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Philadelphia College of Osteopathic Medicine

Department of Psychology

BREAKING THE “SOUND” BARRIER TO FLUENT READING: AN EVALUATION
OF A MIDDLE SCHOOL READING INTERVENTION

By Kimberly Simmerman

Submitted in Partial Fulfillment of the Requirements of the Degree of

Doctor of Psychology

November 2008

**PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
DEPARTMENT OF PSYCHOLOGY**

Dissertation Approval

This is to certify that the thesis presented to us by Kimberly Simmerman
On the 27th day of February, 2008, in partial fulfillment of the
requirements for the degree of Doctor of Psychology, has been examined and is
acceptable in both scholarship and literary quality.

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Abstract

The failure to read efficiently accounts for nearly 80% of the children who meet the criteria for a specific learning disability in America. Moreover, many of those children do not receive instruction that is sufficient to improve their reading achievement to within the average range. The current study examines the Breaking the “Sound” Barrier to Fluent Reading program by comparing pretest and posttest scores on individually administered and group statewide tests of reading achievement. The impact of IQ on progress is evaluated and discussed. Students’ levels of reading proficiency preintervention and postintervention, as determined by the criteria set forth by the state of Pennsylvania and measured by the Pennsylvania State System of Assessment, are also evaluated and discussed. Findings are framed within a Response-to-intervention (RTI) model and recommendations are provided for implementation within a three-tiered system of service delivery.

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Chapter 1

Introduction

Statement of the Problem

Learning disabilities are the most commonly identified disability among U.S. public school students (Lyons et al., 2001). According to the President's Commission on Excellence in Special Education (Lyons et al., 2001), 80% of the children who fit the criteria for learning disabilities do so because of failure to learn to read efficiently. Traditionally, American schoolchildren received special education services for learning disabilities because of academic underachievement, generally based on a severe discrepancy between intellectual capacity and norm-referenced achievement tests (Denton & Mathes, 2003). This model, however, may exclude children who read below expected grade level, though who do not demonstrate the IQ-achievement discrepancy. More recently, the definition and understanding has moved beyond this restricted model, and in addition, reading disabilities have been characterized as poor response to evidence-based, quality instruction (Gresham, 2001). This allows for the school systems to include struggling readers in remedial or special education programs, regardless of their intellectual aptitude, based on their specific instructional needs. Additionally, current trends require that schools carefully consider their instructional practices, utilizing scientifically derived or evidence-based methods and programs to demonstrate high quality, effective instruction.

The call for universal literacy presents a challenge for teachers and curriculum specialists, already faced with the task of providing effective instruction to children with complex constellations of deficits contained under the common umbrella of reading

difficulties (Alexander & Slinger-Constant, 2004). The implications for ineffective reading instruction are vast. Deficits in word reading and decoding can impact fluency, automaticity, and comprehension (Oakland, Black, Stanford, Nussbaum, & Balise, 1998). Poor reading automaticity affects all areas of instruction, and thus it has far-reaching implications for the students’ mastery of the entire scope of school subjects.

Despite the focus on remediating reading difficulties, many children with reading disabilities do not receive intensive enough remedial instruction that leads to the students no longer requiring special education programs (Denton & Mathes, 2003). Foorman and Torgeson (2001) characterize effective intervention as supportive, direct, explicit, intense, and comprehensive beyond what can be easily implemented in the regular education classroom setting. In one review of intervention studies, phonologically based, intensive reading instruction significantly improved reading accuracy for children with reading difficulties and, at times, even eliminated the need for continued specialized instruction (Torgeson, Alexander, Wagner, Rashotte, Voeller, & Conway, 2001).

The developmental nature of reading acquisition and students’ changing needs over time makes choosing reading instruction and curriculum more complex. Children in the early stages of reading development respond well to enhanced, appropriate classroom instruction, which has been demonstrated consistently to improve both accuracy and fluency. These gains are frequently maintained over time without further intervention (Alexander & Slinger-Constant, 2004). Older children benefit from the same scope and sequence of instruction. However, they tend to require more intense and explicit instruction to improve accuracy, and their progress toward fluency tends to be more modest (Alexander & Slinger-Constant, 2004). Subsequently, this may affect

comprehension as reading tends to be more labored. Consideration of this difference necessitates specialized practices, including extra time devoted to fluency-related activities for older children from middle school through high school. Evidence-based, published reading programs geared toward each stage of development make it possible for teachers and school professionals to confidently choose instructional practices.

Purpose of the Study

Breaking the “Sound” Barrier to Fluent Reading (Martin, 2003) is a systematic program that was developed over 25 years through continuous evaluation and modification of instructional strategies that have produced observable reading achievement gains in children with learning disabilities. This program has been implemented consistently by two learning support teachers within a middle school in south central Pennsylvania over a period of several years. Part of the implementation of this program included data collection for progress monitoring, which consisted of reading achievement scores on each student receiving instruction using this model. The purpose of this study is to evaluate the impact of Breaking the “Sound” Barrier to Fluent Reading (Martin, 2003) on reading proficiency and performance in a sample of middle school students.

The information gathered over the years since the official inception of this program has been maintained by the teachers (one of whom is the author of the program) and the school district. Permission has been provided by the school district to obtain and utilize a database of all progress monitoring data collected on students receiving this instruction, as well as a control group. A database was provided to the researcher devoid

of all identifying student information. The database contains demographic information, grade levels, and baseline reading performance on all students in the areas of reading decoding, comprehension, spelling, and a global reading composite. Posttests were administered to students after each year of instruction, which yielded 1 to 4 years of performance data. For the purpose of this study, analysis of the information provided produced a clear picture of the measured reading gains in specific reading domains following the first year of instruction, allowing for comparisons among different groups of students. Demographic information on each child specifies duration of intensive instruction, general cognitive ability, and degree of need in each area.

Some of the children receiving this instruction required full remediation in all reading areas based on specific learning disabilities or other cognitive impairments. Other students participated in an inclusion setting, as they demonstrated needs warranting a less intense level of remediation. Additionally, some children started receiving intensive instruction at a younger age, which proved to impact the efficacy of the intervention. For the purpose of the present study, the data evaluated included group and individual reading achievement scores before and after the first year of intensive reading instruction using the Breaking the “Sound” Barrier to Fluent Reading program (Martin, 2003).

Additionally, the impact of intellectual functioning on progress was evaluated.

In summary, this study attempted to answer the following questions:

- 1) Do students demonstrate progress on individually administered tests of reading achievement after receiving instruction from the Breaking the “Sound” Barrier to Fluent Reading program?

- 2) Do students demonstrate progress on group statewide achievement tests after receiving instruction from the Breaking the “Sound” Barrier to Fluent Reading program?
- 3) Does IQ impact students’ progress on individually administered achievement and group statewide achievement tests administered after receiving instruction from the Breaking the “Sound” Barrier to Fluent Reading program?

Chapter 2

*Related Research/Review of Literature**Natural Reading Development*

Children learn to read through a predictable developmental progression (Alexander & Singer-Constant, 2004; Lovett, Lacerenza, Borden, Frijters, Steinbach, & DePalma, 2000; Norris & Hoffman, 2002). This progression is gradual and occurs through an organized network of both oral and written languages (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Norris & Hoffman, 2002). Although many children learn to read through informal, nondirective school activities (Foorman et al., 1998), 1 in 5 children fail to learn to read effectively despite adequate instructional practices (Lyon, 1995). This poses a problem particularly in later elementary school, as explicit reading instruction is decreased or eliminated in favor of utilizing already-obtained reading skills to learn academic content material, such as history and science. This shift from learning to read to reading to learn often coincides with the identification of reading disabilities, as the instructional materials are too difficult for weak readers and they begin to noticeably fall behind academically (Chall, 1983; Fascio-Vereen, 2004).

Research suggests that there are essential domains central to natural reading acquisition, and specific predictors of reading difficulties based on those core competencies (Alexander & Singer-Constant, 2004; Norris & Hoffman, 2002; Oakland, Black, Stanford, Nussbaum, & Balise, 1998). Reading develops from the bottom up, with core skills linking together into a complex system gleaned from sensory stimuli that are consistent, memorable, emotionally reinforcing, and multisensory (Norris & Hoffman, 2002; Oakland et al., 1998), and functional (Alexander & Singer-Constant, 2004). This

facilitates mapping of reading rules into procedural modules that allow for fluent, smooth reading. In order to develop the complex neural networks necessary for this mapping to occur, children with weaknesses in core abilities required for reading must be immersed in reading instruction and activities, which often does not occur because of diminished interest in reading due to the inherent struggle to engage (Alexander & Singer-Constant, 2004). Reading experiences that are multisensory build stronger links and interconnections among skills, facilitating efficient storage and use of those skills (Norris & Hoffman, 2002; Oakland et al., 1998).

Literacy programs in all primary classrooms should fully incorporate the early reading core competencies, including phonemic awareness and the alphabetic principle (Abbott & Berninger, 1999; Mercer, Campbell, Miller, Mercer, & Lane, 2000; Oakland et al., 1998); mapping spoken sounds to parts of words (Coltheart & Leahy, 1992); rapid word reading (Mercer et al., 2000); vocabulary development (Oakland et al., 1998); orthographic knowledge as naming, recognizing, and writing letters (Abbott & Berninger, 1999); and reading comprehension (Denton et al., 2003; Oakland et al., 1998). The alphabetic principle, which is the association of letters and sounds and the use of those letters and sounds to form words, is often developed naturally through nondirective school activities and standard, primary instruction in reading for children without deficits in skills that facilitate reading (Abbott & Berninger, 1999; Foorman et al., 1998; Oakland et al., 1998; Torgeson et al., 1990). Fluent application of the alphabetic principle requires building block skills. The first of these skills is phonemic awareness, which is the capacity to become consciously aware of individual sounds or phonemes within individual words (Mercer et al., 2000; Norris & Hoffman, 2002). Additional skills

include phonological processing, or the knowledge of relationships between sounds and letters and sound-spelling correspondences (Alexander & Singer-Constant, 2004; Mercer et al., 2000), and sight word acquisition, which is the rapid identification of whole words by sight without having to decode phoneme by phoneme (Abbott & Berninger, 1999; Alexander & Singer-Constant, 2004). Learning sight words is a top-down process, or whole-to-part learning, and is more strongly linked to meaning of words, facilitation of automaticity, and the development of reading comprehension (Norris & Hoffman, 2002). The analysis of the internal structure of a multi-syllable word for the purpose of breaking it into parts to ascertain pronunciation and meaning is a process called structural analysis. It is a comprehensive skill set that requires the foundation of morpheme (sound) and syllable (structural) knowledge obtained through the other bottom-up and top-down core competencies (Abbott & Berninger, 1999).

Although it is clear that with growing reading development children tend to gain stronger phonemic awareness, the causal nature of that relationship is uncertain. It may be that reading development naturally enhances phonemic awareness, or that the acquisition of phonemic awareness fosters reading development (Fuchs, Fuchs, Thompson, Otaiba, Yen, Yang, et al., 2001) or more likely that the two processes are reciprocal and individually necessary. Research suggests that children, from first grade and beyond, simultaneously acquire a growing orthographic lexicon or visual representation of whole words used for rapid recognition and an increasingly complex understanding of letter-sound correspondences used to decode new words efficiently (Coltheart & Leahy, 1992). Although there has been a long-standing debate among researchers about whether children learn to read visually through direct mapping or

phonologically through the orthographic-phonological-semantic pathway, research is clear that when one or more of these areas of competency is underdeveloped, fluency and automaticity are sacrificed (Coltheart & Leahy, 1992; Harm & Seidenberg, 2004). Subsequently, this taxes the struggling reader’s working memory and capacity to comprehend the text fully.

If early childhood performance on tasks measuring rapid automatic naming (RAN) and phonemic awareness are weak, it is highly predictive of a long-term reading disability (Kirby, Parila, & Pfeiffer, 2003). This is consistent with research that supports the evidence for a causal relationship between poor early word identification and phonological processing skills with reading disabilities (Lovett et al., 2000). RAN indicates the speed of lexical access (e.g., how quickly one can state the name of a letter or word). Poor performance is closely correlated with reading difficulties in later grades, particularly in the areas of word reading and comprehension (Kirby et al., 2003; Denckla & Rudel, 1976; Wolf, Bally, & Morris, 1986). This has been shown to predict later unsatisfactory achievement outcomes in response to reading intervention (Fascio-Vereen, 2004). Weak phonemic awareness is more predictive of reading difficulties in earlier grades (Kirby et al., 2003). This is likely because of the developmental shift from bottom-up decoding processes to top-down rapid recognition and access to stored sight words that are required for fluent reading (Alexander & Singer-Constant, 2004; Kirby et al., 2003; Wolf et al., 2001). These top-down processes occur gradually throughout reading development. Language deficits are also known to hinder reading development (Oakland et al., 1998), and past difficulties with language acquisition are common in children with reading disabilities (Richardson & Wallach, 2005). It is possible to identify

children early who are at risk for later reading difficulties by administering brief oral language measures before reading instruction commences. Early identification allows for appropriate skill-based classroom, supplemental, or speech and language instruction to be provided as a prevention of specific weaknesses before ability-achievement discrepancies develop (Kirby et al., 2003).

Persistent difficulty with reading often leads to a diminished interest in activities that require reading, at times resulting in avoidance of such tasks (Fuchs et al., 2001). Early reading failures may yield negative emotional reactions to reading, including avoidance, denial of difficulties, inflexibility of approaches, and fear of continued failure (Wolf, Miller, & Donnelly, 2000). Reading-related activities provide an important means of gaining background knowledge and context, vocabulary, and information about the world, which are all essential components of advanced reading and comprehension. This causes an exacerbation of the problem that may have begun as an academic weakness, possibly allowing it to develop into a reading disability (Fuchs et al., 2001). Failure to engage in reading for pleasure may allow a reading disability to become more pervasive and difficult to remediate through failure to gain the basic knowledge typically acquired from exposure to a variety of written material (Juel, 1996).

