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Reading Development in At-risk Kindergarten Students: A Tier 2 Response-to-intervention RTI Program Using Research-Based Principles in Early Literacy

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READING DEVELOPMENT IN AT-RISK KINDERGARTEN STUDENTS: A TIER 2 RESPONSE-TO-INTERVENTION (RTI) PROGRAM USING RESEARCH-BASED PRINCIPLES IN EARLY LITERACY

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Dissertation Approval

This is to certify that the thesis presented to us by Kathleen T. Pickard

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Abstract

Early identification of struggling readers and direct instruction for these readers are effective in the prevention and treatment of reading problems (Torgesen, 2002). The practice of "wait-to-fail" is being challenged by the responsiveness to intervention (RTI) models, which promote early identification of at-risk students, progress monitoring, and implementation of researched-based tiered interventions. The prereading skills that have been identified as being necessary for future reading achievement include phonological awareness, letter identification, the alphabetic principle, orthography, and rapid automatized naming. The purpose of this current study is to examine the effectiveness of a Tier 2 intervention program that targets these essential prereading skills with at-risk kindergarten students and to assess the effectiveness of this intervention. Students received either the fall only, winter only, or all year intervention, two times per week for one-on-one instruction, with progress monitoring occurring at mid-points. Results suggest that a Tier 2 intervention program can significantly improve critical prereading skills with at-risk students and that these improvements can be sustained at the beginning of first grade. Project K groups were able to positively change their reading trajectories and most were not significantly different from the typical mean performance, with no groups falling below the some-risk benchmark, at post-test. Slow responders required more time to learn and to transfer critical prereading skills but with persistent intervention, significant progress was made. Strong responders to the fall intervention benefitted significantly from instruction, which produced high inoculation effects during kindergarten in all preliteracy skills. The different response rates of students are worthy of educators' attention before determining whether or not a student should be considered as a nonresponder. As educators and psychologists begin to implement the RTI model within schools, several aspects need to be addressed through research to ensure consistency and to avoid some of the same criticisms of the discrepancy model. Some areas that need to be

defined include the elements that constitute a nonresponder, ways to assess a nonresponder, and minimal length of time required of a Tier 2 intervention model.

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Chapter 1

Introduction

Learning to read well and fluently is one of the most important individual endeavors children need to master during their educational careers. Reading allows an individual to gain greater knowledge, excel in academics, explore the past and present, and function in daily tasks. Poor reading ability not only affects academic achievement and development of vocabulary but also affects students' self-esteem, perceptions of the world, and contributes to poor emotional and behavioral development (Muter, 2003). Surveys of children with reading disabilities have found that only 2% complete a bachelor's degree, and among those with drug/alcohol and criminal records, one- half had reading disabilities (Whitehurst & Lonigan, 2002).

Despite the importance of reading and the catastrophic negative effects of poor reading, the National Reading Panel (NRP) reported that at least 90 million adults can be classified as functionally illiterate or lower (National Reading Panel; NRP, 1999). The percentages of school-aged children who demonstrate significant delays in their reading development are at higher rates than the adult illiteracy rates. It has been reported that one in three students (Adams, 1990) or one in five students (Shaywitz, 2003) experience significant reading difficulty. Some suggest even a higher percentage, ranging from 30% to 40%, of school-aged students who cannot demonstrate basic literacy (Allor, Gansle, & Denny, 2006). Percentages of reading failure rise even higher for minority students (Thomas-Tate, Washington, & Edwards, 2004), limited-speaking English students

(Lesauz & Siegel, 2003) and economically-disadvantaged students (Kaplan & Walpole, 2005).

Inequalities exist among students entering kindergarten and such factors as ethnicity and socioeconomic status (SES) can serve as risk factors in reading development (Downey, von Hippel, & Brohn, 2004; McCoach, O'Connell, Reis, & Levitt, 2006; Borman, Benson, & Overman, 2005). It has been shown that minority students within the United States are at a disadvantage when entering kindergarten. After controlling for SES, Hispanic and Native American children were 1.21 months behind Caucasian children, and African American children were .52 months behind their Caucasian counterparts; Asian-American students were .42 months ahead of Caucasian students when entering kindergarten (Downey et al., 2004). This disadvantage appears to continue throughout schooling (Thomas-Tate et al, 2004).

SES has also been shown to a be a powerful predictor of academic success, because disadvantaged students have been found to enter school with lower academic skill sets, and these deficits often continue throughout their formal schooling (McCoach et al., 2006; Arnold & Doctorff, 2003; Chatterji, 2006). For example, more low SES students enter kindergarten with low alphabetic knowledge when compared with their peers living above the poverty level; only 53% of kindergarten students in low SES classification achieved advanced phonological processing by the spring of kindergarten, whereas 75% of their advantaged peers achieved this classification (Kaplan &Walpole, 2005). SES also influences early word reading, with 30% of low SES students achieving early word reading at the end of first grade compared with 87% of their advantaged peers (Kaplan & Walpole). It appears that children from low SES are at a distinct disadvantage

upon entering kindergarten, and the achievement gap is not mediated by schooling, if there is no intervention (Chatterji, 2006). However, these are not the only students struggling, given the fact that one-third of students who have college-educated parents have difficulty learning to read despite the advantage of higher socioeconomic status (Moats, 1999). Given these statistics, it is easy to understand the reasons why reading disabilities are considered one of the most common childhood disorders and are often the most unrelenting (Hindson et al., 2005).

In the past, the Reading Readiness Perspective viewed reading as a developmental process, with proponents theorizing that some children required more time to master prereading skills, but that they would eventually gain the necessary skills to read (Neuman & Dickinson, 2002). This perspective suggested that explicit reading instruction should be delayed until a child reached readiness, acquired certain prereading skills or reached the age of 6.5 (Neuman & Dickinson). However, students experiencing reading difficulties often continued to struggle despite this allowance of more time. For example, students who experience reading difficulties within the early grades are unlikely to reach reading skills equivalent to that of their average peers (Whitehurst & Lonigan, 2002; Chard & Kame'enui, 2000). There is a 90% chance that a poor reader in first grade will continue to be a poor reader in fourth grade (Kamps et al., 2003). Hence, reading disabilities can be resistant (Hindson et al., 2005); as many as 74% of third-grade reading-disabled students remain reading disabled in ninth grade (Foorman, Breier, & Fletcher, 2003).

Another consequence of delaying interventions is that the deleterious effects are still observed when word decoding skills are remediated in later grades. For instance, a

fifth grade student at the 90th percentile typically reads more in two days than a child at the 10th percentile reads in an entire school year (Torgeson, 2001). Additionally, an avid middle school student reads 10,000,000 words in a year, but a struggling reader reads 100,000 words in a year (Whitehurst & Longian, 2002). Not only does this lack of reading affect word reading and reading fluency, but it also impacts vocabulary development, content knowledge, attitude towards reading, and the development of reading comprehension strategies (Whitehurst & Longian). Poor reading fluency is often found in students with prior poor phonological skills, which could result from limited reading practice in the early grades (Torgeson, 2001). However, other researchers suggest that deficits in rapid automatized naming (RAN) in impaired readers is more likely associated with the poor fluency rate rather than with poor phonological skills (Berninger et al., 2001b; McCallum et al., 2006; Booth, Perfeti, MacWhinney, & Hunt, 2000). Clearly, waiting for a student to fail in reading is not an effective educational strategy in reducing the prevalence of reading disabilities and the effects that such a disability creates.

Recent changes in the federal law are demanding improvement in all students' reading skills through the use of research-based methods and strategies, as seen through national educational policies, such as the No Child Left Behind Act of 2001 (NCLB; 2001) and the Individuals with Disabilities Education Improvement Act (IDEA; 2004). School districts, individual schools, specialists, and teachers are struggling with ways to promote reading skills in all students regardless of race, economic status, prior knowledge, or disability. Fortunately, a vast amount of research has been conducted over past decades in the area of reading development, which has led to a greater understanding

of the processes involved in the acquisition of reading skills. These findings are beginning to be translated into research-based techniques and programs. The practice of "wait-to-fail", which is often associated with the discrepancy model in identification of learning disabilities, is being challenged by proponents of responsiveness to intervention (RTI) models (Al Otaiba & Fuchs, 2006; O'Connor, 2000; Vaughn, Linan-Thonpson, & Hickman, 2003). Harsh criticisms from practitioners and researchers are found within the literature because of inherent measurement errors in the discrepancy model (Fuchs, Compton, Fuchs, Bryant, & Davis, 2008). The RTI approach promotes early identification of disabilities, progress monitoring, and implementation of researched-based, tiered interventions to discriminate the root of low achievement (poor instruction vs. disability) and to serve as an intervention (Fuchs et al., 2008) prior to labeling or providing more restrictive services.

With regard to reading, the RTI approach is the most congruent with the current perspective that the best intervention towards promoting adequate reading skills is not a specific intervention, but rather, early intervention. That is, early identification of struggling readers and direct instruction to these readers has been found to be the most effective method for the treatment of reading problems (National Reading Panel; NRP, 2000; Shaywitz, Morris, & Shaywitz, 2008; Schatschneider & Torgesen, 2004). This is often accomplished through targeted interventions in the first few years of formal schooling (kindergarten through second grade), which can often eliminate the negative effects that struggling readers encounter with less intensive instruction in the later grades (Torgeson, 2001). Most reading difficulties can be prevented or eliminated if systematic research-driven instruction is provided, starting in kindergarten (Shaywitz et al., 2008;

Forman, Breier et al., 2003). In fact, if remediation is provided early enough, 82% of poor readers can become successful readers, but if delayed until third through fifth grades, the percentage of successful remediation drops to 46%, and in later grades, the percentage is even lower, ranging from 10% to 15% (Foorman, Francis, Shaywitz, Shaywitz, and Fletcher, 1997). In other words, early intervention not only allows students to develop to their fullest potential, but it also eliminates the negative effects that reading difficulties create, such as poor vocabulary development and low self-esteem (Muter, 2003), poor reading fluency and poor reading comprehension (Torgesen, 2000).

How can early intervention have such large effects? This question is best answered by explaining the process of the "Matthew Effect," which was coined by Stanovich (1986). When applied to reading development, this concept suggests that poor readers who experience difficulties are unable to keep pace with the curriculum, thus falling even further behind their peers. In each subsequent month or year in which adequate remediation is not received, the gap widens. This concept can also be applied to kindergarten students and their later academic performances because the skills that students possess entering school predict higher achievement (Whitehurst & Longian, 2002).

Providing programming, especially for at-risk kindergarten students, may be the best opportunity to prevent low reading achievement or even reading disabilities and the negative effects associated with poor achievement. Accurate identification of at-risk kindergarten students and direct instruction in the prereading skills required to become a successful reader is paramount in preventing reading difficulties. Providing proven curriculums and interventions that target the identified prereading skills necessary for

reading success may provide educators with valuable opportunities to close the gap between low-achieving and high-achieving students in reading. At-risk kindergarten students maintain a disadvantage throughout kindergarten, with the gap widening even more over the summer if intervention is not provided (McCoach et al., 2006). Thus, at-risk students, without targeted intervention programs do not develop mastery of prereading skills that are required to become successful readers in kindergarten. This, in turn, leads to the achievement gap widening even further, and eventually the gap is too wide to remediate effectively; that is, effects are still seen in poor reading fluency and poor reading comprehension, which impacts not only reading but also other academic areas. Providing intervention in kindergarten is now seen as crucial in the development of future reading success (Rouse & Fantuzzo, 2006; Shaywitz et al., 2008; Forman, Breier et al., 2003)

Chapter 2

Literature Review

Prevalence of Reading Disabilities

Reading is imperative in today's highly literate society. However, despite the advances in our understanding of reading acquisition, causative factor, and advances in neurobiology, reading disabilities are the most common childhood disorder (Berninger, Abbott, Thomson, & Raskind, 2001), affecting at least 5% of the general population (Ramus, 2001; Lyons et al,, 2001; Shaywitz & Shaywitz, 2003). On the other hand, math disabilities have been estimated at a 5% to 10% rate of prevalence within a cohort population (Barbaresi, Katusic, Colligan, Weaver, & Jacoben, 2005) and writing language disabilities have been found on a spectrum from a 6.9% to 14.7% rate of prevalence within a cohort population (Katusic, Colligan, Weaver, & Barbaresi, 2009), suggesting that math and writing disabilities are just as common as reading disabilities. However, the most common reason for referral to school psychologists to determine eligibility for special education services is due to difficulties in reading (Burns, 2003); 51% of the children serviced under IDEA are classified as having a specific learning disability (Kane & Tangdhanakanond, 2008). Of this 51%, it is estimated that approximately 80% are children who have been diagnosed with a specific learning disability in reading (Burns, 2003; Shaywitz et al., 2008). Moreover, it is estimated that over 20 million students encounter reading failure, with 2.3 million students receiving special education services (Lyon et al., 2001). Unacceptable percentages of poor readers across our nation exist, ranging from 27% of high school students to 36 % of fourth grade students reading at below basic levels (Shaywitz et al., 2008). Whether students have

been classified as having a reading disability or are considered poor readers, educators and schools need to reduce these unacceptable percentages, especially given the long lasting, negative effects that poor readers experience.

Definition of Specific Learning Disability

The original definition of Specific Learning Disability (SLD) has remained unchanged since its original inception. The Individuals with Disabilities Act of 2004 (IDEA, 2004) defines a specific learning disability in Title 20 United States Code Section 1401(30) cited as 20 USC 1401(30)] as follows:

> (30) Specific learning Disability
>
> (A) In General. The term 'specific learning disability' means a disorder in one or more basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to learn, speak, read, spell, or do mathematical calculations.
>
> (B) Disorders Included. Such term includes conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not apply to children who have learning problems that are primarily the results of visual, hearing or motor disabilities, of mental retardation, of emotional disturbance or environmental, cultural, or economic disadvantage (C.F.R. 300.8).

Furthermore, there must be a lack of achievement with regard to the child's age or a lack of achievement with regard to standards of state- approved, grade-level expectations with appropriate grade-level instruction and experiences. A severe discrepancy between achievement and intellectual ability in areas of oral expression, listening comprehension,

written expression, basic reading skills, reading fluency skills, reading comprehension, mathematics calculation, and mathematics reasoning [see 34 CFR 300.3-9(a)(1)].

Under this definition of SLD, one method of identification is the requirement that a severe discrepancy between aptitude or IQ and achievement must be present in order to qualify for special educational services (Kane & Tangdhanakanond, 2008; Reschly & Yssldyke, 2002), which, in accordance with the federal definition, is an unexpected underachievement in reading despite opportunities to learn (Lyon et al., 2001). However, the definition does not stipulate how to measure or how to define a severe discrepancy, which has led to a lack of uniformity among states or even among school districts within the same state in the diagnosis of a reading disability (Fuchs & Fuchs, 2006). Some states such as Kentucky have low incidents of SLD (2.85%), yet other states such as Rhode Island report incident rates that are 3 times higher than the lowest incident rate (9.43%; Reschly & Hosp, 2004). The inherent flaws in the federal definition of SLD can lead to difficulties in accurately identifying the prevalence of an SLD in reading, given the disparity of interpretation of "severe discrepancy" for identifying reading disabilities. Moreover, the state's definition of SLD and classification criteria can vary, with 40% providing little direction about how to define the severe discrepancy; this leads to varying rates of prevalence and classification within states (Reschly & Hosp, 2004).

With specific regard to reading, Dyslexia is the most common reading disability and is the most frequently researched among school-aged children, with prevalence rates ranging from 5 to 17 percent (Shaywitz & Shaywitz, 2001). Dyslexia is defined as:

> ... a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically results from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction (Lyon, Shaywitz, & Shaywitz, 2003, p. 2).

Identification of Specific Learning Disability

Ability-achievement discrepancy model.

Currently, the most common method of identifying a reading disability is with the use of the discrepancy method, which addresses the unexpected difference in reading skills in relationship to other cognitive abilities. The ability-achievement discrepancy has been found to be laden with measurement errors, and IQ has not been found to be relevant in the identification of SLD (Reschly & Yssldyke, 2002). Limitations of the ability-achievement discrepancy model have been well documented and discussed within the literature (Berninger, 2001a; Hale, 2004; Fuchs & Fuchs, 2006; Kavale, Kaufman, Naglieri, & Hale, 2005; Stage, Abbott, Jenkins, & Berninger, 2003). Such limitations include the fact that the use of this model in the identification and the subsequent determination of special education services are discriminatory and ineffectual in early identification (Shaywitz et al., 2008); they are also invalid (Lyon et al., 2001).

For instance, struggling readers would often be ineligible for special education services until later grades when they clearly required support in early grades because of the statistical nature of the discrepancy model, which is the reason why this model is often referred to as the "wait-to-fail model" (Feifer, 2008). Discrepant readers and those

low-achieving readers who were not discrepant have been found to have similar reading achievement and reading growth (Shaywitz et al., 2008). However, under the discrepancy model, the low achieving readers are not eligible for services that they clearly need because of the measure of their intellectual functioning; this model has been found to be fraught with measurement error (Kavale, Holdnack, & Mostert, 2005). Prevalence and definitions of reading disabilities, as well as methods of identifying reading disabilities, can vary and have been debated thoroughly among researchers. However, it is clear that poor reading rates across the United States exist, and researchers, as well as educators, struggle to redefine and increase consistency in identification.

Responsiveness to Intervention.

A new paradigm shift has begun to occur within the field of psychology with regard to the identification of SLD. Recent regulations have eliminated the requirement of the ability-achievement discrepancy in the identification of a SLD, albeit they still allow for the option to employ the discrepancy model (IDEA, 2004). The responsiveness of a student to researched-based scientific intervention now can aid in the determination of SLD. This type of approach is often called the RTI approach, which eliminates the discrepancy model as a method of identification (Fuchs et al., 2008). No longer do schools need to "wait for a student to fail" to provide services because the RTI approach promotes prompt intervention rather than waiting for special education services (Feifer, 2008).

In fact, the RTI model endorses early identification of struggling students and early intervention (Fletcher, Coutler, Reschly, & Vaughn, 2004). Providing scientifically-validated instructional approaches for all students, while monitoring

progress to ensure early detection of struggling students and by providing subsequent interventions are paramount for success within the RTI model. Given its focus on quality of instruction and early intervention, if properly implemented, this model has the potential to reduce the number of students who are diagnosed with SLD (Burns, Appleton, & Stehouwer, 2005). Implementing the RTI approach has reduced the special education placements with higher achievement outcomes (Brown-Chidsey & Speege, 2005; O'Connor, 2000) and early intervention with younger students produced better outcomes for at-risk students in reading (Speece, Case, & Molloy, 2003; Vellutino, Scanlon, Small, & Fanuele, 2006).

There are three critical components of the RTI models; these include 1) quality of instruction based on scientifically-validated instructional approaches, 2) progress monitoring of that instruction, and 3) data-based decision making to determine the need for more intensive services (Feifer, 2008). More specifically, the RTI approach encourages systematic research-based methods of instruction and teaching within the classroom. When instruction within the regular education classroom is deemed not effective through progress monitoring, tiered intervention in areas of identified need in terms of small group instruction and/or one-to-one instruction are provided. RTI models include tiered levels of intervention ranging from two tiers to four tiers, dependent upon the responsiveness of the student (Fuchs, Mock, Morgan, & Young, 2003).

For example, Tier 1 generally occurs within whole or small-group classroom instruction. If a child continues to struggle based on progress monitoring, then a more intensive intervention is given to the identified at-risk student, Tier 2, can include pull-out, small group tutoring (Fuchs et al., 2003) or even one-to-one tutoring. Frequent

progress monitoring of the researched-based intervention is necessary to determine effectiveness in remediating the learning difficulties. If students do not respond to Tier 2 level of intervention then the intervention is adjusted, or a referral to Tier 3 is made. In Tier 3, an evaluation is conducted, which examines the progress monitoring data as well as other measures, to determine if special education services are warranted or if other, specific instructional supports are required (Brown-Chidsey et al., 2007).

The students who do not respond or make adequate progress while receiving research-based interventions have been labeled as nonresponders (McMaster, Fuchs, Fuchs, & Compton, 2005). However, there is not agreement about the elements that constitute adequate reading progress (Torgesen, 2000). Currently, there are at least three possible methods of demonstrating a lack of progress and need for Tier 3 level of service: performance-level, growth-rate-only, or a combination of both (McMaster et al., 2007). Performance-level provides information regarding the student's progress when compared to benchmarks or grade-level performance and not in context of response to the intervention, whereas growth-rate-only examines the response rate to the intervention and not in relation to benchmark or grade-level expectations (McMaster et al.). Because of the inherent limitations of these approaches, the dual-discrepancy approach, which determines the lack of response in terms response to intervention as well as performance in relation to benchmarks or grade-level expectations has been proposed (Fuchs & Fuchs, 1998).

In a review of literature on the characteristics of nonresponders, researchers have found that the greater portions of these students had PA deficits and other commonly shared characteristics, including phonological retrieval, encoding deficits, low verbal

ability, behavior problems, and developmental delays (Fuchs, 2002). However, identification may vary on how a nonresponse is defined (final benchmark, slope-discrepancy, or dual-discrepancy); the reference group used (normative sample, limited-normative sample, or benchmark); measures of screenings (growth measures, curriculum-based, normed referenced, or criterion referenced), and cut-off points established (.5, 1.0, or 1.5 standard deviations below the selected reference group) (Barth et al., 2008). Given this variability, agreement among different methods for identifying nonresponders was found to be poor because they tended to identify different students although identification of responders was higher (Barth et al.). Without specific guidelines and definitions, states and local school districts are left to define a nonresponder, which will again lead to greater variability among states and school districts in the identification of SLD (Reschly, 2005). Although researchers are still debating the definition of nonresponders, some argue that several aspects of the Tier 2 level of intervention such as intensity, duration, and treatment fidelity need to be established before a definition of nonresponsiveness can be developed (Compton, 2006).

