged from a standard score of 24 to a standard score of 90 on the Word Identification Pretest. Thus, only one participant performed barely within the average range (standard score of 90 to 109). The Spelling of Sounds subtest of the Woodcock Johnson Tests of Achievement –

Third Edition (Woodcock, McGrew & Mather, 2001) was administered as a measure of phonological encoding skill. Spelling performance ranged from a standard score of 61 to a standard score of 103 on the Spelling of Sounds pretest. Five participants performed within the average range (standard score of 90 to 109) on this measure. The Auditory Analysis Test (Rosner & Simon, 1971), a phoneme deletion test, was administered as a measure of phonological awareness. Performance on this non-standardized measure ranged from three to 35 out of 40 correct phoneme deletions. The Rapid Automatized Naming Task (Denckla & Rudel, 1976) was administered as a measure of naming speed. Errors on this test ranged from zero to two errors, with a maximum possible of 50. Completion times ranged from 13 seconds to 45 seconds.

One-way ANOVAs were conducted to determine whether the treatment groups differed significantly on these pretests. The independent variable was the treatment group (DA vs. Practice Only). The dependent variables were the participants' performance on the Word Identification, Spelling of Sounds, Auditory Analysis and Rapid Naming tests. Results showed that the treatment groups did not differ significantly on any of these measures. From the mean scores in Table 1, it is apparent that participants were well below average in their ability to read and spell words as well as pseudowords.

Interestingly, inspection of performance of these students with a reading disability in Table 1 reveals that the mean standard scores of each group on the Word Attack and Word Identification tests were very similar. The absence of a difference was surprising given that previous studies involving students with RD have found superior performance on real word reading tasks compared to nonword reading tasks (Baddeley, Ellis, Miles, &

Lewis, 1982; Greenberg, et. al., 1997; Holligan & Johnston, 1988; Siegel & Ryan, 1988; Snowling, 1981).

Performance of participants on the Word Identification, Word Attack and Spelling of Sounds pretests was examined to identify the kinds of errors committed. Numerous reading errors on both the Word Attack and Word Identification tests reflected phonetic cue reading. Phonetic cue reading involves reliance on partial letter-sound cues to read a word. The miscue is a real word sharing some letters with the printed word. This form of reading was observed through substitution of real words that shared some of the phoneme-grapheme relationships with the actual answer. For example, on the Word Identification test a student said "*mister*" when the word was "*miser*". Similarly, on the Word Attack test a student said "*worry*" when the pseudoword was "*wrey*". In fact, phonetic cue reading was so common that 93% of participants (all but one student) utilized phonetic cue reading at least once on both the Word Identification and Word Attack tests. Some participants used phonetic cue reading as one of their primary strategies for reading unfamiliar words.

Analysis of errors on the Spelling of Sounds pretest reflected semi-phonetic processing as well. Students substituted real words that shared some of the same phoneme-grapheme relationships with the correct answer. For example, a participant wrote "*page*" when the pseudoword was "*pag*". Eighty-three percent of participants produced a semi-phonetic spelling at least once on the Spelling of Sounds test. The majority used semi-phonetic spelling numerous times.

Participants' use of phonetic cue reading and semi-phonetic spelling supports the hypothesis that participants were functioning at the Partial Alphabetic Phase of Ehri's

phase theory of reading acquisition (Ehri, 1999). Their reading performance reflected that they had incomplete knowledge of grapheme-phoneme correspondence and had difficulty segmenting and blending words.

The Dynamic Assessment as an Instructional Instrument

The second set of analyses was conducted to evaluate the instructional value of the DA. There were three hypotheses regarding the DA as an instructional instrument. The instructional elements of the DA focused on developing word attack skills. Therefore, the first hypothesis was that the DA would be an effective means of word attack instruction. The second hypothesis was that the DA would improve students' reading of real words but to a lesser extent because some of the real words could only be read from memory by sight rather than by decoding. Because the spelling of pseudowords (Spelling of Sounds Test) requires many of the same skills as phonological decoding of pseudowords (Word Attack Test), the third hypothesis was that the DA would improve participants' ability to spell unfamiliar words.

The first MANOVA for repeated measures compared the participants' performance on the Word Attack pretest with their performance on the Word Attack immediate posttest. Of interest was the detection of an interaction between treatment group (DA vs. Practice Only) and time of Word Attack test (pretest vs. immediate posttest). The dependent measure was the standard score on the word attack test. As evident in Table 2, the results revealed a significant main effect of time and a significant interaction between time and treatment. Mean performance is plotted in Figure 1. The main effect of treatment was not significant.

Translated into standard scores, the performance of participants receiving the DA improved from a mean standard score of 75.75 on the pretest to a mean standard score of 86.92 on the immediate posttest. In fact, every participant showed improvement, with pretest - posttest gains ranging from 3 standard score points to 27 standard score points. In contrast, the performance of participants in the Practice Only group improved more modestly, from a mean standard score of 74.50 on the pretest measure to a mean standard score of 79.75 on the immediate posttest. All but one participant in the Practice Only group showed improvement, with gains ranging from 1 standard score point to 18 standard score points. This consistent improvement among all but one student clearly shows a practice effect.

In addition to the MANOVA, an effect size was calculated on the posttest scores for further comparison of the improvement in word attack performance resulting from the DA instruction. Results revealed a large effect size (see Table 2), indicating that the DA treatment raised decoding skill much more than the practice treatment. This confirms the usefulness of the DA as a means of word attack instruction.

A third word attack test was administered to participants two weeks after the DA was completed in order to determine whether improvements in participants' performance would be sustained over time. It was anticipated that participants in the DA group would maintain their superiority in word attack performance. A MANOVA for repeated measures was conducted. The independent variables were treatment group (DA vs. Practice Only) and time of word attack test (pretest vs. delayed posttest). The dependent measure was the standard score on the word attack test.

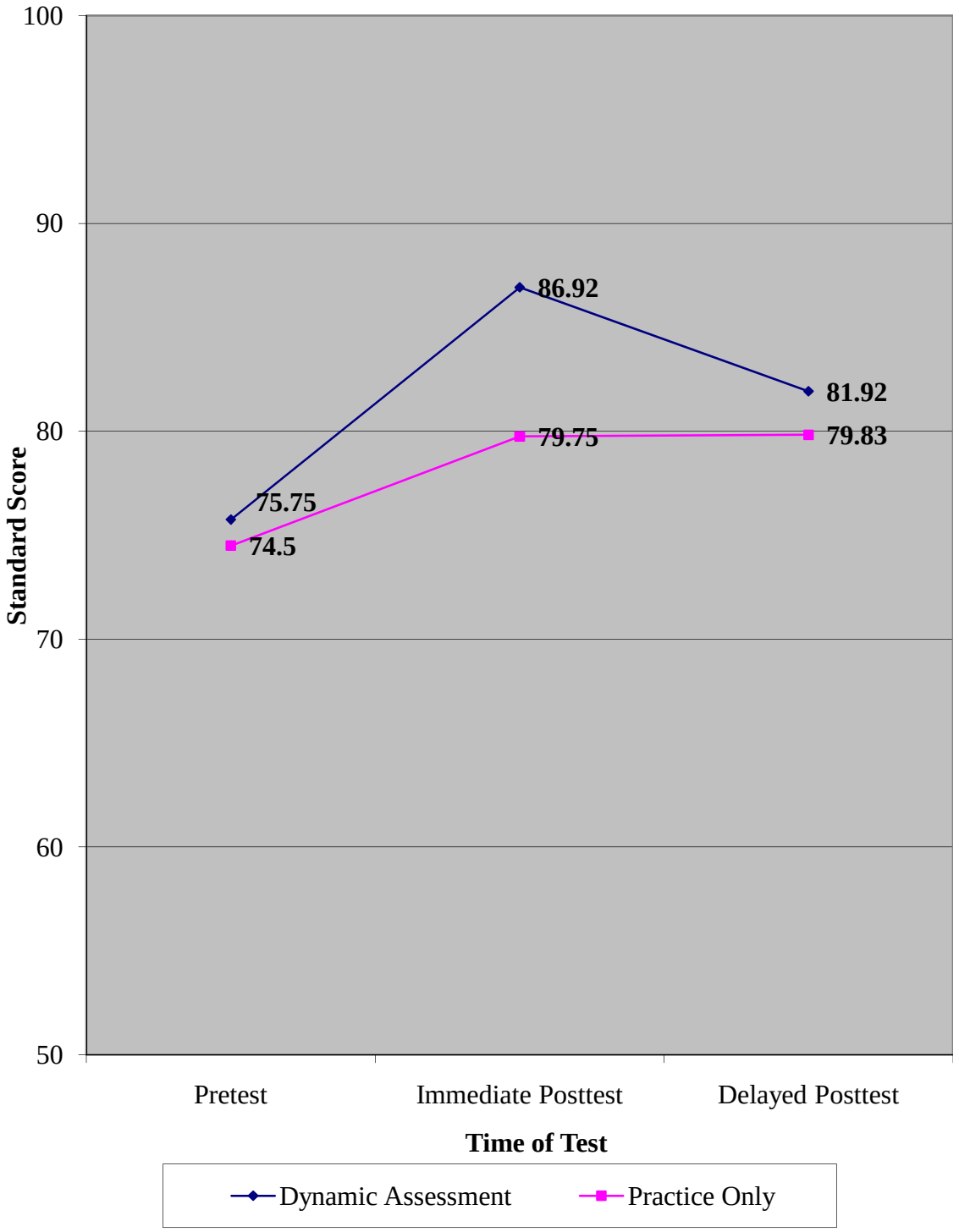
Table 2

Mean Performance on Pretests and Posttests by Treatment Group and Test Statistics

Test	Dynamic Assessment Group Mean (*SD*)	Practice Only Group Mean (*SD*)	Effect Size	*F* - stat *df* (1,22)
Word Attack				G: 1.08 (ns)
Pretest (ss)	75.8 (10.7)	74.5 (13.5)		T: 35.79**
Immediate Posttest (ss)	86.9 (9.0)	79.8 (7.9)	.84	G x T: 4.65*
Delayed Posttest (ss)	81.9 (9.8)	79.8 (7.9)	.24	G: 0.18 (ns)
				T: 9.00**
				G x T: 0.05 (ns)
Word Identification				G: 0.63 (ns)
Pretest (ss)	75.7 (17.7)	71.0 (16.5)		T: 0.43 (ns)
Immediate Posttest (ss)	75.0 (17.1)	68.1 (24.1)	.33	G x T: 0.17 (ns)
Spelling of Sounds				G: 0.74 (ns)
Pretest (ss)	84.8 (10.7)	81.3 (10.5)		T: 0.92 (ns)
Immediate Posttest (ss)	86.0 (8.8)	83.3 (8.8)	.31	G x T: 0.05 (ns)

Note: $N = 12$ participants in each group. G = Group; T = Time of test; ss = standard score with a mean of 100 and a standard deviation of 10; *$p < .05$; **$p < .01$; ns = not significant at $p < .05$. Effect size = M (DA) – M (PO) / pooled SD

Figure 1: Word Attack Performance By Group Over Time



The results revealed no significant interaction between time and treatment group, indicating that the two groups did not differ on the delayed posttest (see Table 2). However, there was a significant effect of time (see Table 2). These findings reveal that the mean word attack scores of both groups were significantly higher on the delayed posttest than on the pretest, indicating that treatment effects persisted even after a delay. Inspection of means in Table 2 and Figure 1 reveals that when the DA group was retested two weeks later, its word attack performance declined by a mean of five standard score points from the immediate posttest. In contrast, retesting did not alter the performance of the Practice group from immediate to delayed posttesting. These results provide evidence that the effect of practice was sustained over time for both groups whereas the added effect of instruction did not persist (see Figure 1).

To determine whether the DA was an effective means of improving students' reading of real words, participants' performance on the Word Identification pretest was compared to their performance on the Word Identification posttest. The Word Identification posttest was administered immediately following completion of the treatments. A MANOVA for repeated measures was conducted. The independent variables were treatment group (DA vs. Practice Only) and time of Word Identification test (pretest vs. posttest). The dependent measure was the standard score on the Word Identification tests. Results revealed no significant main effects of time or treatment (see Table 2). Additionally, there was no significant interaction between time and treatment (see Table 2). On average, the performance of both groups did not change significantly from pretest to posttest (see Table 2). Overall, these results indicate that the DA was not an effective means of instruction in reading real words. Contrary to expectations based

on the pilot study, the gain in participants' word attack skills from pretest to posttest did not transfer and improve their reading of real words.

To determine if DA instruction impacted spelling skill, participants' performance on the Spelling of Sounds pretest and posttest was compared. The Spelling of Sounds posttest was administered immediately following completion of the treatments. A MANOVA for repeated measures was conducted. The independent variables were treatment group (DA vs. Practice Only) and time of Spelling of Sounds test (pretest vs. posttest). The dependent measure was the standard score on the Spelling of Sounds tests. Results revealed no significant main effects of time or treatment, and no significant interaction between time and treatment (see Table 2). Although the spelling performance of participants in both groups improved slightly from pretest to posttest, the gain fell short of significance (see Table 2). Overall, these results reveal that the gains in participants' word attack skills resulting either from the DA or from practice did not transfer and improve students' spelling of unfamiliar words.

The Dynamic Assessment as an Evaluation Instrument

In addition to determining the usefulness of this DA procedure as a means of word attack instruction, the other primary objective of this study was to evaluate the validity of this DA as a measure of word attack reading skill. The DA consisted of a single syllable non-word procedure and a multi-syllable non-word procedure. There were two sets of scores obtained from the DA. The Initial Single Syllable DA and Initial Multi-syllable DA scores represented the number of pseudowords on the DA list that participants decoded correctly independent of scaffolded feedback. The DA Scaffolding Single Syllable and DA Scaffolding Multi-syllable scores indicated the amount of

scaffolded support required to successfully decode all of the pseudowords on the DA list. For the DA Scaffolding scores, participants received points based on the degree of independence in achieving a correct response for each step of a strategy, with higher scores indicating greater independence.

Pearson correlations were calculated between all of the pretest measures and the Initial Single Syllable DA score, the Initial Multi-syllable DA score, the DA Scaffolding Single Syllable score and the DA Scaffolding Multi-syllable score. These values are shown in Table 3. The analysis was limited to the DA group since these were the only participants who received the DA. The correlation between the Initial Single Syllable DA and the Initial Multi-Syllable DA was high and significant ($r = .95$, $p < .01$). Similarly, the correlation between the DA Scaffolding Single Syllable and DA Scaffolding Multi-syllable was high and significant ($r = .94$, $p < .01$).

In interpreting correlations in the present study, it is important to keep in mind that they were based on only 12 observations. Moreover, participants were limited to those with low scores on the literacy tests thus restricting the range of test scores. Inspection of correlations between pretest and DA measures in Table 3 reveals that all but two values would be considered at least moderate in size (i.e., *rs* at or above .40). The fact that moderate correlations fell short of statistical significance is a result of a lack of power. Future research involving more observations is needed to verify the strength of these relationships.