Students who demonstrate minimal motivation to read in middle school are not necessarily unmotivated to read in general (McCray, Vaughn & Neal, 2001; Blintz, 1993), and these struggling readers do not necessarily lose all interest in pleasure reading (Blintz, 1993). However, they report that they have limited opportunity to select reading materials or read material that is personally interesting to them in school (Worthy & McKool, 1996). Students surveyed reported that, contrary to popular conclusions, they

did not dislike reading in general, yet they did not enjoy the type of reading required of them in school (Worthy & McKool). Another group of students surveyed indicated that their perceptions about remedial reading programs were heavily influenced by their understanding of the type of reading tasks assigned to “typical” readers, and that they strongly disliked instruction they deemed remedial or associated with abnormality (Reetz & Hoover, 1992). McCray, Vaughn, & Neill (2001) examined students’ diminished interest in reading and sought to gain firsthand insight into how to address this persistent problem. Students in the study often could not name even a single book, poem, or story that was personally interesting or enjoyable spanning the entire school year (McCray et al., 2001). The same students indicated eagerness to be more effective students, and a desire for instruction that would make them strong readers. Students such as these may be highly motivated to improve the daily struggles encountered by older children who do not read proficiently, including difficulty taking tests, completing assignments, preparing for the work world, and reading a menu (McCray et al., 2001).

Reading Disabilities

Reading is an action that is not innate or natural for everyone (there are those who learn to read seemingly with little or no instruction) (Richardson & Wallach, 2005), but rather is a skill that civilization of man and specific cultural influence has warranted learning. Many cultures today remain illiterate (Duane, 2001). Only recently have all children been expected to learn to read and thus, reading disabilities are a recent phenomenon. They were likely not discovered in the past as only privileged children were expected to read. Reading disabilities, previously called “congenital word

blindness,” were first identified in the late 19th century (Duane, 2001). In 1925, Samuel T. Orton coined the phrase “developmental reading disability,” which he distinguished from “brain damage” and “mental defect” through careful assessment (Orton, 1966). Orton added the word “developmental” in place of “congenital” to deemphasize the inherent nature. Instead, he suggested that multiple factors needed to be considered in the identification of reading disabilities, including teaching methods and social factors (e.g., environmental factors). Orton’s insight provided hope for a favorable prognosis by providing still-heralded guidelines for successful reading instruction (Orton, 1966).

Reading disabilities are referred to by different terms depending on the context in which they are being discussed. That is, the term *dyslexia* refers to a neurologically based disorder that impedes the learning and processing of written language. In contrast, the term *specific learning disability* refers to an educational classification in which a child is eligible to receive special education services under IDEA (Individuals With Disabilities Education Act). An important role of educators is to assess and properly place students based on demonstrated strengths and weaknesses and, currently, the students’ failure to respond to evidence-based interventions, rather than based solely on a clinical diagnosis and demonstration of a need for specially designed instruction.

Dyslexia can manifest as *phonological dyslexia* or *surface dyslexia*. *Phonological dyslexia* is the impaired ability to generalize phonics rules and apply them to sound out or spell words (Snowling & Nation, 1997). On the other hand, *surface dyslexia* is an impaired ability to read words with atypical spelling-sound correspondences or exceptions to general phonics rules (Harm & Seidenberg, 1999). Children may demonstrate deficits on a broader range, including impairment in word reading through a

lexical route (i.e., surface dyslexia) and nonlexical route (i.e., phonological dyslexia), and oral language weaknesses. Such students require instruction that encompasses a broad range of skills in order to remediate their deficits (Torgeson, 2004). While there may be relatively few quantitative achievement differences between children with surface dyslexia and phonological dyslexia, children with more severe phonological deficits are more likely to receive the label of phonological dyslexia (Snowling & Nation, 1997).

It is not uncommon for children to display a broad range of reading and language deficits that must be simultaneously addressed to achieve the maximum benefit. Reading disabilities are often accompanied by a history of difficulties using or acquiring spoken language (Richardson & Wallach, 2005). Children with specific language impairments and dyslexia often share a common risk for reading decoding deficits that can be linked to problems with phonological awareness or processing deficits, or the capacity to actively manipulate individual sounds. Students with broader language problems are also at risk for comprehension deficits (Snowling & Hayiou-Thomas, 2006). The commonality between language deficits and reading disabilities highlights the phonological connection between the two skills.

The identification of reading disabilities is contested among professionals in the field (Speece & Case, 2007), with some disagreement about what constitutes adequate evidence for identification. The traditional model requiring a significant discrepancy between IQ and reading achievement allows for certain exclusionary criteria, including economic disadvantage, mental retardation, emotional disturbance, or environmental or cultural factors. In the model described by Orton (1966), developmental reading disabilities are likely a culmination of an innate deficit compounded by cultural and

environmental factors, all of which may be difficult to ascertain through traditional methods. Additionally, citing economic or cultural factors to exclude a child from eligibility for services may defeat the purpose of assessment and identification. This leaves the labeling of a child for intervention as a subjective, clinical judgment (Speece & Case, 2007), despite the appearance of standardized measures as a basis for decisions.

Reading disabilities are two to four times more frequently identified in boys than girls (Duane, 2001; Speece & Case, 2007), and minority children are significantly over-represented in the special education system (Feuer et al., 1995; Speece & Case). Boys tend to more regularly display disruptive behaviors in conjunction with reading disabilities, possibly yielding a greater rate of referral for assistance compared to girls (Shaywitz, Shaywitz, Fletcher, & Escobar, 1990). The traditional basis for identification of children with reading disabilities tends to rely on clinical judgment, which may be partly responsible for this imbalance in service delivery. Although the traditional model was designed in part to eliminate clinical subjectivity, evaluators are required to judge whether students' discrepancies may be due to the above-mentioned exclusionary criteria of economic disadvantage, mental retardation, emotional disturbance, or environmental or cultural factors. For example, a student with attention-deficit/hyperactivity disorder (ADHD) who lives in a household that moves frequently, thus disturbing the flow of instruction, may be lagging behind academically (i.e., demonstrates a clear discrepancy), but the evaluator may determine that environmental and psychological factors are the culprits for the discrepancy rather than a learning disability. A response-to-intervention model, as described by Fuchs and Fuchs (1998), has promise to minimize the subjective nature of classification by relying on clearly documented failure to respond to

systematically applied evidence-based interventions rather than subjective factors. The response-to-intervention model may more effectively allocate resources to a greater number of students and decrease overall referrals to special education (Troia, 2005).

The response-to-intervention model supports the three-tiered model of intervention. These tiers progress to greater levels of support, depending on the nature of deficits and response to intervention, and demonstrated or risk factors, such as poor word identification in early grades. Vigilance on the part of educators may help identify reading disabilities earlier, as well as those that had remained unidentified by previous teachers or districts (Leach, Scarborough, & Rescorla, 2003). Children with reading disabilities not only present with specific weaknesses, but their rate of reading development is impacted in such a way that they continue to fall farther behind their peers. Response-to-intervention also provides for measurement of both current rate of performance and individual growth over time, supporting this “dual discrepancy” model (Speece & Case, 2007). The dual discrepancy model of identifying children as learning disabled requires that their post-intervention achievement levels be below grade level and that their rate of growth be slower than their peers (Burns & Senesac, 2005).

Response-to-Intervention Model

The three-tier model of instruction is fundamental to the response-to-intervention (RTI) model, in which reading disabilities are only diagnosed following documented provision of evidence-based reading intervention that fails to produce adequate growth. The RTI model of instruction was endorsed by the President’s Commission on Excellence in Special Education (PCESE, 2001; Burns, 2007). In this model, children

move through progressively more intensive instructional methods over time until the best fit is determined and greatest results are achieved (McEneaney, Lose, & Schwartz, 2006). Many reading deficits observed in children are due to instructional deficits (Vellutino, Scanlon, & Jaccard, 2001), a phenomenon which the RTI model seeks to correct. This model allows educators to look within the broader social and instructional context for the source of reading difficulties rather than only exploring factors within the reader, as in traditional identification models (McEneaney et al., 2006).

Traditional special education models require that children demonstrate failure to achieve within their current placement, whereas the RTI model allows children to gain access to support without waiting for them to fail academically (Vaughn & Fuchs, 2003). RTI can lead to intensive, targeted work with students without the bureaucratic red tape associated with referrals for special education services (Gersten & Dimino, 2006). Additionally, because intensive instruction is supplied at the prereferral level, there may be a decrease in mislabeling children with learning disabilities, when their difficulties may have been due to improper instruction or lack of social opportunity to learn to read (Gersten & Dimino, 2006). Previously, researchers posited that the estimates that reading disabilities affected 10% to 20% of the population were overestimates, and they further showed that students provided with intensive instruction no longer qualified as disabled (Shaywitz, Escobar, Shaywitz, Fletcher, & Makuch, 1992). Children’s initial response to intensive intervention can strongly indicate whether reading difficulties can be attributed to cognitive factors (e.g. a reading disability), or are experiential or instructional in nature (Fiorello, Hale, & Snyder, 2006; Snowling, 2004; Vellutino, Scanlon, & Jaccard, 2001).

Initial gains also provide good indicators of a child’s ability to acquire functional reading skills (Vellutino et al., 2001).

Within the RTI framework of reading, instruction at the first tier is general classroom instruction that is evidence-based and consists of a balanced literacy program addressing a variety of learning styles (Denton & Mathes, 2003; Jenkins, Hudson, & Johnson, 2007). Children who continue to struggle with reading following adequate general instruction, or those determined through screening to be at risk for developing reading difficulties, move on to a more intensive second-tier instructional system. This tier offers scientifically validated and targeted interventions designed to strengthen specific weaknesses (Fuchs & Fuchs, 1998; Jenkins et al., 2007). This second-tier instruction is still provided in the regular education setting, likely in small groups (Denton & Mathes, 2003). Since many reading deficits are due in part to inadequate instruction and lack of home and school preliteracy activities, appropriate monitoring of skills acquisition is crucial in matching students’ skill sets with individualized instruction (Snowling, 2004; Vellutino et al., 2001; Burns, 2007).

Research suggests that the most important goal at tier 2 is to maintain word reading skills and to develop independent and accurate reading, which is likely to foster the enjoyment of reading (Torgeson, 2004). Assessment at the tier 2 level may include curriculum-based assessment (CBA) and curriculum-based measurement (CBM), both of which are low-cost, systematic methods for initial and ongoing skill monitoring (Burns, 2007; Henley & Furlong, 2006). CBA provides valuable, reliable information in planning RTI model instruction that is matched to individual levels of competency (Burns, 2007). Allowing for the creation of local norms and a clear strategy for determining when a

child is failing to respond to intervention, CBM informs educators when more intensive intervention is required (Henley & Furlong, 2006). Carefully constructed first- and second-tier instruction can more effectively allocate school resources to serve the greatest number of students and reduce referrals to special education (Troia, 2005).

In the three-tier model, those students who fail to demonstrate adequate response to the more intensive, targeted intervention provided at tier 2 may be referred for placement in special education and a reading disability label considered. In the process of identifying children with reading disabilities, the RTI model must include comprehensive cognitive assessment to identify unique learning needs, which is necessary in order to design optimal instruction (Fiorello et al., 2006; Gersten & Dimino, 2006; Fiorello, Hale, & Snyder, 2006). Once this process is undergone, it is vital that the interventions provided are sufficiently intensive and focused so that the specific weaknesses of each student are thoroughly addressed (Torgeson, 2004; Burns, 2007; Denton et al., 2003; Lovett, Borden, DeLuca, Lacerenza, Benson, & Brackstone, 1994). This third tier intervention is the most intensive and rigorous in duration and time spent, as children with the lowest skill levels require more intensive, longer programs that are typically provided in the regular education setting (Blackman, Fletcher, Clonan, Schatschneider, Francis, Shaywitz, et al., 2004).

Assessment

Adequate instruction must be data-driven based on each child’s specific constellation of strengths and weaknesses, requiring comprehensive assessment practices designed to take all factors into account (Denton et al., 2003; Fiorello et al., 2006; Burns,

2007). Seeking one measure that is comprehensive enough to cover all areas of assessment is unrealistic. Clinicians should choose a variety of measures that are reliable and valid to ensure that either children are not improperly identified as disabled or a disability is missed due to measurement error (Jenkins et al., 2007; Silva, 1996). Comprehensive psychological assessments should include, in addition to measures of intellectual and achievement levels, measures of neurological functioning (Alexander & Singer-Constant, 2004; Fiorello et al., 2006), including gross and fine motor skills, language skills, and executive functioning. An evaluation by an occupational therapist may be warranted, depending on the results from the neurological testing, or if motor deficits are apparent.

A psychoeducational assessment focusing on phonological skills, supplemented by an evaluation by a speech-language pathologist (Alexander & Singer-Constant, 2004), can determine the exact nature of a child’s language and phonological skills, driving targeted instruction. Social aspects, such as family milieu and psychiatric status, should be considered when developing conceptualizations, as these factors can greatly impact response to intervention (Alexander & Singer-Constant, 2004). Additionally, environmental factors may affect school performance in general, resembling a reading disability. Finally, assessment should be ongoing to ascertain progress throughout interventions, as well as to consider continued eligibility for intensive intervention. Children who may not have demonstrated difficulty to the degree that intensive intervention was warranted may present with late-emerging reading difficulties, warranting reexamination of their specific weaknesses and implementation of more targeted instruction (Leach et al., 2003). In such cases, students’ struggles are likely due

to the increasing complexity of reading material over time combined with a relatively mild weakness, rather than a delay in identifying a severe reading disability. The effectiveness of different types of instructional activities depends on specific baseline competencies in each area of reading (Vellutino et al., 2001).

Phonological awareness is measured by tasks that require children to identify, isolate, or blend individual phonemes in words, such as the Sound Blending subtest of the Woodcock Johnson III–Tests of Educational Achievement (WJ–III; Woodcock, McGrew, & Mather, 2000; Torgeson & Wagner, 1994). Tasks that measure nonword reading, such as the Word Attack subtest on the Woodcock Reading Mastery Test–Revised (WRMT–R; Woodcock, 1987), Pseudoword Decoding subtest on the Wechsler Individual Achievement Test–II (WIAT–II; Wechsler, 2001), and the Word Attack subtest on the Woodcock-Johnson III–Tests of Educational Achievement (Woodcock, McGrew, & Mather, 2000) will provide baseline information about phonological awareness for the purpose of instructional planning, but they are not designed to be utilized frequently for progress monitoring. The Comprehensive Test of Phonological Processing (CTOPP) is another measure of phonological processing that provides clear information for the purpose of informing for initial instructional planning and periodic reevaluation, but curriculum-based measurement, as outlined below, is more suited for frequent assessment of reading acquisition skills (Burns, 2007).