Researchers have also expressed other concerns regarding several different issues relative to using RTI as the only method in the identification of SLD (Hale, Kaufman, Naglieri, & Kavale, 2006). Such concerns include lack of guidance in terms of length of intervention (Feifer, 2008; McBride, Dumont, & Willis, 2004), limited scope in terms of areas of need, that is, focusing on single factor (Fiorello, Hale, & Snyder, 2006), definition and lack of standard protocol for identifying nonresponders (Fuchs et al., 2008), and not identifying the basic psychological processes, thus not meeting the legal definition of SLD (Hale et al., 2006). RTI is considered necessary in the identification of

SLD but not sufficient in the diagnosis of SLD (Berninger, 2006). In fact, 'An RTI process does not replace the need for a comprehensive evaluation. A public agency must use a variety of data gathering tools and strategies even if an RTI process is used" (Federal Register, 2006, p.4664). In fact, according to commentary to the final OSERS regulations, "An RTI process does not replace the need for a comprehensive evaluation. A public agency must use a variety of data gathering tools and strategies even if an RTI process is used" (Federal Register, 2006, p.46648).

A "Third Method" for the identification of SLD argues for the identification of cognitive strengths and weakness in relation to academic skills to be utilized when determining the presence of SLD (Hale, Flanagan, Naglieri, 2008). The Balanced Practice Model incorporates a combination of RTI and cognitive assessments for the determination of a SLD (Hale et al., 2006). This model suggests Standardized RTI at Tier 1 and the use of the Problem-Solving Model RTI model approach at Tier 2. Before Tier 3, a comprehensive cognitive processing evaluation with neuropsychology measures should be completed to identify deficits in basic psychological processes and their relationship to academic failure, which, unlike RTI, satisfies all aspects of the federal definition of SLD (Hale et al., 2008). This combination allows for the strength of both approaches yet eliminates or reduces the weakness of each approach as well. Naglieri (1999) proposed the Discrepancy/Consistency Model, which examines cognitive and academic strengths and weaknesses using the Cognitive Assessment System that assesses basic psychological processes of Planning, Attention, Simultaneous, and Successive (CAS; Naglieri & Das, 1997). Hale and Fiorello (2004) proposed the Concordance–Discordance Model of SLD Determination, which entails using the Cognitive Hypothesis

Testing (CHT) approach to illustrate how identifying cognitive processing deficits can relate to academic intervention through a single-study experimental design (Hale et al.).

It is not clear whether the ability-achievement discrepancy model, RTI , or the "Third Method" will prevail as the predominant method of identifying SLD; however, the latter models support the use of tiered interventions that are supported by evidence-based research, and early detection, as well as early intervention with at-risk students.

The Building Blocks of Reading

Why is reading such a difficult skill for some children to acquire? Most children learn to speak through simple exposure to everyday language. Why would this not hold true for reading? Is reading a natural extension of speaking and language development? The answer is no. Learning to read is a complex process that needs to be taught and is not acquired through casual exposure as is the development of oral language (Pellegrini, 2002). In his treatise of the complexities of reading a word, Sternberg (2003) notes:

> ... [Y]ou [the reader] must translate the letter into a sound, creating a phonological code (relating to sound). This translation is particularly difficult in English because English does not always ensure a direct correspondence between a letter and a sound. ... After you somehow manage to translate all those visual symbols into sounds, you must sequence those sounds to form a word; then, you need to identify the word and figure out what that word means; ultimately, you move on to the next word and repeat the process all over again (p. 319).

Given the complexities of reading, what are the necessary prerequisite skills that a child must master in order to emerge as a competent reader? Preliteracy skills are seen

as progressing within a developmental timeline, and each preliteracy skill builds and enhances other co-existing skill sets for future competence. For example, children must combine their knowledge of sounds (phonological awareness) to letters (letter identification) so that a sound-letter correspondence is formed, which is the beginning of the alphabetic principle (Muter, 2003). Both skills, letter identification and phonological awareness (PA), are integral steps in the development of reading text (Muter; Shaywitz et al., 2008). Decoding skills are dependent on understanding the alphabetic principle, and the alphabetic principle is reliant on PA, letter identification, and orthography (McCardle, Scarborough, & Catts, 2001). Therefore, weaknesses or deficits in one area may influence the development or skill level in another skill set.

Reading is a complex process that entails the use of multiple skills and cognitive abilities to achieve fluent reading, with an understanding of the printed text. Reading difficulties or disabilities can be caused by deficits in one or in a combination of skills or abilities, such as phonemic awareness, phonics, verbal comprehension, verbal working memory, rapid automatic naming, motivation, vocabulary, orthography, and oral fluency (NRP, 2000; Fiorello et al., 2006). For the focus of this paper, some preliteracy skills, that is, skills students need to master before beginning to read will be discussed, assessed, and analyzed. Preliteracy skills targeted within this paper include phonemic awareness, letter identification, the alphabetic principle, and rapid automatic naming. This literature review and study will illustrate the importance of establishing these preliteracy skills in kindergarten so that subsequent reading skills may develop unimpeded in later grades; nevertheless, this in no way implies that these skills are the only necessary preliteracy skills.

Phonological Awareness

Researchers have demonstrated the importance of PA in early reading development (Bradley & Bryant, 1983; Foorman et al., 1997; Lonigan, Burgess, & Anthony, 2000; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Snowling, Gallagher, & Frith, 2003; Whitehurst & Longian, 2002), but what is PA and how is it defined?

Definition of phonological awareness.

Phonemic awareness is defined as a student's ability to attend to, identify, process, and manipulate individual units of sound within words that are spoken (Muter, 2003). Individual sound units within words are phonemes, and although there are 26 letters in the alphabet, there are 44 phonemes in the English language (Shaywitz et al., 2008). To be clear, PA does not entail linking sounds to letters or to the written word but involves only sounds in the spoken word and the students' ability to recognize and manipulate these sound units (Sodoro, Allinder, & Rankin-Erickson, 2002).

To illustrate the definition of PA and its nuances, the following example is beneficial. Using the word duck, "… the phonemes /d/, /u/, and /k/ are combined to make the word duck, and the /d/ and /t/ phonemes are contrasted when distinguishing the words duck and tuck. The difference in the pronunciation of /d/ and /t/ is slight. It is only that for /d/ you use your voice and for /t/ you don't; everything else - how you use your tongue and throat, how you shape your lips, how you part your teeth - is identical" (Richgels, 2001, p. 274). Added to this slight distinction in sound is also the way phonemes are folded into each other into seamless speech, which often makes

segmenting phonemes into separate sounds difficult (NRP, 2000). This, in turn, makes linking phonemes to graphemes (sounds to letters) difficult without explicit instruction.

Current research is beginning to explore the relationship between processing rapid auditory acoustic stimuli and phonological development. Phonological mapping occurs by segmenting acoustic wave forms into chucks of time to allow for discrimination; 10 milliseconds typically allows for the distinction, but children who struggle require hundreds of milliseconds for the distinction (Tallal, 2004). It is easy to understand that children with deficits in this area will struggle with the development of PA; thus, rapid auditory acoustic processing is seen as imperative in the development of phonology (Tallal & Gaab, 2006). In a current study, it was found that dyslexic students did not display any differential response in brain activity, but it was found that the control group showed activation in the left frontal cerebral cortex for rapid presentation. After an 8-week remediation program which focused on rapid auditory processing, phonological and linguistic training, children with dyslexia displayed reading and language growth as well as increased brain activation, lending support to this link between rapid auditory processing and phonological/reading development (Gaaba, Gabrielia, Deutschb, Tallal & Temple, 2007)

Types of phonological awareness tasks.

Given the definition of PA, instruction in this area can focus on such skills as phoneme identity (/d/ is in duck, dog, and door), phonemes substitution (substituting /d/ for /t/), phoneme isolation within words (duck begins with /d/), phoneme categorization (common sounds in words such as duck, tuck, and buck), phoneme segmentation (duck is separated into three sounds, /d/, /u/, and /k/), phoneme deletion (what is duck without

the /d/?), phoneme addition (what happens to duck if you add an /s/ to the end of the word?), and phoneme blending (/d/, /u/, and /k/ are combined to make duck) (Center for the Improvement of Early Reading Achievement [CIERA], 2003). Tasks that can assess and promote acquisition of various aspects of PA include the task of rhyming onsets, which separates the initial sound(s) before first vowel in a word, /d/) followed by the rime, which contains the vowel sound and the rest of the word, /uck/) (CIERA, 2003). Other tasks include discriminating auditory sounds that are different; blending separate and distinct sounds into words (sound blending); word-to-word auditory matching; isolating sounds in words; phoneme segmentation, which can include deleting, adding or transposing phonemes in words; and, last, phoneme categorization (Grossen, 1997; Muter, 2003; Nichols, Rupley, Rickelman, & Algozzine, 2004).

As illustrated, there are many PA tasks, and each varies in level of difficulty and the prerequisite skills required for performing the task. The number of phonemes and phonological properties within the word, type of manipulation asked, whether or not the word is real, and whether or not letters are included in the task determine the level of difficulty of each task (NRP, 2000). The following PA tasks are identified by their level of difficulty starting with the easiest: 1) sound comparison - identifying objects based on their common beginning sound; 2) blending real words by their onset-rimes; 3) making real words by blending phonemes; 4) saying the word that remains after deleting a phoneme; 5) segmenting words by their phonemes; and 6) making pseudowords by blending phonemes (Schatschneider, Francis, Foorman, Fletcher & Mehta, 1999).

Teaching the PA skills of blending and segmenting would be difficult if a student does not recognize that words are composed of different sounds or does not know the

names and sounds of letters (Musti-Rao & Cartledge, 2007). Phoneme blending and segmentation of words are considered skills more advanced than phoneme identification or categorization, and utilizing these skills with letters is more highly advanced than utilizing them with sounds (Schatschneider et al., 1999; NRP, 2000). In general, all kindergarten students will benefit from PA instruction because most are nonreaders and have developed few PA skills. However, in first grade discrepancy between reading skills would indicate a different level of PA instruction; that is, good readers may require more advanced PA skills but nonreaders may require reinforcement and review of easier PA skills (NRP, 2000).

Some researchers have questioned whether or not certain subskills of PA are more important than others (Muter, Hulme, Snowling, &Taylor, 1997); however, other researchers have found that some tasks, such as rhyme or phonological sensitivity, phonemic awareness, and segmental awareness are derivatives of the same phonological ability (Anthony & Lonigan, 2004).

Deficits in phonological awareness with relation to reading.

Despite this debate over the importance of certain subskills, the lack of PA in early grades can have a tremendously negative effect on reading outcomes; that is, under-developed PA skills have been linked to reading difficulties and reading disabilities (Allor et al., 2006; Foorman, Breier et al., 2003; Shaywitz & Shaywitz, 2005; Shaywitz et al., 2008; Schatschneider & Torgeson, 2004; O'Connor, 2000). It is now a widely-accepted belief that one of the primary contributors to reading problems are deficits within PA (Gallagher, Frith, & Snowling, 2000; Kirby, Parrila, & Pfeiffer, 2003; Lundberg & Hoien, 2001; O'Connor, 2000; O'Shaughnessy & Swanson, 2000;

Pennington & Lefly, 2001; Shaywitz et al., 2008; Shaywitz & Shaywitz, 2005; Schatschneider & Torgeson, 2004).

PA is seen as a critical skill in reading development, and deficits in this area are at least a contributing factor, if not one of the main causes, of most reading disabilities. PA has been correlated with reading achievement both in first and in second grade, as well as accounting for a unique variance across reading measure (Schatschneider et al., 2004). Some children (at least 20%) have difficulty processing and manipulating sounds at the phoneme level, and this may then lead to difficulty in applying the alphabetic principle (Catts, Adolf, Hogan, & Weismer, 2005). Poor PA skills have been found to be predictive of future poor readers (Bishop, 2003; Hammil, 2004; Morris, Tyner, & Perney, 2000), but early word identification skills have been linked to developed PA skills (Adams, 1990; Castles & Colheart, 2004).

Teaching of phonological awareness.

Research has established the importance of PA, but what is even more promising is that explicit teaching of PA has been found to have positive effects on reading development (Anthony & Lonigan, 2004; Foorman, Breier et al., 2003; Schatschneider & Torgesen, 2004; Torgesen et al., 2001; Vellutino et al., 2006). In fact, a meta-analysis of 52 studies ranging from 1979 to 2000 which met stringent experimental criteria, found that teaching PA significantly improved PA skills, word reading, pseudoword decoding, spelling skills and reading comprehension, albeit with a smaller effect size, when compared with programs that lack this teaching (NRP, 2000). Results of an additional meta-analysis concurred with NRP, finding that PA instruction improved reading skills, but had a less significant effect on reading comprehension (Bus & van Ijzendoorn, 1999).

However, some studies have found that PA instruction had modest and long-term effects for at-risk students in reading comprehension even after six or seven years after the initial intervention (Byrne et al., 2000; Elbro & Peterson, 2004). PA instruction was found to have a significant effect on word decoding tasks such as word reading or pseudoword tasks (Elbro & Peterson; Byrne et al.; NRP, 2000). Improvements in reading measures, in spelling, and in PA were directly linked to the PA training; the effects of the PA training lasted (NRP, 2000).

Additionally, PA instruction benefitted varying skill levels both on reading and on spelling tasks, ranging from disabled to at-risk to average skill-reading levels, but no improvement was noted in spelling in the case of disabled students (Ehri et al., 2001). At-risk students and normally-developing students were found to make similar gains in response to PA teaching, which implies that at-risk readers are not hindered in acquiring PA skills and actually have a greater effect size for transferring these skills into reading (NRP, 2000). Moreover, significantly positive results occurred with various grade levels under different teaching conditions, but greater effect size was seen in preschool and kindergarten (Ehri et al.). Providing systematic and direct instruction in early grades, kindergarten through second grade, is essential and can have a statistically significant and positive lasting effect on reading development; this fact has been substantiated with the literature on reading (Coyne, Kame'enui, Simmons, & Harn, 2004; Foorman, Breier et al., 2003; Shaywitz et al., 2008; Torgeson, 2001; Schatschneider & Torgeson, 2004). However, what specific factors influence teaching and developmental of PA?

As mentioned previously, there are several methods to teach PA, ranging from phoneme identity to phoneme deletion to phoneme segmentation. Should all these skills

be taught, or are some better than others in helping children achieve PA proficiency? For individual PA activities, segmentation and deletion were found to be more effective than blending (NRP, 2000). A recent study supports the findings that segmentation and blending can be particularly effective in producing significant and positive PA results in at-risk students (Allor et al., 2006). Additionally, focusing on one or two of these skills is much more beneficial in the teaching of PA and its transference to reading skills than teaching three or more skills (NRP, 2000). PA tasks of blending and segmentation were found to be more effective in terms of reading and spelling outcomes than a combination of three or more skills.

Additionally, PA instruction that incorporates letters with the teaching of PA is more effective than phonemes only, with at-risk and developing young readers (Fuchs, Fuchs, Thompson, Al Otaiba, Yen & Braun, 2001). Technically, once the introduction of letters is made to sound, this is phonics instruction. However, most researchers, including the NRP, consider this PA instruction because these activities do not go beyond the letter-sound correspondence, such as decoding text, reading or writing activities (NRP. 2000). Teaching PA with letters, excluding reading-disabled students, also led to greater and significantly larger effect sizes for reading and spelling outcomes below second grade (NRP, 2000). A more recent, large scale classroom study, confirmed these findings that PA instruction with letters was significantly more effective than programs that did not include this aspect within the program (Foorman, Chen et al., 2003). In another meta-analysis, researchers concluded that including letters with reading or writing activities rather than metalinguistic activities have proven to impact the acquisition of PA and reading skills substantially (Bus & van Ijzendoorn, 1999). Some

suggest that letters provide students with a concrete visual representation or anchor rather than short-lived fleeting sounds, so that PA develops more easily (Ehri et al., 2001). Another explanation is that the linking of sounds to letters is more closely related to decoding skills, which could account for this finding (Ehri et al.; Bus & van Ijzendoorn).

One specific and popular method of linking sounds to letters are activities such as Elkonin Boxes, which were found to be an effective method in teaching PA to students (Bus & van Ijzendoorn, 1999; Ball & Blackman, 1991; Blachman, Ball, Black, & Tangel, 1994; Murray & Lesniak, 1999). Elkonin boxes or letter box activities include teaching students to segment words by moving corresponding letter(s) for each phoneme contained within an orally-presented word (Bus & van Ijzendoorn; Murray & Lesniak). This is a hands-on technique that teaches the alphabetic principle by segmenting orally presented words and then blending them when the student read their responses (Murray & Lesniak). This teaching technique inspired other techniques such as The Say-It and Move-It Activity (Ball & Blachman, 1991), which utilized the Elkonin boxes. Elkonin boxes are a common teaching technique in today's schools and are utilized in such reading programs as Reading Recovery (Murray & Lesiak). In one particular study, this teaching activity was utilized by moving blank markers to represent phonemes heard and later moving letters corresponding to the phonemes heard into Elkonin boxes. The students who participated in these activities outperformed control groups, and effect sizes were significant for PA ($d = 1.83$), transfer to reading skills ($d = 0.65$), and transfer to spelling skills ($d = 0.94$) (Blachman et al., 1994).

Factors affecting phonological awareness instruction.

Specific PA teaching techniques have been examined, but how long should instruction last to have optimal effect? Does the teacher-student ratio have any influence on the effectiveness of the instruction, and can paraprofessionals be just as effective as certified teachers?

Because of the recent paradigm shift in identifying SLD with the focus on tiered levels of intervention, the question of small group instruction verses one-to-one instruction is pivotal in aiding both schools and students. If small group instruction produces similar or higher effects, schools can serve more students who have been identified as at-risk. Reading studies with young children were undertaken to address this question. Contrary to the opinion that one-to-one instruction is the optimal method of teaching, because this type of instruction provides individualized instruction and immediate corrective feedback, small group instruction was found to be the most effective method or equally effective method when compared to one-to-one instruction (Elbaum, Vaughn, Hughes, & Moody, 2000; Vadsay & Sanders, 2008; Vadasy, Sander, & Peyton, 2006). Small group instruction significantly raised not only PA skills, but also reading and spelling and also produced better long-term results (NRP, 2000). However, results of another meta-analysis found that one-to-one instruction was less effective than small group instruction, but one-to-one instruction was more effective with regard to future reading outcomes (Bus & van Ijzendoorn, 1999).

For example, when small group instruction was compared with one-to-one instruction in individual studies, the following was found: 1) instruction in dyads was found to be just as effective with code-oriented instruction in kindergarten students

(Vadasy & Sanders, 2008), 2) small group instruction (1:3) was not significantly different from 1:1 instruction but 1:10 was as not as effective with regard to reading instruction in second graders (Linan-Thompson & Hickman-Davis, 2002), and 3) no significant difference was found between 1:1 and 1:3 instruction in phonemic and alphabetic skills with kindergarten students (Vadasy et al., 2006). Intervention in reading does not have to be one-to one (Torgesen et al., 2001); 1:2 ratio for instruction may be a useful and cost effective alternative (Vadsay & Sanders)

Another important question that is pivotal in aiding both schools and students during this time of tiered interventions is whether or not paraeducators can effectively deliver intervention programming just as effectively as trained teachers. Schools will be able to ensure effective instruction with less cost, fewer resources, and serve more students if paraeducators can be effective in reading instruction. Research supports the use of paraprofessionals in the effort to remediate reading skills in children (Vadasy & Sanders, 2008; Gunn, Smolkowski, Biglan, & Black, 2002; Musti-Rao & Cartledge, 2007; Vadasy et al., 2006; Allor et al., 2006). Well- trained paraprofessionals were found to be just as effective as certified teachers (Foorman, Breier et al., 2003; Torgesen et al., 1999), and paraprofessionals can produce sufficient treatment fidelity (Allor & McCathren, 2004; Vadasy, Jenkins, & Pool, 2000).

Furthermore, instruction does not have to be lengthy in order to be effective. Significant results in PA training have been found with interventions ranging in time from 15 minutes three times a week (O'Connor, Harty, & Fulmer, 2005); to 20 minutes three times per week, to 8 hours to 16 hours (Musti-Rao & Cartledge, 2007); to 30 minutes a day between November and May (Coyne et al., 2004); and to 30 minutes a day

for 4 to 5 months (Gunn et al., 2002). In a recent meta-analysis, instruction ranging from 5 to 9.3 hours and 10 to 18 hours had a higher effect size than instruction of fewer than 5 hours and more than 18 hours (NRP, 2000). However, it is recommended that PA instruction addresses the needs of the child in a developmentally appropriate manner, is engaging as well as interesting not only for the child but also for the teacher and lasts no longer than 30 minutes per day (NRP, 2000). PA training is seen as essential in the development of reading skills but intensity and duration of instruction can vary with similar results. However, PA is not the only preliteracy skill that is imperative in the development of reading.