The DA was designed to measure word attack skills. Therefore, performance on both the initial DA and scaffolded DA measures was expected to be strongly correlated with performance on the Word Attack pretest. The correlation between the Initial Single

Table 3

Correlations Between Dynamic Assessment (DA) and Pretest Measures (Dynamic Assessment Group)

Test Score	1	2	3	4	5
Pretests					
1 - Word Attack	1.000				
2 – Word Identification	0.544	1.000			
3 – Nonword Spelling	0.564	0.478	1.000		
4 – Auditory Analysis	0.505	0.604*	0.655*	1.000	
5 – PPVT	0.413	0.500	0.445	0.817**	1.000
6 - Rapid Naming of #'s	-0.302	-0.809**	-0.502	0.664*	-0.464
Dynamic Assessment					
7 – Initial Single DA (45 max.)	0.779**	0.566	0.725**	0.805**	0.609*
8 – Initial Multi DA (25 max.)	0.649*	0.674*	0.715**	0.855**	0.667*
9 – Single Syllable DA Scaffold	0.763**	0.289	0.583*	0.672*	0.584
10 - Multi-Syllable DA Scaffold	0.714**	0.475	0.752**	0.802**	0.686*

Note: N = 12 participants; pretests are presented in standard score; Dynamic Assessment measures are presented in raw score; ns = not significant; *$p < .05$; **$p < .01$

(table continues)

Table 3 (continued)

Test Score	6	7	8	9	Mean (*SD*)
Pretests					
1 - Word Attack					75.75 (10.70)
2 – Word Identification					75.67 (17.66)
3 – Nonword Spelling					84.83 (10.69)
4 – Auditory Analysis					21.67 (5.99)
5 – PPVT					92.00 (9.05)
6 - Rapid Naming of #'s	1.000				24.50 (7.88)
Dynamic Assessment					
7 – Initial Single DA (45 max.)	-0.460	1.000			27.42 (9.47)
8 – Initial Multi DA (25 max.)	-0.566	0.947**	1.000		12.33 (4.85)
9 – Single Syl. DA Scaffold	-0.309	0.866**	0.769**	1.000	102.33 (37.02)
10 - Multi-Syl. DA Scaffold	-0.472	0.950**	0.910**	0.940**	160.08 (53.88)

Note: N = 12 participants; pretests are presented in standard score; Dynamic Assessment measures are presented in raw score; ns = not significant; *$p < .05$; **$p < .01$

Syllable DA measure and the Word Attack pretest was high and significant ($r = .78$, $p < .01$). Similarly, the correlation between the Initial Multi-Syllable DA measure and the Word Attack pretest scores was high and significant ($r = .65$, $p < .05$). The strong correlations between the initial DA scores and the Word Attack pretest suggest that the pseudowords selected for the DA were well designed for a test of decoding.

The correlation between the DA Single Syllable Scaffolding measure and the Word Attack pretest was high and significant ($r = .76$, $p < .01$). Similarly, the correlation between the DA Multi-Syllable Scaffolding measure and the Word Attack pretest scores was high and significant ($r = .71$, $p < .05$). These strong correlations between the scaffolded DA scores and the Word Attack pretest suggest that the scoring system for scaffolded instruction was a valid measure of phonological decoding skills.

The DA was designed to assess word attack skills which are associated with real word reading skills. According to Share (1995), word attack skills provide students with a self-teaching procedure for reading and retaining sight words in memory. Therefore it was anticipated that scores on both of the DA measures would be positively correlated with performance on the Word Identification pretest although to a lesser extent than correlations involving the two DA measures and the Word Attack pretest. Results revealed a stronger correlation between the Initial Multi-syllable DA measure and the Word Identification pretest ($r = .67$, $p < .05$) than between the Initial Single Syllable DA measure and the Word Identification pretest ($r = .57$, $p > .05$). In contrast, the correlation between the DA Multi-syllable Scaffolding measure and the Word Identification pretest was moderate and not significant ($r = .48$, $p > .05$). The correlation between the DA Single Syllable Scaffolding measure and the Word Identification pretest was weak and

not significant ($r = .29$, $p > .05$). These results provide some support for the relationship between DA word attack performance and real word reading. Perhaps the multisyllabic DA measure was more strongly related because most of the words that students were reading on the Word Identification test were multisyllabic. Beginning at the second grade-equivalent level, multisyllabic words become increasingly prominent in this test, and all students were able to read words above this level. Also correlations may have been boosted by the fact that some of the multisyllabic real words could be decoded accurately if they were not known as sight words.

The Spelling of Sounds pretest was included to assess phonological encoding skills. Students were given nonwords to spell. This skill was expected to be closely associated with phonological reading of nonwords (word attack). Since the DA was designed to measure word attack skills, spelling pretest performance was anticipated to be highly correlated with performance on the DA, though not as high as correlations between the Word Attack pretest and the DA measures (see Table 3). Results revealed that spelling scores were highly correlated with all four of the DA measures, with *r*s ranging from .58 to .75, indicating that both the initial and scaffolding DA measures were strongly related to phonological encoding skill.

In summary, the correlations between the four DA Measures and both the Word Attack and Spelling of Sounds pretests were strong and significant, indicating the validity of this procedure. The lower correlations between three of the four DA measures and the Word Identification pretest reflected somewhat more complex relationships than were anticipated.

In addition to validating the DA as a form of assessment, further analyses were conducted to assess the predictive power of phonological awareness, cognitive functioning and rapid naming of numbers. Correlations were examined between the four DA measures and the Auditory Analysis Test, Peabody Picture Vocabulary Test (PPVT) and Rapid Automatized Naming pretests.

The Auditory Analysis pretest measured phonological awareness which is closely associated with word attack skills. Therefore, it was anticipated that this Phoneme Deletion pretest would be highly correlated with all four DA measures. Inspection of the correlations in Table 3 reflects that, as anticipated, all of the correlations between the DA measures and Phoneme Deletion were high and significant. In fact, these correlations were the highest observed between the DA measures and any pretest measure, with three of the four correlations in the .80s. These results support the power of phonological awareness in predicting student performance on the DA.

The Peabody Picture Vocabulary Test (PPVT) measures receptive vocabulary. This instrument was used as a pretest to measure cognitive ability (Rapala & Brady, 1990). The correlations between the PPVT and all four DA measures were anticipated to be strong and significant since participants' cognitive functioning was expected to be related to their ability to respond to instruction. The results in Table 3 confirm this. Correlations between the PPVT and the Initial Single Syllable DA, the Initial Multi-syllable DA and the Multi-syllable Scaffolding DA were all strong and significant. In contrast, the correlation between the PPVT and the Single Syllable Scaffolding DA was strong but fell short of significance ($r = .58$, $p > .05$).

The Rapid Automatized Naming task (RAN) was used as a pretest to measure naming speed. The use of the RAN was based on Bowers and Wolf (1993) double-deficit hypothesis. Their hypothesis postulates that developmental reading disabilities can be caused by one or both types of deficits, a phonological deficit and a naming-speed deficit. Based on this hypothesis, it was anticipated that the correlations between the RAN pretest and the DA measures would be strong and significant. As reflected in Table 3, none of the correlations was significant. It should be noted, however, that three of the four correlations were moderate ($r > .40$). Low power may explain the lack of significance.

Analysis of Dynamic Assessment Performance

Analysis of performance on the DA was conducted at both the individual level and the group level. The DA consisted of onset – rime instruction for single syllable pseudowords and syllable segmentation instruction for multi-syllable pseudowords. Participants' performance in these two instructional procedures was analyzed separately.

Analysis of the performance of each individual participant in the DA involved an evaluation of their success on the various components of the decoding process listed in Tables 4 and 5. Table 4 shows the number of times each decoding component was successfully executed. The percentages are displayed in brackets. Performance below 80 percent was considered below mastery and reflects any area of decoding in which the individual participant required further instruction. Although every participant performed below average (below the 25th percentile) on the Word Attack pretest, the performance of 8 of the twelve participants in the DA was at or above mastery on all of the decoding components for single syllable pseudowords (see Table 4). The DA was expected to identify areas of weakness in decoding in all participants because they were poor

Table 4

Performance of Individual Participants on the Single Syllable Dynamic Assessment (DA)

Participant	1	2	3	4	5	6	7
Word Attack Pretest (rs)	4	7	13	11	15	21	17
Word Attack Pretest (ss)	54	64	67	70	75	76	76
Immed. Word Att. Gain Score (ss)	27	14	3	9	22	5	12
Dynamic Assessment Decoding Steps[a]							
Onset Ident.	43(96)	41(91)	43(96)	37(82)	43(96)	44(98)	43(96)
Onset Pronunc.	31(69)	42(93)	41(91)	35(78)	44(98)	43(96)	42(93)
Rime Ident.	45(100)	45(100)	45(100)	43(96)	45(100)	45(100)	44(98)
Rime Pronunc.	29(64)	32(71)	27(60)	27(60)	38(84)	42(93)	40(89)
Onset-Rime Blend.	28(62)	45(100)	38(84)	36(80)	42(93)	45(100)	44(98)
Average Perform.	35(78)	41(91)	39(87)	36(80)	42(93)	44(98)	43(96)

Note*: N* = 12 participants; *rs* = raw score; *ss* = standard score; Dynamic Assessment components are presented in raw score with percentage correct in brackets

(a) The maximum score on each decoding step was 45.

(table continues)

Table 4 (continued)

Participant	8	9	10	11	12	
Word Attack Pretest (rs)	15	21	19	22	30	
Word Attack Pretest (ss)	78	86	87	88	88	
Immed. Word Att. Gain Score (ss)	8	7	8	8	11	
Dynamic Assessment Decoding Steps[a]						Mean Frequency
Onset Ident.	44(98)	44(98)	41(91)	44(98)	45(100)	43(96)
Onset Pronunc.	42(93)	45(100)	44(98)	43(96)	45(100)	41(91)
Rime Ident.	45(100)	45(100)	44(98)	45(100)	45(100)	45(100)
Rime Pronunc.	37(82)	41(91)	39(87)	39(87)	44(98)	36(80)
Onset-Rime Blend.	44(98)	42(93)	44(98)	45(100)	45(100)	42(93)
Average Perform.	42(93)	43(96)	42(93)	43(96)	45(100)	41(91)

Note*: N* = 12 participants; *rs* = raw score; *ss* = standard score; Dynamic Assessment components are presented in raw score with percentage correct in brackets

(a) The maximum score on each decoding step was 45.

decoders. This suggests that the DA may not be as sensitive an evaluation instrument as was anticipated. A revised criterion of performance below a 90 percent mastery level would appear to be more appropriate. This criterion would flag all but three students as requiring further instruction. In Table 4, scores of students falling below a 90 percent criterion are highlighted in grey.

Analysis of individual performance on the Single Syllable DA (see Table 4) using the revised criterion provided the opportunity to identify specific instructional needs of individual participants. Nine of the twelve participants performed below 90 percent accuracy in pronouncing the rime of the pseudowords. This was the component of the single syllable word attack strategy that participants had the most difficulty performing. In contrast, the majority of participants performed above 90 percent accuracy on all other components of the word attack strategy. Only three participants performed below mastery in blending the onset and rime together. Two students performed below mastery in pronouncing the onset of the pseudowords. Participants had minimal difficulty identifying the onset and rime of the pseudowords.

Since participants had the greatest difficulty attempting to pronounce the rime in the pseudowords, a closer examination of these errors was conducted in order to determine whether errors in pronunciation were primarily vowel or consonant errors. Seventy-three percent of rime pronunciation errors only involved the vowel component of the rime. In contrast, only 17 percent of the errors involved the consonant component and 10 percent involved both the vowels and consonants in the rime. Eleven of the 12 participants in the DA had more vowel errors than consonant errors when attempting to pronounce the rime.

Performance of individual students on steps in the Syllable Segmentation strategy is displayed in Table 5. Success rates were calculated for each participant on all of the components of decoding. Similar to results in the Onset-Rime analysis, performance of 80 percent or better as an indicator of mastery would not identify any components of decoding requiring further instruction for 6 of the 12 participants. Consistent with the Onset-Rime analysis, performance of 90 percent or higher reflecting mastery would be a more effective means for identifying weaknesses in decoding which require further instruction. This criterion would flag all but one student. In Table 5, scores of students falling below a 90 percent criterion are highlighted in grey.

Analysis of individual performance on the Multi-Syllable DA (see Table 5) using the revised criterion helped identify the specific instructional needs of each participant. Participants showed difficulties that were evident also in their performance on the Single Syllable DA. Participants had the greatest difficulty pronouncing each segmented syllable. Nine of the 12 participants performed below 90 percent accuracy in pronouncing the first syllable of the pseudowords. Eight of the 12 participants performed below mastery on pronouncing the middle syllable. Seven of the 12 participants performed below mastery on pronouncing the last syllable. In contrast, participants had minimal difficulty identifying each syllable. All participants performed above mastery level in identifying the first and last syllables. Only three participants had difficulty identifying the middle syllable. Participants had moderate difficulty blending the syllables to pronounce the entire pseudoword, with 5 of the 12 participants performing below mastery.

Table 5

Performance of Individual Participants on the Multi-Syllable Dynamic Assessment (DA)

Participant	1	2	3	4	5	6	7
Word Attack Pretest (rs)	4	7	13	11	15	21	17
Word Attack Pretest (ss)	54	64	67	70	75	76	76
Immed. Word Attack Gain Score (ss)	27	14	3	9	22	5	12
Dynamic Assessment Decoding Steps							
Syllable Counting[a]	25(100)	25(100)	21(84)	24(96)	24(96)	24(96)	18(72)
First Syll. Ident.[a]	25(100)	24(96)	24(96)	24(96)	23(92)	23(92)	23(92)
First Syll. Pronunc.[a]	20(80)	20(80)	19(76)	18(72)	24(96)	21(84)	22(88)
Middle Syll. Ident.[b]	8(100)	8(100)	7(88)	8(100)	8(100)	8(100)	7(88)
Middle Syll. Pronunc.[b]	5(63)	7(88)	4(50)	8(100)	8(100)	7(88)	8(100)
Last Syll. Ident.[a]	24(96)	24(96)	25(100)	25(100)	25(100)	25(100)	25(100)
Last Syll. Pronunc.[a]	17(68)	21(84)	16(64)	15(60)	25(100)	23(92)	22(88)
Syllable Blending [a]	21(84)	23(92)	13(52)	16(64)	24(96)	25(100)	21(84)
Average % Correct	86	92	76	86	98	94	89

Note*: N* = 12 participants; *rs* = raw score; *ss* = standard score; Dynamic Assessment components are presented in raw score with percentage correct in brackets

(a) The maximum score on these decoding steps was 45.

(b) The maximum score on these decoding steps was 25.