Children’s ability to rapidly access semantic or phonological information that is stored in long-term memory is typically assessed utilizing rapid automatic naming tasks (RAN) (Torgeson & Wagner, 1994). This is accomplished by requiring children to quickly name 30-50 items printed on a page, with their rate and accuracy measured. Such

tasks are useful as they translate into how well children read fluidly and interact with the text they are reading (Torgeson & Wagner, 1994; Mercer et al., 2000). RAN tasks reliably differentiate poor readers from average readers at every age, including into adulthood (Wolf et al., 2001; Wolf et al., 2002). The Rapid Automatic Naming of Animals test is a commercially produced measure of RAN that has been validated and utilized in reading intervention (RAN–A; Catts, Fey, Tomblin, & Zhang, 2002). Additional commercially produced measures of RAN include Diagnostic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminiski, 1998; Jenkins et al., 2007), Woodcock-Johnson III–Tests of Educational Achievement (Woodcock, McGrew, & Mather, 2000), and the CTOPP.

Oral reading fluency, closely related to RAN, is the measurement of words per minute read correctly from passages of text. One commercially-produced measure of oral reading fluency is the Qualitative Reading Inventory–II (QRI–II; Leslie & Caldwell, 1995), which requires students to read long passages of text in order to measure reading rate and accuracy. This instrument has been validated as useful because the nature of the task demands reflects what children are required to do in the classroom and is strongly indicative of how well students can answer comprehension questions (McCabe, Margolis, & Barenbaum, 2001). The Diagnostic Indicators of Basic Early Literacy Skills (DIBELS) system is used to measure oral reading fluency in young children for the purpose of ascertaining current reading instructional level and measuring initial response to intervention (Jenkins et al., 2007). The DIBELS system is a readily available and can be utilized on all elementary school students within a school district to screen for deficits in reading skills, as measured by oral reading fluency and based on benchmark levels of

competency that the authors determined should be met by specific ages (Jenkins et al., 2007). The Gray Oral Reading Test–III is a norm-referenced, validated measure for ascertaining reading fluency and accuracy (GORT–III; Wiederhold & Bryant, 1992). As with most norm-referenced tests, the QRI–II and the GORT–III are not designed to be administered frequently and are not sensitive to small degrees of growth, and thus, they are not useful for progress monitoring of skill acquisition. Oral reading fluency is also measured through curriculum-based measurement (CBM), which is a useful tool for providing ongoing progress monitoring (Burns, 2007).

The Cognitive Hypothesis Testing (CHT) model of assessment and intervention posits that in order to provide accurate, useful assessments, practitioners must first intervene in a consultation-based problem-solving approach (Fiorello et al., 2006). Following the collection of preliminary data, a working hypothesis about the nature of the reading difficulty is developed. The student is then evaluated through the provision of evidence-based interventions, as in the RTI model of intervention, supplemented by comprehensive cognitive assessment as necessary (Fiorello et al., 2006; McEneaney et al., 2006). The nature of the progress monitoring of students’ responses to evidence-based interventions and the information gathered through the assessment process supports or refutes the initial hypothesis, yielding hypothesis revision if necessary. This may in turn yield additional trial interventions in order to eventually arrive at the best instructional fit to adequately address each student’s specific constellation of strengths and weaknesses (Fiorello et al., 2006; Hale & Fiorello, 2004).

The RTI model requires both baseline and ongoing measures of competency that are adequate to inform practitioners about instructional practices. Gickling’s model of

curriculum-based assessment (CBA) is an initial testing procedure designed to determine students' baseline levels of competency within each academic domain (Gickling & Havertape, 1981). This is useful in the RTI model because in order for evidence-based instructional practices to be effective, they must be matched to each student's instructional level (Burns, 2007). Reading samples are provided to students, and Gickling's model requires that each student read progressively more difficult passages aloud while the examiner counts the number of words read correctly in the passage. If the student correctly reads 98% or more of the words in the passage, he is said to be at the independent level. Instruction at this level often yields boredom because the passages are considered to be too easy (Hintze, Christ, & Methe, 2006; Burns, 2007). If the student correctly reads fewer than 93% of the words in the passage, he is at the “frustration” level. Instruction at the frustration level makes fluid reading difficult, impacting comprehension and leading to discouragement (Burns, 2007; Hintze et al., 2006). The target level for instructional materials is between 93% and 97%, which allows the student to expand his sight word vocabulary while allowing for a degree of comprehension that does not yield boredom or frustration (Burns, 2007; Hintze et al., 2006; Gravois & Gickling, 2002). This method provides reliable data that is valuable for decision-making and seeking to determine appropriate individualized levels of instruction (Burns, 2001; Hintze et al., 2006).

A related method of assessment, curriculum-based measurement (CBM), first described by Deno (1985), relies on the repeated measurement of passage reading fluency (Jenkins et al., 2005; Burns, 2007). CBM focuses on the measurement of oral passage reading fluency, as it is validated to be clearly associated with the key behaviors that are

indicative of overall performance in reading (Hintze et al., 2006). Fluency, or the combination of accuracy and speed, serves as a dynamic indicator of basic reading achievement skills and allows for both formative and summative methods of evaluation (Hintze et al., 2006). Passage reading fluency refers to the number of words in an instructional level passage read correctly per minute. Improvement over time on such measures indicates increased reading competency (Jenkins et al., 2005). Specific benchmarks are considered for normative reference, though improvement is determined by comparing each student’s performance with previously earned scores (Burns, 2007; Stoner, Scarpati, Phaneuf, & Hintze, 2002). Examples of some common benchmarks include those set forth by leading researchers in the field: 40 words per minute by the end of grade 1 (Fuchs, 2003); 50 words per minute by the end of grade 3 (Burns et al., 2002), and a series of specific benchmarks outlined in the DIBELS program (Good & Kaminski, 1998).

Unlike standard norm-referenced tests, CBM is responsive to growth when used frequently (Stoner et al., 2002; Burns, 2007). The frequency of monitoring determines whether the same passage is utilized repeatedly to determine a fluency level or if several instructionally equivalent (i.e., the same degree of difficulty) passages are utilized interchangeably (Jenkins et al., 2005). Same passage retest was found to be effective in that it did not overestimate growth, and memory effects were not significant when used frequently (in this example, every 5 weeks) (Burns, Dean, & Klar, 2004; Jenkins et al., 2005). This method provides good information for use in the RTI model, as there is no error in measurement, which can be observed when using multiple passages (Hintze & Christ, 2004). However, it does limit the frequency of use to intermittent monitoring

(Jenkins et al., 2005). If weekly monitoring is desired, practitioners must rotate several passages to minimize any practice effects from week to week (Jenkins et al., 2005).

Evidence-Based Instructional Practices

The National Reading Panel (2002) and the Rand Reading Study Group (2002) determined that there are key components to reading instructional programs that must be addressed in order to promote literacy in all learners. These include an effective teacher, balanced curricular components, differentiated instruction, explicit instruction, and the integration of research into classroom practice (Denton et al., 2003). Research suggests that even older children, who tend to require more specialized instruction, can rapidly respond to balanced, systematic reading instruction (Berninger et al., 2001). The requirement of the No Child Left Behind Act (NCLB, 2002) that all interventions be evidence-based has sparked research to clearly understand what constitutes effective reading instruction.

Although research has contributed greatly to the knowledge base intended, it has also highlighted the areas where the current education system falls short of educating our youth. Most current special education programs tend to stabilize reading growth, but do not accelerate growth to close the ability-discrepancy gap or bring struggling readers up to grade level (Denton et al., 2003; McKinney, 1990). Programs are often not based on specific skill deficits, but rather overall achievement levels, and they often do not meet students' individual needs (Wickstrom, 2004). Although intensive and effective reading curricula and instruction may decrease the need for many students to receive special

education as they increase their grade level performance, the majority of students do not receive this level of instruction (Denton & Mathes, 2003).

Differentiated instruction. Initially proposed by Samuel T. Orton in approximately 1925, providing differentiated instruction for each child based on specific skill levels was resisted by teachers, who preferred providing standard, uniform instruction for all children (Orton, 1966). The tendency toward positive achievement outcomes in response to appropriate assessment and intervention warrants the question as to whether many classified children demonstrate a true learning disability or merely lack of adequate instruction tailored to their unique constellation of strengths and weaknesses (Denton et al., 2003). An example of such a trend occurred when the instructional practice to focus on whole language approaches during early reading development was prominent. Many children appeared to demonstrate reading disabilities when they actually simply required explicit instruction in the alphabetic principle and phonics due to exposure to an unbalanced reading curriculum (Abbott & Berninger, 1999). Balanced approaches to reading, including top-down approaches designed to improve fluency, automaticity, and comprehension blended with bottom-up approaches targeting decoding, have shown to improve reading accuracy, efficiency, and understanding (Manset-Williamson & Nelson, 2005).

As part of assessment-based practices, consideration for some of the predictive factors that impact reading development is warranted. Weaknesses in processing speed, language development (Oakland et al., 1998), fluency rate (Mercer et al., 2000), phonological awareness, and rapid automatic naming (RAN; Kirby, Parila, & Pfeiffer, 2003) are predictive of poor reading development. These should be measured for each

child and supplemental instruction considered to strengthen these specific areas as needed. A mismatch between students’ instructional materials and individual level of competency can result in ineffective, untargeted instruction and frustration in struggling readers (Burns, 2007). Deficits in RAN are highly correlated with diminished response to reading intervention (Fascio-Vereen, 2004), thus necessitating incorporating strategies to improve the speed of lexical access to the extent possible. Moreover, deficits in executive functioning may diminish the capacity to coordinate the complex mental processes and self-regulation, such as checking, monitoring, and sustaining adequate attention, required for efficient reading (Denckla, Rudel, & Broman, 1981). While below average verbal IQ (VIQ) is indicative of limits to overall reading achievement, initial gains are often accomplished at the same rate as peers with average VIQ (Abbott & Berninger, 1999).

Children with reading disabilities may have strong levels of processing and achievement in other areas, such as mathematics or science (Duane, 2001). It is vital that all skills be measured in order that the proper level of instruction is provided in all subjects. A diminished interest in reading is in part responsible for the perpetuation of reading disabilities in many students (Fuchs et al., 2001), and avoidance of reading can make a reading weakness into a long-term reading disability (Juel, 1996). Utilizing a reading disability as a basis for placement in classes in which the curriculum is not sufficiently challenging may further diminish interest in reading, allowing for discouragement to take hold. Children with reading disabilities may demonstrate advanced proficiency in content areas, thus warranting careful examination of all skills (Duane, 2001). In addition, appropriate placement with accommodations and

modifications for reading difficulties is needed to reduce student frustration (Burns, 2007).

Teacher factors and interest. Effectively designed programs are important, but ineffective implementation of such programs may impede student achievement despite adequate materials and curricula. The National Reading Panel (2000) delineated two sources of professional development to adequately prepare teachers: preservice education designed to prepare teachers to combine all aspects of effective reading assessment and instruction, and well-designed ongoing teacher in-servicing designed to train, not merely inform, practicing teachers in new research-based strategies. Knowledgeable and effective teachers are an integral part of any program (Denton et al., 2003), and teachers must be comfortable enough with the curricula and learning theories underlying them to flexibly integrate assessment and instruction of key components (Denton et al., 2003). This includes, in addition to instruction in developmental reading theory and practice, competency with principles of language development and structures of language (Richardson & Wallach, 2005).

Teachers who are charismatic and engage students at a high level have a definite advantage. However, despite the appearance that such are more effective teachers and have a greater degree of popularity and likeability, simple engagement is not sufficient (Denton et al., 2003). Whether utilizing a scripted or nonscripted program, instruction must be systematic and explicit within a prescribed scope and sequence that is balanced to address all core literacy competencies (Denton et al., 2003). Teachers may tend to feel overwhelmed by the instructional demands and increased scrutiny and accountability built into NCLB and the associated high-stakes testing (Mercer et al., 2000). Yet efforts

to allow teachers flexibility and matching specific programs to teaching styles may ameliorate distress and improve satisfaction, as well as the quality of instruction (Wickstrom, 2004).

Traditional special education classes are often ineffective (Denton et al., 2003; Denton & Mathes, 2003) at balancing the degree to which explicit instruction is replaced with implicit instruction as mastery occurs. To date, most research on designing instructional programs does not rely on special education teachers to provide the interventions directly to students in a natural classroom setting (Fuchs et al., 2001). Collaboration among administrative professionals, clinicians such as school psychologists and speech language pathologists, researchers, and teachers can both bridge the gap between research and practice (Wallach, 2005) and improve educational outcomes for students (Roth & Troia, 2006). Additionally, measures to spark teacher interest and facilitate buy-in, such as strong site coordinators for new educational initiatives and literacy programs and efforts to elicit teacher input and feedback, lead to high-quality instruction (Denton et al., 2003).

Financial resources may be perceived as barriers to effective programming and instruction, especially with older, less typical learners. This may be because age-appropriate instructional materials may be difficult to locate (Manset-Williamson & Nelson, 2005) and few programs exist and are accessible that effectively address the learning needs of this population. With effective assessment practices, a clear scope and sequence to guide instruction, and strong teacher and tutor training, research suggests that effective reading intervention can be implemented with limited financial resources (Manset-Williamson & Nelson, 2005). Although the level of intensity present within

smaller groups or individual instruction sessions is ideal, if students are appropriately divided into homogeneous groups and the instructional principles that comply with generally accepted practices are implemented, positive outcomes with limited resources are reasonable (Denton et al., 2003; Fuchs et al., 2001; Manset-Williamson & Nelson, 2005). Regardless of the program utilized, students should be provided frequent opportunities to respond to the material, afforded immediate corrective feedback, allowed maximum academic engagement time, and offered encouragement and praise for a job well done (Fuchs et al., 2001).

Explicit instruction. Explicit instruction, which research consistently suggests is a necessary component to remedial reading programs for struggling readers (Mercer et al., 2000), is designed to teach skills directly and clearly, making the teacher’s thought process transparent and avoiding confusion by minimizing the inferences the students have to make (Denton et al., 2003). Teachers make cognitive processes visible, slowly transferring decision-making and control from the teacher to the student to foster independence and mastery (Manset-Williamson & Nelson, 2005). Consistent improvements in decoding and comprehension have been demonstrated following instruction that is intensive and explicit, incorporating direct explanation and modeling, guided practice with continual monitoring and feedback, regular review and maintenance, and frequent checks for mastery with necessary adjustments made regularly (Manset-Williamson & Nelson, 2005).