One of the biggest challenges and important aspects of assessing literacy skills in kindergarten is the instrumentation (Invernizzi, Justice, Landrum, & Booker, 2004/2005). Assessment tools must be broad–based and include four major aspects of literacy skills: phonological awareness, alphabet knowledge, concept of word, and grapheme-phoneme correspondence (Invernizzi et al., 2004/2005) and be sensitive enough to discriminate at-risk students also be easy to administer. Another factor that should be considered is the ability for repeated measures. The RTI approach requires that intervention strategies be assessed on a regular basis, and lack of alternative forms would prohibit the effectiveness of the assessment with regard to this approach.

A review of six norm-referenced tests of phonological processes which included assessments such as CTOPP (Wagner et al., 1999), *Phonological Abilities Test* (PAT-M; Muter, Hulme & Snowling, 1999), *Phonological Abilities Test-Revised* (PAT-R; Robertson & Salter, 1997), *Test of Awareness of Language Segments* (TAL-S; Sawyer, 1987); *Test of Phonological Awareness* (TOPA; Torgesen & Bryant, 1994), and

Lindamood Auditory Conceptualization Test-Revised (LAC-R; Lindamood & Lindamood, 1997) was conducted. Each of the tests mentioned above assessed PA, emphasizing different skills, but each had the ability to identify at-risk students within the area of PA. However, only the CTOPP assessed both PA and RAN with the ability to determine strengths and weaknesses of PA, RAN, and phonological working memory (Sodoro et al., 2002).

Orthographic/Letter Identification

In the previous section the importance of PA, which entails an active awareness of sounds within the spoken language, was established. These PA skills are dependent only upon auditory processing, but another important building block of reading utilizes vision and orthographic knowledge. As phonological awareness develops, a child must also learn the letters of the alphabet to become a successful reader.

Letter identification.

Children need to master the name of each letter and the visual symbol that it represents. There are 26 upper case letters and 26 lower case letters that can appear in various sizes and styles of print. This simple task evokes many skills and processes such as visual attention, visual discrimination, visual processing, working memory, and long-term memory, to name a few (Levine, 2002). It is felt that children need to over-learn these 52 letters in order to achieve the fluency and automaticity required for reading and spelling (Adams, 1990).

Letter identification must be mastered before children can begin to read because it is the task of combining letter knowledge and its related sound (the alphabetic principle) that enables children to decode and encode unfamiliar words. The rate at

which children acquire letter identification skills has been shown to be predictive of future reading success (Lonigan et al., 2000; Schatschneider et al., 2004; Muter, Hulme, Snowling, & Stevenson, 2004; Pennington & LeFly, 2001; Scarborough, 2002; Adams, 1990). PA and orthographic processes, which were found to be the best predictors of word reading in English, are important in early reading development (Georgiou, Parrila, & Papadopoulous, 2008) and deficits in these areas can predict a student's response to intervention (Berninger et al., 1999). In fact, letter knowledge and PA are the two best predictors of student reading performance in the first two years of formal schooling (NRP, 2000). Therefore, difficulties in acquiring this one-to-one visual correspondence or establishing adequate visual representation of letters can deter reading development.

However, establishing adequate visual representation of letters, which is a necessary skill in reading, can be influenced by a number of visual-temporal informational processes, which can affect the orthographic representations of letter(s) while reading, such as "...temporal resolution of individual stimuli, temporal order judgments, temporal sequencing matching, and perception of flicker and motion" (Boden & Giaschi, 2007, p. 346). For example, some children with reading disabilities have been found to have poor motion sensitivity or motion processing deficits (Wilmer, Richardson, Chen, & Stein, 2004; Edwards et al., 2004), which implicates visual processing in the role of reading; these children may often complain that letters or words move on the page, miss letters, or transpose letters (Hale & Fiorello, 2004; Fiorello et al., 2006).

Orthographic processes.

Children who have difficulty with the grapheme/morpheme relationship in terms of orthography are often referred to as having orthographic dyslexia or they can be

classified as having an orthographic subtype of reading disability (Hale & Fiorello, 2004; Fiorello et al., 2006). One definition of orthography, in terms of processes within the individual, has generally been defined as "the ability to form, store, and access orthographic representation" (letter, letters, or words) (Stanovich & West, 1989, p. 423). In this subtype of reading disability, students can generally read phonetically consistent words but have more trouble with reading fluency and accurate reading of sight words that may vary in phonemic regularity (Hale & Fiorello).

Effects of poor orthographic skills in relation to reading have also been linked to reading speed (Hale & Fiorello; Georgiou et al., 2008) and to word identification (Burt, 2006; Georgiou et al.) independent of phonological skills, but training in orthographic forms of words led to increased generalization to similar patterned orthographic word forms (Berends & Reitsma, 2007). Therefore, deficits in orthographic processes can lead to difficulties with word reading and reading fluency, but training in orthography can lead to improved word recognition of similar, patterned words. Furthermore, orthographic processing skills have been found to have a significant variance in reading (Fiorello et al., 2006; Georgiou et al.; Torgesen, Wagner, Rashotte, Burgess, & Hect, 1997), indicating its importance and subtype within reading disabilities.

However, there has been debate regarding whether deficits in orthography are "true deficits" or are a result of deficits in the phonological processes (Harm & Seidenberg, 2001; Kevan & Pammer, 2008). Are visual processing deficits the result of reading failure and not an inherent neurological deficit in the visual system? Some researchers argue that orthography and phonological process are interdependent and connected (Ramus, 2003; Vellutino et al., 2004); that is, a degraded phonological system,

in turn, degrades the orthographic systems (Harm & Seidenberg). Phonological reading disabilities are caused by deficits in phonological representations rather than by grapheme-phoneme processes (Harm & Seidenberg). Others argue that visual deficits are independent of the phonological process and believe that the role of orthography needs to be considered as a factor in students' reading skills (Kevan & Pammer; Boden & Giaschi, 2007).

To address this specific controversy, a study examined whether or not visual processing deficits within the dorsal stream are present in children before they learn to read by examining coherent motion and visual frequency, doubling illusion detection (Kevan & Pammer, 2008). If deficits are found before reading, then this would lend credence to the idea that deficits in orthography are not caused by poor phonological processes. Visual processes of children who were at risk for reading difficulties because of family history of dyslexia were examined in comparison to a control group. Visual processing deficits were seen in at-risk children before they learned to read, implicating the dorsal stream (Kevan & Pammer). These researchers propose that deficits in the dorsal stream can result in children being less sensitive to visual stimuli, which does not provide sufficient resources, to direct saccadic eye movement properly and maintain stable fixations. This, in turn, affects the ability of the student to develop stable and accurate lexicon representations or impaired orthographic representations. Therefore, the authors concluded that visual deficits in orthography are not the result of reading failure but, rather, an independent process that can have a negative impact on reading and reading development (Kevan & Pammer). However, others believe that faulty eye

movement is a result of poor reading skills rather than a contributing factor to poor reading (Berninger & Richards, 2002).

Other researchers concur with the theory that impaired magnocellular functioning, which processes rapidly changing visual information and affects the visual dorsal stream, are evident in children with reading disabilities (Hale & Fiorello, 2004; Stein, 2001; Richards et al., 2007). Several theories to explain the deficits within the dorsal stream, more specifically, the deficits in magnocellular functioning in relation to reading, have been proposed; these include visual attention (Vidyasager, 2004), position encoding deficits (Whitney & Cornelissen, 2005), and ocular motor control (Stein) to name a few. Regardless of this debate, it is clear that deficits in visual processing within the dorsal stream (magnocellular functioning) are evident (Kevan & Pammer, 2008; Boden & Giaschi, 2007), and these deficits are often found in children with reading disabilities. Researchers acknowledge that more empirical evidence needs to be collected to thoroughly examine the role and effects of visual processes on reading development (Boden & Giaschi; Kevan & Pammer; Burt, 2006).

Alphabetic Principle

Once letter identification is established along with PA, the next step in the development of reading is for children to combine their knowledge of sounds (phonological awareness) with the letters so that a sound-letter correspondence is formed (Muter, 2003). When this process emerges, children are beginning to learn the alphabetic principle. Understanding and applying the alphabetic principle allows students to decode unfamiliar words (segmenting and blending sounds) as well as accurately recognize familiar words (CIERA, 2004). Furthermore, it is felt that the application and

understanding of the alphabetic principle aid students in accurately predicting words within the context of the sentences, greatly contributing both to word reading and to word reading within context (NRP, 2000).

However, English is considered to have an inconsistent or deep orthography (Caravolas, 2004), which makes learning to read or spell in English even more difficult to struggling readers, given the variance in the letter-sound association in English. For instance, English has 26 letters, but 44 units of individual sounds (phonemes), and from that, 210 graphemes can be produced, but a consistent Czech orthography will produce only 42 graphemes from a 37 letter alphabet (Caravolas). In English, learning the alphabetic principle is understanding how graphemes represent phonemes even though the same letter or letters may represent different phonemes (e.g., f or ph) or the same letter represents different phonemes (e.g., short a or long a; NRP, 2000). Mastering this inconsistent alphabetic principle is the foundation of all future reading skills, and children with phonological reading disabilities (dyslexia) will struggle to acquire the alphabetic principle (Muter, 2003). It is estimated that one in five children will have difficulty applying the alphabetic principle (Shaywitz, 2003).

The alphabetic principle, which is combining these two instrumental skills in early reading, is imperative if a student is to learn to read efficiently, effectively, and fluently. The linking of phonemes to the printed letter(s) that they represent is considered the key to reading (Foorman, Breier et al., 2003) and the most reliable method in the identification of an unknown word when encountered for the first time (Schatschneider & Torgesen, 2004). For example, if students cannot efficiently and effectively decode unfamiliar words by using the letter-sound association of the alphabetic principle, they

often will have many errors in reading as they stumble to sound out words, guess at word configurations, or use contextual clues, all of which are time consuming and often inaccurate, leading to slow, laborious, and dysfluent reading (Schatschneider & Torgesen). Brain-based studies have identified specific areas of the brain that are implicated in the utilization of the alphabetic principle (decoding) or phonological assembly. Deficits in the posterior brain systems, specifically, the angular gyrus, has been shown to experience an underactication in students with dyslexia when they are compared with non-disabled students (Pullen et al., 2000).

Many children with reading disabilities also have difficulty establishing automaticity of sight-word vocabulary. Sight words need to be read accurately, numerous times to develop automaticity, and children with reading disabilities often do not consistently read words correctly and have lower levels of reading practice, which will not only affect fluency but sight word acquisition as well (Schatschneider & Torgesen, 2004). However, neurological studies of the brain with regard to the process of reading indicate that many poor readers often rely on sight word reading rather than on letter-sound correspondence (Shaywitz et al., 2008). They can often memorize words, yet the automaticity of these sight words often does not approach the way in which a typical peer of that same age performs (Shaywitz et al.; Torgesen, 2000; Schatschneider & Torgesen). However, as the progression through grade levels emerge, this reliance on sight words becomes more ineffectual, because a typical third or fourth grader encounters at least 3,000 new words per year (Shaywitz et al.). Compensatory reading strategies can be useful at times for struggling readers, but an ineffectual ability to decode words will

often ensure that these struggling readers remain inaccurate in their reading, thus predicting poor reading fluency and comprehension (Schatschneider & Torgesen).

Teaching of the alphabetic principle.

Given the importance of the alphabetic principle in reading, how does a child begin to learn this coupling of sounds to letters? The process of teaching this principle is most commonly referred to as phonics. Phonemes have a predictable and systematic relationship to graphemes; that is, sounds of spoken words correspond to symbols of the alphabet (Richgels, 2004). This linking of sounds to letters and letters to sounds can have several names throughout the literature including graphophonemic relationships, letter-sound association, letter-sound correspondence, sound-symbol correspondence, and sound spellings (CIERA, 2004), to name a few. It is important to note that there is not always a clear distinction between PA training and phonics. It has been found that including letters with PA instruction increases the effectiveness not only of PA skills but also of reading (Fuchs et al., 2001; Foorman, Breier et al., 2003). However, once letters are introduced, this is considered phonics instruction. For example, the blending of sounds linked with letters is considered synthetic phonics and the segmenting of words into sounds, then into letters is considered phonics through spelling (NRP, 2000). Phonics can be taught through explicit or implicit means by using several teaching strategies, as expressed in Table 1.

Table 1

Description of Explicit and Implicit Instructional Approaches in Phonics

Name	Description
Explicit Teaching Methods	
Analogy Phonics	A method of teaching students to use parts of a known written word (rime) to aid in identifying new words; that is, word families. For example, given the word duck, students will recognize the /uck/ rime and then be able to blend the /t/ sound with the /uck/ sound to form the word tuck (NRP, 2000; CIERA, 2004).
	A method of teaching phonics, based on 100 or so words that are taught as sight words, which examines the known words in terms of the letter-sound association, which promotes reading through the use of morphemes and chucking to avoid decoding one phoneme at a time (Foorman, Breier et al., 2003).
Phonics through Spelling	A method of teaching students to phonemically spell words through segmenting words into phonemes and linking these phonemes with the

Table 1 (continued)

Name	Description
Phonics through Spelling	corresponding letter or letters to form the written word (NRP, 2000).
Explicit teaching methods	
Onset-rime Phonics	A method of teaching that encourages students to identify the onset of a word (letter or letters before the first vowel) and then decode the individual phonemes thereafter (CIERA, 2004).
Synthetic Phonics	A method of converting letter or letters into phonemes (sound) and then blending these sounds into words which is moving from part to whole in the analysis of a word (Foorman, Breier et al., 2003).
Implicit teaching methods	
Embedded Phonics	A method of teaching that relies on incidental learning as students are exposed to letter-sound associations during text reading (NRP, 2000).

Effects of teaching the alphabetic principle.

Systematic phonics instruction, which employs a defined set of sequential steps in teaching the letter-sound association through direct and explicit instruction, is significantly more successful when compared with programs that employ less systematic or no phonetic training (Foorman, Breier et al., 2003; Foorman & Torgesen, 2001; Adams, 1990; Joel & Minden-Cupp, 2000). In a recently study conducted over two years, students who received systematic and direct instruction significantly outperformed students who did not receive systematic programs (Kamps et al., 2008). Several researchers have found that providing phonics instruction or code-oriented interventions, as well as some aspects of PA instruction to at-risk readers in kindergarten and first grade, produced significant results for these at-risk readers (Kamps et al., 2007; Musti-Rao & Cartledge, 2007; Pullen, Lane, Lloyd, Nowak, & Ryals, 2005; Menzies, Mahdavi, & Lewis, 2008; Vellutino et al., 2006; Vadasy & Sanders, 2008; Vadasy et al., 2006) and these results were maintained over time (Gunn et al., 2002; Coyne et al., 2004; O'Connor, 2000).

It has been stated that kindergarten students who begin phonics instruction should be developmentally appropriate and begin with foundational knowledge such as linking of PA to letters (NRP, 2000). Systematic phonetics instruction has been reported to have a significant, positive effect on word decoding and word identification in first graders (Berninger et al., 2002; Torgesen, 2000) and with kindergarten students (Torgesen et al., 1999) when compared to other approaches. Moreover, significant effects were found for spelling skills in kindergarten students, grades one through sixth, disabled students, low-achieving students, and low SES students when systematic and direct phonics instruction

was delivered (NRP, 2000). Recently, a meta-analysis of studies that examined direct phonics instruction with minority students concluded that a benefit is seen when compared with other reading instruction (Jeynes, 2008). Accurate decoding, word recognition and spelling skills are enhanced significantly through systematic phonics instruction, which can assists in the development of reading comprehension (Torgesen, 2000).

Even more promising is the fact that systematic phonics instruction in kindergarten and first grade demonstrated the greatest and most substantial gains in reading and spelling, indicating that phonics instruction is most effective during these early grades when compared to later grades (Foorman, Chen et al., 2003; Torgesen, 2000). Early instruction in systematic phonics could often remedy the negative effects that struggling readers encounter as they progress through their schooling. Instruction at these grade levels should includes letter identification, letter shapes, phonemic awareness, and all major letter-sound associations with the aim of having students use these skills to read and write as instruction continues (CIERA, 2004). There was no significant difference between the modality of teaching; that is, small group, one-to-one, and whole class instruction were equally effective in teaching phonics skills (NRP, 2000). These differ from the findings that PA instruction is more effective when delivered in small group instruction (Bus & van Ijzendoorn, 1999). However, systematic phonics instruction is only one aspect of reading, because others areas such as phonemic awareness, reading fluency, and reading comprehension in text reading must also be developed (Shaywitz et al., 2008).

Assessments of the alphabetic principle.

Two methods of measuring the letter-sound association or the development of the alphabetic principle in children are through tasks called Pseudoword Decoding and Nonsense Word Fluency (NWF), which entails decoding nonsense words in order to tap only into the letter-sound correspondence and their phonological recoding ability and not sight word reading (Fien at al., 2008). These measures are intended to isolate how well students apply their knowledge of phonetics to their decoding skills in unfamiliar words (Fein et al.). More specifically, it assesses their ability to transform graphemes into phonemes, and then blend these sounds into a word (NRP, 2000). Pseudoword decoding tasks are in many standardized individual achievement test such as the *Wechsler Individual Achievement Test- Second Edition* (WIAT-II; The Psychological Corporation, 2001), the *Woodcock-Johnson Tests of Achievement, Third edition* (WJ-III; Woodcock & Johnson, 2001) and the *Process Assessment of the Learner-Reading and Writing* (PAL-RW; Berninger, 2001a), among others.

Word reading and its correctional link with pseudoword decoding has been established (Fein et al., 2008) and NWF has been found to have concurrent as well as predictive validity with other criterion reading measures (Rouse & Fantuzzo, 2006; Vanderwood, Linklater, & Healy, 2008; Schatschneider et al., 2004). However, these pseudoword tasks differ. Pseudoword decoding tasks are untimed, but the task of NWF, as administered on the *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS; Good & Kaminski, 2002), involves both pseudoword decoding (sound-letter association with strong orthographic component) and a rapid automatized naming (RAN) component (Vanderwood et al., 2008). The subtest of NWF on the DIBELS, for example, has been

reported to provide useful data on the students' efficient use of the alphabetic principle (Fien et al.). The alphabetic principle, as assessed by NWF on the DIBELS in kindergarten, accounted for 31% of the variance for future group standardized reading scores as assessed in second grade, demonstrating the importance of learning the alphabetic principle early in formal schooling (Fein et al.). But what is RAN, and does it have importance in the development and assessment of children?

Rapid Automatized Naming

The process of reading is complex and many other skills or factors affect reading development. For instance, research has shown that it is just not PA that affects reading development, but also naming speed deficits, that is, fluency, timing and retrieval speed (Hale & Fiorello, 2004; Torppa, Poikkeus, Laakso, Eklund, & Lyytinen, 2006; Scarborough, 1998; Wolf & Bowers, 1999). Therefore, only do all the prereading skills have to come together and be utilized, but children also have to use these skills effectively and efficiently in decoding unfamiliar words or in identifying sight words. Deficits in the area of retrieval, articulation speed, rapid automatized naming or rapid naming (RAN), and processing speed can affect the efficiency of this highly-complex process, and these weaknesses can affect reading performance (Hale & Fiorello).

Assessments of rapid naming.

One method of assessing retrieval fluency, timing, and retrieval speed have been fluency tasks (timed measures), such as quickly naming colors, letters, numbers, or words with accuracy (Swanson, Trainin, Necocechea, & Hammill, 2003). The PAL-RW is one assessment that incorporates RAN as part of a comprehensive process assessment, which includes tasks of digits, letters, and words (Berninger, 2001a). RAN is considered one of

the four essential areas in the screening of students within the PAL-RW (PA, orthographic skills, and RAN, as well as the alphabetic principle), because RAN deficits have been found in children with reading and writing disabilities, and are predictive of early intervention programming (Berninger, 2001a). The PAL-RW can be used as a screening tool for progress monitoring and for diagnosing processing problems in students who have reading or writing disabilities. If all suggested subtests are given for a particular grade, administration time is approximately 45 to 60 minutes; specialized training is required to administer the test.

Another assessment that incorporates RAN is the *Comprehensive Test of Phonological Processing* (CTOPP; Wagner, Torgesen, & Rashotte, 1999), reportedly, it is able to determine strengths and weaknesses within a student's phonological profile, including RAN, phonological memory, and PA (Sodoro et al., 2002). The CTOPP can assess the type of deficits that students demonstrate, such as PA only, RAN only, or both PA and RAN, which can guide appropriate instructional strategies (Sodoro et al.).

Within RAN assessments, serial naming of letters and numbers (alphanumeric symbols) has a stronger correlation to reading and produces greater effect size than colors and objects, that is, nonalphanumeric symbols or stimuli (Compton, 2003a). However, performance in kindergarten on RAN tasks indicates that the advantage of using letters and numbers is not necessarily the most predicative until automatization of letters and numbers is achieved (Compton, 2003b), given that the task may be assessing knowledge of letters/numbers instead of RAN. Colors and objects are most commonly used with preschool children and kindergarten students who have not yet learned letters or numbers,

but numbers and letters are more commonly used with school-aged children (Berninger, 2001a).

Rapid naming deficits in relation to reading.