(table continues)

Table 5 (continued)

Participant	8	9	10	11	12	
Word Attack Pretest (rs)	15	21	19	22	30	
Word Attack Pretest (ss)	78	86	87	88	88	
Immed. Word Attack Gain Score (ss)	8	7	8	8	11	
Dynamic Assessment Decoding Steps						Mean Frequency
Syllable Counting[a]	24(96)	25(100)	22(88)	24(96)	25(100)	23.4(96)
First Syll. Ident.[a]	25(100)	25(100)	23(92)	24(96)	25(100)	24.0(92)
First Syll. Pronunc.[a]	21(84)	20(80)	21(84)	23(92)	24(96)	21.1(84)
Middle Syll. Ident.[b]	8(100)	8(100)	7(88)	8(100)	7(88)	7.7(96)
Middle Syll. Pronunc.[b]	7(88)	8(100)	8(100)	6(75)	6(75)	6.8(86)
Last Syll. Ident.[a]	25(100)	25(100)	24(96)	25(100)	25(100)	24.8(99)
Last Syll. Pronunc.[a]	21(84)	23(92)	21(84)	22(88)	25(100)	20.9(84)
Syllable Blending [a]	25(100)	25(100)	24(96)	22(88)	25(100)	22.0(88)
Average % Correct	94	96	91	92	95	82

Note*: N* = 12 participants; *rs* = raw score; *ss* = standard score; Dynamic Assessment components are presented in raw score with percentage correct in brackets

(a) The maximum score on these decoding steps was 45.

(b) The maximum score on these decoding steps was 25.

Since participants had the greatest difficulty attempting to pronounce the syllables in the pseudowords, a closer examination of these errors was conducted in order to determine whether errors in pronunciation were primarily vowel or consonant errors. Fifty-seven percent of syllable pronunciation errors involved the vowel component of the syllable. In contrast, only 29 percent of the errors involved the consonant component and 14 percent involved both the vowels and consonants in the syllable. Nine of the 12 participants in the DA had more vowel errors than consonant errors when attempting to pronounce the syllable. In contrast, only one of the participants in the DA had more consonant errors and two participants had an equal number of vowel and consonant errors.

In addition to the evaluation of individual participant performance on the DA, group performance was assessed. Two areas of analysis were conducted for each type of instruction: identifying specific areas of difficulty in segmenting and blending pseudowords; and determining the level of scaffolded support required to enable participants to read the pseudowords successfully. Both areas of analysis involved one-way ANOVAs. Bonferroni's correction was used for each analysis in order to lower the *p* value to safeguard against a Type-1 error.

Errors that occurred during the Onset – Rime DA strategy instruction were analyzed in order to identify the specific procedures causing difficulty. The Onset-Rime strategy taught to participants consisted of five steps: isolating the written onset; saying the spoken onset; isolating the written rime; saying the spoken rime; and blending the onset and rime together to say the word. A repeated measures ANOVA was conducted to compare performance on all five steps. The five steps of the Onset-Rime strategy

represented the independent variable. The dependent variable was the number of errors committed by a student in performing each step. The maximum number of possible errors for each step was 45. Results indicated a significant difference in the frequency of errors, F (1.82, 20.03) = 12.84, $p < .001$. Table 6 shows means and pairwise comparisons using Bonferroni correction. Results revealed that errors in pronouncing the rime spelling were significantly more frequent than any other type of error. Overall, participants had greater difficulty decoding the spelling subunits than identifying the subunits with their fingers.

The Onset-Rime DA strategy was also evaluated in terms of the level of support required in order for participants to successfully complete the five steps of the onset-rime strategy. There were three levels of scaffolded support administered. The experimenter initially explaining the step in the onset-rime strategy. If this was not successful, the experimenter modeled the step using a different pseudoword. As a final level of scaffolded support, the experimenter performed the step using the participant's pseudoword. The single syllable pseudoword list consisted of 45 nonwords. On average, 17.58 of the 45 nonwords were read incorrectly. Since there were five steps to the onset-rime strategy there was an average of 87.5 possible times that a participant might have required some level of scaffolding support. On average, an explanation of the decoding step by the experimenter was necessary 8.42 (SD = 6.63) times during the DA. Modeling of the decoding step was conducted an average of 4.25 (SD = 1.76) times. The decoding step had to be performed by the experimenter an average of 9.00 (SD = 9.40) times. A repeated measures ANOVA was conducted to compare the level of support the DA group needed in order to successfully read the pseudowords. The three levels of scaffolded

Table 6

Mean Number of Errors at Each Pseudoword Decoding Step (Maximum = 45) and Post Hoc Tests of Differences Between Pairs of Means for Single Syllable Pseudowords

Decoding Error Type	Mean (*SD*)	Significant Pairwise Contrasts
1 – Onset Identification	3.417 (1.929)	1 > 3; 1 < 4
2 – Onset Pronunciation	4.250 (4.115)	2 < 4
3 – Rime Identification	1.417 (0.669)	3 < 1, 4
4 – Rime Pronunciation	9.417 (6.273)	4 > 1, 2, 3, 5
5 – Pseudoword Blending	4.000 (4.156)	5 < 4

Note: *N* = 12 participants; Post hoc Bonferroni pairwise comparisons were tested at $p < .05$; ns = not significant

support represented the independent variable. The dependent variable was the number of times each participant needed each level of support. Results indicated no significant difference in the levels of scaffolding support needed in order to successfully decode the pseudowords, F (2, 22) = 2.080, $p > .05$.

Performance in the Syllable Segmentation DA was analyzed to uncover specific areas of difficulty in segmenting and blending pseudowords as well as the level of scaffolded support for students to successfully read the pseudowords.

The Syllable Segmentation DA strategy consisted of eight steps listed in Table 7. A repeated measures ANOVA was conducted to compare performance on all of the steps. The eight steps of the Syllable Segmentation strategy represented the independent variable. The dependent variable was the number of errors committed by a student in performing each step. Results indicated a significant difference in the frequency of errors, F (2.382, 26.199) = 6.605, $p < .01$. Table 7 shows pairwise comparisons using Bonferroni correction. Results reflected that, although there were significant contrasts between many of the decoding steps, there were no specific steps that were consistently more or less difficult than the others. However, generally speaking, participants had greater difficulty decoding the spelling subunits than identifying the subunits with their fingers.

The Syllable Segmentation DA strategy was also evaluated in terms of the level of support required for participants to successfully complete the six to eight steps of the syllable segmentation strategy. Consistent with the Onset-Rime DA strategy, there were three levels of scaffolded support administered: explaining; modeling; and performing.

Table 7

Mean Number of Errors at Each Pseudoword Decoding Step (Maximum = 25) and Post Hoc Tests of Differences Between Pairs of Means for Multi-Syllable Pseudowords

Decoding Error Type	Mean (*SD*)	Significant Pairwise Contrasts
1 – Identify # of Syllables	2.500 (1.883)	1 > 6
2 – First Syllable Identification	1.500 (1.168)	2 < 3
3 – First Syllable Pronunciation	4.833 (2.125)	3 > 2, 4, 6
4 – Last Syllable Identification	1.250 (0.965)	4 < 3, 5
5 – Last Syllable Pronunciation	5.083 (3.088)	5 > 4, 6
6 – Mid-Syllable Identification	0.500 (1.168)	6 < 1, 3, 5
7 – Mid-Syllable Pronunciation	3.250 (4.693)	ns
8 – Pseudoword Blending	3.833 (3.950)	ns

Note: N = 12 participants; Post hoc Bonferroni pairwise comparisons were tested at $p < .05$; ns = not significant

The multi-syllable pseudoword list consisted of 17 two-syllable nonwords and 8 three-syllable nonwords. On average, 8.5 of the 17 two-syllable nonwords and 4.17 of the 8 three-syllable nonwords were read incorrectly. Since there were 6 steps to the multi-syllable strategy for two-syllable words and 8 steps to the strategy for three syllable words there was an average of 84.36 possible times that a participant might have required some level of scaffolding support. On average, an *explanation* of the decoding step by the experimenter was necessary 7.50 (*SD* = 5.95) times during the DA. *Modeling* of the decoding step was conducted an average of 4.42 (*SD* = 2.35) times. The *decoding* step had to be performed by the experimenter an average of 8.17 (*SD* = 7.95) times. A repeated measures ANOVA was conducted to compare the level of support the DA group needed in order to successfully read the pseudowords. The three levels of scaffolded support represented the independent variable. The dependent variable was the number of times each participant needed each level of support. Results indicated no significant difference in the levels of scaffolding support needed in order to successfully decode the pseudowords, F (2, 22) = 1.393, $p > .05$.

Overall, analysis of group performance on the DA was informative about the decoding skills of participants in the DA group. All three levels of scaffolded support appear to be equally important in assisting these phonologically disabled students in successfully decoding single syllable and multi-syllable pseudowords. In addition, when attempting to decode single syllable pseudowords, participants had significantly greater difficulty pronouncing the rime spelling than any other component of word attack. In contrast, when attempting to decode multi-syllable pseudowords no component of

decoding was identified as significantly more or less difficult than the others, although pronunciation of the first and final syllables tended to give students more difficulty.

Chapter 6 – Discussion

This dissertation study investigated a Dynamic Assessment (DA) of word attack skills. The DA used in this study incorporated current knowledge of reading processes. It examined an alternative to traditional assessment practices by providing scaffolded instruction as part of the evaluation process. It was expected that the DA process would teach students strategies to improve their word attack skills and that the DA would be useful in the evaluation of reading disability. To evaluate these effects, a practice only comparison group was included. Results supported expectations. The DA provided instruction that improved participants' word attack performance immediately following instruction. In addition, the DA yielded detailed information about individual participant's level of functioning not attainable through traditional assessment.

Participants' Reading Skills Prior to the Dynamic Assessment

Participants in the present DA study all performed below average on the Word Attack subtest of the Woodcock Reading Mastery Test (Woodcock, 1987, 1998) prior to participation in the DA. According to their pretest performance on the Word Identification subtest of the Woodcock Reading Mastery Test (Woodcock, 1987, 1998) they had acquired a sight-word vocabulary though it was below their expected grade level. In addition, their functioning on both the Word Attack and Word Identification pretests indicated phonetic cue reading. Phonetic cue reading involves reliance on partial letter-sound cues stored in memory to read a word (Ehri, 1999) or partial use of letters to decode a word. All but one of the participants in both the DA and Practice Only groups employed phonetic cue reading when attempting to read real words and pseudowords on the pretests. The frequency with which individual participants employed phonetic cue

reading ranged from one time to four times in both real word and pseudoword reading. In addition to phonetic cue reading, all but three participants in the study employed semi-phonetic spelling on the Spelling of Sounds pretest. This was observed through real word substitutions with words containing some of the same graphemes as the pseudowords on the Spelling of Sounds pretest. Furthermore, participants' performance on the DA revealed that they lacked complete knowledge of grapheme-phoneme correspondences and had difficulty pronouncing individual phonemes and blending phonemes to create words.

It is informative to consider participants' reading and spelling skills in the context of Ehri's (1999) phase theory of reading development in order to determine the form of instruction necessary to address their weaknesses. In the present study, participants' level of reading and spelling skills were consistent with readers at the partial alphabetic phase of reading development (Ehri, 1999). Since participants' specific reading difficulties interfered with their ability to decode unfamiliar words and to read words by analogy, the specific forms of assessment and instruction provided by the DA procedure appeared appropriate to address their needs.

The Effectiveness of the Dynamic Assessment as an Instructional Instrument

The effectiveness of the DA as a means of word attack instruction was determined by evaluating participants' word attack skills before and after the DA procedure was employed and by comparing their performance to that of a control group. The DA word attack instruction with scaffolded feedback was provided to participants in the experimental group. A control group of participants was provided with practice reading the identical list of pseudowords used in the DA, but they were not taught the DA word

attack instruction and were not provided with scaffolded feedback when pseudowords were read incorrectly. Pretest and immediate posttest word attack performance was evaluated using alternate forms of the Word Attack subtest of the Woodcock Reading Mastery Test – Revised (Woodcock, 1987, 1998).

The DA used in the present study was an effective means of word attack instruction. The word attack performance of participants who received the DA improved from pretest to immediate posttest to a greater extent than the performance of participants who only practiced reading the pseudowords. This finding was consistent with other instructional studies in which participants with RD were provided with corrective feedback during a decoding task (Bhattacharya, 2001; Levy, Bourassa & Horn, 1999; Greaney, Tunmer & Chapman, 1997; Lovett, Borden, DeLuca, Lacerenza, Benson & Brackstone, 1994; Lovett & Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach & De Palma, 2000; O'Shaughnessy & Swanson, 2000; Perkins, 1988; van Daal, Reitsma & van der Leij, 1994; van Daal & Reitsma, 1990; Wise & Olson, 1995).

Other studies provide supportive evidence for the effectiveness of the DA instruction provided in the present study in improving the word reading skills of students with RD. In addition, the strengths of their outcomes highlight some of the limitations of the present study. In their analogy training study, Greaney, Tunmer and Chapman's (1997) showed the effectiveness of onset-rime segmentation to improve the word reading skills of students with RD. The analogy training consisted of two steps. During the initial step, each student read target words aloud and received feedback in the form of a check or minus after each word was read. The second step of the training involved spelling words that shared the rime with the target words. During the spelling task, when

a student made an error, corrective feedback was provided to prompt the student to identify the common rime between one of the target words and the spelling word. The student was then asked to write the common rime on the worksheet above each word. An alternate training was provided to the control group. The initial stage of the training was identical to the experimental group. However, during the second stage, each student was asked to read sentences containing the target words. The students received item-specific training focusing on reading each sentence accurately. The group who received the onset-rime analogy training significantly outperformed the item-specific training group on posttest measures of individual word reading, reading of words in connected text, pseudoword reading and phoneme segmentation. In a one-year follow-up, the analogy training group continued to significantly outperform the item-specific training group on measures of pseudoword reading, rime unit identification, and reading words with common rime units. However, differences in phoneme segmentation and individual word reading were not maintained.

Greaney, Tunmer and Chapman's (1997) study was similar to the present DA study in several ways. Both studies employed a pretest-posttest-delayed posttest control group design. In addition, both studies included corrective feedback and involved onset-rime segmentation training. These studies differed in a number of important ways. Greaney et. al.'s (1997) study involved real word reading and real word spelling by rime analogy rather than the pseudoword reading, segmentation and blending training used in the present DA study. Despite the different approaches, both studies showed the effectiveness of onset-rime segmentation training with corrective feedback in teaching decoding skills. It is important to note the results of the one year follow-up of Greaney

et. al. (1997). The experimental group continued to outperform the control group in pseudoword reading, results not sustained in the present DA study. It is possible that onset-rime training that includes both a reading and a spelling component and lasts for 11 weeks results in more sustained pseudoword decoding skills.

Bhattacharya and Ehri's (2004, Bhattacharya, 2001) intervention study demonstrated the effectiveness of teaching students with RD how to segment and pronounce subunits in multisyllabic words. Participants were randomly assigned to one of three conditions: a syllable instruction group, a whole word instruction group and a control group. The syllable instruction group was taught to read the multisyllabic words by attaching adjacent consonants to vowel nuclei and segmenting the words into their constituent syllables. Corrective feedback was provided whenever a participant read a word incorrectly and whenever one of the syllable segmentation procedure steps was not attempted. The participants in the whole word condition were asked to read the same word lists as the syllable segmentation participants. However, they were not given the training in syllabication. Corrective feedback was provided whenever a word was read incorrectly. The participants in the no treatment control condition were just given pretests and posttests. On posttests, the students who received the syllable instruction were able to decode more pseudowords than the control group and were able to recall the spellings of words read during the training better than the control group. In contrast, students who received the whole word training did not perform better than the control group on the spelling or reading transfer tasks. However, the students in the whole word training group with weaker reading skills (reading at the 3rd grade level) were able to recall the spellings of words read during the training better than the control group.