Direct, scripted instruction is superior to programs that rely on exposure to literature, such as whole language programs. These facilitate more rapid word reading and measurable improvement in phonological processing, though scripted programs are

not necessary to achieve strong results (Foorman et al., 1998). The requirement that a program be intensive and strategy instruction explicit may be accomplished in two ways. Educators could use scripted programs that follow a carefully planned series of activities designed to reflect the scope and sequence. On the other hand, knowledgeable and creative teachers can effectively implement explicit instruction without a script by designing classroom lessons and learning tasks within a clearly defined scope and sequence (Denton et al., 2003).

One of the most important considerations when designing an explicit reading program is future generalization. When instruction is explicit to the degree that it does not resemble authentic, natural reading or fails to build in a plan to fade teacher control and assistance, it will likely remain teacher-dependent such that children may not develop effective independent reading skills (Manset-Williamson & Nelson, 2005). Small, homogeneous groups are most effective when providing intensive, explicit instruction as they facilitate group learning and allows for maximum instructional time (Denton et al., 2003).

Phonological awareness and phonics. Phonological awareness is the knowledge of separate and individual sounds or phonemes within spoken language. Strong phonological awareness in early childhood promotes early reading as it is initially easy and emotionally reinforcing when a child learns that there are enjoyable activities that involve spoken and written language (Fuchs et al., 2001). Phonological awareness is also strongly related to subsequent reading skill (Torgeson & Wagner, 1994). In their meta-analysis, Fuchs and colleagues (2001) reviewed more than 60 studies on phonological awareness training. They concluded that these skills can be trained (see also Lovett et al.,

2000). Phonological awareness impacts reading development positively and effectively when training is incorporated with letter-sound or early reading training and even before formal reading instruction begins. Strong evidence exists that children with dyslexia can dramatically improve their letter-sound knowledge through systematic instruction (Lovett et al., 1994).

Phonics instruction, which expands beyond the rote learning of letter sounds (Richardson & Wallach, 2005), involves teaching letter-sound associations, or helping children learn that there is a connection between the sounds in spoken language (phonemes) and letters in written language (graphemes). Although current research is clear that explicit and intensive phonics instruction is a necessary component in a balanced and effective reading program (Manset-Williamson & Nelson, 2005; Fuchs et al., 2001; Denton et al., 2003), specific phonics research does not provide a complete understanding of exactly how phonics intervention works to impact children (Pressley, Graham, & Harris, 2006; Nicholson & Fawcett, 2001). Additionally, phonics-based instruction alone is not sufficient to produce fluent and accurate reading (Lovett et al., 2000). It is apparent, however, that programs that lack phonics-based instruction fail to allow children with reading disabilities or instructional deficits the opportunity to learn and practice phonics rules that they have not obtained through standard instruction or informal reading activities (Oakland et al., 1998). Programs based on developmentally appropriate phonics instruction, such as the Orton-Gillingham based reading programs, produce marked improvement in real word and pseudoword decoding, reading comprehension, and word recognition (Oakland et al., 1998). Additionally, phonological processing skills that are typically deficient in children with reading disabilities are

responsive to treatment, including phoneme segmentation, blending, and letter-sound learning abilities (Lovett et al., 1994).

Fluency. Interventions to improve fluency not only impact the rate at which children read, but the overall efficacy with which they interact with the text. Increased fluency increases the ease with which children read and reduces the demanding nature of the task often experienced by struggling readers (Mercer et al., 2000). Automaticity allows for an enhanced capacity to concentrate on the meaning of the text, as less executive energy is spent trying to plod through the decoding process, and this may increase reading comprehension (Mercer et al., 2000). An increase in sight word vocabulary can drastically improve fluency (Torgeson, Rashotte, Alexander, Alexander, & MacPhee, 2001). Repeated reading of familiar material at the instructional level (Burns, 2007) is the primary practice for improving fluency (Mercer et al., 2000). Repeated reading, partner reading, choice reading, and home reading are effective at improving fluency (Wolf et al., 2000; Young, Bowers, & MacKinnon, 1996). Partner reading and repeated reading allow students exposure to increased modeling of pronunciation, reading cadence, and prosodic features of the text (Wolf et al., 2000).

Since children with learning disabilities of all kinds regularly exhibit performance deficits related to fluency and automaticity, it is important to incorporate strategies specifically designed to enhance fluency and a high level of repetition (Oakland et al., 1998; Jenkins et al., 2005; Kuhn & Stahl, 2003), as well as practice of new materials to facilitate fluidity in execution of newly learned skills (Mercer et al., 2000; Wolf et al., 2000). Although increased fluency is associated with better reading outcomes, especially for children with rapid naming deficits, there is evidence that effective reading instruction

may at times decrease speed of execution while improving accuracy (Wolf et al, 2000; Manset-Williamson & Nelson, 2005). Children may learn new decoding and comprehension skills and notice their own mistakes with more regularity, thus causing them to pause to self-correct where previously they may have skimmed beyond the error. This may be the case especially with older readers, whose reading fluency is less likely to improve with instruction and intervention than younger readers because of the level of disability often associated with persistent reading struggles.

Efficacy of Approaches With Older Children

Reading interventions with older children typically produce mixed results, with 75% of children who demonstrate reading deficits in grade 3 or later continuing to demonstrate academic underachievement into later years (Lovett et al., 2000), and across the country, 25% of high school students are reading at below basic levels (Whitmire, 2005). Kamil and colleagues (2003) reported that in many urban areas, only 50% of students will receive a high school diploma and overall, only 70% of children who enter 8th grade graduate from high school. Early identification and prevention of reading disabilities in older children through early intervention (i.e., working with younger readers who may be at risk) is more effective than attempts to remediate later reading difficulties (i.e., providing focused reading intervention treatment to older children who have been clearly identified as reading disabled) (Alexander & Singer-Constant, 2004). This is because the gap between actual and grade level performance widens each year a child struggles with reading (Shaywitz, Holford, Holahan, & Fletcher, 1995). Research suggests that early identification and intervention, while preferable, may often not be

sufficient to fully remediate more severe reading deficits (Fascio-Vereen, 2004). As such, this requires strong consideration for how to transition children from the elementary grades into middle and high school while continuing with age-appropriate intervention.

Older children benefit from explicit instruction in early reading skills (Manset-Williamson & Nelson, 2005; Abbott & Berninger, 1999), which serve as building blocks for more advanced reading acquisition. Instruction focusing on increasing capacity to apply the alphabetic principle and building orthographic and phonologic skills improves reading performance in grades 4 to 7 (Abbott & Berninger, 1999; Manset-Williamson & Nelson, 2005; McCray et al., 2001; Berninger et al., 2001), with the greatest gains occurring with the explicit instruction of the alphabetic principle. Older children also benefit from regular, repetitive instruction in word identification strategies (Lovett & Steinbeck, 1997; Abbott & Berninger, 1999; Manset-Williamson & Nelson, 2005), and instruction in word reading strategies, especially when applied to high-frequency words, improved both speed and accuracy (Alexander & Singer-Constant, 2004; Mercer et al., 2000). Although teaching children to look at the word in context to determine its possible meaning works more effectively with younger children, as the reading materials become more complex, this is difficult for older readers. More explicit decoding instruction is required when newer, more difficult material does not allow for the use of context cues (Alexander & Singer-Constant, 2004).

Teaching older children to read is a more arduous task than instructing early elementary school students, as older students have progressed developmentally beyond much of the material provided for instruction in early skills (Manset-Williamson & Nelson, 2005). The amount of time and repetition required to facilitate mastery is

typically greater (Blackman et al., 2004). Instructional programs for the middle school learner must be designed with adolescent learners in mind, as they are more advanced both cognitively and socially (Whitmire, 2005). This advancement may be to the advantage of the teacher, as the development of stronger cognitive abilities can facilitate the acquisition of more complex reading skills. Metacognition, or the awareness of thought processes and the understanding that people are thinking beings, can make for greater potential gains when teachers use these strengths to enhance instructional practices (Manset-Williamson & Nelson, 2005). Also, older children continue to expand their world knowledge through school, media, and personal experiences, which can expand the breadth of material teachers may cover when choosing reading materials for this unique population. Unlike very young children, students in middle school and high school may be more motivated to improve their reading, as their deficits yield struggles in daily activities beyond school, such as reading menus and preparing for the work world (McCray et al., 2001).

Fluency is generally an area in which older struggling readers make the least progress; however, some focused interventions have been shown to improve this difficult-to-remediate area (Torgeson et al., 2001; Wolf et al., 2000). As grade-level text becomes richer, typical readers add sight words to their vocabulary rapidly. In order for struggling readers to close the achievement gap in the area of fluency, they must acquire new sight words more rapidly than their typically developing peers, which is a difficult task for which they are generally unprepared (Torgeson et al., 2001). Fluency allows for the completion of literature-based tasks in a reasonable amount of time and is closely linked to comprehension (Manset-Williamson & Nelson, 2005). Supplemental fluency

instruction that focuses on each specific reading subskill being covered in the daily lesson has been shown effective in increasing reading speed and accuracy (Mercer et al., 2000; Manset-Williamson & Nelson, 2005). Fluency instruction yields improvement over time as the duration of supplemental instruction continues (Mercer et al., 2000). Repeated guided oral readings and listening to summary previews of grade-level instructional materials for middle school students may also improve fluency (Alexander & Singer-Constant, 2004; Fascio-Vereen, 2004).

There are several barriers to working with older children (Manset-Williamson & Nelson, 2005). For instance, many students have learned compensatory strategies that are not effective, and they may have been exposed to less than interesting instructional materials needed for explicit teaching (McCray et al., 2001). Most reading material that is age-appropriate is far too difficult for the struggling reader. Teachers are often borrowing socially less mature books to facilitate acquisition and fluency, which does not concurrently enhance interest in reading for older students. This may increase the students' avoidance of the very activities that would improve their ease of reading, which also impacts their level of enjoyment (Fuchs et al., 2001). In one study, middle school students with reading disabilities were unlikely to report a single book, poem, or story they had enjoyed reading throughout the school year, likely because they did not consider the material relevant (McCray et al., 2001). McKenna, Kear, & Elsworth (1995) found that middle school students generally found reading to be a difficult and unappealing activity. Moreover, students who feel that the reading they do in school lacks purpose tend to dislike the activity (Ivey, 1999).

Teachers may also notice that older children who struggle with reading require more repetition and a longer duration of instruction (Abbott & Berninger, 1999; Manset-Williamson & Nelson, 2005; Blackman et al., 2004). While this may yield only small gains initially, balanced and targeted instruction can yield rapid gains, even for older students (Abbott & Berninger, 1999; Berninger et al., 2001). Additionally, the severity and nature of each child’s reading disability impacts learning outcomes (Abbott & Berninger; Richardson & Wallach, 2005; Snowling & Hayiou-Thomas, 2006; Blackman et al., 2004). A mismatch between instructional materials and one’s instructional level may also yield frustration in students who are attempting the difficult task of learning to read (Burns, 2007). This can lend itself to teacher frustration if not properly prepared for the reading acquisition patterns of older children (Denton et al., 2003; Richardson & Wallach, 2005). Furthermore, one study found that adequacy and specificity of IEP reading goals tends to decline as children progress through middle and high school, lacking detail about which basic skills required remediation and likely contributing to the continued reading struggles of the older students (Catone & Brady, 2005).

Failure to Remediate

Reading disabilities are considered to be relatively stable over time (Silva, 1996), especially if identified after first grade. Remediation in its current state often merely stabilizes reading rate and attempts to prevent further decline (McKinney, 1990; Denton et al., 2003; Torgeson, Alexander, Wagner, Rashotte, Kytja, Voeller, et al., 2001). However, the earlier a child is identified and taught new skills for reading, the more effect the instruction and remedial strategies may have on long-term outcome (Brown &

Murray, 2005). This is especially true when intervention occurs before third grade (Shaywitz, 2003). Very early identification is helpful in treating children who will demonstrate persistent difficulties over time. However, there is evidence that as many as two thirds of children identified with reading disabilities before first grade and who receive intervention do not meet the full disability criteria 2 years later (Shaywitz et al., 1992).

Children with reading disabilities often present with other concurrent behavioral, social, or emotional disturbances, as well as negative future outcomes, which may be minimized if reading difficulties are identified early and remediated. Reading disabilities are highly comorbid with depression and anxiety (Williams & McGee, 1994; Goldston et al., 2007). Also common are disruptive behavior disorders, including attention-deficit/hyperactivity disorder, oppositional defiant disorder, and conduct disorder (Goldston et al., 2007). Reading disabilities in children have been associated with the later development of conduct disorder (Williams & McGee, 1994; Carroll, Maughan, Goodman, & Meltzer, 2005), and language impairments in young children are associated with the subsequent development of antisocial personality disorder (Goldston et al., 2007; Beitchman et al., 2001). Furthermore, general functional impairments are not uncommon, such as poor social behavior toward others, difficulty establishing clear roles and boundaries within relationships, struggles with wellness behaviors, impaired thinking and problem-solving, and engagement in behaviors that may be harmful to themselves in some way (Goldston et al., 2007; Angold, Costello, Farmer, Burns, & Erkanli, 1999).

Children with reading disabilities may develop a defeatist attitude, which can lead to a diminished sense of self-worth (Shaywitz, 2003; Brown & Murray, 2005; Goldston

et al., 2007). This leads to poor motivation to learn (Goldston et al., 2007), a general unwillingness to engage in reading activities (Fuchs et al., 2001), and a lack of enjoyment in reading for pleasure. The culmination of their reading impairments leads to general struggles with school performance, further validating for these children that they may not be smart enough to learn new strategies, and making a concerted effort may seem overwhelming and unlikely to yield improvement. Later, adults with persistent reading difficulties may pass this aversion on to their children (Beers, 1998), perpetuating the problem through future generations.