Deficits in RAN are found in many impaired readers (Berninger et al., 2001; Compton, DeFries, & Olson, 2001; Compton, Olson, De Fries, & Pennington, 2002; Kirby et al., 2003; Mc Bride-Chang & Manis, 1996; Meyer, Wood, Hart, & Felton, 1998; Wolf & Bowers, 1999) and these RAN deficits have been found to be predictive of future reading skills of poor readers (Berninger et al., 2001a, Compton, 2003a; Compton, 2003b; Hale & Fiorello , 2004; Kirby et al.; Meyer et al., 1998; Mc Bride-Chang & Manis; Schatschneider et al., 2004; Torppa et al., 2006; Bishop, 2003). In fact, in one study, RAN was the strongest overall predictor of reading achievement in terms not only of fluency but of word recognition and decoding, when compared both to PA and to orthography (McCallum et al., 2006). Moreover, the automaticity rate in the association between letter names and their corresponding orthographic representation influence reading rates both in children and in adults with reading disabilities (Berninger et al., 2001b). However, in a meta-analysis of correlation evidence, it has been suggested that "...the importance of RAN and PA measures in accounting for reading performance have been overstated" (Swanson et al., 2003, p. 407).

There has also been a great debate about whether or not RAN should be considered independent of phonological processing or if it should be considered part of the phonological processing deficits present in many poor readers; this is not unlike the debate on whether or not PA and RAN have the same underlying process. Although there is a causal relationship between RAN and reading, it has been difficult to

differentiate between whether poor reading skills cause deficits in RAN and whether deficits in RAN contribute to reading difficulties (Compton, 2003a; Swanson et al., 2003; Torppa et al., 2006). Some argue that RAN may have predictive capability in terms of reading development only because RAN and PA are related to a common phonological processing system (Schatschneider, Carlson, Francis, Foorman & Fletcher, 2002). In support of RAN as part of phonological processing, a review of research did not support distinct deficits (Vukovic & Siegel, 2006), but others argue that these two processes are not distinctive in the variance of reading because of faulty methodological statistical weaknesses (Schatschneider et al., 2002).

On the other hand, some researchers suggest that RAN should be considered an independent and separate process apart from PA (Wolf & Bowers, 1999, 2000; Swanson et al., 2003; Manis, Dori, & Bhadha, 2000). It is further argued that many subprocesses contribute to RAN; these can include attention, visual, lexical, temporal, and recognition, which restrict RAN tasks as being only phonological processing, confining and under appreciating all the sub processes that are involved in the visual naming task?? (Wolf, Bowers, & Biddle, 2000). It has been stated that PA, orthography, and RAN may become known as the "big three" - that is, the three most important contributors to reading because most experts are beginning to acknowledge all three processes, even though there is debate over the exact nature of the processes (McCallum et al., 2006).

Double-deficit hypothesis.

The double-deficit hypothesis proposed by Wolf and Bowers (1999) is based on the premise that RAN and PA are separate processes and that deficits within these areas

alone or in combination compromise three subtypes including the PA subtype, the RAN subtype, and the double-deficit subtype (combination of PA and RAN).

Evidence from research for this theory has been argued from four different areas of evidence (Schatschneider et al., 2002). First, RAN has been found to account for a unique variance in reading above PA (Manis et al., 2000; McCallum et al., 2006; Wolf & Bower, 1999, 2000). Second, students' performances on RAN and PA predict different aspects of reading. RAN has been shown to be more predictive of reading fluency and spelling, but PA is usually more predictive of decoding ability (Mannis et al.; MaCallum et al., 2006). For example, RAN letters were found to be more predictive of spelling skills than PA tasks. RAN digits were just as predictive as PA in spelling, but PA was more predictive of decoding skills than RAN (Manis et al.). Third, deficits in PA and RAN have been found in students with lower reading achievement than in those with only one deficit in either PA or RAN (Kirby et al., 2003; Lovette, Steinbach, & Frijiters, 2000; Wolf & Bowers, 2000). Elementary students with low PA and low RAN were likely to have reading difficulties by fifth grade; PA was found to be more predictive of future reading skills in early grades, whereas RAN was more predictive in later grades (Kirby et al.). Students with deficits in both in phonological awareness and in RAN are at high risk for developing learning disabilities, and remediation is more difficult because of this dual deficit (Hale & Fiorello, 2004). Last, there is some support that RAN subtypes, that is, PA only, RAN only, and both PA and RAN exist when assessment scores are clustered in analysis (Morris et al., 1998). To extend this further, students with deficits in RAN, orthography, and phonological processing were found to respond slower to early

intervention services even when compared with the Verbal IQ-word reading discrepancy (Stage et al., 2003).

Some researchers are proposing The Triple Word Form Theory of dyslexia based on genetic, neurological, and behavioral research that suggests deficits in one, two, or all three aspects in any combination can create reading failure (Berninger, Raskind, Richards, Abbott & Stock, 2008). The three areas that have been proposed include " ... (a) codes for word-form storage and processing, (b) time-sensitive phonological and orthographic loops for maintaining information in working memory or outputting it, and (c) executive functions for language (e.g., rapid automatic switching of attention)" (Berninger et al., 2008, p 707). The Triple Word Form Theory suggest that dyslexic children require more time to processes and analyze morphological word-forms, have deficits in the phonological loop in relation to working memory which may be affected by impaired executive functions, and that this interferes with learning to spell, write letters, decoding of words and reading (Berninger et al.).

Rapid naming and orthography.

RAN and orthography are strongly related to reading fluency but auditory rapid processes are more closely related to phonetic ability (Booth, Perfeti, MacWhinney, & Hunt, 2000). This should not be surprising, given the fact that visual RAN tasks are a measure of visual naming speed, which emphasizes the recognition of visual stimuli (Sodoro et al. 2002). In fact, when compared with unimpaired readers, those with dyslexia show brain function abnormalities in terms of processing rapidly changing visual information (Booth & Burman, 2001). One could hypothesize that performance on visual RAN tasks may be related to impaired magnocellular functioning, as discussed

previously. Magnocellular functioning processes rapidly changing visual information (RAN tasks), which in turn, produces deficits in temporal information processing (Hari, Renvall, & Tanskanen, 2001). If disruptions in magnocellular functioning occur within the thalamus, this may even be able to explain the PA, RAN, and orthographic deficits because both auditory and visual processing are relayed within this area (Hale & Fiorello, 2004).

Phonological awareness, letter identification, and the alphabetic principle have been identified as necessary skills for the development of literacy and have also been shown to be predictive of future reading skills (Morris, Bloodgood, & Perney, 2000). Standardized assessments in the areas of letter identification, phonological awareness, and RAN should be used to identify at-risk students in kindergarten because this combination of skills was the best predictor of reading achievement at both fall and winter screenings in identifying poor readers at the end of first grade (Bishop, 2003). Screening of reading development is a complex process, because due to the developmental process, assessing skills is like "hitting a moving target" (Speece, 2005, p. 489), which accounts for the reasons why some measures are predictive at different times within kindergarten. For instance, alphabet recognition and the concept of words in print significantly predicted reading achievement in first grade during all three assessments in kindergarten (beginning, middle and end), whereas identifying the beginning and end consonants were predictive in the middle and the end of kindergarten, and word recognition was predictive at the end of kindergarten (Morris et al., 2003).

Conclusion

Learning to read is one of the most important tasks that a child must master, and for some children this task is difficult. Numerous factors such as SES and ethnicity have been shown to influence the reading development, and all students enter formal schooling with varying degrees of readiness. Over the last decade or so, research had begun to examine the skills that a kindergarten students needs in order to achieve reading success, how to measure these skills and how to intervene effectively.

Educators now understand what key factors are required for reading success and have assessment tools to identify at-risk students. Essential skills including PA, letter identification, and the alphabetic principle have been identified as the building blocks of reading and cognitive processes implicated in orthography; RAN also influences the development of reading skills. Deficits within any of these areas generally lead to poor reading in later grades. There are now several assessment measures both nationally-normed and curriculum-based, that examine these facets of developing prereading skills. At-risk students for future reading failure now can be identified as early as kindergarten; intervention should be implemented to promote reading success and prevent the negative effects of poor reading, such as low self-esteem, poor reading comprehension, poor reading fluency, behavioral problems, and higher rates of graduation.

The purpose of this current study is to examine the effectiveness of an early intervention program that targets prereading skills with at-risk kindergarten students. This was completed by examining the effects of a Tier 2 level of intervention program and the lasting effects of this intervention in a subsequent grade by comparing the those students who received the intervention with the mean of the school district on criterion

measures. Can a Tier 2 intervention program using research-based principles of reading, which is provided to identified at-risk kindergarten students, increase prereading skills in relation to typical peers? If so, can these effects be maintained throughout the school year and in a subsequent grade even when intervention is removed? That is, will a Tier 2 level of intervention program increase prereading skills in identified at-risk kindergarten students to the level of an average same-grade peer? If so, is this effect maintained when viewed in terms of future reading skills?

These arguments lead to several hypotheses regarding this present study:

Hypothesis One:

An RTI Tier 2 intervention program (Project K) that targets at-risk kindergarten students will significantly increase prereading skills to meet the DIBELS benchmark of low-risk and there will be no significant difference in the district mean and the mean of kindergarten students who received the Tier 2 level of intervention in ISF and LNF between Time 1 and Time 2 (fall to winter).

Hypothesis Two:

A RTI Tier 2 intervention program (Project K) that targets at-risk kindergarten students, as identified by the DIBELS, will significantly increase prereading skills to meet the DIBELS benchmark of low-risk and there will be no significant difference in the district mean and the mean of kindergarten students who received the Tier 2 level of intervention in LNF, Phoneme Segmentation Fluency (PSF), and Nonsense Word Fluency (NWF) between Time 2 and Time 3 (winter to spring).

Hypothesis Three:

When future reading skills are examined, through the use of the Direct Reading Assessment (DRA; Beaver, 2006), Project K students will meet grade-level expectations in the fall of first grade. The Project K students will be the same in terms of frequency distributions as the control group, with regard to the DRA levels.

Chapter 3

Method

Participants

The participant data were drawn from a sample of 739 kindergarten children from four elementary schools in a moderately-sized suburban school district located in Eastern Pennsylvania; these students' records were encoded into their school district's data base as being screened by the DIBELS within the 2006-2007 and the 2007-2008 school year. This archival database was released for the purposes of this study following the school district's procedure and with the approval of the Philadelphia College of Osteopathic Medicine Institutional Review Board. Detailed information with regard to SES of the sample was not available, although the sample consisted primarily of middle to high SES students who lived in a suburban setting. Percentages of low-income families as determined by the enrollment in the free or reduced lunch program ranged from 3% to 13%, with the average for all four elementary school totaling 7.5 % for the 2006-2007 school year. The sample consisted chiefly of Caucasian students with an equal representation of gender. See Table 2 for descriptive statistics regarding this sample.

Table 2

Basic Demographic Characteristics of Sample

School year	*n*	*% within school year*
2006-2007	371	100.0
Gender		
Males	198	51.6

Table 2 (continued)

School year	*n*	*% within school year*
Females	186	48.4
Session		
AM	211	54.9
PM	173	45.1
Ethnicity		
African American	16	4.2
Asian	16	4.2
Caucasian	347	90.4
Hispanic	5	1.3
2007-2008	355	100.0
Gender		
Males	173	48.7
Females	182	51.3
Session		
AM	195	54.9
PM	160	45.1
Ethnicity		
African American	13	3.7
Asian	26	7.3
Caucasian	313	88.2

Table 2 (continued)

School year	*n*	*% within school year*
Hispanic	3	.7
Total Sample	739	100.0
Gender		
Males	371	50.2
Females	368	49.8
Session		
AM	406	54.9
PM	333	45.1
Ethnicity		
African American	29	3.9
Asian	42	5.7
Caucasian	660	89.3
Hispanic	8	1.1

Inclusion and Exclusion Criteria

Within the school district, four possible educational programs existed, including half-day AM kindergarten, half-day PM kindergarten, extended-day kindergarten, and half-day special education services within a diagnostic classroom, excluding speech and language services. For the purposes of this study, the extended-day kindergarten students ($n = 84$) as well as the special education ($n = 5$) students were considered a confounding variable and excluded from this data base. Therefore, only regular education students

who attended either AM or PM kindergarten were included within this study (n = 683). With these exclusionary criteria, extended day kindergarten students (n = 67) and special education students (n = 5) were eliminated within the control group. Within the intervention group, two were eliminated from the fall only, nine were eliminated from the winter only, and six were eliminated from the all year intervention group.

As in any school district, attrition occurred; however, analysis of data occurred between time frames such as fall to winter (Time 1) and winter to spring (Time 2). Therefore, students who moved into the district or those who moved out were not removed from this data base. Any student who did not have complete data scores from Time 1 to Time 2 or Time 2 to Time 3 was not included within this particular analysis. Table 3 reports the n values for the 2006-2007 and the 2007-2008 school years with respect to the independent variable groups. Within the intervention group, four students moved into the district; they did not participate in the fall DIBELS testing but received services after the fall intervention.

Table 3

Total Subjects in each Independent Variable Group

Intervention Group	*n*
2006-2007	
Fall only	9
Winter only	11
All year	9
Control	355

Table 3 (Continued)

Intervention Group	*n*
2007-2008	
Fall only	6
Winter only	12
All year	9
Control	328
Total subjects	
Fall only	15
Winter only	24
All year	17
Control	683

Dependent Variables

The Dynamic Indicator of Basic Early Literacy Skills.

The DIBELS, which was completed as the school district's typical screening process for kindergarten students, served as the criterion measure within this study. The DIBELS (sixth edition) was obtained from the DIBELS website (DIBELSuoregon@edu.com) and duplicated for the school district screening measure.

Many school districts nationwide have been utilizing the DIBELS as a curriculum-based assessment in their efforts to regularly assess early reading skills as well as examine the students' responses to intervention and programs. As of the 2006-

2007 school year, 11,212 school districts have chosen to assess and utilize the DIBELS scoring system (Official DIBELS Home Page, retrieved February 14, 2007). School districts not only administered the DIBELS to identify students who are at-risk for reading failure but also used the DIBELS to identify whether or not current educational programming and/or additional instructional strategies are effective, as well as to aid in determining which students are no longer in need of additional services (Hintze et al., 2003). The DIBELS is not only widely used within school districts but has also been widely used in research studies as criterion measures to determine the effectiveness of interventions or programming (Linan-Thompson & Hickman-Davis, 2002; Bursuck et al., 2004; Martin, Emfinger, Synder, & O'Neal, 2007; Menzies et al., 2008; Kamps et al., 2003; Gunn et al., 2000, 2002; Allor et al., 2006; Thomas-Tate et al., 2004;Vadasy et al., 2006).

The DIBELS is a curriculum screening instrument which consists of brief measures that have been identified by research as necessary in the development of reading skills (Good & Kaminski, 2002). The DIBELS can be used in progress monitoring as well as in early identification of poor readers; it is similar to the PALS-RW and the CTOPP ; however, this assessment requires less time, no specialized or extensive training, and can be given by regular school personnel (Good, Gruba, & Kaminski, 2002). The DIBELS consists of four measures for kindergarten students as discussed in Table 4; these are the Initial Sound Fluency (ISF), Letter Naming Fluency (LNF), Nonsense Word Fluency (NWF), and PSF (Phoneme Segmentation Fluency). The DIBELS assesses areas of early literacy skills that have been identified by the NRP (2000) and the National

Research Council (1998) as being necessary in the development of young readers (Elliott, Lee, & Tollefson, 2001).

Table 4

Description and Validity of the DIBELS Subtests

Subtest	Description and validity
Nonsense Word Fluency	Students are given a sheet of paper with randomly-ordered nonsense words in VC or CVC order and asked to verbally express each sound or read the word to gain all points. The students have one minute to name all the sounds or words that they can. This measures understanding of the alphabetic principle as well as the students' ability for phonological recoding. Criterion-related validity with the WJ-III Readiness Cluster is .36 in January of first grade. There are 20 alternative forms, and alternative-form reliability is .83 (Good & Kaminski, 2002).
Phoneme Segmentation Fluency	The examiner says a three or four phoneme word, and the students must reproduce all the phonemes in the word individually. For example, if "cat" is presented, then the students must say "/c/ /a/ /t/" to

Table 4 (continued)

Subtest	Description and validity
Phoneme Segmentation Fluency	receive a total of three points for the word. This is a one minute probe and assesses students' phonemic awareness skills. Criterion-related validity with the WJ-III Readiness Cluster is .54 in the spring of kindergarten (Good & Kaminski, 2002).
Initial Sound Fluency	The examiner presents and identifies four pictures. The students are then asked to point to the picture that corresponds to the sound that the examiner says. For example, point to the picture that begins with a /w/. Next, the student is asked to orally identify the beginning sound of a presented word and match the sound to one of the pictures. This measures a student's ability to recognize and produce initial sounds in an orally-presented word. Criterion-related validity with the WJ-III Readiness Cluster is .36 in spring of kindergarten. There are 20 alternative forms, and alternative-form reliability is .72 in kindergarten (Good & Kaminski, 2002).

Table 4 (continued)

Subtest	Description and validity
Letter Naming Fluency	Students are presented with randomly-ordered lower and upper case letters and asked to verbally identify as many as they can in a one-minute period. This test measures knowledge of the letters of the alphabet and is also a measure of rapid naming. Criterion-related validity with the WJ-III Readiness Cluster is .70, and alternative-form reliability is .88 in kindergarten (Good & Kaminski, 2002).

Early literacy skills assessed through the DIBELS include phonemic awareness, alphabetic understanding, as well as fluency and automaticity of these skills (Official DIBELS Home Page, retrieved February 14, 2007). These subtests consist of one-minute probes that are individually administered up to four times a year, can regularly monitor reading progress with alternative forms, and are sensitized to subtle progress over time (Good et al., 2002). Test-retest reliability coefficients ranged from .53 to the low .70's, and alternative forms for the four specific subtests are within acceptable parameters (.72 to .88) (Elliott et al., 2001).

The DIBELS can be used to identify students at risk for reading failure, to monitor their progress, and to evaluate the effectiveness of prereading instruction (Elliott et al., 2001). The DIBELS strongly correlated to subtest and composite scores of the

CTOPP that measured phonological awareness and memory, and to a lessor extent, rapid naming tasks (Hintze, Amanda, & Stoner, 2003). It was concluded that the CTOPP and the DIBELS are measuring similar constructs and that educators could use either instrument to assess children with regard to their phonological awareness skills; however, it is recommended that the DIBELS should be used as a screening instrument and that a more thorough assessment should be conducted before costly interventions are made (Hintze et al., 2003).

In another recent study, NWF and LNF, when compared to the Woodcock-Johnson -Revised (WJ-R; Woodcock & Johnson, 1990), were found to be valid measures (Speece, Mills, Ritchey, & Hillamn, 2003). NWF was found to have a correlation of .59 with the WJ-R Letter Word Identification and Word Attack subtests, and LNF was found to have a correlation of .55 with Letter Word Identification and .44 with Word Attack (Speece et al., 2003). Research indicates that this assessment offers a unique and much needed method for assessing prereading skills in nonreading kindergarten students; it is quick, efficient, can be used in progress monitoring and does not require extensive training.

The DIBELS has been found to identify at-risk reading students (Elliott, Huai, & Roach et al., 2007; Elliott et al., 2001; Good et al., 2002; Rouse & Fantuzzo, 2006) as well as having predictive validity (Rouse & Fantuzzo; Good et al., 2002; Good et al., 2001; Burke , Hagan-Burke, Kwok, & Parker, 2009; Fien et al., 2008). For instance, it has been found that the fall DIBELS screening in kindergarten can be predictive of future reading failure or success with a high degree of accuracy (Good et al., 2002). It has been shown that students who achieved benchmark goal for PSF in the spring of kindergarten

were found to meet the Oral Reading Fluency (ORF) in first grade 92% of the time. Students who did not meet the PSF in the spring of kindergarten were found to meet only the ORF expectations in first grade 11% of the time (Elliott, et al., 2007).

In addition to predictive validity, the DIBELS has also been found to have concurrent criterion-related validity with other individualized standardized measures and with curriculum-based measures (Elliot et al., 2001; Good et al., 2001; Good et al., 2002; Hintze et al., 2003; Rouse & Fantuzzo, 2006; Speece et al., 2003). A recently published research article found that the DIBELS subtests of LNF, NFW, and PSF were found to have a significant, positive relationship with measures of overall reading as assessed by curriculum-based assessments (DRA); each subtest was also found to have face validity with similar literacy constructs within the kindergarten subtests (Rouse & Fantuzzo). LNF was also found to have a strong correlation with the Test of Early Reading Ability (Reid, Hresko, & Hammill, 2001); LNF, PSF, and NWF explained 51% of the variance of the DRA scores (Rouse & Fantuzzo). In order of predictive strength of reading skills, LNF was the strongest, followed by NWF, and then PSF (Rouse & Fantuzzo). As an example, criterion-related validity was found between the DIBELS and the CTOPP, which suggests that the DIBELS and CTOPP measure similar constructs (Hintze et al.).

The Direct Reading Assessment.

The DRA is a standardized criterion-referenced reading measure that assesses growth in literacy over time (Beaver, 2006) and was administered by the school districts' classroom teachers who taught grades first through fifth grades; this was done twice a year, in September and May as standard practice for monitoring reading progress. This instrumentation assesses decoding skills, reading fluency, reading comprehension and is

considered a strong indicator of performance in school reading tasks (Menzies et al., 2008). The DRA is individually administered, with the teacher selecting the most appropriate level for the student to begin the assessment (Beaver, 2006). Students are asked to read out loud for two minutes in order to obtain the running record; they are then asked to finish reading the story silently. The teacher then asks the students to tell him or her about the story, administering probes to gather more information from the story. The teacher administers additional DRA levels until the student is unable to pass both the accuracy and compression portions of the DRA, at which time the prior DRA level would be assigned. The DRA levels and the benchmark level expectations are expressed in Table 5 and the school district's categorical level is expressed in Table 6.