Results of the study revealed that the graphosyllabic analysis training significantly improved the word identification, word attack and spelling skills of students with RD. The syllable segmentation component of the present study was based on the design of Bhattacharya and Ehri's (2004, Bhattacharya, 2001) study and, therefore, shares many characteristics in terms of both training and feedback. In both studies, participants were taught to read multi-syllable words, divide the words into syllables, pronounce the syllables and blend the syllables together to say the words. In addition, both studies involved corrective feedback. Consistent with the present study, the segmentation training resulted in significant improvement in participants' word attack skills over the control group. Unlike the present study, participants in the syllable segmentation training in Bhattacharya and Ehri's (2004, Bhattacharya, 2001) also had significant improvements in word identification and spelling over the control group. There are several reasons why their design may have resulted in more generalized improvements in reading and spelling. Bhattacharya and Ehri's (2004, Bhattacharya, 2001) study involved four training sessions in which a total of 100 words were practiced as compared to the single onset-rime and syllable segmentation trainings in the present study. In addition, Bhattacharya and Ehri's (2004, Bhattacharya, 2001) study involved a larger number of participants and focused on an individual type of training (syllable segmentation).

The Amount of Intervention Required to Improve Word Attack Skills

The DA for the present study was designed to replace traditional assessment of reading disability in educational settings. In schools the typical initial evaluation of a student to determine eligibility for special education services is a relatively brief process. Therefore, in order for the DA to function as a replacement to traditional assessment, the

DA needed to be brief. This restricted the quantity of instruction that could be provided. In contrast, the majority of instructional studies to teach decoding skills to participants with RD has involved long-term instructional programs (O'Shaughnessy & Swanson, 2000; Levy, Bourassa & Horn, 1999; Lovett, Borden, DeLuca, Lacerenza, Benson & Brackstone, 1994; Lovett, Warren-Chaplin, Ransby & Borden, 1990; Lovett & Steinbach, 1997, Lovett, Lacerenza, Borden, Frijters, Steinbach & De Palma, 2000; van Daal, Reitsma & van der Leij, 1994; van Daal & Reitsma, 1990; Wise & Olson, 1995). In fact, only two other studies reviewed involved a fairly brief training period (Bhattacharya, 2001; Perkins, 1988).

In Bhattacharya's (2001) syllable segmentation study, participants were taught to read multi-syllable words, divide the words into syllables, pronounce the syllables and blend the syllables together to say the words. The treatments lasted for four instructional sessions, each thirty minutes long. The training focused on a simple strategy. Despite the brevity of instruction, syllable segmentation training significantly improved participants' word identification, word attack and spelling skills over both the no treatment control group and whole word corrective feedback group. It should be noted, however, that posttests were only administered shortly after the training. The sustained effect of the intervention could not be determined since no delayed posttests were administered.

Perkins (1988) studied the effects of different types of feedback on the word attack performance of males with RD in first through fourth grades. Participants were asked to read pseudoword trigrams with a consonant-vowel-consonant structure (e.g., dat). The study included four types of feedback treatments: no feedback; general

feedback that the word was read incorrectly; corrective modeling in which the examiner read the pseudoword trigrams correctly; and corrective sound-it-out feedback in which the examiner performed segmentation of the pseudoword trigrams into each phoneme. Instruction was brief, with each student participating in three training sessions. Results showed that all forms of feedback were superior to no feedback in improving participants' word attack performance. The two forms of corrective feedback were superior to general feedback. Corrective modeling produced the largest pretest to immediate posttest gain.

The DA instructional component of the present study was even shorter than Bhattacharya's (2001) and Perkins' (1988) studies as it consisted of only two sessions. In addition, the instructional component of the DA was more complex because it consisted of teaching two different word attack strategies, compared to the single strategy taught in the other two studies. The onset-rime strategy was taught during the first instructional session (approximately forty-five minutes). A brief review of this strategy was provided during the second instructional session (approximately five minutes). This was immediately followed by the multi-syllable instruction (approximately forty-five minutes). The multi-syllable strategy was similar to Bhattacharya's (2001) syllable segmentation strategy. Given the brevity and complexity of the instructional component of the DA compared to the other instructional studies in word attack instruction, the significant improvement in participants' decoding performance compared to the practice only group is noteworthy.

Follow-up Posttest to Determine if Improvement in Performance Was Sustained Over Time

The vast majority of the research studies involving the word attack skills of disabled readers did not include a follow-up posttest. In fact, in the National Reading Panel's meta-analysis of studies on phonemic awareness (National Reading Panel, 2000) there were no studies involving word attack skills that included a follow-up word attack posttest. In the review of the literature conducted for this dissertation study only three studies included any follow-up word attack posttest (Greaney, Tunmer, & Chapman, 1997; Perkins, 1988; Wise & Olson, 1995). The infrequency of studies with follow-up posttests is notable given that this procedure is necessary to determine the degree to which gains in word attack skills are sustained over time.

Greaney, Tunmer, & Chapman's (1997) study, reviewed earlier, involved onset-rime segmentation training for students with RD. Results of the study revealed that segmentation - analogy training was superior to item specific training in improving the performance of students with RD on measures of individual word reading, reading of words in connected text, pseudoword reading and phoneme segmentation. However, in a one-year follow-up, although the analogy training group continued to significantly outperform the item-specific training group on measures of pseudoword reading, rime unit identification, and reading words with common rime units, the differences in phoneme segmentation and individual word reading were not maintained. The follow-up posttest provided the opportunity to identify which skill improvements were maintained over time and which skill improvements were not sustained.

Perkins' (1988) study, reviewed in the previous section, consisted of a brief instructional period of three training sessions. Results showed that any form of feedback was superior to no feedback in improving participants' word attack performance. The two forms of corrective feedback were superior to general feedback. Corrective modeling produced the largest pretest to immediate posttest gain. However, results of the follow-up posttest, administered one week after the immediate posttest, revealed that all of the groups declined in performance from immediate posttest to follow-up posttest. In particular, the group that received corrective modeling showed the largest decrease in maintenance across time. Despite the decline in performance from immediate posttest to follow-up posttest, when looking at performance across time, all of the groups showed an improvement in performance from the pretest to the follow-up posttest. This improvement could be interpreted as a practice effect. Perkins (1988) suggested that the technique producing the greatest immediate gain may not be the technique that is most effective over time. These unexpected findings reinforce the importance of including follow-up posttests in studies involving instruction. Results of the follow-up posttest also parallel the findings in the present study in that the performance of participants declined from the immediate posttest to the delayed posttest.

Wise and Olson (1995) conducted an instructional study in which students with RD received fifty half-hour training sessions over a four month period. The study involved a comparison of explicit phonological analysis instruction and comprehension instruction. At the immediate posttest, the group that received explicit phonological analysis instruction showed greater gains in phonological awareness, pseudoword decoding and untimed word recognition. This study included two long-term follow-up

posttests (Olson, Wise, Ring & Johnson, 1997). Results of the first follow-up posttest, conducted one year after the study, showed that the group receiving explicit phonological analysis instruction continued to have stronger decoding and phoneme awareness skills compared to the comprehension instruction group. However, by the second follow-up posttest, conducted two years after the study, there were no significant group differences in decoding and phoneme awareness skills. This study provides further evidence for the importance of follow-up assessments over time to monitor the sustained effectiveness of instruction.

To determine whether the improvement in participants' performance was sustained over time in the present study, a delayed word attack test was administered two weeks after the DA was completed. Performance was evaluated using the Word Attack subtest of the Woodcock-Johnson III Tests of Achievement (Woodcock, McGrew & Mather, 2001). Results showed that the greater gain of the DA group compared to the Practice Only (PO) group, from pretest to immediate posttest, did not persist on the delayed test. Rather scores of the DA group declined to the level of the PO group on the delayed posttest (see Figure 1). These results show that the contribution of DA instruction to the improvement in word attack performance was not sustained over time. These results were consistent with Perkins' (1988) study. Both studies included a brief word attack instructional component, an immediate posttest and a follow-up posttest one to two weeks after the immediate posttest was administered. In addition, both studies showed an increase in word attack performance on the immediate posttest of the group receiving instruction and a decline in word attack performance on the follow-up posttest.

It is important to note that the present study represents the only DA study which included a follow-up posttest. Given the results of the delayed posttest in the present study and the findings of the other studies that included a follow-up posttest (Perkins, 1998; Wise & Olson, 1995), follow-up posttests are critical in order to determine the long-term effectiveness of instruction. Follow-up posttests provide the opportunity to measure the degree to which the instruction has been internalized and has become a component of the participant's arsenal in attacking a novel word.

Further examination of the word attack performance of both the DA group and the Practice Only group indicated that practice played a role in improving decoding skills. A comparison of the rise in performance of the DA group and the PO group from the Word Attack Pretest to the Delayed Word Attack Posttest revealed a similar increase for both groups. These results provide evidence that the effect of practice in attacking pseudowords was sustained over time for both groups whereas the effect of the instruction did not persist.

A common component of effective instruction is repetition. Present findings indicated that simply having students practice reading nonwords without feedback can improve their skill. In Perkins' (1988) word attack instruction study, she also found that practice in decoding pseudowords improved participants' performance. One possible explanation for the positive impact of practice on word attack performance can be found in Harm and Seidenberg's (1999) connectionist model of reading acquisition. Their model focuses on an orthographic -> phonological pathway as the primary means of developing word reading skills (Harm, McCandliss & Seidenberg, 2003). Based on their model, participants' exposure to nonwords through hearing, sight and pronunciation may

have strengthened the grapheme-phoneme and larger unit connections in memory. These changes in word subunit memory may have generalized to reading novel nonwords that shared graphemes and larger word subunits with the previously read nonwords. This transfer of learning may have contributed to improvements in participants' performance reading nonwords.

In the present study, based on the practice hypothesis, one would expect students' decoding of the pseudowords to improve as they progressed through training. However, it was not possible to examine this because the pseudowords were not equal in difficulty throughout the list but rather became more difficult.

Practice appeared to have a sustained positive impact on decoding nonwords. In contrast, the initial positive contributions of the DA instruction to decoding nonwords did not appear to persist. What caused the limited impact of the DA instruction? The instructional component of the DA may not have exerted a sustained effect over time as a result of the brief nature of the training. The majority of studies in decoding instruction provided training over an extended period of time (Levy, Bourassa & Horn, 1999; Lovett, Warren-Chaplin, Ransby & Borden, 1990; Lovett, Borden, DeLuca, Lacerenza, Benson & Brackstone, 1994; Lovett & Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach & De Palma, 2000; O'Shaughnessy & Swanson, 2000; van Daal, Reitsma & van der Leij, 1994; van Daal & Reitsma, 1990; Wise & Olson, 1995). Many of the studies included a training period of several months. In contrast, the present DA training only lasted for two sessions. This brief instructional component may not have provided enough practice on the two word attack strategies it taught for them to become an established part of participants' decoding repertoire. Therefore, the participants may not

have recalled the strategies two weeks later. Unfortunately, there was no assessment of memory for the word attack strategies during the delayed posttest. Such an assessment, conducted immediately after the delayed word attack posttest, would have helped determine if the brevity of instruction played a role in the limited impact of the DA on word attack skills. There is also little anecdotal evidence as to the retention of the DA strategies. Although participants were observed independently utilizing both of the strategies they were taught during the DA, there was no overt use of either strategy observed during either the immediate or delayed word attack posttests.

Another possible reason for the decline in decoding performance of the DA group from the immediate to the delayed word attack posttests is the difference in sensitivity of the measures in evaluating decoding skills. The Immediate Word Attack Posttest was a different form (Form H) of the Word Attack Pretest (Form G) of the Woodcock Reading Mastery Test. Both measures were standardized using the same population and are very similar in structure. Correlations between performance on these two measures revealed their strong relationship in the present study ($r = .92$, $p < .01$). In contrast, the Delayed Word Attack Posttest was a subtest of the Woodcock-Johnson Tests of Achievement. It contained only 29 pseudowords compared to the 45 pseudowords in the pretest and immediate posttest. The correlation between the pretest and delayed word attack posttest was strong and significant ($r = .77$, $p < .01$), but not as strong as the pretest and immediate word attack posttest. Therefore, reduced sensitivity of the delayed posttest may have been a factor.

A third possible reason for the decline in decoding performance of the DA group from the immediate to the delayed word attack posttests may have been that the DA

training did not focus enough on pronunciation skills. The Analysis of the types of errors that occurred during the DA indicated that pronouncing the rime and syllable units of the pseudowords were the most frequent types of errors. More specifically, mispronouncing the vowel component of the rime and syllable units correctly was the most common mistake. This frequent error is reflective of inadequate letter-sound knowledge. The DA consisted primarily of training in segmentation and blending training with some teaching of vowel rules. Therefore, it appears that the DA did not provide adequate training in the area of greatest weakness, the teaching of letter-sound relationships, in order to have a sustained impact on participants' decoding skills.

Although the gains in word attack performance of participants in the DA group were not sustained over time, it is important to consider the specific objectives and the degree to which they were achieved. The DA was designed as a short term assessment/instructional procedure intended to be used to identify a participant's unique strengths and weaknesses in decoding unfamiliar words and to determine the specific elements of instruction that are useful for affecting change in the person's decoding skills. It was intended as a tool for indicating the types of follow-up instruction that might prove effective rather than functioning as a comprehensive method of instruction.

In order to identify the reason for the improvement in decoding performance of the DA group from the pretest to the immediate posttest it is helpful to look at the core components of the DA training. Participants were taught to segment the pseudowords, say each segment, and blend them together. This decoding strategy was likely to have encouraged participants to carefully analyze the letter-sound relationships in the words and reduced their tendency to depend on phonetic cue reading. Improvements in

pseudoword decoding following the Word Attack pretest were also observed during the DA training. Participants were so successful at decoding the pseudowords during the DA that the criterion for identifying areas of weakness had to be raised to 90% mastery, a very high level of performance. This improvement in decoding pseudowords over the participants' pretest performance may have also been due to the effectiveness of the DA training in teaching participants to carefully analyze the letter-sound relationships when decoding pseudowords. Although the DA training was effective in short-term decoding gains participants probably reverted to their typical strategy of phonetic cue reading by the time the delayed Word Attack posttest was administered.