Negative future outcomes associated with reading disabilities include, in addition to intergenerational transfer of risk and the mental health conditions previously noted, an increased likelihood of dropping out of high school or not moving on to higher education (Slavin, 1998; Werner, 1993). Students may eventually experience greater challenges obtaining employment, higher rates of delinquent behaviors, and at times incarceration (Slavin, 1998; Werner, 1993; Chhabra & McCardle, 2004; National Institute for Literacy, 1997). Limited career and continuing education options for the future may enhance the low sense of self-efficacy that facilitates negative affective states and self-defeating behaviors (Goldston et al., 2007). Unfortunately, children who can not read proficiently have fewer adult opportunities, leading to diminished economic security and overall sense of wellbeing (Chhabra & McCardle, 2004).

Breaking the “Sound” Barrier to Fluent Reading

The program reviewed in the present study incorporates several research-based strategies and principles into the instructional system (Martin, 2003). Designed through

work with adolescent students, the Breaking the “Sound” Barrier program integrates age-appropriate thematic suggestions that are emotionally reinforcing to older children.

Research indicates that a barrier to working with older children is lack of interesting, relevant instructional materials and activities that teens find interesting (Wolf et al., 2000; McCray et al., 2001). By making lessons fun, which the study program accomplishes by suggesting adolescent themes such as football, teachers can combat negative attitudes to learning, facilitating success (Wolf et al., 2000). As the Breaking the “Sound” Barrier program is not scripted, teachers are afforded the flexibility to seek student input about themes and specific lesson development, increasing the likelihood that students will find the material personally engaging and memorable (McCray et al., 2001). The concepts are taught over time utilizing the same consistent theme, thus facilitating interconnection among concepts through efficient storage and retrieval of newly learned information (Norris & Hoffman, 2002; Oakland et al., 1998). Students draw pictures and utilize multisensory approaches to learning, which strengthen recall and use of otherwise independent skills (Norris & Hoffman, 2002). Orthographic knowledge of letters and words is enhanced through mapping onto thematically consistent images, making it visually captivating, emotionally reinforcing, and memorable (Abbott & Berninger, 1999).

The Breaking the “Sound” Barrier program includes a strong reliance on explicit instruction of basic early literacy skills (Mercer et al., 2000; Manset-Williamson & Nelson, 2005). Children with greater skill deficits require longer, more intensive programs and additional inclusion of repetition, practice, and maintenance activities, all of which are included in this program (Blackman et al., 2004). The combination of direct

explanation and modeling, followed by continuous feedback, regular review and maintenance, and weekly checks for mastery allow teachers utilizing this program to make necessary adjustments to meet individual needs as necessary, in accordance with research (Burns, 2007; Fiorello et al., 2006; Manset-Williamson & Nelson, 2005; Denton et al., 2003). Martin (2003) also suggests implementing peer modeling and mentoring, which has been shown to improve not only the skill levels of those learning the new skills, but also those more skilled students providing the mentorship (Martin, 2003; Calhoon, 2005).

The study program provides a reading curriculum in lesson plan format with a specific scope and sequence designed to enhance both bottom-up and top-down avenues of reading skill acquisition (Norris & Hoffman, 2002; Alexander & Singer-Constant, 2004; Abbott & Berninger, 1999). Concrete strategies for enhancing phonological awareness and processing are taught through explicit, intensive, and systematic instruction in the alphabetic principle, which research indicates yields improvement in real word and nonword reading, spelling, and reading rate (Blackman et al., 2004; Fuchs et al., 2001). Fluidity and automaticity are enhanced through sight word identification strategies, repeated reading, preteaching unfamiliar words, and guided practice (Burns, 2007; Lovett & Steinbeck, 1997; Torgeson & Wagner, 1994). Teachers are afforded the flexibility within the structured scope and sequence of the program to tailor instruction to their own teaching style, which has been shown to ameliorate stress and enhance teacher satisfaction (Wickstrom, 2004). Martin (2003) offers training workshops that facilitate the flexible integration of key components of the program into existing classroom structures, which are areas supported in current best practices (Denton et al., 2003;

National Reading Panel, 2002). In conclusion, the Breaking the “Sound” Barrier to Fluent Reading program contains all of the key components that the National Reading Panel (2002) has outlined as necessary for effective reading instruction, including an effective teacher, balanced curricular components, differentiated instruction, and explicit instruction.

Chapter 3

Methods

Participants

The participants in this study will include students in fifth through eighth grades in a rural public school district in Pennsylvania. For confidentiality purposes, the name of the school district and of the students who participated in the intervention will remain anonymous. The data for this study was provided to Philadelphia College of Osteopathic Medicine (PCOM) by the school district as a blinded data base that included formative and summative test results, as well as a listing of grade level, sex, IQ information, level of intensity of instructional supports, number of school years receiving intervention, and grade at which each student entered the intervention. All identifying information was removed from the database prior to PCOM receiving it, thus keeping the identities of individual participants confidential. The blind database, in the form of a Microsoft Excel file, contains demographics and test scores for 101 students, and data analysis was conducted on all complete records. Participants were excluded from the study if there was no way to identify their age, sex, or length of time in the intervention, or if testing data was missing or incomplete. All participants were receiving special education services under IDEA at the time of the intervention, and each had an Individualized Education Program (IEP) to address his or her specific instructional needs.

Data for the present study were retrospectively analyzed and spanned a period of approximately 9 years, from September 1998 through June 2006. No single participant was represented more than once throughout the sample.

Overview of Research Design

Independent variables. The independent variables for this study were gathered by the school district in the current research. Relevant information gathered from the students’ school records included race, sex, special education classification, verbal IQ, performance IQ, full-scale IQ, educational program, grade upon entering special education, grade upon entering period of intensive reading instruction, and number of years of intensive instruction.

Procedures. Permission from the school district was obtained in order to gain access to the data to assess the effectiveness of the program on student reading achievement (see Letter from Superintendent of Schools, Appendix A). The investigator agreed to complete confidentiality guidelines for this study to the extent that all identifying participant information, including the name of the school in which the study was conducted, were removed from the database by the author to ensure full confidentiality. Agreement from the author of Breaking the “Sound” Barrier to Fluent Reading (Martin, 2003) was provided to evaluate and discuss the effectiveness of the program.

Intervention. All student participants in the current study received instruction utilizing the Breaking the “Sound” Barrier to Fluent Reading (Martin, 2003) program. The program is a comprehensive phonics-based instructional program designed for use with struggling middle and high school students or to teach beginning phonics skills to elementary school children. The program is presented in lesson plan format, with guidelines for teachers to create meaningful classroom lessons based on the principles and sample activities provided. The Breaking the “Sound” Barrier program places a

strong emphasis on making phonics instruction meaningful and memorable by incorporating a theme that connects all instruction from beginning to end while allowing for the flexibility of allowing for a teacher-chosen theme. The program indicates that while children in middle school special education classrooms tend to like football, and that engaging them through meaningful activities versus immature instructional level materials improves retention through emotional engagement, other themes may be more appropriate and may be substituted based on the specific student population.

Breaking the “Sound” Barrier to Fluent Reading incorporates peer modeling to facilitate mastery and command of the material over time, also designed to improve retention, as well as a social bond among grade level peers and children across program years. Strategies to improve reading and spelling are multisensory, including an emphasis on visual learning with inclusion of auditory and kinesthetic adjuncts. The premise of Breaking the “Sound” Barrier is that students in regular education tend to learn to read through mostly auditory channels, with little attention given to meaning- and memory-enhancing strategies utilizing visual learning channels, such as picture associations between letters and sounds that can later be used as “crutches” for applying specific reading skills.

Measures

The data utilized for the present study were existing information available on the student participants based on school district progress monitoring practices. All measures were regularly utilized by the school district in the course of monitoring student progress relative to instructional practices. Each instrument will be discussed below.

Kaufman Test of Educational Achievement. The Kaufman Test of Educational Achievement–Comprehensive Form (K–TEA; Kaufman & Kaufman, 1985, 1998) is an individually administered, norm-referenced measure designed to assess reading, mathematics, and spelling achievement for children and adults aged 6 years through 22 years. The K–TEA was developed and standardized in 1985 and renormed in 1996. The normative sample from 1996 was demographically representative of the 1994 U.S. census data. Reliability data was provided in the original K–TEA manual (Kaufman & Kaufman, 1985), but was not reported for the 1997 norms. Reliability and validity information provided in the K–TEA manuals shows that internal and test-retest reliability and content, construct, and concurrent validity are satisfactory (Sattler, 2001).

The participants’ reading decoding, spelling, reading comprehension, and overall reading achievement were ascertained using the K–TEA before receiving the intervention, then following each year of instruction, including the final year, yielding baseline, formative, and summative data on the academic components of reading achievement throughout the intervention period. The learning support teacher for each year administered the achievement assessment measures to the participants as a means of progress monitoring for the school district. These scores were entered into a database to track progress over a period of several years. The K–TEA Reading Decoding subtest requires participants to read letters and words from a list in order of increasing difficulty. The Reading Comprehension subtest requires participants to read passages aloud or silently, then orally respond to one or two questions requiring literal or inferential comprehension. The Spelling subtest assesses written spelling in a traditional spelling test

format. Overall reading is computed by combining the Reading Decoding and Reading Comprehension subtest scores into a composite reading score.

Pennsylvania System of School Assessment. The Pennsylvania Department of Education requires that all public schools in the state administer the Pennsylvania System of School Assessment (PSSA) in reading in grades 3, 5, and 8, the results of which place each child’s performance in one of four categories: below basic, basic, proficient, or advanced (Mercer, Campbell, Miller, Mercer, and Lane, 2000; Fusaro, Shibley, & Wiley 2006). The PSSA has been rigorously studied, yielding results that indicate high levels of reliability and validity and a strong representation of the core content standards of each academic area measured (Thacker, 2004). The purpose of the test within the state as a whole is to provide accountability and measure adequate yearly progress per the No Child Left Behind Act, which mandates that all children, regardless of disability, in schools that receive Title I funds demonstrate proficiency in reading, writing, and math by 2014. All students in the present study who were in the district in grades 5 and 8 received the PSSA, and results are indicated as individually reported by the Pennsylvania Department of Education. Scaled scores, which have a mean of 1300 and a standard deviation of 100, are provided, as well as categorical information, for the purpose of analysis in the present study.

Stanford Achievement Test–Ninth Edition. The Stanford Achievement Test–Ninth Edition (SAT–9, 1995) is a norm-referenced, group-administered test of educational achievement that is utilized on a national scale for similar purposes as the PSSA. Participants received the SAT–9 each year of the present study, and their total reading, reading comprehension, and reading vocabulary scores are provided in the blind

database providing yearly progress information. The SAT-9 is a highly reliable and valid measure of academic achievement which consists of multiple choice and open-ended test items, ranging from simple interpretations to understanding highly complex reading passages. On vocabulary items, students are asked to identify words, synonyms, and antonyms. The two subtests are compiled to yield the total reading composite.

Plan for Analysis

This study was a retrospective study of educational testing data. It compared archival data from 64 students who received classroom instruction utilizing the *Breaking the “Sound” Barrier to Fluent Reading* program (Martin, 2003). The purpose of this study was to ascertain what, if any, factors correlated with improved academic achievement over time. The data were analyzed utilizing within- and between-subject designs, allowing for both normative and ipsative comparisons to determine both group progress and progress relative to the normative sample. The plan for analysis of each individual hypothesis follows:

Hypothesis 1. Students participating in the Breaking the “Sound” Barrier to Fluent Reading program would demonstrate improved scores following the first full year of intervention on individually administered tests of academic achievement relative to baseline, preintervention scores.

Analysis 1. Data were analyzed utilizing a one-sample *t* test by comparing the group means of pretest and posttest scores on individually administered tests of academic achievement, measuring specifically reading decoding, comprehension, spelling, and overall reading achievement.

Hypothesis 2. Students participating in the Breaking the “Sound” Barrier to Fluent Reading program would demonstrate improved post-intervention scores on group statewide academic achievement tests relative to baseline, preintervention scores.

Analysis 2. Data were analyzed utilizing a one-sample *t* test by comparing the group means of pretest and posttest scores on group statewide academic achievement, measuring specifically reading decoding, comprehension, spelling, and overall reading achievement.

Hypothesis 3. IQ scores of students participating in the Breaking the “Sound” Barrier to Fluent Reading program would be a mediating factor that impacted the improvement of their scores on individually administered and group statewide tests of academic achievement.

Analysis 3. Data were analyzed by grouping the participants into three groups (below average, average, and above average IQ), and repeated measure *t* tests were used to compare group means on individually administered and group statewide tests of academic achievement for each IQ group. A similar analysis was performed based on verbal IQ level, performance IQ level, and full scale IQ level.

Chapter 4

*Results**Descriptive Statistics of the Study Sample*

The study sample consisted of 64 middle school students who participated in an intensive reading remediation program. Data were gathered on gender, special education classification, verbal IQ, performance IQ, and full scale IQ, years in and grade entering the program, and scores on various measures of reading performance, as measured by the K-TEA. Additionally, PSSA pretest and posttest scores were recorded. Demographics are reported on the entire study sample, though some data points were not available on all subjects, thus reducing the total number of subjects for various analyses, which will be specified in each analysis in this section. Subjects whose relevant data were entirely unavailable were excluded from the original database provided by the school district.

Gender. Participants ($n = 64$) were 47 boys (73.4%) and 17 girls (26.6%) in a rural public school in Pennsylvania. The control group ($n = 31$) consisted of 27 boys (87.1%) and 4 girls (12.9%).

Grade entering reading program. Reading performance data was gathered on each participant based on their first year of participation in the Breaking the “Sound” Barrier reading program, and is outlined in Table 1.

Intellectual functioning. The participants’ verbal IQs ranged from standard scores of 72 to 132, with a mean score of 95.06 and a standard deviation of 10.19. Performance IQ scores ranged from 77 to 126, with a mean of 99.88 and a standard deviation of 13.22. Full scale IQ scores range from 72 to 122, with mean score of 96.64 and a standard deviation of 10.35. For this study, below average is defined as an IQ score equal to or

Table 1. Grade Entering Reading Program

	<i>n</i>	% of sample
Entered program in fifth grade	30	46.9%
Entered program in sixth grade	14	21.9%
Entered program in seventh grade	16	25.0%
Entered program in eighth grade	4	6.3%

below 89. Average intellectual functioning is defined as 90 to 109 and above average is defined as equal to or greater than 110.