Table 5

Benchmark Expectations of the Direct Reading Assessment

Grade	September	May/June
First	3-6	16-18
Second	18-20	28
Third	28-34	38

Table 6

District Categorical Level based on the Direct Reading Assessment Scores

Grade	Level	September	May/June
First			
	Below Basic	0 (A), 1	> 8
	Basic	2	10, 12, 14
	Proficient	3, 4, 6, 8	16, 18
	Advanced	>10	> 20
Second			
	Below Basic	< 12	< 16
	Basic	14, 16	18, 20
	Proficient	18, 20	24, 28
	Advanced	> 24	> 30

It should be noted that the DRA levels are not on a consistent or uniform scale. For instance, kindergarten level begins with A and then continues, one through four. Levels then proceed by 2's after four, through 20; however, after 20, levels do not rise consistently by two's (skipping 22, 32, 42 etc.) (Beavers, 2006).

The DRA has been found to have criterion-related construct validity, " … with coefficients ranging from .65 to .84 when compared to scores on other nationally standardized", inter-rater reliability estimates range from .74 to .80, and test-retest reliability estimates range from .91 to .99" (Rouse & Fantuzzo, 2006, p. 345). In a recent

study, the DRA and subtests of LNF, NWF, and PSF of the DIBELS were found to have a positive, significant relationships with concurrent DRA scores and future first grade DRA scores, with LNF having the strongest association with the DRA end of first grade reading scores (Rouse & Fantuzzo).

Procedure

A coded data base was provided by the school district for the purposes of this study, which included the DIBELS raw scores for September, January, and May for all kindergarten students during the 2006-2007 and 2007-2008 school years. Other demographic information included in this data base consists of gender, teacher, school, type of kindergarten programming (AM, PM or Full-day), participation in Project-K, and future DRA reading scores. For the 2006-2007 school year, both fall and spring first grade DRA, as well as the fall second grade DRA scores were included within the data base. For the 2007-2008 school year, first grade fall DRA scores were included. Any possible identifying features of the data were coded prior to the data base release.

Staff training and data collection.

The school district collected the DIBELS data as part of their regular screening assessments for kindergarten students. The school district used teams of staff members to assess each school in one day, and these teams remained generally consistent throughout both school years. These teams included school psychologists, reading therapists, instructional support teachers, instructional aides, an early education coordinator, and school psychology interns, as well as school psychology practicum students. In both of the school years, the school psychology doctoral intern and the school psychology interns

were members of all school teams in each year. Teams ranged from five to seven staff members, depending upon the school's enrollment and staff availability.

With regard to training, several of the team members received formal training on the DIBELS through a workshop that was conducted in the spring prior to the 2006-2007 school year outside of the school district. The school district also held a training one week before the first assessment in September of 2006 to review and/or teach the DIBELS procedures and standardization practices. The workshop was attended by all members of each school's assessment team during the 2006-2007 school year. The training was conducted by a formally trained team, which included the instructional support teacher, reading specialist, and school psychologist of one particular school.

In addition to a power point presentation, the DIBELS screening was role-played by the training staff during the presentation and another trainer scored the responses on an overhead. Next, staff members were given ample opportunity to practice the assessment procedures with each other after the formal introduction. Each staff member gave each subtest while the trainers circulated around the room to address concerns, questions, or to correct improper procedures. A similar training was held one week before the January DIBELS assessment to review skills and practice the new subtests that would be administered. In May of 2007, training was held for three new team members who replaced some staff members. The following school year, most team members within each school remained the same except for two new staff members. The training session was repeated in September and in January for the two new staff members who joined the DIBELS assessment team.

Each school was assigned a day within a 7 day period to assess its kindergarten students. Most assessments occurred within the same week with a few exceptions because of scheduling. All assessments within the schools occurred within a 7 day period. Students were generally assigned randomly to each assessor, by class. Class lists were cut in half; that is, one assessor was given the beginning of the alphabet and the other assessor was given the latter half of the alphabet. In an attempt to maintain consistent caseloads, some students were redistributed to another examiner if one caseload had too many or too few students. The average number of AM or PM children on each caseload per assessor ranged from 8 to 9 students per session, but the variability ranged from four to 12 students.

The DIBELS screening measures were given according to timeline and recommendations of the assessment. In the fall, two subtests were administered including the ISF and LNF. In January, the subtests of ISF, LNF, PSF, and NWF were administered, beginning two weeks after the return from the holiday break. Last, the beginning May assessment included the subtests of LNF, PSF, and NWF.

Each examiner was responsible for the scoring of his or her caseload, making up assessments of absent children within a week of the assessment, and returning protocols to the designated school team leader. Once the school team leader received all protocols for the school, the protocols were given to the school psychology doctoral intern, who had coordinated the DIBELS assessment for the school district. The school psychology doctoral intern then reviewed the scoring of the protocols of each child and entered the scores into the data base. This process was repeated three times during each academic year; these occurred in the middle of September, the middle of January, and the

beginning of May. The previous scores of September and January were checked while entering the new results. The final May data base was checked by a School Psychologist before the data base was released.

In addition to these scores, the DRA scores of the 2006-2007 kindergarten students were entered; this included three scores (fall of first grade, spring of first grade and fall of second grade). The 2007-2008 kindergarten students' fall DRA scores for first grade were entered as well. The scores were entered by a school psychologist prior to the data base being released to the researchers.

Criteria for Project K.

The instructional support teacher (IST) received the DIBELS data base from the coordinator of the DIBELS assessment team approximately two weeks after the assessments occurred. The IST teacher analyzed the data and identified students who were eligible for the program by rank-ordering them in terms of the greatest need. Kindergarten students were rank-ordered by risk level on each DIBELS benchmark test. Project K served students that met the following criteria (in order) until all available 32 spots were taken : 1) "at-risk" on more than one benchmark test by lowest score; 2) "at-risk" on one benchmark test by lowest score; 3) "some-risk" on more than one benchmark test by lowest score; and, 4) "some-risk" on one benchmark test by lowest score. After students were identified, letters were sent to parents indicating their child had qualified for Project K; the letters also explained the program. All children selected for the program participated in this intervention during both the 2006-2007 and the 2007-2008 school years. Any remaining students who qualified for the program based on the DIBELS assessment remained on a waiting list in rank order, and when students no

longer qualified for the program through progress monitoring, the next student was taken into the program.

Program implementation.

One of the four elementary schools within the school district chose to develop a prereading intervention program for kindergarten students, labeled Project K, which was guided by research-based principles of early literacy for students who were identified as at-risk or some-risk for developing future reading difficulties as assessed by the DIBELS. The premise on which Project K was based involved the utilization and implementation of a Tier 2 intervention program which would aid in the development of prereading skills; this prevention would reduce the number of struggling readers in first and subsequent grades. Early prereading skills such as fluency of letter identification, the alphabetic principle and PA were seen as essential in the development of reading skills and were addressed through a creative and innovative program. The DIBELS assessments were seen as tapping into measures of phonological awareness (ISF and PSF), measures of the alphabetic principle (LNF and PSF) as well as RAN. Project K was designed to be a cost-effective, Tier 2 prereading intervention program that used parent volunteers to provide one-to-one instruction to those students who qualified for the program.

The teaching activities of Project K were developed by the building's reading specialist to address the areas of literacy identified in the literature as necessary for future reading skills. The program was designed to be engaging to the student and to be varied for both the instructor and the student. Tasks were designed to be game-like and most were hands-on and interactive. The activities listed under each category that correspond to the DIBELS subtests began with more basic skills and ended with more complex

skills. Instructors began with the easier tasks first and, as progress was made, they moved on to more advanced skills.

Parent volunteers were the instructors for the Project K program and were supervised by the building's reading specialist. According to district policy, all parent volunteers provided both Child Abuse History clearance as well as clearance for criminal histories. For the 2006-2007 school year, four parents participated in the program and volunteered 60 to 90 minutes of their time, two days a week. For the 2007-2008 school year, three parent volunteers returned to the program and two additional parents were added. These parent volunteers were known by the school staff for their work within the school prior to Project K and were chosen because of their dedication, dependability, and their level of rapport with the students. Their average education was college-level; these parents had children within the school, none of whom were kindergarten students. With regard to ethnicity and gender, all instructors were female, eight were Caucasian, and one was African-American. Two parents had children who were receiving special education services within the school district.

Parent volunteers were trained in the appropriate instructional techniques by the reading specialist, either in small group instruction (two volunteers) or one-on-one instruction. The reading specialist demonstrated each task, explained its purpose, and method of recording progress of the students for each particular area. The volunteer then role-played the various activities, with the reading specialist acting as the student. Each child had a folder with sheets that corresponded to the four types of activities that could be used (ISF, LNF, PSF, and NWF). The volunteers were instructed to place the date that each activity was completed and rate the students' ability levels in each activity that

was performed on that particular day. A rating system from one to three was established and utilized, indicating the instructors' assessments of the student skills. A score of one delineated limited understanding, a score of two demonstrated some understanding of the skill and a score of three indicated that the student consistently performed correctly on the task.

The monitoring sheets served several purposes, but of greatest importance, the sheets provided a self-monitoring system for the instructor; these kinds of sheets had been utilized before in another study that was also a pre-reading program that targeted similar preliteracy skills (Nelson, Gregory, Benner, & Gonzalez, 2005). At a glance, the instructors could ascertain whether or not the students were consistently performing well on a particular activity and when to move to another task. Moreover, the reading specialist was able to monitor the progression of each student by reviewing the sheets as well. Volunteers were regularly monitored by the reading specialist through the review of the progress monitoring sheets and through direct observation, to ensure treatment fidelity. Information regarding the number of observations performed by the reading specialist is not available.

Instruction was provided in a one-on-one setting in order to maintain the greatest amount of time on task, engagement with the learning material, and targeted intervention based on the individual student's needs, given the short time frame of the intervention (15 minutes). ISF activities focused on the initial sounds of words which included finding objects that began with the same sound provided or by providing the sound of the object shown. These tasks included activities such as the Alphabet Book, Picture Puzzles, Phonics Strips, and Photo Noun Cards. The LNF activities focused on

recognizing, naming, and writing both the upper and lower cases of the alphabet as well as alphabetic order, with speed of identification stressed. Specific names of tasks within this category included Sandbox Writing, Magna Doodle, Alphabet Puzzle, and Flashcards. PSF activities focused on segmenting words or names of pictured objects into their 3 or 4 individual phonemes with activities called Pushing Pennies, Word Building, Picture Cards, and Spoken Words. Last, the NWF activities included Fundations Cards, Alphabet Puzzle, Picture Puzzle, Flashcards, Cookie Sheet, and Let's Spell. These tasks focused on the linking of individual sound(s) to the corresponding letter, the alphabetic principle, with a later emphasis on decoding or creating real and nonsense words. For a further description of activities and materials used within this intervention see in Appendix 1 through 4.

Direct instruction on the identified pre-reading skills, areas for which the students qualified, was provided two times per week for 15 minutes, for nine weeks, during the fall to winter and winter to spring time frames. The parent volunteers were assigned up to 4 students either in the AM or in the PM session of kindergarten and taught the same student for both days while they remained within the program. The ISF and the LNF activities were completed between the fall and winter administration of the DIBELS, and only in the area(s) of identified need. All of the activities with the exception of ISF, depending upon the students' need(s), were completed between the winter and spring administration.

Progress monitoring.

Progress monitoring was completed at the mid-point between the fall and winter administration of the DIBELS and the mid-point between the winter and spring

administration of the DIBELS, which occurred between the fourth and fifth week of each session. In the fall, if students achieved the mid-point score between the low-risk fall benchmark and the low-risk winter benchmark, or in the spring, he or she received at least a mid-score between the winter low-risk benchmark and the spring low-risk benchmark in all areas assessed, these scores were interpreted as the student's no longer being eligible for Project K. The mid-point scores, as listed in Table 7, were obtained by subtracting the fall benchmark for low-risk from the winter benchmark for low-risk, dividing the answer by two; this was then added to the fall benchmark for low-risk. Any answer that ended in .5 was then rounded up.

Table 7

Benchmark and Progress Monitoring Criteria for Low-risk on the DIBELS

Subtests	ISF	LNF	PSF	NWF
Fall	>7	>7		
PMF	>16	>17		
Winter	>24	>26	>17	>12
PMW		>33	>26	>18
Spring		>39	>34	>24

Note. DIBELS = Dynamic Indicators of Basic Literacy Skills (Good & Kaminski, 2002); ISF = Initial Sound Fluency; PSF = Phoneme Segmentation Fluency; Letter Naming Fluency; NWF = Nonsense Word Fluency; PMF = progress monitoring fall; PMW = progress monitoring winter

The mid-point score was believed to indicate that the students were now on the trajectory of a low-risk reader, as established by the DIBELS benchmarks; that is, half-way through the fall and winter administration, the students decreased their skill gaps to the level of expectations for their grades and for the time of year. It is hypothesized that after students meet low-risk expectations, they will continue to make progress along a non-risk trajectory.

After all DIBELS assessments, except for the fall which included the PMF and PMW, any Project K student who met benchmarks in all areas assessed were dismissed from the program. A letter was sent home to the parents to inform them of their children's' progress and subsequent dismissal from the program. The first student on the waiting list was then placed into the program and a letter was sent home to inform parents of their child's participation.

Within the school district, the DRA scores are obtained on all elementary school students, except for kindergarten, in the fall and spring of each academic year. Substitute teachers are obtained for each teacher on the scheduled DRA day to teach their classes. The regular education teacher administered the DRA one-on-one to each student in the entire class throughout that particular day. Each teacher had been trained in the administration and the results are reviewed by the reading specialist.

Analyses

Standard statistical measures were performed to quantify demographic and mean performance information for the participants among the students; these included percentage of males/females, ethnic composition of the sample, and other variables that will provide descriptive and pertinent information regarding the study sample.

Additional data analysis to control for violations of normality assumptions may be pursued to increase the generalization and utility of the study.

The independent variable was delineated into four separate groups: 1) students who received Project K in the fall only (fall only), 2) students who received Project K in the winter (winter only), 3) students who received Project K in both the fall and the winter (all year) and 4) students who represented the district mean without including the Project K students. For each subtest of the DIBELS (ISF, LNF, PSF, and NWF), a repeated measures MANOVA was performed to determine whether or not the independent variable, groups within Project K, significantly increased their pre-reading skills as assessed by the DIBELS between each time measures (fall to winter, winter and spring) when applicable. Using the MANOVA allows the exploration of the three independent variable groups, as well as the control group, by comparing subtests between time and within groups to explore interaction effects of repeated measures. Post hoc analyses were utilized for multiple group comparisons.

Chapter 4

Results

Hypothesis One - Fall to Winter

An RTI Tier 2 intervention program (Project K) that targets at-risk kindergarten students, as identified by the DIBELS, will significantly increase pre-reading skills to meet the DIBELS benchmark of low-risk, and there will be no significant difference in the district mean and the mean of kindergarten students who received the Tier 2 level of intervention in ISF and LNF between Time 1 and Time 2 (fall to winter) in ISF and LNF.

Initial Sound Fluency.

Table 8 represents the means and standard deviations of the intervention, Project K and the control group, with regard to the performance in ISF from fall to winter. An inspection of the means revealed that the Project K intervention groups displayed substantially lower initial sound knowledge when compared with the overall mean of the school district. The mean performance of the fall only, as well as the all year Project K group, fell within the at-risk benchmark of the DIBELS at pre-test. At post-test, all groups made substantial gains in their letter sound knowledge. In fact, the fall only Project K mean was four times higher and the all year Project K group mean was three times higher at post-test.

The Box's Test of Equality Matrices, which tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups, was violated ($p < .001$) and the Levene's Test of Equality of Error of Variance, which tests the null hypothesis that the error variance of the dependent variable is equal across

groups, was significant for ISF fall ($p = .007$); therefore, a univariate approach to the data was undertaken.

Table 8

Means and Standard Deviations of Initial Sound Fluency from Fall to Winter

		Fall		Winter	
Group	*n*	*M*	*SD*	*M*	*SD*
Control	654	14.55	9.19	27.05	13.06
Fall only	15	6.40	5.30	27.53	10.76
Winter only	20	8.20	4.79	19.25	6.92
All year	17	4.89	6.42	16.82	7.46
Total	706	13.96	9.21	26.59	12.92

A repeated measures MANOVA full factorial model with Type III sums of squares was performed on the four independent variable groups (fall only, winter only, all year, and control) between repeated measures of ISF from fall to winter. Tests of within-subjects effects using the Huynh-Feldt statistic, revealed a significant main effect for repeated measures from Time 1 to Time 2 ($F(1,702) = 139.52, p < .001$), accounting for 17 % of the variance between fall and winter. Tests of between-subjects effects, revealed a significant main effect for the Project K groups as well ($F(3,702) = 10.08, p < .001$), accounting for 4% of the variance with a sufficient power (power = .998). There was a significant interaction effect between time measures and Project K groups ($F(3,702) =$

2.96, $p = .032$), accounting for 1% of the variance, with an associative limited power of .702.

The significant effect was linear between repeated measures ($F(1,702) = 139.52$, $p < .001$) as well as between repeated measures and groups ($F(3,702) = 2.96$, $p = .032$). Moreover, there was a disordinal interaction; that is, one group's (fall only) pretest mean was lower than the winter only and the control group, although at post-test, the fall only group surpassed both the winter only and the control group. This finding is depicted in Figure 1.

A one way analysis of variance (ANOVA) was performed to examine the main effect for the Project K groups, with Bonferroni post hoc analyses used to determine group differences. There was a significant effect between groups ($F(3,716) = 12.85$, $p < .001$) in the fall and a significant effect between groups on post-test ($F(3,716) = 12.85$, $p < .001$). Each Project K group fell significantly below the control group in pre-test prior to intervention, indicated by the significant post hoc test of Bonferroni and the Student-Newman-Keuls. However, after receiving the intervention, the fall only Project K group was no longer significantly different from the mean of the district (control group) and was significantly higher than the other Project K groups. Moreover, contrasts performed on all groups between Time 1 and Time 2 revealed significance for all groups, which indicates all groups made significant progress between Time 1 and Time 2, but the fall only Project K group was the only group able to achieve a mean score similar to that of the district mean.

With regard to the DIBELS benchmark of ISF, as Figure 2 illustrates, the control group as well as the fall only Project K group fell above expectations of low-risk on the

winter post-test of ISF. The all year Project K group, as well as the winter only Project K group, which did not receive any intervention, fell above the at-risk benchmark of the DIBELS, but did not meet low-risk benchmark.

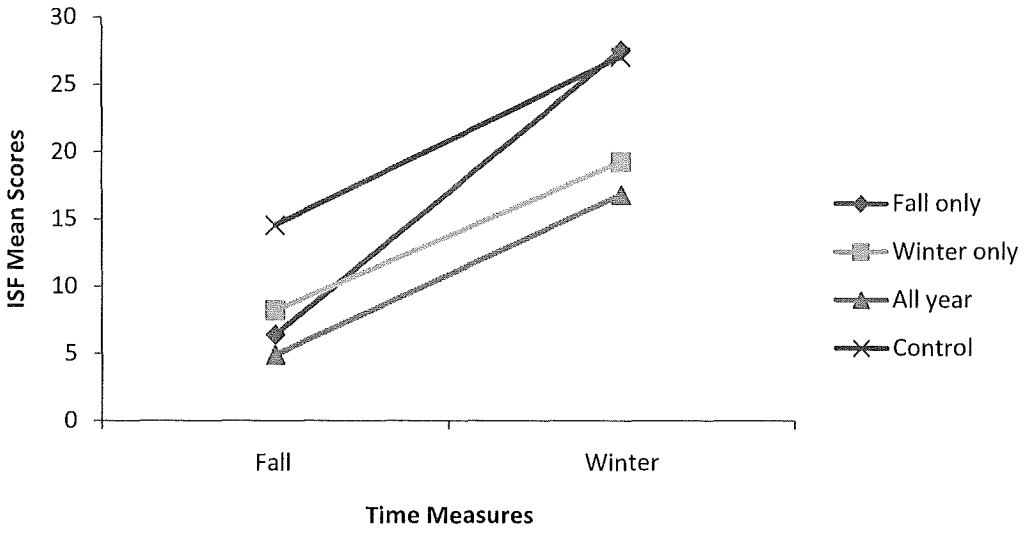

Figure 1. Mean scores of Initial Sound Fluency (ISF) between fall and winter.

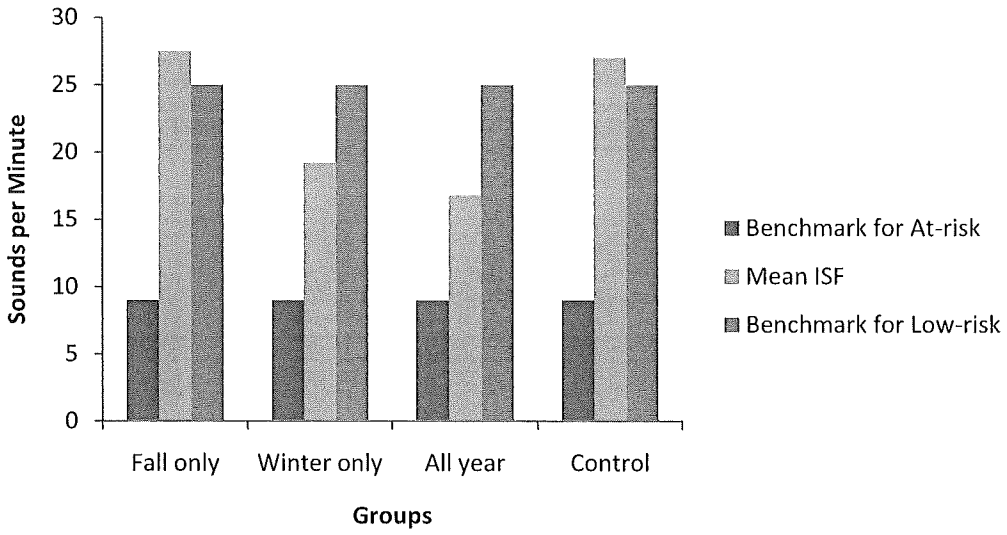

Figure 2. Initial Sound Fluency winter mean in comparison with at-risk and low-risk DIBELS benchmark. DIBELS = Dynamic Indicators of Basic Early literacy Skills; ISF = Initial Sound Fluency.