Transfer of Learning to Decoding of Untaught Pseudowords, Sight Word Reading and Phonological Encoding

Transfer of learning in instructional studies on decoding is typically determined by evaluating participants' performance on tasks such as reading and spelling of untaught real and pseudowords. A significant improvement in performance in any of these skills from pretest to posttest following intervention is interpreted to show transfer of learning to that skill. A number studies involving training in real word recognition have shown successful transfer of learning (Bhattacharya, 2001; Levy, Bourassa and Horn, 1999; Lovett, Borden, DeLuca, Lacerenza, Benson and Brackstone, 1994; Lovett & Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach & De Palma, 2000; O'Shaughnessy and Swanson, 2000; van Daal, Reitsma and van der Leij, 1994; van Daal and Reitsma, 1990).

In the present DA study, transfer of learning was evaluated with the Word Attack (decoding of untaught pseudowords) and Word Identification (real word reading) subtests

of the Woodcock Reading Mastery Test (Woodcock, 1987, 1998) and the Spelling of Sounds (pseudoword spelling) subtest of the Woodcock-Johnson Tests of Achievement–Third Edition (Woodcock, McGrew & Mather, 2001). Studies conducted by Lovett and her colleagues (Lovett, Warren-Chaplin, Ransby & Borden, 1990; Lovett, Borden, DeLuca, Lacerenza, Benson & Brackstone, 1994; Lovett & Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach & De Palma, 2000) utilized the same word identification and word attack measures. In addition, these three studies included the GFW Spelling of Sounds subtest (Goldman, Fristoe & Woodcock, 1974), a pseudoword spelling measure similar to the one used in the present study.

In their study on word recognition and spelling training, Lovett, Warren-Chaplin, Ransby & Borden (1990), worked with fifty-four students with RD ages seven through thirteen. Students received sixty minutes of instruction four times a week for a total of thirty-five sessions. There were two experimental conditions that involved systematic instruction in spelling and word recognition of real words. The control condition provided the same amount of training, but instead of reading instruction the training involved classroom strategies including organizational skills, self-help techniques and academic problem solving. Although students who received training in reading outperformed controls in reading instructed words and in spelling pseudowords, they did not outperform controls in reading uninstructed real or pseudowords. Therefore, transfer of learning only occurred in pseudoword spelling for both experimental conditions. Lovett et. al. (1990) attributed the transfer failure to difficulty in subsyllabic segmentation.

In their next instructional study, Lovett et. al. (1994) attempted to address the limitations of the previous study. Although the treatment groups and amount of instruction was consistent with the previous study, one of the treatment groups received more thorough training in subsyllabic segmentation. Results revealed a significant increase in performance on the transfer tasks that involved reading uninstructed real and pseudowords. The phonological training program also yielded an increase in performance on uninstructed pseudoword spelling, but not uninstructed real word spelling. Transfer of learning was apparent in both training conditions. However, greater transfer of learning occurred for the group that received the phonological training. Lovett and Steinbach (1997) replicated their findings in a similarly designed study.

In the present study, successful transfer of learning occurred for reading uninstructed pseudowords. In contrast, there was no transfer of learning for reading uninstructed real words or spelling uninstructed pseudowords. Performance of the DA group on the Word Identification subtest of Woodcock Reading Mastery Test (Woodcock, 1987, 1998) did not improve from pretest to posttest compared to the performance of participants in the practice only group. There was no difference in participant performance across treatment type or time. In fact, there was a slight, but not significant decline in the performance of both the DA and Practice Only groups. Similarly, the pseudoword spelling performance on the Spelling of Sounds subtest of the Woodcock-Johnson Tests of Achievement– Third Edition (Woodcock, McGrew & Mather, 2001) of participants who received the DA did not improve from pretest to posttest compared to the performance of participants who only practiced reading the

pseudowords. There was no difference in participant performance across treatment type or time.

Lovett and her colleagues (Lovett, Borden, DeLuca, Lacerenza, Benson & Brackstone, 1994; Lovett & Steinbach, 1997) observed more generalized transfer of learning than was observed in the present study. There are a couple of important differences between their studies and this study. The studies conducted by Lovett et. at. (1994, 1997) included thirty-five instructional sessions. In contrast, the DA in this study included two instructional sessions (one for single syllable pseudowords and one for multi-syllable pseudowords) and one brief review session (for single syllable pseudowords only). In addition, the number of participants in the experimental group in studies conducted by Lovett et. al. (1994, 1997) were almost double the size of the experimental group in this study. Both of these advantages in the studies by Lovett et. al. may have contributed to greater generalization in transfer of learning.

Distinctive Aspects of the Instructional Element of this Study

There are a number of exceptional qualities about the DA instructional component of the present study that show its potential as an instructional/assessment instrument. It contained the briefest instructional time of any of the studies reviewed. Despite the brevity of training, the DA was an effective means of short-term decoding instruction. In addition, the DA was one of only three studies that contained a follow-up posttest. The results of the follow-up word attack posttest showed that the skills learned through the instructional procedure were not sustained over time. This reinforces the importance of follow-up posttests for instructional studies. Without follow-up, posttest researchers

cannot assume that studies that show immediate improvement are indicative of longer-term gains in the skill being assessed.

There have been a number of studies that have involved a population with RD at the secondary education level (Bhattacharya, 2001; Lovett, Borden, DeLuca, Lacerenza, Benson & Brackstone, 1994; Lovett & Steinbach, 1997, Lovett, Lacerenza, Borden, Frijters, Steinbach & De Palma, 2000; van Daal, Reitsma & van der Leij, 1994). However, this DA study was the only decoding instruction study that included an adult reading disabled population. Given the critical importance of reading for adults with a reading disability and their responsiveness to instruction during this study, there is a clear need for further instructional research with this population.

Another unique characteristic of this study was the motivational component of the DA. During the Word Attack pretest, many DA and control participants were observed to express frustration at their difficulty reading pseudowords. In contrast, many of the participants in the DA group expressed enthusiasm when they successfully implemented the DA strategies during the DA instruction. The power of enabling individuals with a history of failure to successfully decode nonwords is noteworthy.

Dynamic Assessment as an Evaluation Instrument

Although many studies were reviewed for this dissertation that contributed to our understanding of either the instructional needs or assessment needs of populations with RD, there was only a handful that studied both instruction and assessment of reading. These DA studies covered a range of reading skills from comprehension (Bednar & Kletzien, 1990), to oral reading errors (Perkins, 1988), and phonemic awareness skills (Spector, 1992). They have also included a broad range of skill levels from preliteracy

skills (Spector, 1992) to mature reading processes (Bednar & Kletzien, 1990) and have included populations ranging from preschool (Spector, 1992) to adulthood (Bednar & Kletzien, 1990). The evaluation procedures have ranged from individual sessions (Swanson, 1995) to longitudinal assessments (Abbott, Reed, Abbott & Berninger, 1997).

The outcome of the present DA study provided further evidence for the value of DA for the evaluation of phonological reading disability. The strength of this DA as an instructional instrument has been reviewed above. The value of this DA as an assessment instrument will be examined next.

The catalyst for the conduct of the present study was recognition of the need for an appropriate means of assessing reading disability. The inadequacies of the traditional assessment model, still widely used in educational settings, have been well established (see Literature Review for a summary of traditional assessment methods and their limitations). Since this DA study began, there have been considerable developments in the recommendations for the assessment of reading disability at both the state and federal educational agency level. These recommendations have been largely driven by a recognition of the inadequacies of the traditional assessment model in appropriately identifying and addressing the needs of students with RD.

In 2004 the Individuals with Disabilities Education Act (IDEA, 2004) was reissued. One of the revisions in the law was that educational institutions are no longer required to use a traditional discrepancy between IQ and achievement in order to determine the presence of a learning disability. The evaluation procedure can now include a process to evaluate a student's response to research-based intervention (20 USC 1414 (b) (6) (A&B)). Similarly, the most recent update of policy on classification of

students with a learning disability by the New York State Department of Education states that, “In determining whether a student has a learning disability … the school district may use a process that determines if the student responds to scientific, research-based intervention as part of the evaluation procedure … and … is not required to consider whether a student has a severe discrepancy between achievement and intellectual ability…”(New York State Department of Education, 2005, p. 38). Many education departments in other states have responded to the federal government’s new position on assessment in a similar manner. Neither the federal government nor New York State Department of Education has disallowed application of the discrepancy model, but they have opened the door for more research-based interventions.

One of the primary approaches that has been embraced by both educational researchers and government educational agencies to address the optional changes offered by federal and state agencies has been response-to-intervention (RTI) (see Literature Review for a summary of RTI). This method of assessment is designed to differentiate between underachievement due to poor instruction and underachievement resulting from an actual learning disability. Through RTI, students are identified as learning disabled based on failure to succeed in a given academic area despite instruction that is typically effective for students (Fuchs, Fuchs, & Compton, 2004). Although RTI is growing in popularity, there are a number of limitations to RTI (Fuchs et. al., 2004). Some RTI designs lend themselves to false positives, a fast track to classification as learning disabled. Other RTI designs tend to under-identify students with learning disabilities. The degree of intervention that is required within a mainstream setting in order to implement RTI and continue with successful interventions is often not realistic to

maintain. In addition, the expertise required to develop and implement interventions is often beyond the scope of expertise of a mainstream teacher.

Although RTI is the new "buzz" term and the primary focus of educational institutions attempting to move away from the discrepancy model, the federal and state recommendations for alternative assessment methods are written so vaguely (as government educational agency recommendations often are) that they open the door to a broad range of research-based interventions. The performance of the DA instrument in the present study reflects that through further development it may have potential as a form of evaluation of reading disability well suited to the new assessment recommendations. The level of analysis of most standardized reading assessment measures is at the word level, although some provide the opportunity to assess at the syllabic level. In contrast, the DA enabled the analysis of individuals' word attack difficulties at the subsyllabic level. For example, the analysis of the results of the DA revealed that the majority of the participants required additional instruction in pronouncing the rime in pseudowords. In contrast most did not require additional instruction in pronouncing the onset or identifying the onset and rime. Closer examination of participant errors when attempting to pronounce the rime in pseudowords provided meaningful information about the specific difficulties requiring additional support. Seventy-three percent of rime pronunciation errors only involved the vowel component of the rime. In contrast, only 17 percent of the errors involved the consonant component and 10 percent involved both the vowels and consonants in the rime. Eleven of the 12 participants in the DA had more vowel errors than consonant errors when

attempting to pronounce the rime. These results provide substantial evidence that the majority of participants in the DA required further instruction in vowel spelling patterns.

The ability to analyze performance at the subsyllabic level is an important component of an assessment instrument since weak phonological decoding skills are a critical deficit in many children and adults with a reading disability (Bruck, 1988; Moats & Lyon, 1993; Rack, Snowling, & Olson, 1992, Share, Jorm, Maclean & Matthews, 1984; Siegel, 1989; Spear-Swerling & Sternberg, 1998; Stanovich, 1991; Stanovich, 1982; Stanovich & Siegel, 1994; Torgesen, 1998; Vellutino, Scanlon and Spearing, 1995). Further evidence for the importance of analysis at the subsyllabic level came from studies conducted by Lovett and her colleagues (Lovett, Warren-Chaplin, Ransby & Borden, 1990; Lovett, Borden, DeLuca, Lacerenza, Benson & Brackstone, 1994; Lovett and Steinbach, 1997; Lovett, Lacerenza, Borden, Frijters, Steinbach & De Palma, 2000). They found that instruction that involved sub-syllabic segmentation training was more effective than segmentation training using larger units in pseudowords. Since this is an important component of instruction it is also an important component of an assessment process intended to develop individualized instruction. Assessment that can produce a detailed picture of an individual's weaknesses and strengths is important for the development of effective instruction.

This DA enabled the identification of the component word attack sub-skills with which the participant struggled. The DA decoding strategy involved 4 word attack subskills: counting the number of syllables (multi-syllable words only); segmenting the pseudoword; pronouncing each segment of the pseudoword; and blending the segments together to pronounce the whole pseudoword. The majority of participants did not have

difficulty counting the number of syllables in multi-syllable pseudowords, with only 3 of the twelve participants performed below mastery (90 percent accuracy). Performance of participants in segmenting pseudowords was strong with most participants performed above mastery. In segmenting single syllable pseudowords, all but one participant performed above mastery in identifying the onset and all of the participants performed above mastery in identifying the rime. Similarly, all of the participants performed above mastery in identifying the first and last syllable when segmenting multi-syllable pseudowords. In contrast, four of the twelve participants performed below mastery in identifying the middle syllable. This performance reflected that participants had greater difficulty in segmenting pseudowords with more than two syllables.

Participants in this study had the greatest difficulty pronouncing the segments of pseudowords, with eleven of the twelve participants performing below mastery. More participants had difficulty pronouncing the rime than the onset of single syllable pseudowords. Nine of the twelve participants performed below mastery in pronouncing the rime, whereas, only 2 of the 12 participants performed below mastery in pronouncing the onset. In contrast, there was greater consistency in pronouncing syllables in multi-syllable pseudowords. Nine out of twelve participants performed below mastery in pronouncing the first syllable. Eight out of twelve participants performed below mastery in pronouncing the last syllable. Seven out of 12 participants performed below mastery in pronouncing the middle syllable.

The final word attack subskill measured during this DA was blending of the segments of pseudowords. Blending represented an area of moderate difficulty with 5 of the 12 participants performing below mastery in blending the syllables in multi-syllable

pseudowords. Three of the same five participants also performed below mastery in blending the onset and rime in single syllable pseudowords.

The detailed information provided through this DA about specific word attack subskill weaknesses could be used to develop instruction to address the specific deficits if each individual evaluated. The results of this DA reflect that the greatest area of instructional need for most participants was in developing their ability to pronounce syllables and sub-syllabic (onset and rime) units.

Although identifying skill deficits is critical for designing effective instruction, understanding the amount of support needed to affect change in the word attack subskill deficits is also important. Another strength of the DA as an assessment instrument is that it supports this understanding through inclusion of scaffolded instruction. This feedback provided by the examiner is an important component of the interaction between the examiner and the student. Perkins' (1988) study on the effectiveness of feedback on the oral reading performance of boys with a reading disability showed the value of scaffolding instruction. Participants were asked to read nonsense words with a consonant-vowel-consonant structure (e.g., dat). There were three treatment groups that were provided with different forms of feedback and a control group that received no feedback. Results revealed a significant advantage of feedback over no feedback. The type of feedback also made a significant difference. Modeling of the correct pronunciation of the whole pseudoword was the most effective form of feedback, followed by corrective feedback suggesting a sound-it-out strategy, and then general form of encouragement. Results of Perkins' (1988) study showed the importance of feedback

in instruction and the need to consider the quality and type of feedback provided during instruction.

Scaffolded instruction given to the DA group in the present study provided the opportunity to determine the strength of the relationship between syllabic, subsyllabic and graphemic word segments and the corresponding sounds. The strength of these relationships was determinable because the scaffolded instruction gradually increased in the support provided. This level of assessment afforded the opportunity to determine the participant's 'Zone of Proximal Development' (ZPD) (Vygotsky, 1978). Consistent with Vygotsky's model, this DA involved assessing participants' problem solving abilities with the assistance of a skilled partner. Vygotsky believed that this form of assessment was more representative of an individual's true ability than the person's independent performance. The interaction between a child and a more knowledgeable partner provides the opportunity to observe emergent developmental processes. Vygotsky referred to the difference between a child's independent functioning and his/her functioning when interacting with a more knowledgeable partner as the child's ZPD (Lidz, 1991).