Hypothesis 1 Results

Hypothesis 1 stated that students participating in the Breaking the “Sound” Barrier to Fluent Reading program would demonstrate improved scores on individually administered tests of academic achievement after the first year of treatment relative to baseline, preintervention scores. Paired sample *t* tests were performed to measure group means and determine if the students demonstrated significant improvement on individual measures. As hypothesized, there was significant improvement following the first year of intervention on the K-TEA in the areas of Reading Decoding, Spelling, Reading Comprehension, and overall reading as measured by the K-TEA Reading Composite, as outlined in Table 2. In addition to being statistically significant, the Cohen’s *d* coefficients for the K-TEA reading scores suggest that the differences were robust. There

were no significant differences found based on the Stanford Achievement Test on overall reading achievement, Reading Vocabulary, or Reading Comprehension (Table 3).

Hypothesis 2 Results

Hypothesis 2 stated that students participating in the Breaking the “Sound” Barrier to Fluent Reading program would demonstrate improved post-intervention scores on group statewide academic achievement tests relative to baseline, preintervention scores. A repeated measures *t* test was performed to measure group means and determine if participants demonstrated significant improvement on the PSSA following the intervention. Cohen’s *d* was computed with each *t* test to determine effect sizes as follows: a coefficient of 0.2 is indicative of a small effect size, scores of 0.3 to 0.7 are indicative of a moderate effect size, and a coefficient greater than 0.8 is considered a large effect size.

As hypothesized, participants demonstrated significant improvement on the PSSA scaled scores following the intervention. In addition to being statistically significant, the Cohen’ *d* coefficient was 0.39, which is suggestive of a moderate degree of growth following the intervention. The students in the study group improved their scores by an average of 73.27 points following middle school reading intervention with the study program.

t tests were performed on a control group of students who took the PSSAs and received reading remediation during the same time period with an alternative reading program. This was to draw a comparison between the study group, who improved significantly following instruction with the Breaking the “Sound” Barrier to Fluent

Table 2. Mean K-TEA Reading Raw Scores and *t* for Preintervention and Post-intervention for Study Sample

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	27.91	33.73	5.82	-8.967	43	.000	1.35
<u>K-TEA</u> Reading							
Comprehension							
subtest raw score	22.42	29.77	7.34	-10.446	42	.000	1.59
<u>K-TEA</u> Spelling							
subtest raw score	16.96	19.86	2.90	-9.334	49	.000	0.91
<u>K-TEA</u> Reading							
Composite raw							
score	50.87	62.96	12.18	-12.756	50	.000	1.79

Reading program, and the control group, who did not receive the study intervention.

First, an independent samples *t* test was performed to determine if there was a difference between the baseline performance levels of the control and study groups. There was no significant difference between the two groups, suggesting that any differences between each group’s PSSA scores at posttest is a true difference. A repeated measures *t* test was

Table 3. Mean SAT-9 Reading Standard Scores and *t* for Preintervention and Postintervention for Study Sample

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>SAT-9</u> Reading							
Composite							
standard score	27.89	24.01	3.88	1.645	26	.112	0.32
<u>SAT-9</u> Reading							
Vocabulary							
standard score	29.68	25.91	3.77	1.305	21	.206	0.25
<u>SAT-9</u> Reading							
Comprehension							
standard score	36.09	31.74	4.35	1.198	22	.244	0.25

performed on this control group to determine if the students in that group demonstrated significant improvement on the PSSA following alternative reading intervention (Table 4). As hypothesized, participants who did not receive the study program did not improve their PSSA scores from preintervention levels. Their mean scores following middle school reading intervention decreased by an average of 19.45 points.

Table 4. Mean PSSA Scaled Scores and *t* for Study Group and Control Group

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Study group							
<u>PSSA</u> scores	1074.02	1147.29	73.28	-2.983	57	.004	0.39
Control group							
<u>PSSA</u> scores	1062.74	1043.29	19.45	0.713	30	.482	0.13

Hypothesis 3 Results

Hypothesis 3 stated that the IQ scores of the participants would be a mediating factor that impacted the improvement of their scores on both individually administered and group statewide tests of academic achievement. The participants were divided into three IQ level groups (below average, average, and above average). Repeated measures *t* tests were performed to measure group means to determine what impact, if any, intellectual level had on degree of improvement on individually administered tests of academic achievement and group statewide assessments. Analyses were repeated for verbal IQ, performance IQ, and full scale IQ.

Verbal IQ. Students with verbal IQ scores within the below average range (VIQ less than 89) demonstrated significant improvement on the K-TEA in all areas (see Table 5): Reading Decoding, Spelling, Reading Comprehension, and overall reading as

Table 5. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scores, and *t* for Preintervention and Postintervention for Students with Below Average Verbal IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	27.00	30.89	3.89	-2.376	8	.045	0.79
<u>K-TEA</u> Reading Comprehension							
subtest raw score	20.75	26.75	6.00	-3.257	7	.014	1.15
<u>K-TEA</u> Spelling							
subtest raw score	18.73	22.27	3.55	-6.500	10	.000	1.96
<u>K-TEA</u> Reading composite raw score							
score	51.27	59.00	7.73	-3.907	10	.003	1.18
<u>SAT-9</u> Reading composite							
standard score	22.43	18.14	4.29	2.109	6	.079	0.80
<u>SAT-9</u> Reading Vocabulary							
standard score	22.17	15.50	6.67	2.294	5	.070	0.94

SAT-9 Reading

Comprehension

standard score	27.50	25.17	2.33	0.560	5	.600	0.23
PSSA scaled score	1054.11	1179.44	125.33	-1.916	8	.092	0.64

measured by the Reading Composite. In addition to being statistically significant, strong Cohen’s *d* coefficients are suggestive of a large effect size. There were no significant differences between pretest and posttest scores on the PSSA or the Stanford Achievement Test in the areas of overall reading, Reading Vocabulary, or Reading Comprehension.

Students with verbal IQ scores within the average range (VIQ 90 to 109) demonstrated significant improvement in all areas of reading achievement measured by the K-TEA (Table 6): Reading Decoding, Spelling, Reading Comprehension, and overall reading as measured by the Reading Composite. Analyses also indicated significant improvement on the PSSA. Again, Cohen’s *d* coefficients are suggestive of a large degree of change from pretest to posttest performance. There were no significant differences found between pretest and posttest as indicated by the Stanford Achievement Test in the areas of overall reading achievement, Reading Vocabulary, and Reading Comprehension.

There were very few students whose verbal IQ scores were within the above average range (VIQ < 110); therefore, statistical analyses were not possible for this study.

Table 6. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Average Verbal IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	26.29	32.76	6.47	-6.676	20	.000	1.46
<u>K-TEA</u> Reading Comprehension							
subtest raw score	22.05	28.86	6.81	-6.659	20	.000	1.45
<u>K-TEA</u> Spelling							
subtest raw score	15.08	7.84	2.76	-5.238	24	.000	1.05
<u>K-TEA</u> Reading composite raw score							
score	48.31	60.96	12.65	-10.162	25	.000	1.99
<u>SAT-9</u> Reading composite							
standard score	24.86	21.45	3.41	.804	12	.437	0.22
<u>SAT-9</u> Reading Vocabulary							
standard score	27.90	25.90	2.00	.336	9	.745	0.11

SAT-9 Reading

Comprehension

standard score	34.80	30.40	4.40	.586	9	.572	0.19
PSSA scaled score	1097.67	1300.67	203.00	-5.359	14	.000	1.38

There was substantial growth in all areas of the K-TEA and the students' PSSA scaled scores improved drastically following intervention with the study program (Table 7).

Performance IQ. Students with performance IQ scores within the below average range (PIQ lower than 89) demonstrated significant improvement in reading achievement as measured by the K-TEA in the following areas: Spelling and overall reading, as indicated by the Reading Composite (Table 8). High Cohen's *d* coefficients are suggestive of a large effect size in the areas of spelling and overall reading. As measured by the K-TEA, there were no significant differences found in the areas of Reading Decoding or Reading Comprehension. There were no significant differences found on the PSSA, nor were differences found as measured by the Stanford Achievement Test in the areas of overall reading achievement, Reading Vocabulary, or Reading Comprehension.

Students with performance IQ scores within the average range (PIQ from 90 to 109) demonstrated significant improvement in all areas of reading measured by the K-TEA: Reading Decoding, Spelling, Reading Comprehension, and overall reading as indicated by the Reading Composite (Table 9). Students also demonstrated significant improvement on the PSSA. Strong Cohen's *d* coefficients suggest a great degree of

Table 7. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Above Average Verbal IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	27.00	38.00	11.0	-11.000	1	.058	7.80
<u>K-TEA</u> Reading Comprehension							
subtest raw score	19.00	31.00	12.0	-6.000	1	.105	4.24
<u>K-TEA</u> Spelling							
subtest raw score	13.50	18.50	5.00	-5.000	1	.126	3.55
<u>K-TEA</u> Reading composite raw							
score	46.00	69.00	23.00	-7.667	1	.083	5.42
<u>SAT-9</u> Reading composite							
standard score	70.00	61.00	9.00	1.500	1	.374	1.06
<u>SAT-9</u> Reading Vocabulary							
standard score	70.50	67.00	3.50	1.400	1	.395	0.90

SAT-9 Reading

Comprehension

standard score	55.33	44.67	10.67	2.630	1	.119	1.52
<u>PSSA</u> scaled score	1155.00	1543.00	388	**	**	**	**

change from pretest to posttest conditions. There were no significant differences found as measured by the Stanford Achievement Test in the areas of overall reading achievement, Reading Vocabulary, or Reading Comprehension.

Students whose Performance IQ scores were within the Above Average range (PIQ greater than 110) demonstrated significant improvement in all areas of reading as measured by the K-TEA: Reading Decoding, Spelling, Reading Comprehension, and overall reading as indicated by the Reading Composite (Table 10). Students also demonstrated significant improvement on the PSSA. Strong Cohen’s *d* coefficients suggest large effect sizes from pretest to posttest conditions. No significant differences were detected on the Stanford Achievement Test in the areas of overall reading achievement, Reading Vocabulary, or Reading Comprehension.

Full Scale IQ. Students whose Full Scale IQ scores were within the Below Average range (FSIQ lower than 89) demonstrated significant improvement in the following areas as measured by the K-TEA: Spelling, Reading Comprehension, and overall reading as indicated by the Reading Composite (Table 11). Strong Cohen’s *d*

Table 8. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Below Average Performance IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	28.14	33.00	4.86	-1.827	6	.117	0.69
<u>K-TEA</u> Reading Comprehension							
subtest raw score	24.14	29.00	4.86	-2.422	6	.052	0.92
<u>K-TEA</u> Spelling							
subtest raw score	16.89	19.78	2.89	-3.309	8	.011	1.10
<u>K-TEA</u> Reading composite raw							
score	55.22	64.78	9.58	-3.132	8	.014	1.04
<u>SAT-9</u> Reading composite							
standard score	37.50	33.00	4.50	1.130	5	.310	0.46
<u>SAT-9</u> Reading Vocabulary							
standard score	38.00	32.00	6.00	0.636	5	.553	0.26

SAT-9 Reading

Comprehension

standard score	33.09	37.83	4.74	0.176	5	.867	0.07
<u>PSSA</u> scaled score	1134.75	1351.75	217.0	-2.881	3	.063	1.44

coefficients suggest large effect sized from pretest to posttest conditions. As measured by the K-TEA, no significant improvement was found in the area of Reading Decoding, or on the PSSAs. No significant differences were detected on the Stanford Achievement Test in the areas of overall reading achievement, Reading Vocabulary, and Reading Comprehension.

Students whose Full Scale IQ scores were within the Average range (FSIQ 90 to 109) demonstrated significant improvement in all areas of reading as measured by the K-TEA: Reading Decoding, Spelling, Reading Comprehension, and overall reading as indicated by the Reading Composite (Table 12). Students also demonstrated significant improvement on PSSA scores. Strong Cohen’s *d* coefficients are suggestive of large effect sized following intervention. There were no significant differences detected on the Stanford Achievement Test in the areas of overall reading achievement, Reading Vocabulary, or Reading Comprehension.

Students whose Full Scale IQ scores were within the Above Average range (FSIQ greater than 110) demonstrated significant improvement on the K-TEA in the following areas: Reading Comprehension and overall reading as indicated by the Reading

Table 9. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Average Performance IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	26.00	32.94	6.94	-7.958	16	.000	1.93
<u>K-TEA</u> Reading Comprehension							
subtest raw score	20.50	28.13	7.63	-9.175	15	.000	2.30
<u>K-TEA</u> Spelling							
subtest raw score	16.15	19.60	3.45	-7.667	19	.000	1.72
<u>K-TEA</u> Reading composite raw							
score	46.10	58.91	12.80	-9.995	19	.000	2.23
<u>SAT-9</u> Reading composite							
standard score	24.92	23.24	1.68	.625	8	.549	0.21
<u>SAT-9</u> Reading Vocabulary							
standard score	28.43	26.71	1.71	1.279	6	.248	0.48

SAT-9 Reading

Comprehension

standard score	33.50	29.50	4.00	.979	7	.360	0.35
PSSA scaled score	1042.08	1175.62	133.54	-2.648	12	.021	0.73

Composite (Table 13). Strong Cohen’s *d* coefficients are suggestive of a great degree of improvement following the intervention. As measured by the K-TEA, no significant difference was detected in the area of Reading Decoding, and there was not significant data to run an analysis in the area of Spelling. No statistically significant differences were detected as measured by the PSSA or the Stanford Achievement Test. It is noteworthy that despite the relatively small sample size, substantial growth was observed in all areas of the K-TEA and on PSSA Scaled Scores, as outlined in Table 13.