Letter Naming Fluency.

The means and standard deviations of the intervention groups, Project K and the control group, with regard to the LNF performance from fall to winter are shown in Table 9. An inspection of the means revealed that the all year Project K group had the lowest mean but the control group displayed the highest mean, with a distinct advantage over all the Project K groups. At the winter assessment, the all year project K group tripled their rate of letter identification and all groups made substantial progress between Time 1 and Time 2.

The Box's Test of Equality Matrices, which tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups, was not violated ($p = .256$). Therefore, a multivariate approach to the data was undertaken. Alpha level was set at $p = .05$ for all levels of analysis.

Table 9

Means and Standard Deviations of Letter Naming Fluency from Fall to Winter

		Fall		Winter	
Group	*n*	*M*	*SD*	*M*	*SD*
Control	654	27.34	14.83	42.86	14.65
Fall only	15	15.60	10.17	41.13	11.45
Winter only	20	19.25	13.40	33.46	12.99
All year	17	12.41	9.78	36.41	9.91
Total	706	26.50	14.91	42.35	14.47

A repeated measures MANOVA full factorial model with Type III sums of squares was performed on the independent variable groups (fall only, winter only, all year, and control) between repeated measures of LNF from fall to winter. The Wilks' lamdba multivariate test of overall difference among groups revealed a significant main effect for repeated measures from Time 1 to Time 2 ($F(1, 702) = 300.83, p < .001$), accounting for 30% of the variance between fall and winter with a sufficient associative power (power = 1.00). Tests of between-subjects effects indicated a significant main effect for Project K groups as well ($F(3,702) = 6.55, p < .001$), accounting for 3% of the variance with an acceptable power (power = .972). Additionally, a significant interaction effect between time measures and Project K groups ($F(3,702) = 7.05, p < .001$), accounting for 3% of the variance with a sufficient associative power (power = .981) was also revealed.

Tests within-subjects contrasts revealed that there was significant liner effects for repeated measures ($F(1,702) = 300.82, p < .001$) and between times and groups ($F(3,702) = 7.05, p < .001$). There was a disordinal interaction; that is, two group's (all year and fall only) pretest means were lower than all other independent variable groups, but at post-test, the all year and fall only Project K groups surpassed the winter only Project K group as depicted in Figure 3. This finding is not unexpected because the winter only Project K group did not receive any intervention within this repeated measure.

A one way analysis of variance (ANOVA) was performed to examine the main effect for the Project K groups by repeated measures, with Bonferroni post hoc analyses used to determine group differences. There was a significant effect between groups ($F(3,718) = 4.14, p = .006$) at pre-test and a significant effect at post-test between groups

($F(3, 718) = 10.42, p < .001$), indicating significant group differences at each time measure. Utilizing the Bonferroni method of multiple comparisons, each Project K group was not significantly different from each other in the fall pre-test. However, fall only and all year Project K groups fell significantly below the control group but the winter only Project K group and the control group were not significantly different. At post-test, groups that received the intervention (fall only and all year) were no longer significantly different from the district mean or control group. The winter only Project K group, which did not receive the intervention, fell significantly lower than all other groups, despite a higher pre-test mean when compared with other Project K groups, as illustrated in Figure 3. However, the Student-Newman-Keuls revealed no significant difference among the four independent variable groups at post-test. Moreover, contrasts performed on all groups between Time 1 and Time 2 revealed significance for all groups, indicating that all groups made significant progress between Time 1 and Time 2.

With regard to the DIBELS benchmark of LNF, as Figure 4 illustrates, all Project K groups as well as the control group fell above expectations on the low-risk benchmark of the DIBELS with the regard to post-test in the winter.

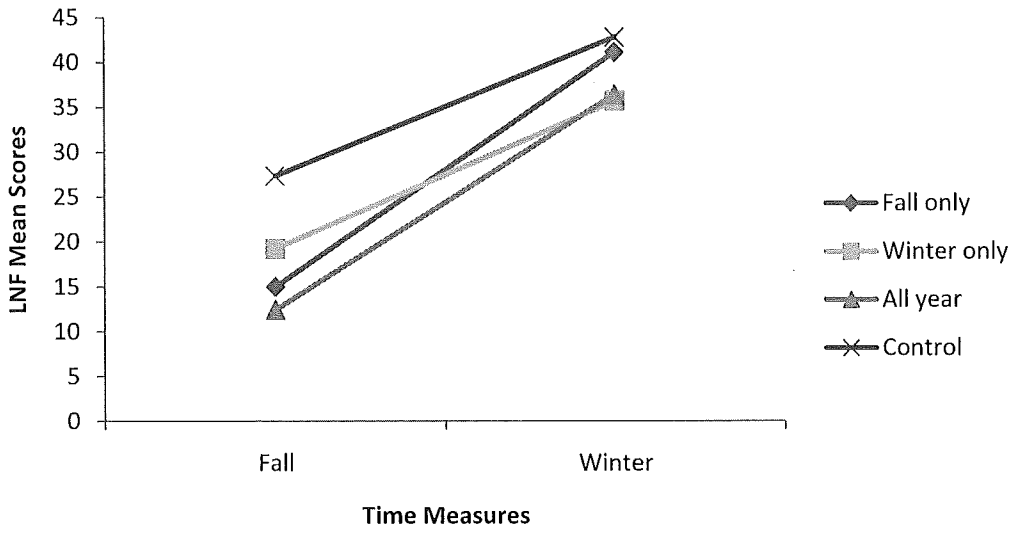

Figure 3. Mean scores of Letter Naming Fluency (LNF) between fall and winter.

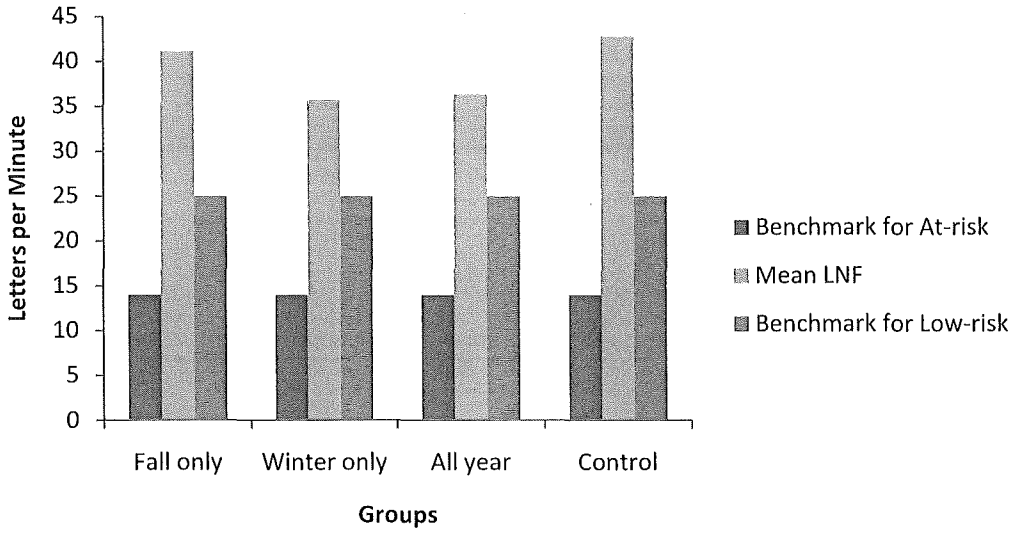

Figure 4. Letter Naming Fluency winter mean in comparison with at-risk and low-risk DIBELS benchmark. DIBELS = Dynamic Indicators of Basic Early literacy Skills; LNF = Letter Naming Fluency

Hypothesis Two - W inter to Spring

A RTI Tier 2 intervention program (Project K) that targets at-risk kindergarten students, as identified by the DIBELS, will significantly increase pre-reading skills to meet the DIBELS benchmark of low-risk and there will be no significant difference in the district mean and the mean of kindergarten students who received the Tier 2 level of intervention in LNF, PSF, and NWF between Time 2 and Time 3 (winter to spring).

Letter Naming Fluency.

Table 10 represents the means and standard deviations of the intervention, Project K and control group, with regard to the performance from winter to spring on LNF. An inspection of the means revealed that the all year and fall only Project K groups did not make any substantial progress between pre-test and post-test and the winter only Project K made better gains in the area of letter identification.

The Box's Test of Equality Matrices, which tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups, was not violated ($p = .181$). Therefore, a multivariate approach to the data was undertaken. Alpha level was set at $p = .05$ for all levels of analysis.

Table 10

Means and Standard Deviations of Letter Naming Fluency from Winter to Spring

		Winter		Spring	
Group	*n*	*M*	*SD*	*M*	*SD*
Control	653	42.86	14.56	50.24	14.85
Fall only	15	41.13	11.45	46.33	13.17

Table 10 (Continued)

		Winter		Spring	
Group	*n*	*M*	*SD*	*M*	*SD*
Winter only	24	33.46	12.99	42.54	11.99
All year	17	36.41	9.91	38.94	12.83
Total	709	42.35	14.47	49.62	14.83

A repeated measures MANOVA full factorial model with Type III sums of squares was performed on the four independent variable groups (fall only, winter only, all year, and Control) between repeated measures of LNF from winter to spring. The Wilks' Lamdba multivariate test of overall difference among groups revealed a significant main effect for repeated measures from Time 2 to Time 3 ($F(1,705) = 27.49, p < .001$), accounting for 4 % of the variance between winter and spring with a sufficient associative power (power = .999). Tests of between-subjects effects revealed a significant main effect for the Project K groups as well ($F(3,705) = 5.54, p = .001$), accounting for 3% of the variance with a sufficient power (power = .94). However, there was not a significant interaction effect between time measures and Project K groups ($F(3,705) = 1.40, p = .239$).

Tests of within–subjects contrasts revealed a significant liner effect for repeated measures from Time 2 to Time 3 ($F(1,705) = 27.49, p < .001$), accounting for 4 % of the variance between winter and spring indicating a uniform change between repeated time measures; however, there was not a significant linear effect between repeated measures

and Project K groups ($F(1, 705) = 1.408, p = .239$). There was a disordinal interaction; that is, one group (winter only) pretest mean was lower than the all other Project K groups but at post-test, the winter only group surpassed the all year Project K group. This finding is depicted in Figure 5.

A one way analysis of variance (ANOVA) was performed to examine the main effect for the Project K group collapsed between Time 2 and Time 3, with Bonferroni post hoc analyses used to determine group differences. There was a significant effect between groups ($F(1,705) = 8.93, p = .003$) when repeated time measures were collapsed. There was no significance between fall only and the control group indicating that the fall only students, who did not receive intervention between Time 2 and Time 3, were able to maintain their gains made between Time 1 and Time 2. However, the fall only group, although not significantly different from the control group, was also not significantly different from the other Project K groups. The winter only and the all year Project K groups were significantly lower than the control group but as stated previously, all Project K groups did not differ from each other. However, the post hoc test of Student-Newman-Keuls, found no significant difference among groups.

Contrasts performed on all groups between Time 2 and Time 3 revealed significance for the control and the winter only groups, but the fall only and all year groups did not make significant progress between the winter and the spring assessments. This indicates that although the fall only group was not significantly different from the control at Time 3, this group did not continue to make significant progress when the intervention was removed.

With regard to the DIBELS benchmark of LNF, as Figure 6 illustrates, all groups except for the all year Project K group were able to exceed benchmark expectations of the DIBELS for the spring LNF benchmark. The all year group fell slightly below the low-risk benchmark but within the some-risk benchmark.

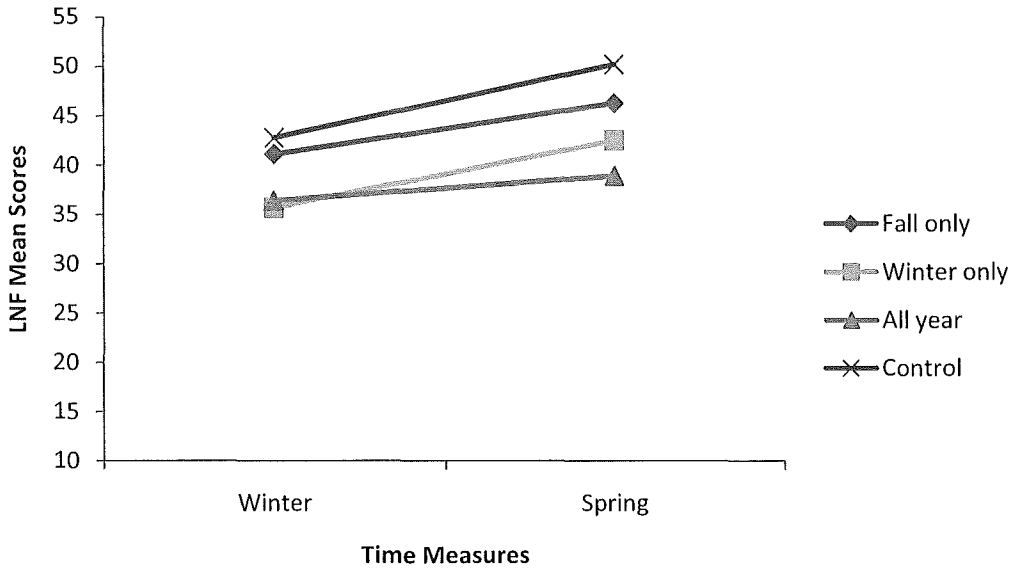

Figure 5. Mean scores of Letter Naming Fluency (LNF) between winter and spring.

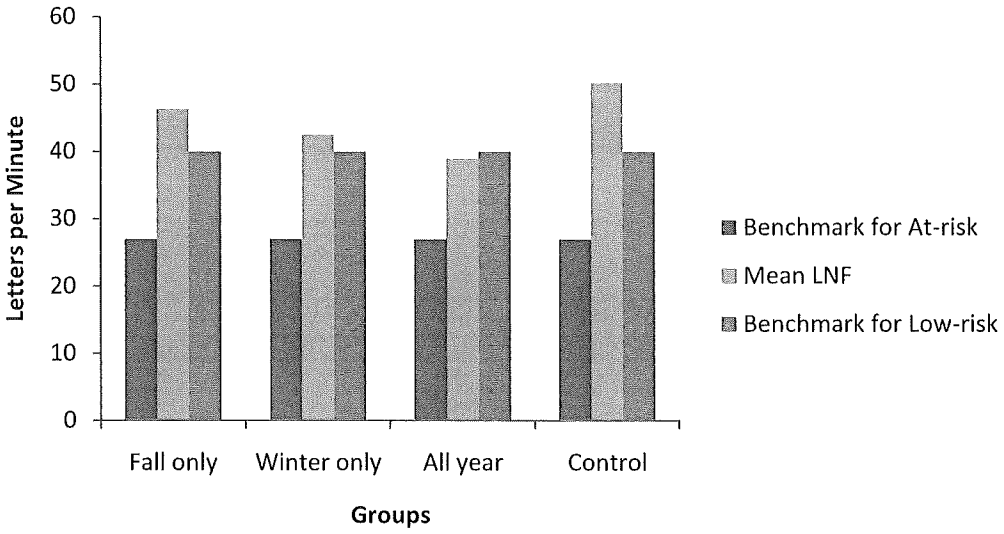

Figure 6. Letter Naming Fluency spring mean in comparison with at-risk and low-risk DIBELS benchmarks. DIBELS = Dynamic Indicators of Basic Early literacy Skills; LNF = Letter Naming Fluency

Phoneme Segmentation Fluency.

Table 11 represents the means and standard deviations of the intervention, Project K and the control group, with regard to the performance in PSF from winter to spring. An inspection of the means revealed that both the all year and the winter only Project K groups were at a distinct advantage in phoneme segmentation, when compared with the fall only Project K group and the control group in the winter. In fact, the fall only and the control group demonstrated three times higher mean scores than the all year Project K group. After the winter intervention, this distinctive mean difference was not present. Because the Box's Test of Equality Matrices, which tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups, was violated ($p = .001$) and the Levene's Test of Equality of Error of Variance, which tests the null hypothesis that the error variance of the dependent variable is equal across groups, was significant for PSF in the winter ($p < .01$), therefore, a univariate approach to the data was undertaken.

Table 11

Means and Standard Deviations of Phoneme Segmentation Fluency from Winter to Spring

		Winter		Spring	
Group	*n*	*M*	*SD*	*M*	*SD*
Control	652	25.09	14.12	38.63	13.97
Fall only	15	24.47	14.36	42.53	10.62
Winter only	24	9.29	8.49	36.79	12.34

Table 11 (Continued)

		Winter		Spring	
Group	*n*	*M*	*SD*	*M*	*SD*
All year	17	7.41	5.68	35.82	14.74
Total	708	24.12	14.34	38.59	13.86

A repeated measures MANOVA full factorial model with Type III sums of squares was performed on the four independent variable groups (fall only, winter only, all year, and control) between repeated measures of PSF from winter to spring. Tests of within-subjects effects using the Huynh-Feldt statistic, revealed a significant main effect for repeated measures from Time 2 to Time 3 ($F(1,704) = 259.80, p < .001$), accounting for 27 % of the variance between winter and spring. Tests of between-subjects effects revealed a significant main effect for the Project K groups as well ($F(3,704) = 7.88, p < .001$), accounting for 3 % of the variance with a sufficient power (power = .99). There was a significant interaction effect between time measures and Project K groups ($F(3,704) = 15.52, p < .001$), accounting for 6% of the variance with an associative sufficient power of 1.00.

The significant effect between repeated measures was linear ($F(1,704) = 259.80, p < .001$), and the significant effect between repeated measures and groups ($F(3,704) = 15.52, p < .01$) was also linear. In fact, there was a disordinal interaction; that is, one group's (fall only) winter mean was higher than the control group but at post-test, the

mean of the fall only group was lower than the control group. This finding is depicted in Figure 7.

A one way analysis of variance (ANOVA) was performed to examine the main effect for the Project K group, with Bonferroni post hoc analyses used to determine group differences. There was a significant effect between groups ($F(3,716) = 18.06, p < .001$) in the fall but no significant difference between groups on post-test ($F(3,716) = .758, p = .518$). Project K groups of winter only, who received no intervention, and all year Project K group fell significantly below the control and fall only group in the winter. In the spring, there was no significant difference among any of the four groups as indicated by the Bonferroni post hoc test as well as the Student-Newman-Keuls. Moreover, contrasts performed on all groups between Time 2 and Time 3 was significant for all groups, indicating that all groups made significant progress between Time 2 and Time 3.

With regard to the DIBELS benchmark of PSF, as Figure 8 illustrates, all means of Project K groups, as well as the control group, fell above expectations of low-risk on the spring post-test of PSF. It should be noted that the all year Project K group fell just above expectations.

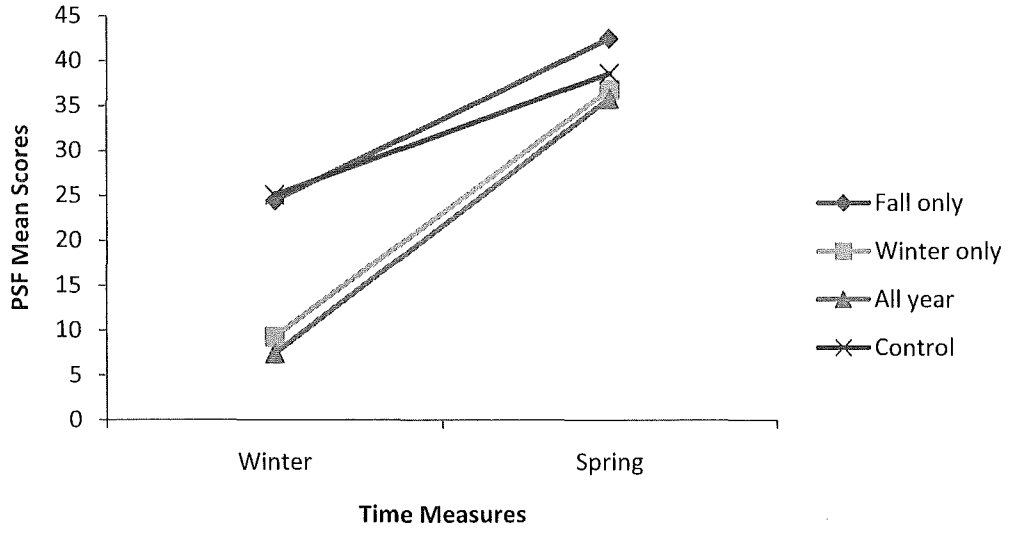

Figure 7. Mean scores of Phoneme Segmentation Fluency (PSF) between winter and spring.