In the present study, the level of support provided through scaffolded instruction included the following gradations, extending from no support to complete support: allowing the student to complete the task independently, offering an explanation (cueing), modeling using a different pseudoword, or performing the specific task. This process provided detailed assessment information on the unique functioning of each participant that could be applied to the development of an instructional program. Establishing the

ZPD provided information to develop individualized instruction that utilizes the student's strengths in addressing his/her deficits.

The Relationship Between Dynamic Assessment Measures and a Standardized Measure of Word Attack Skills

The Word Attack pretest provided a standardized measure of decoding skills to compare with the DA measures. Since the DA was designed to measure word attack skills, the relationships between the word attack pretest and the DA measures were anticipated to be strong and significant. As expected, the correlations between the Word Attack pretest and both the Initial Single Syllable DA and Initial Multi-Syllable DA measures were both strong and significant. These strong correlations suggest that the pseudowords selected for the DA were well designed for a test of decoding. Although both correlations were strong and significant, the findings suggest that the Single Syllable DA subtest was a somewhat stronger measure of word attack skills than the Multi-Syllable DA. One reason why the multi-syllable correlation was somewhat lower than the single syllable correlation may involve the way the Woodcock Word Attack subtest is structured. It consists of 36 single syllable nonwords but only 9 multisyllabic nonwords. Moreover, most of the multisyllabic words are positioned towards the end of the list. Because performance is terminated when students fail to read 6 consecutive nonwords, students may not even reach the latter multisyllabic words on the list. Thus, scores on the Word Attack subtest reflect mainly single syllable nonword reading skill rather than multisyllabic nonword reading skill.

The relationships between the Word Attack pretest and the DA Scaffolding scores were also examined in order to evaluate further the value of the DA as an assessment

measure. The correlation between the Word Attack pretest and both the DA Single Syllable Scaffolding and Multi-Syllable Scaffolding measures were high and significant. This suggests that the scoring system for scaffolded instruction was an accurate measure of phonological decoding skills. Overall, the relationships between the Word Attack pretest and all four DA measures strongly support the validity of the DA as an instrument for evaluating decoding skills.

Future Research Applications of Dynamic Assessment

There are a number of aspects of the DA that could be explored in future research to further understand its value as an assessment/instructional instrument. Future research could also address some of the limitations of this DA study. It would be helpful to determine the individual impact of different instructional components of the DA. It would also be meaningful to consider how effective the DA would be when used with different populations. Given the success of the DA in this study, and the educational movement towards RTI, a study could be conducted in which the DA is modified to function as a form of RTI.

The design of the scaffolded instruction of the DA included vowel rule explanations. This was included in the study because adult literacy students exhibited much difficulty decoding vowels accurately when attacking pseudowords. Instead of using vowel rule explanations, future research could include the addition of keywords with word segments identical to those in the pseudowords. This would provide participants with the opportunity to utilize the strategy of reading by analogy when attempting to read the pseudowords. The addition of keywords to the design could address the vowel pronunciation difficulties of participants without adding substantial

instructional time on vowel pronunciation training. This design change and subsequent practice in reading by analogy may also result in increased transfer of skills to reading real words.

Since the scaffolded instruction of the DA included both pseudoword segmentation training and vowel rule explanations, it would be important to determine the individual roles that each of these components of instruction played in improving the word attack skills of the participants. A future study could be designed with four different experimental conditions. One group could receive the DA pseudoword segmentation training without vowel rule explanations. A second group could receive vowel rule explanations without the DA pseudoword segmentation training. A third group could receive both the DA pseudoword segmentation training and the vowel rule explanations. The final group could function as a control group, receiving exposure to the pseudowords without feedback (practice only). This design could isolate the role of each of these components of the instruction in improving word attack performance as well as examining the role that the two play together.

Although the amount of DA instruction was sufficient to significantly improve the decoding skills of the DA group over the Practice Only group when the immediate posttest was administered this difference in improvement was not sustained when the delayed posttest was administered two weeks later. One possible reason for the lack of sustained improvement may have been the limited amount of DA instruction the DA group received. There are several ways in which the amount of DA instruction could be increased. The number of instructional sessions could be increased from one single syllable strategy session and one multi-syllable strategy session to several sessions of

instruction on each strategy. The problem with increasing the number of instructional sessions is that this would interfere with the intended application of the DA as a short term assessment/instructional procedure. One way to address the limited amount of DA instruction the participants receive without increasing the number of training sessions would be to increase the practice of the strategies within the existing number of session. The DA procedure could be revised so that the participants would utilize the decoding strategy on every pseudoword regardless of whether they initially read the pseudoword correctly. Another way to increase the amount of instruction within the existing number of sessions would be to increase the amount of scaffolded feedback the participants receive. Approximately half of the pseudowords on the DA list were independently decoded correctly. Increasing the difficulty of the spelling patterns of some of these easier words would increase the ceiling of the assessment. This is likely to result in greater difficulty decoding more of the pseudowords. The consequence would be that participants would receive more practice utilizing the DA strategies and they would receive more scaffolded feedback.

Although the number of participants in this study was sufficient to determine the strength of the DA as an instructional instrument, further research with a larger number of participants would be beneficial. It would be helpful to better understand the relative role that different skills played in predicting improvement in word attack skills. If a future study is conducted with a larger number of participants, a multiple regression analysis could be performed to examine the contribution of cognitive functioning (Peabody Picture Vocabulary Test-Third Edition, Williams, K. T. & Wang, J., 1997), phonemic awareness (Auditory Analysis Test, Rosner & Simon, 1971), and rapid naming

of numbers (Rapid Automatized Naming Task, Denckla & Rudel, 1976), while controlling for pretest word attack performance. Some of these skills have a well documented role in explaining variance in the word attack skills of phonologically disabled readers whereas others are more controversial. This multiple regression analysis could shed some light into the relative contribution of these skills to growth in decoding skill through instruction.

All of the participants in this study had below average word attack skills. However, their skills varied widely from slightly below average (22nd percentile) to very deficient (below the first percentile). Future research could be conducted on phonologically disabled participants with a narrower range of word attack skills. This would be helpful in determining the effectiveness of DA for participants with extremely weak decoding skills compared to those with slightly below average skills.

The present study included participants ranging from twelve years old through sixty-six years old. It would be helpful to conduct future DA studies on more homogeneous age groups. Individual studies could be conducted with adult RD students, high school RD students and middle school RD students. This could provide greater understanding of the usefulness of the Dynamic Assessment for each age group.

The DA in the present study provided substantial information that could be critical for the design of effective instruction. A future study could be designed that incorporates the DA procedure into an RTI framework. An initial DA could be conducted to identify the participants' response to the instruction provided. Individualized instruction could then be created for each participant. After a predetermined number of instructional sessions the DA could be readministered to

determine the effectiveness of the individualized instruction. This process could be repeated over again several times. This type of RTI framework for the DA could be applied in a school setting. A future study like this could determine the usefulness of this DA in a 'real world' application.

The Educational Implications of this Dynamic Assessment Study

This DA requires an individual to possess strong assessment and instruction skills in order to administer it effectively. In a school setting, school psychologists are trained to be the experts in assessment, but they typically have minimal experience providing instruction. In contrast, teachers are highly trained at providing instruction to students, but rarely have assessment skills. Therefore, implementation of this DA by a school professional would probably require extensive training.

The effectiveness of this DA procedure as both a means of instruction and assessment has been reviewed throughout this chapter. The results of this study show the potential of DA to fill a void in current educational practice that has to be addressed both in terms of the educational needs of phonologically disabled readers and in terms of the recommendations of federal and state educational agencies. Although considerable development of this instrument is still needed, its success in this early form is encouraging.

Appendix A – Parental Consent Form

(Printed on CUNY Graduate Center letterhead)

My name is Alan Tener and I am a student in the Ph.D. Program in Educational Psychology at the Graduate Center of the City University of New York (CUNY). I am also a school psychologist at Northport High School. As part of my dissertation, I am conducting a study, entitled "The Contribution of Dynamic Assessment to the Evaluation of Word Attack Skill in Phonologically Disabled Readers." This study is designed to determine if an assessment method is useful in measuring and improving the reading skills of students with a reading disability. I am interested in your child's participation in this study.

Participation is voluntary and there are no negative consequences for withdrawing at any time or declining to participate. The study is designed to benefit participants by providing information about their reading skills. There are no anticipated risks involved in this study. There will be approximately 30 students participating. The assessment will consist of three 45 minute sessions and one ten minute session.

Students with a learning disability are eligible to take part in the study. Each student will be told about the study before being asked to participate. If the student consents to participate, he/she will be given a number of tasks designed to assess reading and related skills during the first session. The second session will consist of the dynamic assessment. Each student will be given a list of made-up words to read. If the student is unable to read a word, he/she will be trained to break down unfamiliar words in order to read them. The third session will include completion of the dynamic assessment and

three reading related tasks to see if the dynamic assessment helped the student reading unfamiliar words. A brief reading test will be given several weeks later.

All of the information collected will remain strictly confidential, and will be stored in a locked file cabinet, to which only I, and my advisor, will have access. I may publish results of the study, but names of people, or any identifying characteristics, will not be used in any publications. A copy of the study will be available to you in the future upon your request. If you so wish, information can be shared with your child's teacher.

If you have any questions about this study please call me at (631) 262-6730 or alantener@mval.net. You can also contact my advisor, Professor Linnea Ehri, at (212) 817-8294 or lehri@gc.cuny.edu. If you have any questions about your rights and the rights of your child as a participant in this study, you can contact Kay Powell, IRB Administrator, The Graduate Center of the City University of New York, (212) 817-7525, kpowell@gc.cuny.edu.

If you would like your child to participate please sign and return this consent form in the enclosed, self-addressed envelope. A copy of this consent form will be returned to you. Thank you for your consideration.

I grant permission for my child_____ to participate in this study [circle one]. Yes No

Parent's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix B – Participation Consent Form for Secondary Level Student

(Printed on CUNY Graduate Center letterhead)

My name is Alan Tener and I am a student in the Ph.D. Program in Educational Psychology at the Graduate Center of the City University of New York (CUNY). I am also a school psychologist at Northport High School. As part of my dissertation, I am conducting a study, entitled "The Contribution of Dynamic Assessment to the Evaluation of Word Attack Skill in Phonologically Disabled Readers." This study is designed to determine if an assessment method is useful in measuring and improving the reading skills of students with a reading disability.

I am interested in your participation in this study. The following guidelines and conditions apply:

- Participation is voluntary
- There are no negative consequences for withdrawing at any time or declining to participate.
- The study is designed to benefit you by providing helpful information about your reading skills.
- There are no anticipated risks involved in this study.
- There will be approximately 30 students participating.
- The assessment will consist of three 45 minute sessions and one 10 minute session.

If you consents to participate:

- Session 1 – You will be given a number of reading and related tasks.

- Session 2 – You will be given a list of made-up words to read. If you have trouble reading any words, you will be taught how to break down unfamiliar words in order to read them.
- Session 3 – You will include more made-up words to read. If you have trouble reading any words, you will be taught another method of breaking down unfamiliar words in order to read them. You will also be given three reading related tasks to see if the dynamic assessment helped you read unfamiliar words.
- Session 4 – A brief reading test will be given several weeks later.

All of the information collected:

- Will remain strictly confidential.
- Will be stored in a locked file cabinet, to which only I, and my advisor, will have access.
- May be published, but names of people, or any identifying characteristics, will not be published.
- A copy of the study will be available to you in the future upon your request.

If you have any questions about this study please call me at (631) 262-6730 or alantener@mval.net. You can also contact my advisor, Professor Linnea Ehri, at (212) 817-8294 or lehri@gc.cuny.edu. If you have any questions about your rights as a participant in this study, you can contact Kay Powell, IRB Administrator, The Graduate Center of the City University of New York, (212) 817-7525, kpowell@gc.cuny.edu.

I would like to participate in this study [circle one]. Yes No

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix C – Participation Consent Form for Adult Literacy Student

(Printed on CUNY Graduate Center letterhead)

I am a graduate student pursuing my doctorate at the Ph.D. Program in Educational Psychology at the Graduate Center of the City University of New York (CUNY). As part of my dissertation I am conducting a study that is designed to improve the way teachers teach reading to students with a reading disability. Participation in the study is voluntary. Even if you agree to participate you will be free to stop at any time. All you have to do is let me know that you want to stop. There are no negative consequences for stopping at any time or saying that you don't want to participate. There are no likely risks involved in this study. Approximately 30 to 40 students will be participating. I will be working one-to-one with you for three sessions that will take approximately 45 minutes each and one session of about ten minutes.

If you agree to work with me, you will be compensated $25.00 for your time. During the first session, I will ask you to do a number of different activities like reading real words, made up words and numbers without any help from me. The next time we meet I am going to ask you to read another list of made-up words. I want you to try your best to read each word. If you have trouble reading any word I will show you some strategies that may make it easier to read the word. The third time we meet I am going to ask you to read another list of made up words and I will teach you another strategy for reading them. Then I will ask you to read some real words, to read some make up words and to spell some made up words without any help from me. We will meet up again one last time for about ten minutes and I am going to ask you to read some more made up words.

I may want to record our meetings on an audiotape to make sure that the procedure is consistently administered and scored. It's OK if you don't want me to record our meetings. Just let me know. The recording will remain confidential and will be erased after it is reviewed. The results of the study may be published. However, specific information about you and the other students will remain confidential and will not be used in the publication. All of the data collected will be kept in a locked file cabinet in my office to which only my advisor or I will have access. If you wish, information that may help with your reading can be shared with your reading instructor.

If you have any questions about this study please call me at (631) 262-6730 or alantener@mval.net. You can also contact my advisor, Professor Linnea Ehri, at (212) 817-8294 or lehri@gc.cuny.edu. If you have any questions about your rights as a participant in this study, you can contact Kay Powell, IRB Administrator, The Graduate Center of the City University of New York, (212) 817-7525, kpowell@gc.cuny.edu.

If you would like to participate please sign this consent form below. If you agree to participation a copy of this consent form will be returned to you.

- I understand the activities in which I will participate.
- I understand that participation in this study is voluntary. If I decide that I do not want to participate or I decide to stop at any time during the study I will be free to do so without any negative consequences.
- I understand that any information about me will be kept confidential.
- I agree to participate in this research project.

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix D – The Auditory Analysis Test Script and Data Sheet

Phoneme Deletion Task Instructions

"Now we will play with some sounds in words. You need to listen to me very carefully. I am going to say a word, and then I will ask you to repeat it once exactly the way I say it. Then I want you to repeat it again, but without a certain part. We will practice so you get the idea.

Here is an example."

"Say **cowboy**." (Child R). "Now say it without the **boy**." (Child R.)

(if correct) "Good."

(If wrong, explain and model correct response) "The word is 'cowboy'. I need to say it without 'boy'. So I say 'cow'."

"The next practice word is toothbrush."

"Say toothbrush." (Child R.). "Now say it without the tooth." (Child R.)