Relationships between IQ levels, PSSA scores, and performance following the first year of instruction in each area of reading were explored to help determine the impact of IQ on academic achievement. For the study group, verbal IQ was moderately correlated with PSSA baseline performance ($r = .463, p < .05$), but no correlation was detected between VIQ and PSSA final scores. There was no correlation detected between PIQ and FSIQ and PSSA baseline or final scores. VIQ scores were also moderately correlated with performances on the Stanford Achievement Test following the first year of instruction in the areas of general reading as indicated by the SAT Reading Composite ($r = .492, p = .009$), SAT Vocabulary ($r = .621, p = .001$), and SAT Reading

Table 10. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Above Average Performance IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	26.25	31.38	5.13	-3.122	7	.017	1.11
<u>K-TEA</u> Reading Comprehension							
subtest raw score	21.25	28.63	7.38	-3.076	7	.018	1.09
<u>K-TEA</u> Spelling							
subtest raw score	15.00	17.56	2.56	-2.484	8	.038	0.83
<u>K-TEA</u> Reading composite raw							
score	49.30	61.10	11.80	-4.775	9	.001	1.51
<u>SAT-9</u> Reading composite							
standard score	24.41	17.24	7.17	1.042	6	.388	0.39
<u>SAT-9</u> Reading Vocabulary							
standard score	25.20	21.40	3.80	.626	4	.565	0.39

SAT-9 Reading

Comprehension

standard score	25.00	25.20	9.80	.871	4	.433	0.39
<u>PSSA</u> scaled score	1127.63	1372.29	244.63	-4.638	7	.002	1.64

Comprehension ($r = .432, p = .025$). Verbal IQ was also correlated with K-TEA Reading Comprehension subtest scores following the first year of instruction ($r = .364, p = .025$). No correlations were discovered between PIQ and FSIQ scores and specific areas of reading achievement.

Additional Findings

PSSA scaled scores are divided into four categories, in order of ascending scores: below basic, basic, proficient, and advanced. PSSA baseline scores for the study group placed 63% of the students in the below basic category and 37% in the basic category, both of which are below the proficient level. The study group advanced following instruction with the Breaking the “Sound” Barrier to Fluent Reading program as indicated by their final PSSA categories: below basic (25.9%), basic (25.9%), proficient (33.3%), and advanced (14.8%). The same data were gathered and counted for the control group, who did not receive instruction utilizing the study program. Their baseline PSSA category distribution was as follows: below basic (87.1%), basic (12.9%). Following

Table 11. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Below Average Full Scale IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	31.63	35.63	4.00	-2.056	7	.079	0.73
<u>K-TEA</u> Reading Comprehension							
subtest raw score	26.63	31.13	4.50	-2.846	7	.025	1.01
<u>K-TEA</u> Spelling							
subtest raw score	20.56	22.89	2.33	-3.055	8	.016	1.02
<u>K-TEA</u> Reading composite raw							
score	60.11	67.33	7.22	-3.081	8	.015	1.03
<u>SAT-9</u> Reading composite							
standard score	42.71	35.14	7.57	1.662	6	.148	0.63
<u>SAT-9</u> Reading Vocabulary							
standard score	40.57	32.86	7.71	.946	6	.381	0.36

SAT-9 Reading

Comprehension

standard score	45.29	40.29	5.00	.626	6	.555	0.24
<u>PSSA</u> scaled score	105.80	1261.20	155.40	-1.286	4	.268	0.58

remedial reading instruction, their PSSA category distribution was as follows: below basic (77.4%), basic (16.1%), proficient (3.2%), and advanced (3.2%).

In examining the PSSA data and observing individual subjects’ movement from one category to another from pretest to posttest, there are additional differences between the study and control groups. Within the group of students who received instruction with the study program, of those whose PSSA pretest scores were within the below basic category ($n = 17$, 63% of sample), 35.3% of students remained in the below basic category at posttest ($n = 6$), 29.4% advanced to the basic category ($n = 4$), 29.4% advanced into the proficient category ($n = 5$), and 5.9% advanced into the advanced proficient category ($n = 1$). Of the students in the study group whose PSSA pretest scores were within the basic category, 10% fell into the below basic category at posttest ($n = 1$), 20% remained at the basic level ($n = 2$), 40% advanced to the proficient level ($n = 4$), and 30% moved to the advanced category ($n = 3$).

Within the control group who received alternative reading intervention, of those students whose PSSA pretest scores were within the below basic category at pretest ($n = 27$, 87.1% of sample), 77.8% remained at the below basic level at posttest ($n = 21$),

Table 12. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Average Full Scale IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
K-TEA Decoding							
subtest raw score	25.22	32.17	6.96	-7.914	22	.000	1.65
K-TEA Reading Comprehension							
subtest raw score	19.91	27.27	7.36	-7.731	21	.000	1.65
K-TEA Spelling							
subtest raw score	15.25	18.50	3.25	-7.081	27	.000	1.34
K-TEA Reading composite raw score							
score	46.17	59.17	13.00	-10.453	28	.000	1.94
SAT-9 Reading composite standard score							
standard score	15.09	14.49	0.59	.328	13	.748	0.09
SAT-9 Reading Vocabulary standard score							
standard score	15.09	14.70	0.39	.145	9	.888	0.05

SAT-9 Reading

Comprehension

standard score	23.82	22.00	1.82	.553	10	.592	0.17
PSSA scaled score	1071.32	1246.32	175.0	-5.651	18	.000	1.30

14.8% advanced to the basic level ($n = 5$), and 3.7% advanced to the proficient level. Of the students in the control group whose pretest PSSA scores were within the below basic level ($n = 4$, 12.9% of sample), 75% regressed to the below basic level at posttest ($n = 3$), and 25% moved to the advanced level ($n = 1$).

Overall, of the students who did not receive the study intervention whose PSSA scores at pretest were below the proficient level ($n = 31$, 100% of the sample), 6.5% advanced to at least a proficient level ($n = 2$). Within the sample of students who received instruction with the study program whose PSSA scores at pretest were below the proficient level ($n = 27$, 100% of the sample), 48.1% advanced to at least a proficient level following intervention ($n = 13$).

Table 13. Mean K-TEA Reading Raw Scores, SAT-9 Reading Standard Scores, PSSA Scaled Scores, and *t* for Preintervention and Postintervention for Students with Above Average Full Scale IQ Scores

	Pre intervention	Post intervention	mean difference	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
<u>K-TEA</u> Decoding							
subtest raw score	28.50	30.00	1.50	-1.000	1	.500	0.71
<u>K-TEA</u> Reading Comprehension							
subtest raw score	21.50	35.50	14.00	-14.000	1	.045	9.93
<u>K-TEA</u> Spelling							
subtest raw score	12.50	17.50	5.00	**	**	**	**
<u>K-TEA</u> Reading composite raw score							
	50.00	65.50	15.50	-31.000	1	.021	21.83
<u>SAT-9</u> Reading composite standard score							
	69.00	49.33	19.67	1.428	2	.290	0.82
<u>SAT-9</u> Reading Vocabulary standard score							
	64.33	53.33	11.00	1.997	2	.184	1.15

SAT-9 Reading

Comprehension

standard score	70.00	49.33	20.67	1.278	2	.329	0.74
PSSA scaled score	1202.50	1574.50	372.00	-14.308	1	.044	10.12

Chapter 5

Discussion

Goal of the Study

This study attempted to determine whether middle school students who received remedial reading instruction using the Breaking the “Sound” Barrier to Fluent Reading program demonstrated significant improvement on measures of reading achievement. This was determined using pretest and posttest scores in the areas of reading decoding, comprehension, and spelling. Additionally, this study examined whether participants improved significantly on group statewide tests of academic achievement relative to controls, as measured by the Pennsylvania State System of Assessment (PSSA). The final area of analysis sought to determine whether intellectual level, as indicated by verbal, performance, and full scale IQ scores, impacted degree of improvement on individual and group measures of reading achievement. Analyses yielded several significant findings, including improvement in all areas of reading achievement and group statewide assessments, as well as information about the role of intellectual level in response to reading intervention, as outlined below.

Findings of the Study

The initial hypothesis, which stated that students who received remedial reading instruction using the Breaking the “Sound” Barrier to Fluent Reading program would demonstrate significant improvement on individually administered tests of academic achievement following the first year of instruction, was supported by the data. This suggests that, in general, students improved their reading skills, following 1 year of

instruction with the study program, in the areas of reading comprehension, spelling, and decoding. This increased their overall reading performance, as hypothesized.

The results were not unexpected, as research indicates that older children can benefit from systematic instruction, including the key components of effective teaching, balanced curricular components, and differentiated, explicit instruction (Berninger et al., 2001; National Reading Panel, 2002; Martin, 2003). The Breaking the “Sound” Barrier program pulls from the classic Orton-Gillingham scope and sequence of instruction in phonological awareness and processing, which has been shown to improve real word and pseudoword decoding, reading comprehension, and word identification (Oakland et al., 1998; Gillingham & Stillman, 1997). Furthermore, the Breaking the “Sound” Barrier to Fluent Reading program is intensive and explicit in teaching skills that target phonological awareness, which has been clearly shown to improve overall reading performance by strengthening letter-word knowledge, decoding, and reading comprehension (Lovett et al., 1994; Manset-Williamson & Nelson, 2005). The program also includes specific strategies that have been linked to success, including direct explanation and modeling, guided practice, regular review and maintenance, peer modeling, and frequent checks for mastery with instructional modifications made accordingly (Burns, 2007). Additionally, the Breaking the “Sound” Barrier program places a strong emphasis on teacher and student engagement by making the curriculum age appropriate and interesting (Martin, 2003). Research has demonstrated that students’ diminished interest in reading may be, in part, responsible for the perpetuation of reading disabilities, especially in older students (Fuchs et al., 2001). This aspect is one of the key components of the Breaking the “Sound” Barrier program.

Hypothesis 2 stated that students who received remedial reading instruction using the Breaking the “Sound” Barrier to Fluent Reading program would demonstrate significant improvement on group statewide assessment scores, as indicated by the PSSA. The data collected for this study support this hypothesis, suggesting that the students were able to generalize their skills and put them into practice beyond the classroom environment and under standardized assessment conditions. Students in the control group who received alternative reading remediation did not demonstrate significant improvement on the PSSA scores, which is also supportive of the second hypothesis. These results echo the research which states that systematic instruction that utilized top-down and bottom-up approaches targeted at decoding improves overall reading performance (Manset-Williamson & Nelson, 2005).

The phonological awareness and processing skills taught through the Breaking the “Sound” Barrier program are strongly linked to future reading accuracy, efficiency, and comprehension and can be readily trained through the type of intensive instruction provided to the study group (Manset-Williamson & Nelson, 2005; Torgeson & Wagner, 1994; Fuchs et al., 2001; Lovett et al., 2000). In the current educational climate where high-stakes testing is utilized as the measure of student achievement, these results are more relevant than at any other time in recent history. Improved accuracy, efficiency, and comprehension are necessary to achieve proficiency on group statewide tests of reading achievement, such as the PSSA.

Hypothesis 3 stated that students’ intellectual levels, as indicated by verbal, performance, and full scale IQ scores, would be a mediating factor in students’ scores in individually administered and group statewide assessment scores. Intellectual functioning

has been linked to overall reading performance and may be indicative of the level of proficiency that can be reached by students with IQ scores that are below average (Abbott & Berninger, 1999). First, considering performance improvements on the PSSAs, the students in the groups whose VIQ, PIQ, or FSIQ were below average did not demonstrate significant gains in performance as measured for this study, though clear improvements were observed. Students' whose IQ scores were within the average range demonstrated significant improvement. Analyses were completed for students whose PIQ and FSIQ were within the above average range, who improved significantly from pretest to posttest times, though the number of subjects was minimal, which warrants cautious interpretation and generalization of these results. There was only one student whose VIQ was within the above average range, and although this individual demonstrated a robust improvement, statistical analyses were not performed.

The impact of intellectual functioning on group standardized test performance is of particular relevance to public school districts, as the current climate of public education dictates that such assessment tools are the basis for greater budgetary decisions about individual districts at the state and federal levels. Based on the current study and pending future research, students who demonstrate a traditional IQ-achievement discrepancy may be more likely to demonstrate improvement on group assessments following effective reading instruction than students with below average intellectual ability who receive similar instruction (Tiu, Thompson, & Lewis, 2003). The PSSAs are designed to measure overall reading achievement relative to core curriculum content standards.

To reach a proficient level, students must demonstrate mastery across a variety of domains. Research suggests that students with lower IQ scores, especially within the verbal domain, may have a more limited capacity to demonstrate overall proficiency, although they are responsive to instruction at a rate similar to their same-aged peers with average intellectual functioning (Abbott & Berninger, 1999). Struggling readers with above average intellectual functioning are more likely to demonstrate phonological deficits as the basis for their reading disabilities. This suggests that IQ alone is not a sufficient predictor for reading performance without also examining baseline phonological awareness (Tiu, Thompson, & Lewis, 2003; O’Malley, Francis, Foorman, Fletcher, & Swank, 2002; Johnston & Morrison, 2007).

The students who struggled on the PSSAs following instruction did, however, demonstrate significant improvement on the K-TEA measures of reading achievement, which are individually administered and do not have the same time constraints. Use of curriculum-based measurement in the application of the Breaking the “Sound” Barrier to Fluent Reading program may help target lessons directed at improving fluency when appropriate. Reading speed and efficiency are areas that are more resistive to intervention, especially with older children. When efficiency is improved, comprehension and enjoyment are enhanced, which fosters an interest in reading for pleasure.

Students’ performance in each area measured by the K-TEA, relative to intellectual level, is also relevant to school application. Students with average intelligence demonstrated significant improvement in all areas of reading, in addition to demonstrating highly significant levels of improvement on the PSSAs. In the area of reading decoding, the students with below average VIQ scores demonstrated significant

improvement following instruction with the Breaking the “Sound” Barrier to Fluent Reading program. Their scores continued to be lower on average ($M = 30.9$ following first year) compared with students whose PIQ and FSIQ were within the Below Average range ($M = 33.0$ and $M = 35.6$, respectively), who did not demonstrate statistically significant improvement. This may manifest in the school setting as obvious growth in the special education classroom relative to previous performance, though they may continue to be below grade level relative to same-aged peers and those with at least average intellectual levels. This again highlights the research suggesting that although students with below average intellectual functioning demonstrate strong initial growth following effective instruction, there is a limit to the degree to which they may demonstrate proficiency (Abbott & Berninger, 1999). Furthermore, it has been found that students with below average IQ scores may be more responsive to interventions targeted at phonemic awareness than their counterparts with higher IQ scores, suggesting that phonological awareness is more often impaired in struggling readers with average to above average intellectual functioning (O’Malley et al., 2002; Johnston & Morrison, 2007).