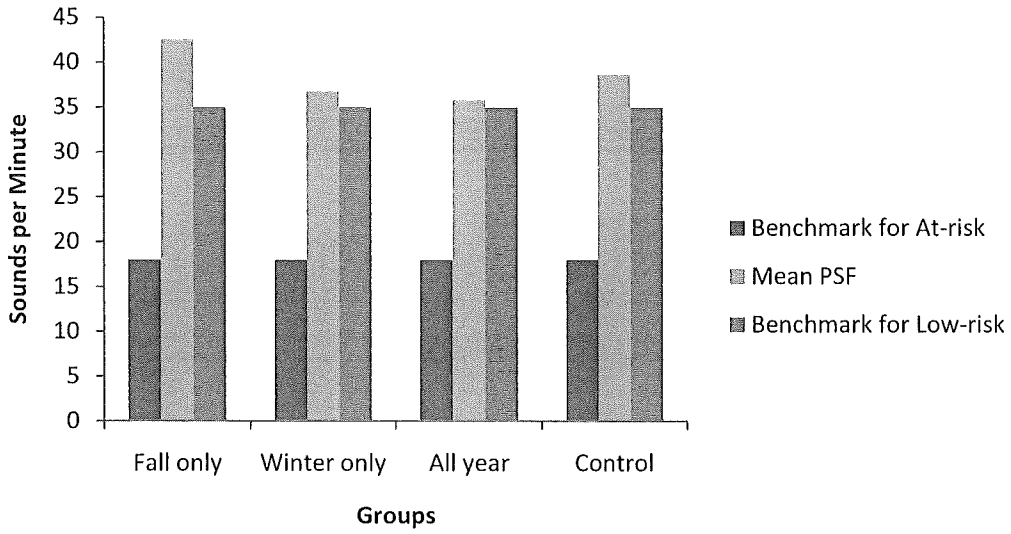

Figure 8. Phoneme Segmentation Fluency spring mean in comparison with at-risk and low-risk DIBELS benchmarks. DIBELS = Dynamic Indicators of Basic Early literacy Skills; PSF = Phoneme Segmentation Fluency.

Nonsense Word Fluency.

The means and standard deviations of the intervention, Project K and the control group, with regard to the performance in PSF from winter to spring is listed in Table 12. An inspection of the means revealed that the all year and the winter only Project groups were lowest in their ability to apply the alphabetic principle when compared with the fall only Project K group and the control group. In fact, the control group's mean performance was approximately double of all year Project K group. However, at post-test this difference between the all year and control group was not as substantial.

The Box's Test of Equality Matrices, which tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups, was violated ($p < .001$) and the Levene's Test of Equality of Error of Variance, which tests the null hypothesis that the error variance of the dependent variable is equal across groups, was significant for NWF in winter and spring ($p < .05$); therefore, an univariate approach to the data was undertaken.

Table 12

Means and Standard Deviations of Nonsense Word Fluency from Winter to Spring

		Winter		Spring	
Group	*n*	*M*	*SD*	*M*	*SD*
Control	650	26.26	20.25	35.72	22.82
Fall only	15	24.27	10.46	34.33	15.43
Winter only	24	17.58	13.42	29.00	10.73
All year	17	13.94	7.91	29.76	8.17

Table 12 (continued)

		Winter		Spring	
Group	*n*	*M*	*SD*	*M*	*SD*
Total	706	25.62	19.82	35.31	22.17

A repeated measures MANOVA full factorial model with Type III sums of squares was performed on the four independent variable groups (fall only, winter only, all year, and control) between repeated measures of NWF from winter to spring. Tests of within-subjects effects using the Huynh-Feldt statistic, revealed a significant main effect for repeated measures from Time 2 to Time 3 ($F(1,702) = 60.95, p < .001$), accounting for 8 % of the variance between winter and spring. Tests of between-subjects effects revealed a main effect for the Project K groups that approached significance ($F(3,702) = 2.32, p = .074$), accounting for 1 % of the variance and suggesting a trend. There was not a significant interaction effect between time measures and Project K groups ($F(3,702) = 1.18, p = .318$).

Tests of within-subject contrasts revealed a significant linear effect for repeated measures ($F(1,702) = 60.95, p < .001$), indicating a uniform change between times; however, there was no significant linear effect between repeated time measures and groups, indicating this effect was not uniform. There was a disordinal interaction; that is, one group's (all year) pretest mean was lower than all other groups but at post-test, the all year group surpassed the winter only. This finding is depicted in Figure 9.

A one way analysis of variance (ANOVA) was performed to examine the main effect for the Project K group when collapsed crossed time measures, with Bonferroni post hoc analyses used to determine group differences. There was no significant group differences ($F(3,705) = 2.32$, $p = .074$). However, the winter only and the all year Project K groups approached significance, indicating a trend that these groups performed lower than the control group. Moreover, contrasts performed on all groups between Time 2 and Time 3 was significant for all groups, indicating that all groups made significant progress between Time 2 and Time 3.

With regard to the DIBELS benchmark of PSF, as Figure 10 illustrates, all means of Project K groups, as well as the control group, fell above expectations of low-risk on the spring post-test of NWF.

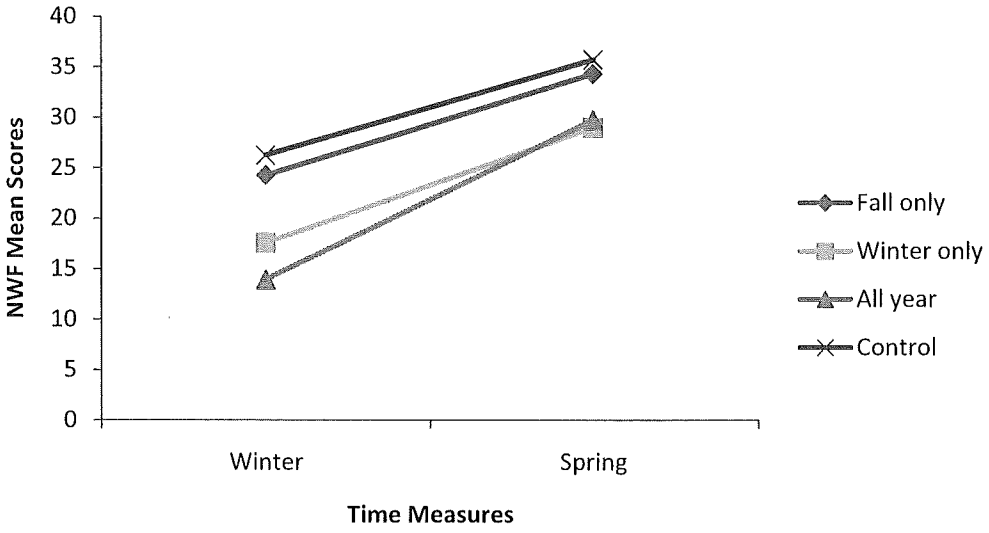

Figure 9. Mean scores of Nonsense Word Fluency (NWF) between winter and spring.

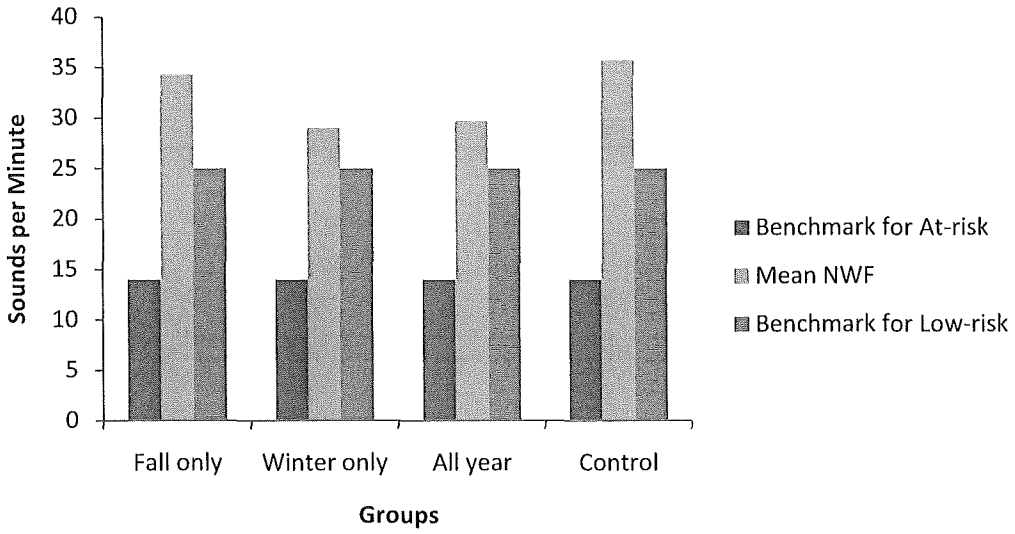

Figure 10. Nonsense Word Fluency spring mean in comparison with at-risk and low-risk DIBELS benchmark. DIBELS = Dynamic Indicators of Basic Early literacy Skills; NWF = Nonsense Word Fluency.

Hypothesis Three

When future reading skills are examined through the use of the Direct Reading Assessment, Project K students will meet grade-level expectations in the beginning of first grade.

Data was analyzed by a Pearson Chi-Square statistic because of the categorical nature of the data, with the alpha level of significance $p < 0.05$. The Pearson Chi-Square revealed significance between the independent variable groups with regard to the DRA levels ($\chi 2\ (3) = 10.53, p = .018$; $\varnothing = .121, p = .018$), thus, rejecting the null hypothesis that the independent variable groups and DRA levels are independent of each other and accepting that there is an association between the independent variables and DRA levels. Upon inspection of the percentages of students in each DRA level with regard to their grouping, it appears that the majority of the students fell within the Proficient range but there was lower representation in other DRA levels as illustrated in Table 13. When comparing the control and the Project K groups, the lowest percentage of students fell within the Below Basic range, followed by the Advanced range and then Basic range.

Table 13

Percentages of Beginning of First Grade Direct Reading Assessment Levels

	Control		Project K	
Level	*n*	%	*n*	%
Below Basic	26	3.80	0	0.00
Basic	99	14.50	4	8.30
Proficient	419	61.30	42	87.50

Table 17 (Continued)

	Control		Project K	
Level	*n*	%	*n*	%
Advanced	92	13.50	3	4.20
Total	636	100.00	48	100.00

Chapter 5

Discussion

Early intervention is now seen as essential in preventing reading disabilities or reading failures in all students. With recent changes to IDEA 2004, the RTI approach to identifying disabled students is being utilized within schools. There is a need to evaluate Tier 2 interventions in terms of their effectiveness especially with nonreading kindergarten students, in relation to future reading skills. This study examined the efforts of one elementary school to draw on validated research practices to design and implement an early intervention program (Tier 2) that targeted identified, early literacy skills in efforts to reduce at-risk students at the end of kindergarten and to prevent reading failures in future grades.

The results of the study suggest that early intervention in the form of a Tier 2 intervention program can significantly improve critical prereading skills with at-risk kindergarten students during kindergarten, and that these improvements can be sustained at the beginning of first grade. The findings of this study concurs with early intervention research, which suggest that early identification of struggling kindergarten students can be effective if systematic and direct instruction is provided to improve critical prereading skills in the prevention of future reading problems (NRP, 2000; Schatschneider & Torgesen, 2004; Shaywitz et al., 2008; Forman, Breier et al., 2003). It has been suggested that providing early intervention services in kindergarten through second grade, using researched-based practices is difficult and even challenging within classrooms and schools (Abbott, Greenwood, Buzhardt, & Tappia, 2006). However, this

study demonstrates that schools can provide these types of services which can be both effective and cost prohibitive.

Phonological Awareness (ISF and PSF)

With regard to PA, the results of this study are significant, highly promising, and supports research advocating systematic and direct instruction in early grades, such as kindergarten; these are essential and can have a statistically significant as well as positive lasting effect on reading development (Coyne et al., 2004; Foorman, Breier et al., 2003; Shaywitz et al., 2008; Torgeson, 2001; Schatschneider & Torgeson, 2004).

Within this study, at-risk students who received intervention only in the fall were able to outperform the typical performance of the district at the winter assessment in ISF. Moreover, this group appeared to be able to transfer learned skills to more advanced assessments of PA (PSF) because the fall only intervention group exhibited no significant difference when compared to the typical performance of the district on the PSF measure at the winter assessment. Students who received the fall only intervention were able to continue to make significant progress, as assessed by the spring benchmark and actually outperformed the district mean on this task, despite no intervention services within this time frame. The winter only Project K group was also able to make significant progress in PSF and was no longer significantly different from the district mean and met benchmark expectations as well. However, the fall only Project K group outperformed the winter only Project K group in all post-measures.

Students who have underdeveloped PA skills benefit less from reading instruction (Allor et al., 2006), whereas young students who receive systematic and direct interventions in PA display a more rapid response to beginning reading instruction

(Schneider, Roth, & Ennemoser, 2000). The results of this study support these statements because the fall only Project K group benefitted more from the intervention than did the winter only students in all areas assessed, despite the withdraw of services from the fall only group and the higher initial mean scores of the winter only. This finding that students benefit more fully from early instruction because it affects the development of other prereading skills has been labeled inoculation (Coyne et al., 2004). Early intervention programs that address weaknesses in PA and alphabetic principle reduce the percentages of at-risk students, thus making any further intensive interventions unnecessary if provided within a specific timeframe (Coyne et al.).

Early intervention acts as a jump start for reading development (O'Connor, 2000) and can inoculate students against reading failure. The reciprocal effect of establishing strong prereading skills in terms of PA, letter identification, and the alphabetic principle builds well-developed orthographic representations in memory and produces a strong foundation for future reading skills (Vellutino et al., 2006). The results of this study are consistent with the work of Vellutino and colleagues, who have found that early intervention services at the beginning of kindergarten produce significant improvement in phoneme segmentation as well as other prereading skills, with strong responders benefiting the most (Vellutino et al.).

On the other hand, the all year Project K students made significant progress from the fall to the winter benchmarks in ISF; however, they were unable to equal the mean of the district or that of the fall only group. This all year group no longer fell within the at-risk with regard to ISF benchmark, but was unable to meet the benchmark expectations. Moreover, their performance on the PSF assessment in the winter was the lowest of all

the other groups, indicating that PA skills demonstrated in ISF did not transfer to another type of PA task as did the fall only Project K group. However, at the spring benchmark of PSF, the all year intervention group no longer differed from the mean of the district and met the low risk benchmark for PSF after a total of 10 hours of instruction. These findings concur with other studies, which found that some students within their intervention responded more slowly, but with persistent interventions significant progress can be made (Vellutino et al., 2006; Berninger et al., 2002; Coyne et al., 2004). This difference in response rate among the Project K students will be addressed later in this section.

It should be noted that the total intervention time of the fall only group and the winter only group consisted of 4 1/2 hours over a nine week time frame. This small amount of instructional time appears to have had significant and lasting effects on tasks that assess PA skills. However, this is slightly less in duration (5 to 9.3 hrs or 10 hrs to 16 hrs) than the most effective instructional time length found in a recent meta- analysis (NRP, 2000); however, the fall only and winter only Project K groups demonstrated significant gains in the area of PA despite this limited instructional time. The all year students received double the amount of intervention time, which is within the optimal time frame for PA interventions. However, given the response of the fall only Project K group, the length of instruction may not be as important when compared with the time when the intervention occurred. PA interventions may not need to be lengthy for some at-risk students, especially if interventions are received at the beginning of kindergarten (Vellutino et al., 2006; Coyne et al., 2004).

It has been suggested that there is a need for simple, practical intervention programs that can be provided by teachers and paraeducators (Allor et al., 2006). In the majority of studies, PA instruction has been conducted by researchers (Fuchs et al., 2001). With the paradigm shift to RTI, schools will need researched-based, effective, practical, cost-effective programs that teachers and paraeducators can implement with a high degree of treatment fidelity. This present study adds to the growing literature that paraprofessionals can be used in providing effective instruction within a Tier 2 level of intervention (Vadasy & Sanders, 2008; Gunn et al., 2002; Musti-Rao & Cartledge, 2007; Vadasy et al., 2006; Allor et al., 2006). This study suggests that schools can implement a cost-effective, preventive prereading program that can be administered by paraprofessional or in the case of this study, parent volunteers.

Alphabetic Principle (LNF and NWF)

The results of this study found that subtests of LNF and NWF, which assess letter identification and the alphabetic principle, were not as robust as they were with PA. However, valuable as well as significant insights into the remediation of at-risk kindergarten students in terms of letter identification and the alphabetic principle can be surmised. Initially, for the task of letter identification with a RAN component (LNF), students who received the fall intervention (fall only and the all year group) fell significantly below the distinct mean at pre-test but not at post-test and met the benchmark for the winter DIBELS of LNF, indicating a significant repeated measures, group, and interaction effect. The rate at which children acquire letter identification skills has been shown to be predictive of future reading success (Lonigan et al., 2000; Schatschneider et al., 2004; Muter et al., 2004; Pennington & LeFly, 2001; Scarborough,

2002) and orthographic processes were found to be one of the best predictors of word reading (Georgiou et al., 2008), suggesting that these at-risk students benefited dramatically from the intervention. However, between the winter to spring time frame, the fall only and the all year intervention groups did not make significant progress when the intervention was withdrawn or when additional skills were targeted by the intervention. This indicates that they were able to maintain a level above benchmark without additional instructional activities; however, they did not progress.

It has been found that teaching PA with letters focusing only on two skills is more effective than teaching three or more skills at a time (NRP, 2000; Fuchs et al., 2001; Foorman, Chen et al., 2003). One could argue that the introduction of PSF, LNF, and NWF teaching activities interfered with the progress on LNF. However, because the mean of the all year students fell above the DIBELS benchmark for LNF in the winter, many students within this group did not receive direct and systematic instruction with regard to letter identification, suggesting that multiple skills were not factors. Furthermore, the lack of significant progress made by the fall only Project K group compared with the significant progress of the winter only group, who did receive the intervention, also suggest that this is not a factor.

Given the results of the other DIBELS subtests, specifically fall to winter LNF, it can be assumed that most of the students had learned the letters of the alphabet but the automaticity or fluency of letter identification was not as fully developed. Alphabetic automaticity is considered a developmental task which develops in preschool through kindergarten, and that effective instruction solidifies these skills to produce fluent and rapid letter retrieval skills (Torgesen, 1998). This automaticity of prereading skills are

linked to later reading fluency measures (Berninger, Abbott, Vermeulen, & Fulton, 2006) because the level of automaticity between letters and sounds or letter names affects the reading fluency of reading disabled students (Stage et al., 2006). Letter identification has to be over-learned to establish fluency (Adams, 1990). At-risk students may need more time and more interventional strategies to allow them to develop fluency and immediate recall of the letters. Withdrawing intervention or instructional activities too soon can stifle significant and positive progress in the area of the letter identification fluency.

The lack of progress of the fall only and all year Project K groups is important in illustrating the role that cognitive processes like RAN can play in the acquisition of preliteracy skills. Deficits in RAN have been found in children with reading and writing disabilities (Berninger et al., 2001a; Berninger et al., 2001b; Compton et al., 2001) and can be predictive of future poor reading skills (Hale & Fiorello, 2004). Assessments need to incorporate this fluency or retrieval component in order to monitor the progress of students accurately (Burke et al., 2009). To extend this argument further, it illustrates the need for cognitive neuropsychology assessments when determining the need for special education, because these assessments will allow for an examination of cognitive processes, and can be instrumental in forming an appropriate educational program for the student (Hale et al., 2006).

NWF is the DIBELS task that incorporates the alphabetic principle with the commencement of decoding or phonics skills. Students not only had to identify the letters but also had to convert them into the corresponding sounds in a rapid fashion to meet expectations of the DIBELS benchmark. This task combines the skills of PA, RAN, as well as letter identification, and is considered a more advanced task. The linking of

phonemes to the printed letter(s) is considered imperative to reading text (Foorman, Breier et al., 2003).

In the pretest of NWF, there was a trend that suggested the winter only and the all year Project K groups performed substantially lower than the fall only and the control group; however, at post-test this trend was no longer present. All groups were able to meet benchmark expectations of low-risk and were not significantly different from the district mean, despite the fact that NWF is a more advanced task than other DIBELS measures. Moreover, all groups made significant progress between Time 2 and Time 3 as well as met the benchmark for low-risk on the NWF task. This initial lack of significance among groups at pre-test may have diminished the overall results of this task; however, it suggests that interventions as well as classroom practices may have begun to build some decoding skills in students.

Future Reading Trajectories and Skills

Reading trajectories that are established early in schooling, are resistant to change, and difficult to remediate (Coyne, Kame'enui, & Simmons, 2001) without early intervention (O'Connor, 2000). This statement is supported by the winter only group's DIBELS trajectories before intervention. The winter only Project K group did not receive any intervention between the fall and the winter assessments. Between time measures, their DIBELS subtest trajectories did not substantially reduce the gap between them and the control group, if at all. Thus, the gap between the winter only and the control group did not close, despite formal schooling. This suggests that at-risk students who do not receive intervention services, despite formalized schooling, are not able to close the gap between typically performing peers without intervention services (Chatterji,

2006). This is consistent with research which indicates that the skills kindergarten students possess upon entering school will often determine their reading trajectories (Kaplan & Walpole, 2005; McCoach et al., 2006). The trajectories of the Project K groups within this study are consistent with the assertion that poor reading trajectories can be improved if critical prereading skills are improved within kindergarten (Burke et al., 2009; Torgesen et al., 2001).