(if correct) "Good."

(If wrong, explain and model correct response) "The word is 'toothbrush'. I need to say it without 'tooth'. So I say 'brush'."

"Okay. We are now ready to start."

Routine:

"Say (word on list)." (Child R.)

"Now say it again but without (phoneme of word to be deleted)." (Child R. Record R.)

(**STOP** after **4** consecutive errors.)

[NOTE: Letter in parentheses refers to the phoneme, not the letter name.]

Phoneme Deletion Task – Scoring Sheet

Participant Name _____

a. cow(boy) _____

b. (tooth)brush _____

1. birth(day) _____

2. (car)pet _____

3. bel(t) _____

4. (m)an _____

5. (b)lock _____

6. to(ne) _____

7. (s)our _____

8. (p)ray _____

9. stea(k) _____

10. (l)end _____

11. (s)mile _____

12. plea(se) _____

13. (g)ate _____

14. (c)lip _____

15. ti(me) _____

16. (sc)old _____

17. (b)reak _____

18. ro(de) _____

19. (w)ill _____

20. (t)rail _____

21. (sh)rug _____

22. g(l)ow _____

23. cr(e)ate _____

24. (st)rain _____

25. s(m)ell _____

26. Es(ki)mo _____

27. de(s)k _____

28. Ger(ma)ny _____

29. st(r)eam _____

30. auto(mo)bile _____

31. re(pro)duce _____

32. s(m)ack _____

33. phi(lo)sophy _____

34. s(k)in _____

35. lo(ca)tion _____

36. cont(in)ent _____

37. s(w)ing _____

38. car(pen)ter _____

39. c(l)utter _____

40. off(er)ing _____

Appendix E – The Rapid Automatized Naming (RAN) Task

Naming of Numbers Script, Data Sheet, and Presentation Cards

Instructions

(Present practice card)

(Point) "What are these numbers?" (Student names them) "Good."

"Now let's see how **FAST** you can name these numbers. Go as fast as you can."

(Student names them)

"Is that the fastest you can go? Try again." (Student R) "Good."

(When you are satisfied that the student is complying, proceed.)

(Present test card) "Here is a page of numbers. I want you to say these numbers as fast as you can. When I say **GO** you should start here." (Point to the first number on the test card) "Go across the top line. Then do the next line. Keep doing each line until you get to the end. If you make a mistake just keep on going."

"Okay? Let's try it. Ready – **GO!**"

(Begin stopwatch when participant names the first number; stop watch when participant says final number, record any errors.)

(error record)

6 4 7 9 2 4 6 7 2 9

7 9 4 2 9 6 4 2 7 6

4 6 7 4 7 9 2 6 9 4

9 7 2 6 9 7 4 7 6 2

7 4 9 2 4 2 6 4 2 7

Time:_____

RAN - Practice Board

(These numbers were presented on 5” x 8” index cards in a font size of 31.)

[2 6 9 7 4]

RAN - Test Board

(These numbers were presented on 5” x 8” index cards in a font size of 31.)

6	4	7	9	2	4	6	7	2	9
7	9	4	2	9	6	4	2	7	6
4	6	7	4	7	9	2	6	9	4
9	7	2	6	9	7	4	7	6	2
7	4	9	2	4	2	6	4	2	7

Appendix F – Single Syllable Pseudoword List for Dynamic Assessment

These pseudowords were presented on 5” x 8” index cards in a font size of 18 with a maximum of 10 words per page.

jad

fip

mosh

bame

seff

nusp

tead

shile

clage

tril

lote

slank

pule

kive

whef

snay

plux

dight

spleek

hume

groam

straib

broy

theat

pon’t

glope

shrude

frawn

twing

sheeb

pherth

kloab

sprenth

knaff

praib

swoin

raize

quanch

rhecked

squile

Appendix G – Single Syllable Pseudoword Review List for Dynamic Assessment

These pseudowords were presented on 5” x 8” index cards in a font size of 18 with a maximum of 10 words per page.

septh

nups

stime

thope

chand

Appendix H – Multi-Syllable Pseudoword List for Dynamic Assessment

These pseudowords were presented on 5” x 8” index cards in a font size of 18 with a maximum of 10 words per page.

luber

hivert

roches

kimcote

yuffet

dupchean

wolley

farthax

phasart

jowsef

pishert

shubah

thepied

pasheck

victaze

serndith

premoked

sufnervox

noggelmont

julberoff

prelament

lorpincher

primoptune

churtoshup

hatinshord

Appendix I – Dynamic Assessment Procedure for Single Syllable Pseudowords

"I'm going to ask you to read some nonsense words. Some of the words will be easy to say whereas others will be more difficult. Read each word aloud, one at a time. Go from the top of the list to the bottom. Say them slowly enough so that I can hear each word clearly. If you are not sure how to say a word, try it anyway."

(PI will take out the index cards with the single syllable pseudowords printed on them. Beginning with page 1 the PI will place the pseudoword list in front of the participant. All of the pseudowords will be covered with an index card. The PI will begin by revealing the first pseudoword, leaving the other pseudowords covered. As the participant reads each pseudoword correctly the PI will move the index card down the list uncovering the next pseudoword. The first time the participant reads a pseudoword incorrectly, the PI will proceed with the dynamic assessment)

Initial (first misreading) Single Syllable Pseudowords: Onset-Rime Procedure

1. **"A nonsense word like this is sometimes hard to read because it is not a real word that you have ever seen or heard before. One way to read a word you have never seen before is called the 'Head and Body Method'. First you have to separate the beginning consonants from the first vowel and the rest of the word. You can think of it as separating the head from the body in a word. The consonants that come before the first vowel are the head** (PI uses thumbs to point out the onset of the sample pseudoword) **and the rest of the word is the body** (PI uses thumbs to point out the rime of the pseudoword)**. Now use your thumb to cover up the body of your word."**

   (If correct PI will proceed to step 2 of routine.)

   (If error)

   "That's not quite right. This is how you cover the body of the word."

   (PI will cover the onset of PI's pseudoword.)

   "Now you do it just like that."

   (PI has participant copy with his/her pseudoword.)

   (If correct PI will proceed to step 2 of routine.)

   (If error)

   "That's not quite right. This is how you cover the body of the word."

   (PI will cover the onset of participant's pseudoword.)

2. **"Now try to read the head of the word."**

   (If correct proceed to step 3 of routine.)

   (If error and pseudoword has <u>one phoneme onset</u> PI will say,)

"That's not quite right. The sound is actually…"

(PI will say the onset of the participant's pseudoword and proceed to step 3.)

(If error and pseudoword has multi-phoneme onset the PI will say…)

"It may be easier to say each of the sounds in the head separately and then put them together."

(If error PI will say…)

"It takes a little practice. I'll show you with my nonsense word."

(PI will model using the PI's pseudoword)

"Now you try."

(If error, PI will say…)

"That's not quite right. It sounds more like…"

(PI will model using the participant's pseudoword.)

3. **"Now cover up the head of the word and try to read the body."**

(If correct proceed to step 4 of routine.)

(If error PI will say…)

"It may be easier to say each of the sounds in the body separately and then put them together. Try it."

(If error PI will say…)

"It takes a little practice. I'll show you with my nonsense word."

(PI will model using the PI's pseudoword)

"Now you try."

(If error, PI will say…)

"That's not quite right. It sounds more like…"

(PI will model using the participant's pseudoword.)

4. **"Now that you know how to read the head and the body of the word put them together to read the whole word."**

   (If correct proceed to step 5 of routine.)

   (If error PI will say…)

   "It takes a little practice. I'll show you with my nonsense word."

   (PI says the head, then the body, then blends them together to say the whole pseudoword in his sample pseudoword.)

   "Now you try."

   (If error, PI will say…)

   "That's not quite right. It sounds more like…"

   (PI will model using the participant's pseudoword.)

5. **"Nice job! Use the 'Head and Body Method' if you need help reading other nonsense words on the list."**

   (PI will use his sample pseudoword to model each step of the procedure. He will use his thumbs to demonstrate each step and will say…)

   "Cover the body with your thumb. Read the head. Then cover the head and read the body. Then put the head on the body and read the whole word. Let's try the next one."

   (PI will continue presenting pseudoword cards.)

Follow-up (subsequent misreadings) one syllable procedure:

1. **"That's not quite right. It may be helpful to use the 'Head and Body Method' to read this nonsense word. Go ahead and try the 'Head and Body Method'."**

   (If the participant successfully performs the procedure go to Step 5 of routine.)

   (If the participant is unable to perform any particular step in the routine PI will proceed to that step.)

   (If the participant is unable to perform the procedure at all the PI will prompt the participant by asking…)

   "What is the first step that you should do?"

   (If participant covers the rime and leaves the onset exposed proceed to Step 2 of routine.)

   (If the participant reads the onset correctly without being instructed to do so proceed to Step 3 of routine.)

   (If error PI will say…)

   "First you have to separate the beginning consonants from the first vowel and the rest of the word. You can think of it as separating the head from the body in a word. The consonants that come before the first vowel are the head (PI uses thumbs to point out the onset of the PI's pseudoword) **and the rest of the word is the body** (PI uses thumbs to point out the rime of the pseudoword)**. Now use your thumb to cover up the body of your word."**

   (If correct PI will proceed to Step 2 of routine.)

   (If error PI will say…)

   "That's not quite right. This is how you cover the body of the word."

(PI will cover the onset of PI'S pseudoword.) **"Now you do it just like that."** (PI has participant copy with his/her pseudoword.)

(If correct PI will proceed to Step 2 of routine.)

(If error PI will say…)

"That's not quite right. This is how you cover the body of the word."

(PI will cover the onset of participant's pseudoword.)

2. "What is the next step you should do?"

(If participant says, "Read the head.", the PI will say…)

"**That's correct. Go ahead and read the head."**

(If participant reads the head correctly PI will proceed to step 3 of routine.)

(If error PI will say…)

"Try to read the head of the word."

(If correct proceed to step 3 of routine.)

(If error and pseudoword has <u>one phoneme onset</u> PI will say,)

"That's not quite right. The sound is actually…"

(PI will say the onset of the participant's pseudoword and proceed to step 3.)

(If error and pseudoword has <u>multi-phoneme onset</u> the PI will say…)

"It may be easier to say each of the sounds in the head separately and then put them together."

(If error PI will say…)

"It takes a little practice. I'll show you with my nonsense word."

(PI will model using the PI's pseudoword)

"Now you try."

(If error, PI will say…)

"That's not quite right. It sounds more like…"

(PI will model using the participant's pseudoword.)

3. "What is the next step you should do?"

(If participant says, "Cover the head and read the body.", the PI will say…)

"Go ahead."

(If error PI will say…)

"Try to cover up the head of the word and try to read the body."

(If correct proceed to step 4 of routine.)

(If error PI will say…)

"It may be easier to say each of the sounds in the body separately and then put them together."

(If error PI will say…)

"It takes a little practice. I'll show you with my nonsense word."

(PI will model using the PI's pseudoword)

"Now you try."

(If error, PI will say…)

"That's not quite right. It sounds more like…"

(PI will model using the participant's pseudoword.)

4. "Now that you know how to read the head and the body of the word what do you do next?"

(If participant says, "Put them together and say the whole word.", the PI will say…)

"**Go ahead and read the whole word."**

(If the participant reads the pseudoword correctly proceed to step 5 of routine.)

(If error PI will say…)

"Try to put them together and read the whole word."

(If correct proceed to step 5 of routine.)

(If error PI will say…)

"It takes a little practice. I'll show you with my nonsense word."

(PI says the head, then the body, then blends them together to say the whole pseudoword in his sample pseudoword.)

"Now you try."

(If error, PI will say…)

"That's not quite right. It sounds more like…"

(PI will model using the participant's pseudoword.)

5. **"Nice job! Use the 'Head and Body Method' if you need help reading other nonsense words on the list. Let's try the next one."**

   (If participant is unable to read his/her pseudoword correctly, PI will use his sample pseudoword to model each step of the procedure. He will use his thumbs to demonstrate each step and will say…)

   "Cover the body with your thumb. Read the head. Then cover the head and read the body. Then put the head on the body and read the whole word."

Appendix J - Review of Dynamic Assessment Procedure for Single Syllable Pseudowords

Introduction**: "The last time we met I showed you a strategy for reading unfamiliar single syllable words. Do you remember the name of the strategy?"**

(If participant says the 'head and body method' proceed to Step 1)

(If not PI will say…)

"It was called the 'head and body method'."

1. **Today I am going to show you a strategy for reading words that have more than one syllable. Before we do that I want you to read a few single syllable nonsense words. If you have trouble reading a word I want you to use the 'head and body method to read it. Let's try one."**

   (PI presents the list of five single syllable pseudowords. Using a blank index card to cover the pseudowords below, the PI presents the first pseudoword to the participant. If the participant reads the pseudoword correctly the next one on the list will be uncovered.)

   (If the participant reads any of the five pseudowords incorrectly the PI will proceed to Step 2.)

   (Once the participant has completed the single syllable pseudoword list the PI will proceed with the multi-syllable pseudoword list.)

2. **"That's not quite right. It may be helpful to use the 'Head and Body Method' to read this nonsense word. Go ahead and try the 'Head and Body Method'."**

(If the participant successfully performs the procedure go to Step 6 of routine. If the participant is unable to perform any particular step in the routine PI will proceed to that step.)

(If the participant is unable to perform the procedure at all the PI will prompt the participant by asking…)

"What is the first step that you should do?"

(If participant covers the rime and leaves the onset exposed proceed to Step 3 of routine.)

(If the participant reads the onset correctly without being instructed to do so proceed to Step 4 of routine.)

(If error PI will say…)

"First you have to separate the beginning consonants from the first vowel and the rest of the word. You can think of it as separating the head from the body in a word. The consonants that come before the first vowel are the head (PI uses thumbs to point out the onset of the PI's pseudoword) **and the rest of the word is the body** (PI uses thumbs to point out the rime of the pseudoword)**. Now use your thumb to cover up the body of your word."**

(If correct PI will proceed to Step 3 of routine.)

(If error PI will say…)

"That's not quite right. This is how you cover the body of the word." (PI will cover the onset of PI'S word.) **"Now you do it just like that."** (PI has participant copy with his/her word.)

(If correct PI will proceed to Step 3 of routine.)

(If error PI will say…)

"That's not quite right. This is how you cover the body of the word." (PI will cover the onset of the participant's pseudoword.)

3. "What is the next step you should do?"

(If participant says, "Read the head.", the PI will say…)

"**That's correct. Go ahead and read the head."**

(If participant reads the head correctly PI will proceed to step 4 of routine.)

(If error PI will say…)

"Try to read the head of the word."

(If correct proceed to step 4 of routine.)

(If error and pseudoword has <u>one phoneme onset</u> PI will say,)

"That's not quite right. The sound is actually…"

(PI will say the onset of the participant's pseudoword and proceed to step 4.)

(If error and pseudoword has <u>multi-phoneme onset</u> the PI will say…)

"It may be easier to say each of the sounds in the head separately and then put them together."