Overall, students whose PIQ was within the below average range demonstrated significant improvement in the fewest areas (spelling and overall reading composite), with no observable improvement in comprehension or decoding. At the same time, the students with lower PIQ presented with higher initial scores in comprehension, decoding, and overall reading, indicating that those with lower VIQ present with more severe reading deficits, thus requiring a greater degree of remediation. This indicates that low PIQ was not indicative of reading difficulties, whereas, consistent with the research,

students with below average VIQ scores demonstrated clear deficits on measures of reading (Tiu, Thompson, & Lewis, 2003; Stage, Abbott, Jenkins, & Berninger, 2003; Cohen et al., 2001). The same group of students, again despite failure to demonstrate significant improvement on the PSSAs, presented with higher baseline and final PSSA scores than their counterparts. This again highlights that verbal IQ is widely considered to be more closely associated with general reading problems than performance or full scale IQ scores (Abbott & Berninger, 1999).

The students whose FSIQ scores were within the below average range presented with higher overall baseline and final K-TEA scores than both other below average groups. This suggests that despite less than significant levels of improvement, their performance is more commensurate with students on grade level than those students with lower verbal IQ scores, with VIQ again most predictive of reading difficulties.

Discussion of Additional Findings

The primary additional finding of interest and relevance is the advancement of children through the PSSA categories as their skills improve following effective reading instruction. As supported by the data, students who received instruction utilizing the study program demonstrated statistically significant improvement on their PSSA scores. The data collected indicating the pretest and posttest category (i.e., below basic, basic, proficient, or advanced proficient) is educationally relevant for public schools and parents because a substantial number of struggling readers are not proficient, both by classroom and state standards (Lyons et al., 2001; PCESE, 2002). Consistent with available research, these findings suggest that students who struggle at the beginning of middle

school have a chance to improve their scores to the point of proficiency (Berninger et al., 2001). That is to say that in this study, students who received standard instruction continued to fall below a minimum level of proficiency, but of those who received instruction with the Breaking the “Sound” Barrier program, nearly half advanced to a proficient level.

Assumptions of Study

The analyses performed on the available data were based on the assumption that the district handled the data with integrity, and that the individuals who entered the data did so carefully and in good faith. The PSSA data were gathered from the school database of scores provided by the state of Pennsylvania, and the scores are assumed to be accurate. It is also assumed that teachers who taught the participants utilizing the Breaking the “Sound” Barrier to Fluent Reading did so under the guidelines provided within the program and in the way that the author intended the program to be implemented. This assumption facilitates generalization of results and the promotion of scientific inquiry in the form of reproducing the results obtained in this study.

Limitations of Study

The present study was conducted retroactively on a blind database provided by a public school district. While the data contained in the database were obtained through reliable and valid norm-referenced measures, because the current researchers did not directly administer these measures to the student participants, there is no assurance that administration was conducted in accordance with standardization procedures. This

limitation does not apply to the PSSA test, as it can be assumed that the teachers administered the test in accordance with the standardized set of instruction provided them. Additionally, the PSSA test is a group test, which does not require the rigorous training to administer that the K-TEA requires. The data was entered into the blind database by a teacher in the school district, preventing the researcher from performing integrity checks to determine that the data was entered accurately. Additionally, while one of the teachers who performed the intervention was the author of Breaking the “Sound” Barrier to Fluent Reading (Martin, 2003), the current researchers were not present during the implementation of the intervention, which does not provide us information on the integrity of the intervention implementation. Finally, the database contains information for all of the children who received instruction utilizing the reading intervention program being studied, but the current research does not contain a control group, except for the control group on which PSSA scores were available. A comparable control group would have allowed comparisons between the study intervention and at least one additional type of reading intervention.

There are limitations inherent in field research, including the present study. Field research is defined as research that takes place in a natural setting, in this case a public school, as opposed to a controlled laboratory setting. Data were gathered from records, and the treatment condition was administered by teachers as opposed to researchers, as may have been attempted in a laboratory. In field research, there are outside influences on performance that cannot always be measured or accounted for, such as an historical event that may impact results, teacher changes, classroom environments that may be less than ideal, or other factors that could confound results. For example, had the students in the

study group been in a spacious, well-lit classroom, while the students in the control group were crammed into an overcrowded room, it would be impossible to determine the most likely reason for the study effects. Although there are no confounds known to the researchers in the present study, a study limitation must include a statement allowing for the possibility that a confounding condition existed.

Recommendations for Future Research

This study served to provide preliminary support for the use of the Breaking the “Sound” Barrier to Fluent Reading program with children in middle school grades who require reading remediation. The first recommendation to enhance future studies of this program would be to include a control group for all areas of reading achievement to provide a basis for comparison for all results. The present study was a retrospective study based on data provided to the researchers by a public school district. At the time of the data collection for the present study, students in the school district were receiving alternative reading remediation in the context of special education classrooms. It would be well advised to collect data on the students who do not receive the study intervention, thus shifting the study design to an experimental design, strengthening the results, and broadening the conclusions that can be drawn from those results.

As discussed in the previous section on limitations in the present study, the author of the Breaking the “Sound” Barrier to Fluent Reading program was a primary instructor in the school district in which data were collected. In step with shifting the study design from an archival review of available data to a true experimental design, measures to increase the integrity checks in the implementation of the program and data collection

would minimize the limitations mentioned in the previous section. Additionally, training of groups of teachers, who would then implement the program as would happen on a broader scale, would approximate how the program would be implemented should it be mass marketed. The researcher would be involved in data collection and study design prior to implementation of the program rather than after data had already been collected. Accordingly, measures for measuring progress would be carefully chosen to maximize understanding of the acquisition and development of specific reading skills.

A third recommendation, as alluded to in discussing the study design, would be to include data collection measures that are more frequent and more specific with respect to specific skills taught in the Breaking the “Sound” Barrier to Fluent Reading program. The K-TEA and SAT-9 are designed to measure broad progress on an infrequent basis, typically not more regularly than annually. The constructs measured by the K-TEA in the present study, such as reading comprehension, are often measures of more than one construct in a single task. For example, students may be asked to read passages and sentences and then answer questions about those passages and sentences. This task may measure not only reading comprehension, but also word identification, working memory, and attention and concentration. It is possible to diversify the measures utilized in future studies in order to gain insight into more specific skills.

Assessment of the success of the Breaking the “Sound” Barrier to Fluent Reading program might include the core competencies of reading, which are also the factors that are predictive of long-term reading difficulties when not sufficiently developed. These include fluency rate (Mercer et al., 2000), phonological awareness (Kirby et al., 2003), and rapid automatic naming (RAN) (Kirby et al., 2003), in addition to the constructs

already measured, including comprehension, spelling, and decoding. The measures utilized for data collection in the current study were those that the school district utilized on a regular basis and did not include additional measures for the purpose of conducting research.

While seeking one measure that is comprehensive enough to cover all areas of assessment is unrealistic, clinicians should take care to choose a variety of measures that are reliable and valid to ensure that children are not either improperly identified as learning disabled or a disability is missed due to measurement error (Jenkins et al., 2007; Silva, 1996). As outlined in Chapter 2, there are several norm-referenced measures that provide specific baseline information for the purpose of ascertaining instructional levels. Phonological awareness is measured by tasks that require children to identify, isolate, or blend individual phonemes in words (Torgeson & Wagner, 1994). The Word Attack subtest on the Woodcock Reading Mastery Test–Revised (WRMT–R; Woodcock, 1987), Pseudoword Decoding subtest on the WIAT–II (Wechsler, 2001), and the Word Attack subtest on the Woodcock-Johnson III–Tests of Educational Achievement (Woodcock, McGrew, & Mather, 2000) will provide baseline phonological decoding information, but they are not designed to be utilized frequently for progress monitoring. The Comprehensive Test of Phonological Processing (CTOPP) is another measure of phonological processing, but curriculum-based measurement is more suited for frequent assessment (Burns, 2007).

Rapid Automatic Naming (RAN) tasks reliably differentiate children who are average readers from children with other learning disabilities at every age, including into adulthood (Wolf et al., 2001; Wolf et al., 2002). The Rapid Automatic Naming of

Animals test is a commercially produced measure of RAN that has been validated and utilized in reading intervention (RAN–A; Catts et al., 2002). One commercially-produced measure of oral reading fluency is the Qualitative Reading Inventory–II (QR–II); Leslie & Caldwell, 1995). It requires students to read long passages of text in order to measure reading rate and accuracy, and is strongly indicative of how well students can answer comprehension questions (McCabe, Margolis & Barenbaum, 2001). The Diagnostic Indicators of Basic Early Literacy Skills (DIBELS) system is used to measure oral reading fluency in young children for the purpose of ascertaining current reading instructional level and measuring initial response to intervention (Jenkins et al., 2007). The Gray Oral Reading Test–III is a norm-referenced, validated measure for ascertaining reading fluency and accuracy (GORT–III; Wiederhold & Bryant, 1992). As with most norm-referenced tests, the QRI–II and the GORT–III are not designed to be administered frequently, and thus are not indicated for regular progress monitoring of skill acquisition. Oral reading fluency is also measured through curriculum-based measurement (CBM), which is a useful tool for providing ongoing progress monitoring of overall reading achievement (Burns, 2007).

Gickling’s model of curriculum-based assessment (CBA), as outlined in Chapter 2, is an initial testing procedure designed to determine students’ baseline levels of competency (Gickling & Havertape, 1981). This is useful in the response-to-intervention (RTI) model because in order for evidence-based instructional practices to be effective, they must be matched to each student’s instructional level (Burns, 2007). The target level of mastery for instructional level materials is between 93% and 97%, which allows students to expand their sight word vocabulary while allowing for a degree of

comprehension that does not yield boredom or frustration (Burns, 2007; Hintze et al., 2006; Gravois & Gickling, 2002). This method provides reliable data that is valuable for decision-making and seeking to determine appropriate individualized levels of instruction (Burns, 2001; Hintze et al., 2006).

A related method of assessment, curriculum-based measurement (CBM), also outlined in Chapter 2, relies on the repeated measurement of passage reading fluency for ongoing outcome assessment (Jenkins et al., 2005; Burns, 2007; Deno, 1985). CBM focuses on the measurement of oral passage reading fluency as it is validated to be clearly associated with the key behaviors that are indicative of overall performance in reading (Hintze et al., 2006). Unlike standard norm-referenced tests, CBM is responsive to growth when used frequently (Stoner et al., 2002; Burns, 2007). Additionally, reading fluency allows for more efficient interaction with the text (Mercer et al., 2000) and facilitates greater enjoyment of reading. The current study does not measure this skill, though the reading intervention being studied includes strategies to develop fluency. Further research may uncover additional levels of effectiveness of Breaking the “Sound” Barrier to Fluent Reading, as the title suggests, in the area of reading fluency. Over time, this difficult to develop skill may be enhanced, thus maximizing the impact of instruction and the strength of results of future studies.

Additional measures may include spelling tests that examine the number of letters correctly placed instead of the number of correctly spelled words. An anecdotal finding of the author of the Breaking the “Sound” Barrier to Fluent Reading program, which is not reflected in this data, was that the students who were unable to spell a word so that others could understand what was written were making only minor errors following

instruction, yielding words that were deciphered with relative ease. This growth is not reflected, but future studies may wish to account for this potential improvement.

Consideration for how the RTI model may be applied to the Breaking the “Sound” Barrier to Fluent Reading model is warranted given the preliminary results of the present study. Currently, the program is being used at the tier 3 level of intervention with children who have already been identified as disabled readers. The first tier, or universal, balanced reading instruction for all students, would benefit from the principles outlined in this program. Future research into the program may include trials in the general education classroom with all students, which would inherently decrease the level of intensity of the program while preserving most of the instructional principles. Should any of the students fail to achieve benchmarks or were identified as at risk for reading difficulties, the second tier of intervention would include CBA and CBM to determine whether the identified students respond to evidence-based instruction. For the purposes of future research, the Breaking the “Sound” Barrier program could be used in a small group setting with curriculum-based pretests and posttests. Were it determined that students were responsive to the second tier intervention, determinations about their continued need for small group instruction would be made. Those who continued to struggle would then be referred for possible psychoeducational assessments to determine whether placement in the special education system was warranted. The study program could be utilized at all three tiers as the balanced curriculum that utilized both bottom-up and top-down approaches to reading, in accordance with the recommendations of the National Reading Panel (2002).

Another recommendation for future research may be an additional research question regarding skills that are specifically predictive of improvement on statewide assessments. This study demonstrated that students with verbal, performance, or full scale IQ scores within the below average range, or below 89, are less likely to improve on these standardized measures, even with adequate instruction. It may be clinically relevant to determine if other skills, such as executive deficits, are more predictive, and can thus be taught or accommodated in the testing session. For example, if the reason that an individual scored within the below average range on measures of intellectual ability was determined to be very slow processing speed or poor attention and focus, these factors might be minimized to increase performance. In conclusion, additional data points for research, including executive deficits and processing speed, may help guide intervention more effectively than a cursory observation of general intellectual level.

A final recommendation would be to further explore what the current data may offer by computing students' improvement over time. Contained within the current data set, while the number of students who continued to receive instruction beyond the first year was lower than the sample evaluated in the present study, are achievement test scores following second, third, and fourth years of instruction. Further analysis may provide insight into how some of the students, perhaps those with more modest levels of improvement following the first year of instruction, may have fared after spending more time in the curriculum.

Conclusions

The present study provides preliminary findings that support the effectiveness of the Breaking the “Sound” Barrier to Fluent Reading program (Martin, 2003), and it offers strong support for further exploration into this program in future studies. Participants of all intellectual levels demonstrated improvement in all areas of reading achievement measured by the K-TEA (comprehension, spelling, and decoding) and on the PSSAs relative to controls. The present study demonstrated that although reading difficulties are more difficult to remediate in older children (Lovett et al., 2000), with comprehensive instruction, their skills can improve to the level of proficiency.

Learning disabilities continue to be the most commonly identified disabilities identified among U.S. public schoolchildren (Lyons et al., 2001), a category in which 80% of its members have failed to learn to read efficiently (Commission on Excellence in Special Education, 2002). Unfortunately, despite the need to remediate reading difficulties, many children do not receive the quality instruction they need (Denton & Mathes, 2003), which is defined as supportive, direct, explicit, intense, and comprehensive (Foorman & Torgeson, 2001). The Breaking the “Sound” Barrier to Fluent Reading program offers a promise of meeting those criteria, and the preliminary results uncovered in the present study support those claims. The program was created based on the latest reading research, and further study may help uncover potential yet undiscovered with the goal of providing the most effective, user-friendly reading instruction to struggling middle school students.

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