This current study validates the premise that early intervention with kindergarten students can have positive effects on the acquisition of literacy skills and can also have positive effects on future reading skills that are measured within first grade (Anthony & Lonigan, 2004; Foorman, Breier et al., 2003; Schatschneider & Torgesen, 2004; Vellutino et al., 2006). Students who participated in the Project K intervention were able to positively change their reading trajectories of critical prereading skills and match the typical mean performance of the district in most areas assessed, with no groups falling within the at-risk range at post-test.

Moreover, this positive progress transferred to their performance on the fall DRA in first grade because only four students out of 48 who received the intervention fell within the Basic range, and no students fell within the Below Basic range. District level expectations of Proficient were met by 87.5% of the Project K students in the fall of first grade, even after summer vacation. This percentage is consistent with another study's finding indicating that between 75% to 100% of the kindergarten students who received 25 hours of intervention services were able to make acceptable reading progress in mid-first grade (Coyne et al., 2006). This present study achieved comparable rates with only 4 1/2 to 10 hours of instructional time. The percentage of Project K Students within the

Basic or Below Basic range was 8.3%, whereas the district percentage was 18.3%, suggesting that this intervention reduced the number of at-risk students, which is consistent with some RTI research (Brown-Chidsey & Speege, 2005; O'Connor, 2000; Speece et al., 2003). Of the four students of Project K that fell below Proficient, two students were from the all year Project K group, as would be expected and two were from the winter only Project K group, adding support for the earliest intervention.

The results of this study suggest that targeting critical prereading skills in kindergarten can reduce poor reading trajectories, thus reducing reading failure (Torgesen et al., 2001; Torgesen, 2002; Good, Simmons, & Smith, 1998; Burke et al., 2009). Early intervention can be imperative in reducing the rate of reading failure in future grades (Schatschneider & Torgesen, 2004; Shaywitz et al., 2008). Schools will benefit more fully by providing early intervention services when the probability of successes is high and little instructional time is needed to meet with success (Berninger et al., 2002).

Rate of Response

Although all students within the intervention responded to the treatment, they did so at different rates. There appeared to be fast responders as well as slow responders to the intervention, as delineated by the fall only and winter only Project K groups (fast responders) and the all year Project K group (slow responders). This different response rate to intervention has been documented in other studies (Berninger et al., 2002; Berninger et al., 2000; Coyne et al., 2004; Vellutino et al., 2006). However, the overall significant results of the all year Project K students in meeting benchmarks and mean district scores on the DIBELS subtests at the end of the kindergarten and the beginning of

first grade were somewhat surprising, but promising, given their initial response to the intervention.

Strong responders to kindergarten intervention programs can experience an inoculation effect through the middle of first grade (Coyne et al., 2004) to the end of second grade (Berninger et al., 2002) and through third grade (Vellutino, et al., 2006). This current study highlights the fact that strong responses to a fall kindergarten intervention are significantly beneficial and produce high inoculation effects during kindergarten. That is, the fall only Project K students appear to have benefited more from the intervention. They outperformed the winter only group in all DIBELS subtests after the fall intervention, despite the winter only group's higher initial mean scores in all areas assessed in the fall. This suggests that the winter only students would have benefitted more fully from intervention services at the start of the school year rather than delaying services. Berninger and colleagues found that providing intervention to these fast responders jolted the acquisition of reading skills and these students were able to maintain average levels in reading through second grade (Berninger et al., 2002). As stated previously, at-risk students identified at the start of kindergarten who receive intervention gain a stronger foundation of literacy skills, and benefit more fully from early instruction because they achieve stronger, more integrated first grade literacy skills, often requiring less instructional intervention time (Vellutino et al., 2006).

On the other hand, the all year Project K group, which involves students who could be considered as slow responders, did not display the magnitude of effect or transference of skills to other tasks as the fall only intervention group initially displayed. The all year Project K group consistently performed lower on initial pre-tests when

compared with all groups and required double the length of intervention to meet most expectations or benchmarks. This consistent pattern of significantly lower scores on most measures throughout the year, when compared with the accomplishments of the fast responders has been noted in another study (Berninger et al., 2006). The all year group required more time to learn and transfer critical prereading skills, but with persistent intervention significant progress was made. They were no longer significantly lower than the typical mean performance of the school district in LNF, PSF, and NWF. Moreover, the all year Project K students met spring benchmarks for PSF and NWF and fell slightly below the benchmark for LNF (38.94 vs. 39.00). These findings are consistent with similar studies which found that harder-to-remediate children require more instructional intervention than other students, but could eventually meet with grade level expectations (Vellutino et al., 2006; Berninger et al., 2002; Coyne et al., 2004).

It has been suggested that a student's initial response to treatment could be considered a barometer to serve as a discriminator between biological or environmental causes of reading struggles and to aid educators in identifying nonresponders (Vellutino et al., 2006). Researchers have noted that not all students will respond to researched-based effective instruction (McMaster et al., 2005). Estimates of students not responding to intervention range from 20% to 30% within regular education (Torgesen, 2000) and to over 50% in special education (Fuchs et al., 2001). These students may require intensive and lengthy intervention to make or maintain gains and have been labeled as nonresponders in the research (McMaster et al., 2005). Frequency of nonresponders who do not respond to intensive intervention or Tier 2 level of interventions ranges from 2% to 6% of the population (Torgesen, 2000).

However, it is felt that the all year Project K students should be categorized as slow responders rather than as the nonresponder group that has been identified in the research. A meta-analysis conducted to examine nonresponders found that researchers use different criteria to define nonresponsiveness either by performance level or by growth rate (Al Otaiba & Fuchs, 2002). Performance rate within the analysis was defined as point from the 10^{th} to 50^{th} percentile on different assessment tools and the growth rate was defined as no growth or limited growth (Al Otaiba & Fuchs). Some researchers have suggested a dual-discrepancy approach (Fuchs & Fuchs, 1998), which suggests that students who are classified as nonresponders must be lower than their peers in both in growth rates and in performance levels (McMaster et al., 2005).

In general, the all year Project K students were able to match or exceed the growth rate of the district and were also able to meet benchmark expectations as established by the DIBELS. This suggests that there was no discrepancy either in growth rate or in performance rate when compared with average peers at the end of kindergarten. However, these students did require twice the amount of time to establish these skills when compared with the fast responders; hence, the slow to respond label. The different response rates of students to early intervention services are worthy of educators' attention because they need to be aware of these patterns before determining whether or not a student should be considered as a nonresponder. If the intervention is withdrawn too soon, these slow- to- respond students may look as if they are nonresponders, despite the inaccurate label.

Limitations

The focus of this study was to examine preliteracy skills in kindergarten students, and, because of this focus, other areas in the development of reading were not addressed such as reading comprehension, working memory, and language development. Although the findings of this study provides support for the use of Tier 2 interventions with kindergarten students relative to prereading skills, there are several limitations to this study that must be considered.

First, a small sample size and unequal representation with regard to the students who received the intervention ($n = 54$) may have influenced the findings, given their rather limited number. Moreover, there was considerable homogeneity in the population and representation of low SES and minority students was lacking. Therefore, these factors may not allow for a high level of generalization or inferences about other populations.

Another factor that may have influenced the results of this study is that the intervention occurred in one particular school and not throughout the district. The results of this study may have been influenced by unforeseen school and/or teacher effects. The procedure to ensure fidelity of treatment must also be examined. Although the parent volunteers were trained, observed, and used monitoring sheets to track the performance of students, which were then reviewed by the reading specialist, no formal observations were scheduled and no data is available on the instruction of these parent volunteers. Therefore, these factors suggest a need that the study be replicated to demonstrate the effectiveness in other schools with different populations. Moreover, within subjects factors, such as intellectual functioning or cognitive processes, may have influenced the

interventions groups, such as the all year Project K group. However, without intellectual measures and cognitive measures, these confounding variables cannot be interpreted. Regression to the mean may have influenced the results of this study as well.

The exclusion of the extended-day kindergarten students may have contributed to these results because these students were seen as being the highest at-risk students within the district and may have a higher potential for the nonresponder classification. Eliminating the neediest or highest-at-risk students may have unduly influenced the positive results of this study. However, the results of this study provide a realistic picture of what a school with dedicated and creative staff members can accomplish in terms of early intervention with kindergarten students, without specialized programming and the effects that Tier 2 level of intervention can have on future reading skills.

Future Research

This study needs to be replicated in different school settings and with diverse populations to determine the effectiveness of Project K. It is worthy of replication because of the positive and significant results that were achieved with a minimal time of intervention (4 1/2 hrs to 10 hrs). Some studies employed a longer time of intervention, 30 minutes a day, (Vellutino et al., 2006; Coyne et al., 2004; Gunn et al., 2002), yet others (O'Connor et al., 2005; Musti-Rao & Cartledge, 2007) employed under 15 to 20 minutes, two to three times a week. If similar results and long-term benefits can be achieved with less intervention time, then more students who are at-risk have the potential to gain entry into an intervention. Moreover, examining the effectiveness of small-group instruction with the Project K intervention may also be beneficial because more students can be serviced through the program if small groups are just as effective as

one-to-one instruction. Furthermore, longitudinal research would be beneficial in examining whether or not the effects of the intervention are long lasting or if they dissipate in later grades. "

As educators and psychologists begin to implement the RTI model within schools, several aspects within this model need to be addressed through research and practical use. Questions such as, "What qualifies a student as a non responder?". "How should this be measured?"; "What is the minimal length of time and duration for a Tier 2 intervention"?, and "How can treatment fidelity be guaranteed?", are some areas that need consideration by the schools as well as researchers (Compton, 2006). Based on this study, if the intervention is removed too soon for slow responders, then a higher number of non responders will be identified; thereby increasing the percentage within special education services. Psychologists and schools need to make careful data-based decisions that are guided by research, given the disparity of responses to intervention among students. Consistency within the RTI model is imperative; otherwise, the RTI approach to identifying SLD might be susceptible to the same criticisms given to the discrepancy model because different states and different school districts within the same state may develop different standards of practice regarding RTI. RTI is a powerful and promising method in identifying SLD; however, if questions and definitions within this model are not addressed, this model, like the ability-achievement model, will come under scrutiny.

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Appendix A

Description of the Initial Sound Fluency Activities

Name	Description of materials and activities
Alphabet book	Description of material This activity used the book, *My Big Alphabet Book,* which was bought commercially through an education supply magazine (Steps to Literacy, 2006). The book is 10 inch by 13 inch long which included tab pages for letter groupings. The pages presented color pictures of an object(s) that corresponded to the named letter which was represented in both lower-case and upper-case form (Aa). The word for each object shown was displayed in black print below the picture. Description of activity The instructor and the student examined the book together while the instructor stressed the beginning sounds of objects. "What starts with the sound /l/?" or "What letter is at the beginning of light?" were encouraged as a way to elicit answers from students. The purpose of this task was to aid students' understanding that objects can be grouped by beginning sound.

Appendix A (continued)

Name	Description of materials and activities
Picture puzzles	Description of material This activity used 4 inch by 6 inch rectangles that contained both upper-case and lower-case form of a single letter in blue with a red background for all 26 letters which was bought commercially through an education supply magazine (Steps to Literacy, 2006). This piece was connected to another blue background piece with a yellow object that represented the initial sound of the letter that it was linked to. This foam puzzle could be separated between the letter and the corresponding object. Additionally, the letters and the objects could be removed from the background, leaving silhouettes of the removed objects or letters. Description of activity Instructor chose six to eight objects that had been removed from its foam puzzle. The instructor then stated, "Find me the object that begins with /p/."

Appendix A (continued)

Name	Description of materials and activities
Phonic strips	Description of material Phonic strips, which was bought commercially through an education supply magazine (Steps to Literacy, 2006), were long rectangles (8 x 2), which had been divided into four parts leaving four 2 x 2 inch squares on the strip. The first square had both the upper-case and lower-case letter in the upper left-hand corner on the square. A colored picture, which begins with this letter, was in the middle and the word for the picture was printed below the object. The first letter of the word was underlined to emphasize the beginning letter. The tiles for this activity were 2 x 2 squares that contained a colored picture of a common object with a word underneath the picture and a line for the missing beginning letter (_us for bus, _ at for bat, and _ ed for bed). Each consonant letter of the alphabet had three corresponding cards, and the back of each card had the matching letter and corresponding object that appeared on the phonic strip.

Appendix A (continued)

Name	Description of materials and activities
Phonic strips	Description of activity Beginning consonants were the focus of this activity. The instructor prepared for this activity prior to the student arriving by choosing 3 or 4 phonic strips and the corresponding picture tiles. The child sorted the tiles according to beginning sound and laid the titles on the corresponding strip. This activity can be self-checked by looking on the tile's back. The second activity was in game format; the instructor pulled several phonic strips and the corresponding tiles. The tiles were arranged in a pile facing up. The instructor and the student took turns placing the top tile on the matching strip. The player who completed a strip won.
Photo noun cards	Description of material This activity used 40 6x6 inch photographed colored pictures of common nouns which are typically found around the house. This activity was bought commercially through a popular education supply magazine (Resources for Reading, 2006).

Description of activity

The child named the object and its initial sound. A blend (/cr/ for crib was acceptable. In another activity, the instructor arranged four chosen photo cards in a square. Next the instructor asked the student, "Which picture begins with the /t/ sound" or "Which sound does box begin with".

Appendix B

Description of the Letter Naming Fluency Activities

Name	Description of materials and activities
Sandbox writing	Description of material The sandbox consisted of an 8x8 inch wooden box with white sand inside the box. The bottom of the box was of a dark blue board so that when letters were written with the finger deeply enough the blue would show the letter that was written. This sandbox was bought commercially through an education supply magazine (Primary Learning, 2006). Description of Activity The instructor helped the student recognize letters, name letters, and write letters in both upper case and lower case. Speed of naming letters was encouraged as well as accuracy of the written letter. The instructor asked the student to write a letter named or say the letter that was written by the instructor. Unknown letters, which were not quickly written or named, would continue to be asked in that session or subsequent sessions. Known letters were mixed with unknown letters to avoid frustration.

Appendix B (continued)

Name	Description of materials and activities
Magna Doodle	Description of material The Magna Doodle is a commonly purchased child's toy that allowed students to draw black letters with a magnetized pen on a 4¼ x 7½ white surface area. The letter drawn could be erased by moving a lever across of the length the board. Description of activity In this activity, the instructor helped the student recognize letters, name letters, and write letters in both upper-case and lower-case. Speed of naming letters was encouraged as well as speed and accuracy of the written letter. The instructor would ask the student to write a letter named or say the letter that was written by the instructor. Unknown letters that were not quickly written or named would continue to be asked in that session or subsequent sessions. Known letters were mixed with unknown letters to avoid frustration.

Appendix B (continued)

Name	Description of materials and activities
Alphabet puzzle	Description of material The foam alphabet puzzle, which was bought commercially through an education supply magazine (Steps to Literacy, 2006), is an 11½ by 11½ yellow square with blue lower case letters that can be taken out of the puzzle, leaving the letter silhouette. This yellow square could be removed from a red tray, which contained a white laminated card with pictures of objects. When the letters were removed and the letter foam board was placed within the tray, a picture of an object with the same beginning sound would show through within the silhouette of the letter. Description of activity The instructor would begin this activity by removing a small number of letters and placing them on the work surface. The yellow foam square was removed from the red tray. As the letter was named, the child retrieved the puzzle piece and replaced it within the puzzle. As this activity progressed, the number of letters available at the start of the activity increased.

Appendix B (continued)

Name	Description of materials and activities
Alphabet flashcards	Description of material Flashcards consisted of all upper case letters appearing on the front of a 3 x 6 rectangular card with the corresponding lower case letter appearing on the back of the card. Each card had color codes at the bottom with different colors on each side which allowed students to check for accuracy during alphabetic activities. These flashcards were bought commercially through an education supply magazine (Resources for Reading, 2006). Description of activity There were four different activities that the instructor could have chosen from while working with the flashcards. In the Line Up activity, students would line shuffled cards (either lower or upper case) in alphabetic order. The color bars would match when correct. In the Missing Letters activity, the instructor arranged the letters in ABC order and removed some letters leaving spaces. The child then

determined which letters were missing and replaced them. The third activity was called, "Who's the Teacher". The child showed a letter card to the instructor who then answered either correctly or incorrectly. The student gave a thumbs up for correct or a thumbs down for incorrect. Lastly, in the Basic Drill activity, one flashcard was revealed one at a time. The sequence of focus for this activity first consisted of the upper-case letters, then lower-case letters, and finally mixed (lower-case and upper-case letters together). The instructor and the student worked to increase speed.

Appendix C

Description of the Phoneme Segmentation Fluency Activities

Name	Description of Materials and Activities
Pushing pennies	Description of material This activity used three pennies and a 9 x 13 inch magnetic cookie sheet. On this cookie sheet, a 2 x 6 rectangle, which was divided into thirds, had been drawn in black marker. Description of activity In this activity, the students were given various words containing three phonemes such as mop, tub, ship, dig, wet, back, red, chin, fun, and dash. The digraphs /sh/ /ch/ /th/ /wh/ and /ck/ make one sound. Students identified and pronounced the sounds within the given word orally and then pushed a penny into a box for each sound.
Word building	Description of material This activity consisted of 3¾ x 4½ rectangles, each with a picture representing a three phoneme word such as "pig" or "sun" with the word printed below (Didax Inc., 1993). The cards were cut into thirds to represent the three sounds. Colored backgrounds contrasted the picture and the word

Appendix C (continued)

Name	Description of materials and activities
Word building	listed below. Once the puzzle was reassembled, the word and the picture were complete as well. This puzzle was bought commercially through a popular education supply magazine (Resources for Reading, 2006). Description of activity In this activity, the instructor placed pieces of the puzzles onto the working surface. The student then put the puzzle together to build a word. As each puzzle was assembled, the student tapped each sound and then said the whole word once the puzzle was complete.
Picture cards	Description of material This is a program-made activity that consisted of common objects printed from the computer on 2 x 4 inch white labels. The labels were then adhered to a green 3 x 5 index card. The phoneme segmentation of the word was handwritten on the back for the instructor.

Appendix C (continued)

Name	Description of materials and activities
Picture cards	Description of activity The instructor begins by showing one of the index cards with an object shown. The student names the picture and produced its individual phonemes.
Spoken words	Description of material No materials needed for this activity.
	Description of activity The instructor orally presents a word of three to four phonemes. The child segments the word into individually phonemes out loud. Some words used include box (b-o-x), rash (r-a-sh), snack (s-n-a-ck), bench (b-e-n-ch), town (t-ow-n), to name a few.

Appendix D

Description of the Nonsense Fluency Activities

Name	Description of materials and activities
Sound cards	Description of material This activity used 3 x 4¼ inch lamented cards that are part of the Fundations Reading Program (Wilson Language Training Corporation, 2002). The cards contain the upper-case and lower- case letters on the top of the card which was written in black. A colored picture of an object that had the same beginning sound was in the middle of the card. At the bottom, the letter, name of object, and sound are written in black. Description of activity In this activity, the students were asked to name the letter, the object and the sound and then recite all three together. For example, A, apple, /a/.
Alphabet board	Description of material See Letter Naming Fluency section for description.

Appendix D (continued)

Name	Description of materials and activities
Alphabet board	Description of activity In this activity, the instructor removed 6 to 8 letters from the board to reveal the pictures underneath. The name of the picture was stated and then the student said the beginning sound of the object named and the corresponding letter name before finding and replacing the puzzle piece.
Picture puzzles	Description of material This activity, which was bought commercially through an education supply magazine (Steps to Literacy, 2006), consisted of a 26 rectangular two part puzzle that had a picture of an object on one side of the puzzle and the corresponding beginning letter in both upper-case and lower-case on the other. The two sides could be pulled apart, which provided a unique puzzle fitting for the object and its corresponding letter.
	Description of activity In this activity, the student says the name of the picture, its initial sound, and then located its corresponding letter.

Appendix D (continued)

Name	Description of materials and activities
Flashcards	Description of material Flashcards consisting of 52 colored photo cards of objects on a 3 x 6 rectangular card with the corresponding upper-case and lower-case letter appearing on the back of the card with the name of the object. Long and short vowels were included as well as secondary sounds for the letters c, g, and x. This product was bought commercially through an education supply magazine (Resources for Reading, 2006). Description of activity The instructor presented the picture of an object on one card. The students are asked to provide the sound of the object as well as the letter.
Cookie sheet	Description of material This activity used a 9 x 13 inch cookie sheet and 26 magnetic letters, with vowels and consonants in contrasting colors. On this cookie sheet, a 2 x 6 rectangle divided into thirds had been drawn in black marker. A program-made

Appendix D (continued)

Name	Description of materials and activities
Cookie sheet	word pack of three phoneme words were printed in thick black computer ink on 2 x 3 green laminated index cards consisting of 18 nonsense words and 36 real words. Description of activity The instructor read a word from the word card pack and the student tapped the three sounds out before building the word by pushing the appropriate letters into the squares on the cookie sheet. Differences between real words and nonsense words were discussed.
Let's spell	Description of material This was a commercially produce flip-book (Resources for Reading, 2006) segmented into thirds, which allowed the production o a variety of 3 phoneme words. The first and the last phonemes were consonants and the middle sound was always a vowel.

Appendix B (continued)

Name	Description of materials and activities
Let's spell	Description of Activity The students randomly flipped cards to reveal words. The child then read then word, either as a whole or as separate sounds, and decided if the word was real or nonsense.