(If error PI will say…)

"It takes a little practice. I'll show you with my nonsense word."

(PI will model using the PI's pseudoword.)

"Now you try."

(If error, PI will say…)

"That's not quite right. It sounds more like…"

(PI will model using the participant's pseudoword.)

4. **"What is the next step you should do?"**

   (If participant says, "Cover the head and read the body.", the PI will say…)

   "Go ahead."

   (If error PI will say…)

   "Try to cover up the head of the word and try to read the body."

   (If correct proceed to step 5 of routine.)

   (If error PI will say…)

   "It may be easier to say each of the sounds in the body separately and then put them together."

   (If error PI will say…)

   "It takes a little practice. I'll show you with my nonsense word."

   (PI will model using the PI's pseudoword)

   "Now you try."

   (If error, PI will say…)

   "That's not quite right. It sounds more like…"

   (PI will model using the participant's pseudoword.)

5. **"Now that you know how to read the head and the body of the word what do you do next?"**

   (If participant says, "Put them together and say the whole word.", the PI will say…)

   "**Go ahead and read the whole word."**

   (If the participant reads the word correctly proceed to step 6 of routine.)

   (If error PI will say…)

   "Try to put them together and read the whole word."

(If correct proceed to step 6 of routine.)

(If error PI will say…)

"It takes a little practice. I'll show you with my nonsense word."

(PI says the head, then the body, then blends them together to say the whole pseudoword in his sample pseudoword.)

"Now you try."

(If error, PI will say…)

"That's not quite right. It sounds more like…"

(PI will model using the participant's pseudoword.)

6. **"Nice job! Use the 'Head and Body Method' if you need help reading other nonsense words on the list. Let's try the next one."**

   (PI will use his sample pseudoword to model each step of the procedure. He will use his thumbs to demonstrate each step and will say…)

   "Cover the body with your thumb. Read the head. Then cover the head and read the body. Then put the head on the body and read the whole word."

Appendix K - Dynamic Assessment Procedure for Multi-Syllable Pseudowords

"Now that we reviewed the 'Head and Body Method' I'm going to ask you to read some more nonsense words. Some of the words will be easy to say whereas others will be more difficult. Read each word aloud, one at a time. Go from the top of the list to the bottom.

Say them slowly enough so that I can hear each word clearly.

If you are not sure how to say a word, try it anyway."

(PI will take out the index cards with the multi-syllable pseudowords printed on them. Beginning with page 1 the PI will place the pseudoword list in front of the participant. All of the pseudowords will be covered with an index card. The PI will begin by revealing the first pseudoword, leaving the other pseudowords covered. As the participant reads each pseudoword correctly the PI will move the index card down the list uncovering the next pseudoword. If the participant reads a word incorrectly the PI will proceed with the dynamic assessment.)

1. **"A nonsense word like this is sometimes hard to read because it is not a real word that you have ever seen or heard before. Another reason it is hard is because it has more than one syllable, and these have to be put together to read the word. Look at my word. It has ____(# of syllables) syllables. How can I tell? I look for the vowels or vowel clusters that sit between the consonants. I count them. This tells me how many syllables I need to read and put together. The vowels are A, E, I, O, U, and sometimes Y. Vowels sometimes stand alone, surrounded by consonants and sometimes sit together in clusters. I will point to**

the vowels in my word and count them. There are ___ separate vowels or vowel clusters, so there should be ___ syllables. Now you do that for your word."

(If error PI will say…)

"That's not quite right. Let me show you."

(The PI will point to the vowels and vowel clusters in the participant's pseudoword and count them.)

2. **"The next step is to read each syllable. Use your thumb to show each vowel with its consonants, and read the syllable. Begin by showing only the first syllable with your thumb. Then work through the word showing the next syllable followed by the next syllable until you have read all the syllables. Try it."**

   (If correct proceed to Step 3 of routine.)

   (If error PI will say…)

   "That's not quite right. Let me show you with my nonsense word. The first syllable in the word is…"

   (PI places his thumbs around the first syllable in the PI's pseudoword and reads it, repeating this procedure with each following syllable.)

   "Now you try with your nonsense word."

   (If correct proceed to Step 3 of routine.)

   (If error PI will say…)

   "This is how you read it…"

   (PI places his thumbs around the first syllable in the participant's pseudoword and reads it repeating this procedure with each following syllable.)

   "Now you try."

3. **The next step is to put the syllables together to read the whole word. You try it."**

   (If correct proceed to Step 4 of routine.)

   (If error PI will say…)

   "That's not quite right. Let me show you how to do it using my nonsense word."

   (PI will say each syllable of the PI's pseudoword separately and then blend them together.)

   "Now you try with your nonsense word."

   (If correct proceed to Step 4 of routine.)

   (If error PI will say…)

   "That's not quite right. Let me show you."

   (PI will say each syllable of the participant's pseudoword separately and then blend them together.)

   "Now you try."

4. **"Nice job! Next time you come to a hard nonsense word like this, use the method of dividing the word into its syllables to help you read it. Let's try to read the next one."**

Follow-up multi-syllable procedure:

1. **"That's not quite right. It may be helpful to use the method of dividing the word into its syllables to help you read this nonsense word. Go ahead and try."**

   (If participant successfully performs the procedure go to Step 4 of routine.)

   (If participant is unable to perform any particular step in the routine PI will proceed to that step.)

   (if participant is unable to perform the procedure at all the PI will prompt the participant by asking…)

   "What is the first step that you should do?"

   (If participant counts the syllables proceed to Step 2 of the routine.)

   (If error PI will say…)

   "Remember that a nonsense word like this is sometimes hard to read because it is not a real word that you have ever seen or heard before. Another reason it is hard is because it has more than one syllable, and these have to be put together to read the word. How many syllables does your word have?"

   (If correct PI will proceed to Step 2 of the routine.)

   (If error PI will say…)

   "That's not quite right. Let me show you with my nonsense word. It has ____(# of syllables) **syllables. How can I tell? I look for the vowels or vowel clusters that sit between the consonants. I count them. This tells me how many syllables I need to read and put together. Point to the vowels in your word and tell me how many syllables the word has."**

   (If correct PI will proceed to Step 2 of the routine.)

(If error PI will say…)

"The vowels are A, E, I, O, U, and sometimes Y. I will point to the vowels in my word and count them. There are ___ separate vowels or vowel clusters, so there should be ___ syllables. Now you do that for your word."

(If correct PI will proceed to Step 2 of the routine.)

(If error PI will say…)

"That's not quite right. Let me show you."

(The PI will point to the vowels in the participant's pseudoword and count them.)

2. "What's the next step you should do?"

(If the participant reads the syllables the PI will proceed to Step 3 of the routine.)

(If error PI will say…)

"The next step is to read each syllable. Use your thumb to show each vowel with its consonants, and read the syllable. Begin by showing only the first syllable with your thumb. Then work through the word showing the next syllable followed by the next syllable until you have read all the syllables. Try it."

(If correct proceed to Step 3 of routine.)

(If error PI will say…)

"That's not quite right. Let me show you with my nonsense word. The first syllable in the word is…"

(PI places his thumbs around the first syllable in the PI's pseudoword and reads it, repeating this procedure with each following syllable.)

"Now you try with your nonsense word."

(If correct proceed to Step 3 of routine.)

(If error PI will say…)

"This is how you read it…"

(PI places his thumbs around the first syllable in the participant's pseudoword and reads it repeating this procedure with each following syllable.)

"Now you try."

3. **"What's the next step that you should do?"**

(If the participant reads each syllable and then combines them the PI will proceed to Step 4 of the routine,)

(If error PI will say…)

"The next step is to put the syllables together to read the whole word. You try it."

(If correct proceed to Step 4 of routine.)

(If error PI will say…)

"That's not quite right. Let me show you how to do it using my nonsense word."

(PI will say each syllable of the PI's pseudoword separately and then blend them together.)

"Now you try with your nonsense word."

(If correct proceed to Step 4 of routine.)

(If error PI will say…)

"That's not quite right. Let me show you."

(PI will say each syllable of the participant's pseudoword separately and then blend them together.)

"Now you try."

4. **“Nice job! Next time you come to a hard nonsense word like this, use the method of dividing the word into its syllables to help you read it. Let’s try to read the next one.”**

Appendix L - Protocol for Pseudowords with Multiple Pronunciations

"This word is a little unusual because the way you pronounce the vowel in the first syllable depends on how you separate the word. If you leave the first syllable open like this (PI covers the end of the word following the first vowel or vowel blend) **the vowel is long and therefore sounds like this…** (PI says long vowel sound). **In contrast, if you close the first syllable like this** (PI covers the end of the word after the first closed syllable) **then the vowel is short and therefore sounds like this…** (PI says short vowel sound)."

Appendix M - Dynamic Assessment Data Sheets For Single Syllable Pseudowords

Key: Ind = independent Ex = Explained Mod = modeled w/PI's word list Per = performed

Word	Step 1 Ident. Onset	Step 2 Say Onset	Step 3a Ident. Rime	Step 3b Say Rime	Step 4 Combine
	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
j – a – d	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex. Mod. Per	Ind Ex Mod Per	Ind Ex Mod Per
f – i – p	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
m – o – sh	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
b – a – m – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – e – ff	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
n – u – s – p	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
t – ea – d	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
sh – i – l – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
c – l – a – g – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
t – r – i – l	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
l – o – t – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per

Key: Ind = independent Ex = Explained Mod = modeled w/PI's word list Per = performed

Word	Step 1 Ident. Onset	Step 2 Say Onset	Step 3a Ident. Rime	Step 3b Say Rime	Step 4 Combine
	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – l – a – n – k	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
p – u – l – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
k – i – v – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
wh – e – f	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – n – ay	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
p – l – u – x	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
d – i – ght	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – p – l – ee – k	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
h – u – m – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
g – r – oa – m	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – t – r – ai – b	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
b – r – oy	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per

Key: Ind = independent Ex = Explained Mod = modeled w/PI's word list Per = performed

Word	Step 1 Ident. Onset	Step 2 Say Onset	Step 3a Ident. Rime	Step 3b Say Rime	Step 4 Combine
	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
th – ea – t	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
p – o – n – t	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
g – l – o – p – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
sh – r – u – d – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
f – r – a – w – n	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
t – w – i – n – g	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
sh – ee – b	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
ph – e – r – th	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
k – l – oa – b	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – p – r – e – n – th	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
kn – a – ff	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
p – r – ai – b	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per

Key: Ind = independent Ex = Explained Mod = modeled w/PI's word list Per = performed

Word	Step 1 Ident. Onset	Step 2 Say Onset	Step 3a Ident. Rime	Step 3b Say Rime	Step 4 Combine
	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – w – oi – n	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
r – ai – z – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
q – u – a – n – ch	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
rh – e – ck – ed	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – q – u – i – l – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – e – p – th	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
n – u – p – s	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
s – t – i – m – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
th – o – p – e	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
ch – a – n – d	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per

Appendix N - Dynamic Assessment Data Sheets For Multi-Syllable Pseudowords

Key: Ind = independent Ex = Explained Mod = modeled w/PI's word list Per = performed

Word	Step 1 # of Syllables				Step 2 & 3 First Syllable				Step 3 & 4 Last Syllable				Step 5 Combine			
	Ind	**Ex**	**Mod**	**Per**		**Ind**	**Ex**	**Mod**	**Per**	**Ind**	**Ex**	**Mod**	**Per**	**Ind**	**Ex**	**Mod**	**Per**
l – u – b – e – r	Ind	Ex	Mod	Per	**Ident.**	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per				
					Say	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per
h – i – v – e – r – t	Ind	Ex	Mod	Per	**Ident.**	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per				
					Say	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per
r – o – ch – e – s	Ind	Ex	Mod	Per	**Ident.**	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per				
					Say	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per
k – i – m – c – o – t – e	Ind	Ex	Mod	Per	**Ident.**	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per				
					Say	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per
y – u – f f – e – t	Ind	Ex	Mod	Per	**Ident.**	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per				
					Say	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per
d – u – p – ch – ea – n	Ind	Ex	Mod	Per	**Ident.**	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per				
					Say	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per
w – o – l l – e – y	Ind	Ex	Mod	Per	**Ident.**	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per				
					Say	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per	Ind	Ex	Mod	Per

Key: Ind = independent Ex = Explained Mod = modeled w/PI's word list Per = performed

Word	**Step 1 # of Syllables** Ind Ex Mod Per		**Step 2 & 3 Syllable 1** Ind Ex Mod Per	**Step 3 & 4 Syllable 2** Ind Ex Mod Per	**Step 5 Combine** Ind Ex Mod Per
f – a – r – th – a – x	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
ph – a – s –a – r – t	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
j – o – w – s – e – f	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
p – i – sh –e – r – t	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
sh – u – b – a – h	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
th – e – p – ie – d	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
p – a – sh – e – ck	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per
v – i – c – t – a – z – e	Ind Ex Mod Per	**Ident.**	Ind Ex Mod Per	Ind Ex Mod Per	
		Say	Ind Ex Mod Per	Ind Ex Mod Per	Ind Ex Mod Per

Key: Ind = independent Ex = Explained Mod = modeled w/PI's word list Per = performed

Word	**Step 1**	**Step 2 & 3**	**Step 6 & 7**	**Step 4 & 5**	**Step 8**
	# of Syllables	**First Syllable**	**Middle Syllable**	**Last Syllable**	**Combine**
	Ind Ex Mod Per	**Ind Ex Mod Per**	**Ind Ex Mod Per**	**Ind Ex Mod Per**	**Ind Ex Mod Per**
s – e – r – n – d – i – th	Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per		I**dent.** Ind Ex Mod Per **Say** Ind Ex Mod Per	Ind Ex Mod Per
p – r – e – m – o – k – ed	Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per		**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	Ind Ex Mod Per
s – u – f – n – e – r – v – o – x	Ind Ex Mod Per	**Ident**. Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	Ind Ex Mod Per
n – o – gg – e – l – m –o – n – t	Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	Ind Ex Mod Per
j – u - l – b – e – r – o – ff	Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	Ind Ex Mod Per
p – r – e – l – a – m – e – n – t	Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	Ind Ex Mod Per
l – o – r – p – i – n – ch – e – r	Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	**Ident.** Ind Ex Mod Per **Say** Ind Ex Mod Per	Ind Ex Mod Per

Ident. Ind Ex Mod Per **Ident.** Ind Ex Mod Per **Ident.** Ind Ex Mod Per

p – r – i – m –o – p – t – u – n – e Ind Ex Mod Per **Say** Ind Ex Mod Per **Say** Ind Ex Mod Per **Say** Ind Ex Mod Per Ind Ex Mod Per

Ident. Ind Ex Mod Per **Ident.** Ind Ex Mod Per **Ident.** Ind Ex Mod Per

ch – u – r – t – o – sh – u – p Ind Ex Mod Per **Say** Ind Ex Mod Per **Say** Ind Ex Mod Per **Say** Ind Ex Mod Per Ind Ex Mod Per

Ident. Ind Ex Mod Per **Ident.** Ind Ex Mod Per **Ident.** Ind Ex Mod Per

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